PHASE 3 ENVIRONMENTAL SITE ASSESSMENT Former Alcan Fuels Ltd. Site Haines Junction, YT

0201-98-13537

Submitted to:

Indian & Northern Affairs Canada

March, 1999



EBA Engineering Consultants Ltd.

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EXECUTIVE SUMMARY

EBA Engineering Consultants Ltd. (EBA) was requested by the Department of Indian and Northern Affairs Canada (INAC) to provide a proposal for a Phase 3 Environmental Site Assessment (ESA). The objective of the assessment was to investigate the lateral and vertical extent of contamination in the vicinity of a former bulk fuel storage site. This proposal formed the basis of a Call-up, under Standing Offer 98-6200, to conduct the Phase 3 ESA.

A combination of hand auger holes, test pits and boreholes were advanced on the property to assess soil contamination in the area formerly occupied by three aboveground storage tanks (ASTs). The field work was conducted in two stages to confirm the precision of field screening equipment under the site conditions and then to complete the delineation of hydrocarbon contamination on the property.

A combination of ten hand auger holes and nine test pits were used in the preliminary stage of field work and a total of 21 boreholes were advanced to a maximum depth of 12.3 m in the second stage to collect representative soil samples. On-site screening of soil vapours and soil samples was used to assist in determining the borehole locations, depth of completion and to select appropriate samples for laboratory analysis.

Throughout the field work a total of 72 soil samples were collected and analyzed using field screening equipment. From the soil samples collected, 35 were selected for laboratory analysis to determine hydrocarbon concentrations for comparison with selected criteria. Groundwater was not encountered on the site during this drilling program.

The criteria for determining acceptable concentrations of hydrocarbons in the soil were derived from the Commercial Land Use guidelines and standard contained in either Canadian Council of Ministers of the Environment documents or in the Contaminated Sites Regulations (Yukon). Based on field screening and laboratory results, including those obtained in a previously completed Limited Phase 2 ESA, two areas of contamination were delineated. The volumes of contaminated soil were estimated at 940 m³ and 110 m³ for a total of approximately 1050 m³.

Remediation options are presented, based on the contaminants and soils found at the site.



1.0 INTRODUCTION

EBA Engineering Consultants Ltd. (EBA) received a Call-up under Standing Offer 98-6200 to conduct a Phase 3 Environmental Site Assessment (ESA) of a lot formerly leased to Alcan Fuels Ltd. in Haines Junction, Yukon (Figure 1). The site is located at km 1937 on the Alaska Highway, the UTM coordinates are northing 6 737 750 and easting 363 100 on map sheet 115 A/13.

A previous Limited Phase 2 ESA¹ at this site found concentrations of hydrocarbons in excess of commercial land use standards². near three former bulk tank locations on the site.

All references in this report are to the three former AST locations unless otherwise specified. The information present in this report has also been organized in relation to the former tank locations. This allows for the interpretation of the results based on these three identified sources of the contamination.

This report incorporates and is subject to the attached "Environmental Report - General Conditions".

1.1 BACKGROUND

In June 1998, Mr. Thomas Echervogt, on behalf of Source Motors, retained EBA to perform a Limited Phase 2 ESA that included the subject property.

The objectives of the Limited Phase 2 assessment were to identify soil contaminated with hydrocarbons and to determine if there are significant hydrocarbon contamination issues relative to the Contaminated Sites Regulations. A total of four boreholes were advanced by Great Northern Oil Inc. to assess soil conditions in the vicinity of the three former bulk tank locations. EBA was present throughout the drilling program to conduct on-site hydrocarbon vapour testing of representative soil samples from all boreholes and to select appropriate samples for laboratory analysis. Due to limitations with the drilling equipment supplied, these boreholes did not extend beyond 6.4 m depth.



The bulk tanks consisted of two vertical above ground storage tanks (ASTs), one gasoline, the other stove oil, and a horizontal AST for furnace oil (Figure 2). Information collected through interviews conducted as part of the Limited Phase 2 ESA indicated that these were the only products stored in the respective tanks. This information was not verified, as records were not available within the Yukon.

Following decommissioning of these tanks it was reported (T. Echervogt) that the berms were pushed inward and the site was levelled. It was anticipated that this may have covered or obscured other signs of contamination such as surface stains or stressed vegetation in the area formerly occupied by the tanks. Details of fuel delivery systems (unloading and dispensing) could not be verified and no plans of the tanks or piping systems were found. The gasoline and stove oil ASTs were located inside a common containment dike. The furnace oil tank did not have a containment dike.

In the Phase 2 ESA laboratory analytical results of concentrations of hydrocarbons in the soil samples were compared to the Commercial Land Use standards established in the Contaminated Sites Regulations. Laboratory results showed soil samples from three of the four boreholes had hydrocarbon concentrations well in excess of the regulatory standards. The type of hydrocarbon contamination detected was not consistent between boreholes, indicating releases of hydrocarbons from more than one source.

From the laboratory analytical results it was known that contamination in the area of the gasoline AST extended to beyond 6.4 m and was thought to be a mixture of gasoline and diesel type products. The mixing of contaminants was thought to indicate the lateral migration of contaminants on the site.

1.2 OBJECTIVES OF THE CURRENT STUDY

The objectives of this Phase 3 ESA were to:

- 1. determine the vertical and lateral extent of soil contamination which had been identified in the Limited Phase 2 ESA;
- 2. determine if groundwater contamination had occurred, if groundwater was encountered within a reasonable depth; and
- 3. suggest remedial options based on the results of the assessment.



For the purpose of assessing contamination, the chemical analytical results have been compared to guidelines in both the Canadian Council of Ministers of the Environment publications and standards in the Contaminated Sites Regulations. A detailed discussion of the assessment criteria is presented in Section 2.4 of this report.

1.3 AUTHORIZATION

Call-up number 98-6200-01 was issued to EBA based on a proposal submitted to Indian and Northern Affairs Canada dated July 24, 1998.

1.4 SITE DESCRIPTION

Alcan Fuels is located adjacent to the Alaska Highway, approximately 2.1 km west of the Haines Road intersection in Haines Junction, Yukon Figure 1. The subject site is adjacent to the northern side of the service station property (Lot 88 Group 803 of Plan 55189) as shown in Figure 2.

The soil stratigraphy of the site consists of surficial fill from the levelling of the old containment berms, overlying a damp to moist, dense, glacial till consisting of silt and clay with a trace of sand and gravel. There are also sand lenses throughout the till that vary in thickness from 0.1 m to 1.3 m. At depth, this glacial till decreases in moisture content and increases in density. Drilling this material was very difficult. Groundwater was not encountered in any of the boreholes during the subsurface investigation. These soil conditions are consistent with other sites in the Haines Junction area.

Within the old containment cell areas, fill materials were observed to exist from the surface to varying depths of 1.0 m to 1.5 m. After the ASTs were removed from the containment cells the berms of each cell were used as fill and pushed into the depression of the containment cell area. This was substantiated by debris found at approximate depths of 1.0 m to 1.5 m in some of the boreholes.

Groundwater was not encountered in any of the boreholes drilled on the site. The static water level in a well (Figure 2) on the adjacent property was measured at approximately 30.0 m below surface. A dense silty till layer was encountered at depths ranging from approximately 8 to 12 m in boreholes drilled at this site. This layer appears continuous throughout the site and it is



anticipated that it would form a barrier to the vertical migration of contaminants. Penetration of this layer was purposely minimal; to ensure that this protective barrier would be left intact.

The site was cleared of vegetation and generally flat (Photograph #1) with a gentle slope to the southwest. The nearest surface water is the Dezadeash River approximately 400 m south of the site (Figure 1).

1.5 SCOPE OF WORK

The Phase 3 ESA was based on information obtained during the Limited Phase 2 ESA. Since fine grained soils (low void ratio) were encountered in the earlier field work program, there was concern that the field screening equipment may not provide a level of precision that would allow decisions to be made during the drilling program. To determine if field screening could be relied upon to make decisions in the field, a preliminary soil investigation was undertaken to determine the precision of the vapour monitoring equipment and immunoassay soil test kits, given the soil conditions at this site.

The scope of work completed for this Phase 3 Environmental Site Assessment was as follows:

- Conducted additional information review to locate background material on piping locations, as-built drawings and tank usage.
- Designed a field program to identify the vertical and lateral extent of soil and groundwater contamination using the commercial land use classification and criteria in CCME publications and CSR.
- Conducted a preliminary soil investigation to identify the lateral extent of contamination and to determine the precision of the field screening equipment under the site conditions.
- Conducted a drilling program to delineate contaminant plumes on the site.
- Submitted soil samples for analysis of benzene, toluene, ethylbenzene and xylenes (BTEX), extractable hydrocarbons, volatile petroleum hydrocarbons, and Polycyclic Aromatic Hydrocarbons (PAHs) for comparison with selected guidelines and standards.
- Prepared a report discussing the field program, chemical analysis results, environmental
 concerns associated with the site and remediation options based on the contamination found at
 the site.



2.0 METHODOLOGY

The field program was conducted in two stages; the first was designed to test field screening equipment under the site conditions present and to establish the lateral extent of near surface contamination. This allowed for a better understanding of the near surface contamination and maximized the efficiency of the second stage drilling program.

2.1 PRELIMINARY SOIL INVESTIGATION

Available information indicated that contaminant releases were at or near the surface of the site. Therefore, a preliminary stage of the field investigation was used to determine the approximate lateral extent of contamination in the upper two metres of soil. This stage was also used to determine the precision of the field screening equipment.

A soil vapour probe was used in conjunction with a hollow stem hand auger and test pitting (dug by hand) to collect soil and soil vapour samples down to approximately two metres below surface. The vapour probe would be inserted into the soil and vapours drawn up into testing instrumentation through a Teflon® tube. The vapour probe system was first field tested by inserting the probe approximately 0.5 m into the soil in an area of known contamination on the site (Borehole 13413-BH01 Phase 2 ESA) to compare instrument readings with laboratory results obtained during the Phase 2 assessment. Soil samples were collected by inserting a core sampler with a clean stainless steel tube liner through the hollow stem auger and retrieving a sample from the undisturbed soils below the auger tip. Soil samples from the test pits were collected from the bottom of the test pit using a clean sampling trowel.

Sampling equipment was cleaned with a soap and water mixture and rinsed with water prior to sampling at each sample depth. Auger flights were cleaned in a similar fashion between each test hole.

Ionizable soil vapour concentrations were used as an indicator of hydrocarbon contamination in the soil. The vapours were analyzed with either a Photovac MicroTIP® or a Rae MiniRae® photoionization detector (PID) using a 10.6 eV lamp. These instruments provide a digital readout of the level of ionizable components of the vapour. The PID readings provide a semi-quantitative



comparison of ionizable vapour levels in soil which were used to select soil samples with the highest apparent hydrocarbon contamination in each borehole.

Selected soil samples were analysed using an EnviroGardTM Soil Field Lab with Total Petroleum Hydrocarbons (TPH) specific test kits as a second field screening tool. This is an immunoassay kit that produces a reaction specific to total petroleum hydrocarbons (TPH). The extent of reaction is measured by a colourmetric change and compared to standards with known concentrations using a photometer.

Hand auger holes and test pits were located in a step out pattern to identify the lateral extent of contamination. PID readings were recorded at 0.5 m intervals from hand auger holes and test pit locations, and duplicate soil samples were collected from approximately every metre during this preliminary stage of the site investigation. One sample, from selected duplicate sets, was analyzed using the immunoassay TPH field kit; the second sample was retained for laboratory analysis.

Samples for laboratory analysis were selected based on PID and immunoassay test results. The selected samples covered the full range of field screening results to establish field screening results indicative of contaminant concentrations in excess of criteria and to detect false negatives. Laboratory results from selected samples were used to confirm contaminant levels and to establish levels of confidence in the PID and immunoassay field test results in order to focus the second stage drilling program.

2.2 DRILLING AND SOIL SAMPLING PROGRAM

Following the collation of field screening and laboratory results the second stage drilling plan was developed. The drilling plan involved first collecting grab samples (disturbed soil samples) along the lateral edge of the near surface contaminant plume in order to supplement information on the lateral extent of near surface contamination. Once the lateral extent of contamination had been clearly defined, hollow stem augers and a 50 mm diameter sampling spoon were used to collect undisturbed samples to determine the vertical extent of contamination.

The drilling program was undertaken from September 14 to 17, 1998. The drilling program employed an all-terrain vehicle mounted CME 750 drill rig for both solid and hollow stem augering to collect soil samples. A total of 9 solid stem boreholes and 12 hollow stem boreholes



were drilled in the locations as shown in Figures 3 to 5. Field screening equipment was used to assist in determining the extent of drilling as well as selection of samples for laboratory analysis.

Soil samples were collected approximately every 1.5 m from each borehole. Sampling was more frequent when apparent contamination or stratigraphic changes were detected. Grab samples were collected by first trimming the exterior soils on the auger flights and sampling the newly exposed soil from between the auger flights for each of the boreholes. Undisturbed soil samples were collected by advancing the 50 mm split spoon through the hollow stem augers and sampling in the undisturbed soils beyond the auger tip.

Field analysis of soil vapours was conducted on all soil samples collected; results are recorded on the individual borehole logs. Following completion of the boreholes, samples were selected (based on PID readings and sample location) for analysis using the immunoassay field kit. Samples were selected for laboratory analysis based on field screening results and sample location. Field screening results were also used to assist in determining borehole locations and the efficient use of drilling equipment. Laboratory analysis was used to determine soil contaminant concentrations for comparison to selected criteria.

2.3 LABORATORY ANALYSIS

Soil samples collected for analysis were stored and shipped in a cooler packed with ice to Enviro-Test Laboratories (ETL) in Edmonton. ETL is an accredited laboratory under The Canadian Association for Environmental Analytical Laboratories (CAEAL).

Soil samples were submitted for chemical analysis of benzene, toluene, ethylbenzene and xylenes (BTEX), Volatile Petroleum Hydrocarbons (VPH), Extractable Petroleum Hydrocarbons (C10-C18) and Extractable Petroleum Hydrocarbons (C19-C32) concentrations. Following these analyses, five samples with the highest Extractable Petroleum Hydrocarbon concentrations were selected for Polycyclic Aromatic Hydrocarbons (PAHs) analyses.



2.4 ASSESSMENT CRITERIA

For the purpose of this assessment, both the Canadian Council of Ministers of the Environment (CCME) guidelines³ and Contaminated Sites Regulations (CSR) have been used in the evaluation of the concentration of contaminants in the soil, as directed by INAC. The commercial land use category was selected as the applicable land use for this site based on current use of the property.

The CCME guidelines were used as the primary reference. Where guidelines have not been listed for particular parameters, the CSR standards were used. For the CCME criteria, generally the 1997 recommended guidelines are listed. The provisional guidelines and check values were also review to determine which criteria was the most stringent.

For volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons and heavy extractable petroleum hydrocarbons only the CSR generic numeric soil standards are available. It should be noted that the hydrocarbon concentrations are reported as Extractable Petroleum Hydrocarbons (EPH) followed by the carbon range. The Contaminated Sites Regulations specify commercial land use standards for Light Extractable Petroleum Hydrocarbons (C10 - C18) and Heavy Extractable Petroleum Hydrocarbons (C19 - C 32) which are 2000 ppm and 5000 ppm respectively. The concentrations listed in the regulations essentially consist of EPH values, which are corrected for Polycyclic Aromatic Hydrocarbons (PAH). Since PAH concentrations were not expected to significantly affect the analytical results at these action levels, the EPH analyses have been used. For the site, five soil samples with the highest EPH concentrations were submitted for analysis of PAH concentrations to validate this assumption.

In the CSR, BTEX compounds have several numerical values associated with each land use. These "matrix numerical values" allow for site specific factors to be taken into consideration in the evaluation of concentrations of contaminants in soil. The site specific factors of human intake of contaminated soil and toxicity to soil invertebrates and plants are required to be considered for all sites. Groundwater was not encountered in the Phase 3 drilling program but the standard for groundwater used for drinking water was *considered* due to a well located on the adjacent property. This well is not currently used for drinking water (per. T. Echervogt). Where more than one CSR criteria is available, the most stringent applicable criteria has been listed.



Based on the proximity to the Dezadeash River, the CSR aquatic life criteria were also considered in the evaluation of concentrations of hydrocarbons at the site. In all cases the most stringent criteria related to the factors considered have been provided in Tables 1 to 3.

For the purposes of estimating the volume of soil that may be contaminated in excess of the selected criteria, laboratory analyses for all parameters were considered. Where any one parameter was in excess of the criteria that sample was considered to be within the contaminant plume. Contours were then established for the extent of the contaminant plume at the surface, 3.0 m depth and 11 m depth. Where adjacent boreholes showed concentrations of contaminants that bracketed the criteria, the contour was placed nearest the borehole with contaminant concentrations below criteria. The volume of contaminated soil was then calculated as the volume contained within the contours. This method of calculating the volume of soil assumes a consistent lateral migration between boreholes.

3.0 RESULTS

Tables #1 – 4 summarizing the chemical analysis are presented at the end of this report. This is preceded by Figures containing information on site and borehole locations. The raw data tables, results of soil grain size analyses and borehole logs are presented in Appendix A. The Enviro•Test Laboratory and Norwest Labs Chemical Analyses Reports and QA/QC data are presented in Appendix B.

Tables are broken down into data collected during the Limited Phase 2 ESA and the Phase 3 ESA. The identification number for each sample, borehole, hand auger hole or test pit is preceded by a five digit job number which is unique to each of the two phases of work. This combination of job number and identification number is consistent throughout the summary tables, raw data tables and analytical results sheets.



3.1 SOIL CHEMICAL ANALYSIS

Laboratory analyses of hydrocarbon concentrations in soil are provided in Tables 1 through 3 and Table 4 contains Polycyclic Aromatic Hydrocarbon results. The results are grouped by borehole location except for PAHs. The borehole numbers, sample numbers and sample depths are listed within each table. Borehole locations are shown on Figures 3 through 8. The CCME and CSR criteria for Commercial Land Use are provided in each Table for comparison to analytical results.

Polycyclic Aromatic Hydrocarbon laboratory analyses were performed on five samples with the highest EPH concentrations. The results presented in Table 4 show that all parameters analyzed are below the selected criteria.

Bulk Gasoline AST

The laboratory results (Table 1) indicate that contamination exceeding the criteria was found in the area of the Gasoline AST to a maximum depth of 10.9 m (Borehole 13537-BH25). The chromatogram for this sample is typical of a diesel type of product indicating the source to be from other than the Gasoline AST. The BTEX compounds exceed both the CCME and CSR criteria in Boreholes 13413-BH01 & 04, 13537-BH10, & 23 and in Test Pit 13537-TP01 as shown in Table 1. The CSR standards for Volatile Petroleum Hydrocarbons and/or Light Extractable Petroleum Hydrocarbons were exceeded in Boreholes 13413-BH01 & 04, 13537-BH10, 20, 23 and 25 and in Test Pit 13537-TP01.

Of the soil samples collected in this area only the sample from 1.7 to 1.9 m in Borehole 13413-BH04 has a chromatograph indicating only a gasoline product. All other samples analyzed show patterns that indicate light end hydrocarbons in the C8 to C12 range, typical of gasoline and kerosene products as well as the presence of a diesel type of product.

The analytical results suggest that the contamination in the vicinity of the Gasoline AST appears to merge with the contaminant plume originating from the vicinity of the Stove Oil AST. Figures 5 & 6 depict the area estimated to contain concentrations of hydrocarbons in excess of the criteria.



Stove Oil AST

The laboratory results (Table 2) indicate that contamination exceeding the criteria was found in the area of the Stove Oil AST. Boreholes 13413-BH02 and 13537-BH23 had concentrations of some or all of the BTEX compounds which exceed the CCME criteria in the upper 3.3 m of the soil profile. Boreholes 13537-BH13 & 23 had benzene concentrations exceeding the CSR standard for groundwater flow to drinking water and Borehole 13537-BH23 and Test Pit 13537-TP05 had concentrations of light extractable petroleum hydrocarbons exceeding the CSR standards. Field screening results also indicate elevated hydrocarbon concentrations in the upper 2.7 m of soil in Borehole 13537-BH11. The chromatograms for these samples all show evidence of a diesel type of product, presumably stove oil.

Analytical results from Boreholes 13537-BH12, 13 & 22 located to the north and east of Boreholes 13537-BH02 (Figure 3) show concentrations of hydrocarbons below the selected criteria. Field screening results from these boreholes as well as hand auger holes and test pits generally indicate concentrations of hydrocarbons that are anticipated to be below the criteria. One notable exception is Test Pit 13537-TP05 (Figure 3) which have concentrations of hydrocarbons in excess of the criteria for Extractable Petroleum Hydrocarbons (C10 – C18) as shown in Table 2.

Figures 5 & 6 depict the area estimated to contain concentrations of hydrocarbons in excess of the criteria. The results suggest that contamination originating in the vicinity of the Stove Oil AST has combined with contamination in the vicinity of the Gasoline AST.

Furnace Oil AST

Laboratory analytical results for soil samples in the vicinity of the Furnace Oil AST (Table 3) indicate three borehole locations that contain concentrations of hydrocarbon contamination exceeding the criteria. Analytical results from Borehole 13413-BH03 (1.3 to 1.5 m) show concentrations of toluene and xylenes which exceed CCME guidelines. This soil sample also has concentrations of benzene and EPH (C10 –C18) which exceed the CSR standards. Hand auger hole 13537-HA09 had concentrations of toluene exceeding the CCME guidelines and Borehole 13537-BH19 had concentrations of benzene exceeding the CSR standards.



Field screening results indicate that Borehole 13537-BH07 also had concentrations of contaminants expected to exceed the criteria.

Figures 7 & 8 depict the area estimated to contain concentrations of hydrocarbons in excess of the criteria.

3.2 SOIL GRAIN SIZE ANALYSES AND BOREHOLE LOGS

Soil conditions encountered in the Phase 3 drilling program were similar to those encountered during the Limited Phase 2 ESA. Soil stratigraphy information for all boreholes is detailed in the borehole logs provided in Appendix B.

The grain size analysis reports from the Limited Phase 2 ESA are presented in Appendix A. The analysis shows that soils which generally ranged from 0.3 to 5.5 m were a mixture of silt and clay with only a trace of sand or gravel (Photograph #3).

Soil grain size analysis completed on borehole BH13413-1 (Limited Phase 2 ESA) indicated that the soil at the 3.0 m level was silt and clay with a trace of sand. This changed to silt with sand and a trace of gravel for the sample collected at approximately 6.2 m in this borehole.

4.0 INTERPRETATIONS

4.1 GENERAL

Significant hydrocarbon contamination exceeding both CCME and CSR criteria was encountered in two general areas. One area is located in the vicinity where the gasoline and stove oil ASTs were located and the second area is near the former furnace oil AST. The contaminant plumes appear to be contained within the property boundaries.

The contamination found near the gasoline and stove oil ASTs appears to be from two distinct sources. The contaminant plumes have combined at depth to form a single plume. Since the laboratory analytical results show three distinct types of contamination which correspond to the three ASTs, the discussion of results has been separated based on the contaminant source.



The transition to dense glacial till at depth is considered to be continuous throughout the site and is also considered to be a barrier to the vertical migration of hydrocarbons. It may also contribute to the lateral migration of contaminants along the top of this layer. It is further noted that organic materials were encountered intermittently at various locations and depths throughout the site (Photograph #2). These materials could also be providing pathways for the lateral migration of hydrocarbons within the site. Both these factors could increase the volume of affected soil.

The current land use is for the storage of materials related to the operation of the adjacent service station. Since the site was graded following the removal of the ASTs, a 200 mm layer of relatively uncontaminated soil has been placed over the contaminated material. This will limit direct contact with the contaminated soil on the site and reduce volatilization of hydrocarbons from this soil. Shallow excavations in the area of the contaminated soil will obviously expose this soil for direct contact. Currently there is unrestricted access to the site.

Remediation options based on the contaminants found at the site are presented in Appendix C.

4.2 FIELD SCREENING

Field screening results were compared to laboratory analyses for the five soil samples selected during the preliminary field work stage. A graph of the logarithmic values of the PID readings, EnviroGard results and the laboratory analytical values are presented in Charts 1 & 2. While the field screening results were not considered to correlate well with the concentrations of BTEX compounds and VPH concentrations (Chart 1) they were considered adequate to provide an indication of the presence of the extractable petroleum hydrocarbons as shown in Chart 2.

Field screening results which were thought to indicate contamination were established, based on the results of the Limited Phase 2 ESA and the preliminary field work. By comparing results such as those illustrated in Chart 2 a PID reading of 100 ppm was considered to indicate concentrations of hydrocarbons which may exceed the selected criteria. For the immunoassay tests a result of greater than 625 ppm was considered to indicate concentrations of hydrocarbons in excess of the selected criteria.



4.3 GASOLINE AST

The Limited Phase 2 ESA found a gasoline type of contaminant, in the vicinity of the former Gasoline AST, to a depth of over 6.4 m. Boreholes drilled during the Phase 3 assessment found contamination in excess of the criteria to a depth of approximately 11 m (13537-BH25). The subsurface investigation determined that there was a sand layer or lens within the glacial till from 10.7 m to 12.0 m at Borehole 13537-BH25. The sand layer underlies dense, damp glacial till and overlies very dense, dry glacial till (hardpan). Hydrocarbon contamination above criteria was detected from the surface to a depth of approximately 9.0 m within the dense glacial till and at a depth of 10.7 m to 10.9 m within the sand. Analytical results for the soil sample collected from a depth of 11.2 m to 11.4 m within the sand confirmed very low concentrations of hydrocarbon contamination. Therefore, excessive hydrocarbon contamination was limited to the upper portion of the sand layer in this location, which suggests that this is the lower extent of the contaminant plume.

The lateral extent of contamination has been estimated from information obtained from boreholes around the perimeter of this plume. In particular Boreholes 13537-BH10 & 19 show that concentrations of contaminants which exceed the criteria were not found at these borehole locations to the south of the AST. Concentrations of EPH at 2100 ppm were detected in Borehole 13537-BH20 (3.0-3.3 m) to the southwest of the AST. This is marginally over the criteria of 2000 ppm and is anticipated to be indicative of the edge of the contaminant plume. Borehole 13537-BH21 had concentrations of hydrocarbons which are below the criteria and Borehole 13537-BH11 had field screening results which were interpreted as indicating concentrations of hydrocarbons below the criteria.

Boreholes 13537-BH06, 08 & 09 to the east of the Gasoline AST (west of the Furnace Oil AST) also had concentrations of hydrocarbons anticipated to be below the criteria for all samples analysed.

The northern edge of the gasoline contaminant plume is obscured by contamination originating from the area of the Stove Oil AST.

Based on the laboratory results and field screening, the soil thought to contain hydrocarbon contamination in excess of the criteria has been estimated to be 940 m³. The spatial extent of this contamination is illustrated in Figures 5 & 6.



4.4 STOVE OIL AST

Contamination discovered during the Limited Phase 2 ESA in the area of the Stove Oil AST was thought to have migrated vertically and laterally to mix with contamination from the Gasoline AST. Knowing that the gasoline contaminant plume impacted an area generally to the southwest of the Stove Oil AST, the drilling program was focused on determining a northern and eastern limit to the plume.

Boreholes 13537-BH12, 13 & 22 all show concentrations of hydrocarbons below the criteria, indicating that there was limited migration of contaminants to the north and east of the former Stove Oil AST location.

Hydrocarbon concentrations (EPH C10-C18) well above the criteria were detected in Borehole 13537-BH23 located to the southeast of the Stove Oil AST. It appears from the chromatograph results that the product is similar to a Stove Oil type of product, suggesting that lateral migration has occurred in this direction.

The overlap of the stove oil and gasoline in the chromatographs suggests that both products are present to the southern edge of the contaminant plume shown in Figure 4.

4.5 FURNACE OIL AST

The Limited Phase 2 ESA found hydrocarbon contamination in excess of CSR criteria at the Furnace Oil AST location. The contamination appeared to be confined to the upper two metres of soil. The gas chromatographs were consistent with a furnace oil type of contaminant.

During the Phase 3 ESA, soil samples from boreholes located on the northern, western and eastern side of the former AST location had concentrations of hydrocarbons at or near the lower detection limit of laboratory analytical equipment. These concentrations are well below the selected criteria. Boreholes to the south of the former AST location encountered evidence of hydrocarbon contamination although concentrations were generally below criteria. Soil samples from Boreholes 13537-BH09, 14 & 18 all had concentrations of contaminants below the criteria,



with the highest concentrations in each borehole generally being found in the upper two metres of soil.

Field screening results from Borehole 13537-BH07 indicated that concentrations of hydrocarbons which may exceed the criteria were found down to 2.2 m. The next soil sample at 3.7 - 3.9 m was submitted for laboratory analysis and shows concentrations below the applicable criteria.

Based on the laboratory results and the field screening the soil though to contain hydrocarbon contamination in excess of the criteria has been estimated to be 110 m³. The spatial extent of this contamination is illustrated in Figures 7 & 8.



5.0 CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the laboratory program indicates that contamination in excess of the commercial land use standards in both the Canadian Council of Ministers of the Environment guidelines and the Contaminated Sites Regulations was found in the vicinity of all three former AST locations on the site. The total volume of soil contaminated in excess of the criteria is estimated at 1050 m³. The soil is contained within the property boundary and does not appear to have migrated laterally to the adjacent properties.

A dense glacial till layer was detected in various locations at depths below seven metres. Analytical results show that the hydrocarbon concentrations in this layer do not exceed the criteria. It is therefore concluded that this layer is forming a barrier to the vertical migration of the hydrocarbons.

The contaminants are not affecting the current use of the site for storage.

The following recommendations are made respecting future action at this site:

- Should a land use change be contemplated, the results of this study should be reviewed to
 determine the potential impacts of the contaminants on the proposed new land use.
- Periodic testing of the well should be conducted to determine existing water quality and allow for the monitoring of changes to this water quality.
- Should any site grading or excavation take place appropriate precautions should be taken to reduce direct contact with the soil and hydrocarbon vapours.



6.0 CLOSURE

This report has been prepared for the exclusive use of the Department of Indian and Northern Affairs Canada, for the purposes as described in Section 1 of this report. It has been prepared in accordance with generally accepted geo-environmental practices. Further information regarding the use of this report is presented in the attached Environmental Report – General Conditions, which forms part of this report.

EBA trusts this report meets your requirements at this time. If you have any concerns or comments EBA would be pleased to discuss the report or any questions which you may have.

Respectfully submitted,

EBA Engineering Consultants Ltd.

Reviewed by:

YUKON Lawanan

TERRITOF

Donald J. Wilson Senior Environmental Scientist

Non Wilan

J. Richard Trimble, P. Eng.

Project Director Yukon Region

DJW/dw

Macintosh HD:0201 DJW:98 Projects:13537 DIAND Alcan:13537 Report Components:13537 report

REFERENCES

³ Canadian Council of Ministers of the Environment, 1997. Recommended Canadian Soil Quality Guidelines.



¹ EBA Engineering Consultants Ltd., 1998. Limited Phase II Environmental Site Assessment, Alcan Fuels Ltd., Haines Junction, YT. Unpublished contract report submitted to Source Motors Ltd.

² Government of Yukon, 1996. Environment Act, Contaminated Sites Regulations, 1996/192

EBA Engineering Consultants Ltd. (EBA) ENVIRONMENTAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these "General Conditions".

A.1 USE OF REPORT

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

A.2 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed on site at the time of EBA's investigation. The client, and any other parties using this report with the express written consent of the client and EBA, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The client, and any other party using this report with the express written consent of the client and EBA, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or

development of the property, the decisions on which are the sole responsibility of the client.

A.2.1 Information Provided to EBA by Others

During the performance of the work and the preparation of this report, EBA may have relied on information provided by persons other than the client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

A.3 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of EBA providing the services requested, the client agrees that EBA's liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

- (1) With respect to any claims brought against EBA by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to EBA under this Agreement, whether the action is based on breach of contract or tort:
- (2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless EBA from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by EBA, whether the claim be brought against EBA for breach of contract or tort.

ENVIRONMENTAL REPORT - GENERAL CONDITIONS

A.4 JOB SITE SAFETY

EBA is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of EBA personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

A.5 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for EBA to properly provide the service, EBA is relying upon the full disclosure and accuracy of any such information.

A.6 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments. recommendations, or any other portion of this report.

A.7 EMERGENCY PROCEDURES

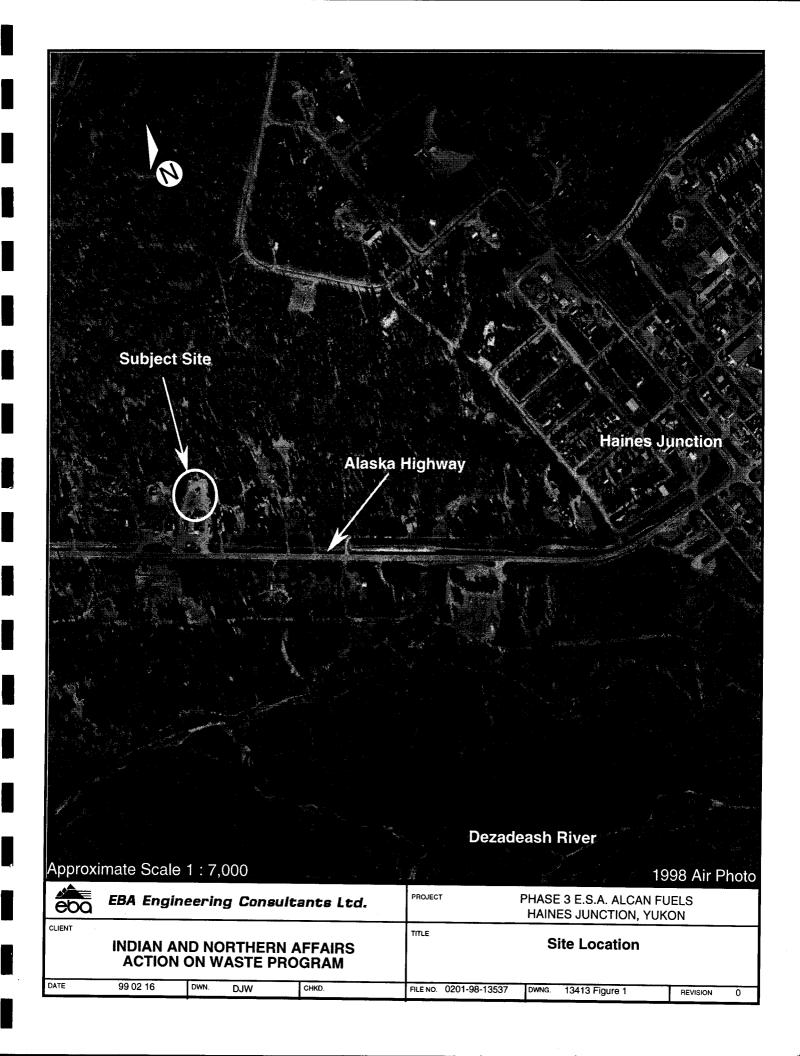
The client undertakes to inform EBA of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of EBA may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect EBA employees, other persons and the These procedures may involve environment. additional costs outside of any budgets previously agreed to. The client agrees to pay EBA for any expenses incurred as a result of such discoveries and to compensate EBA through payment of additional fees and expenses for time spent by EBA to deal with the consequences of such discoveries.

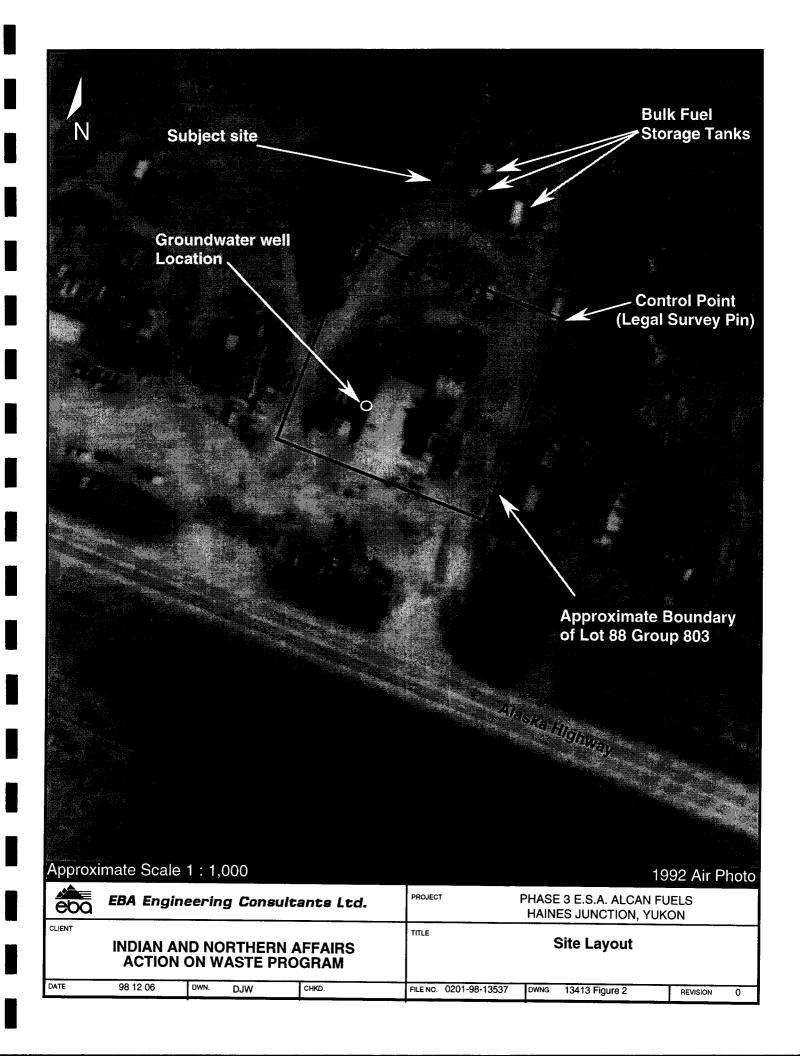
A.8 NOTIFICATION OF AUTHORITIES

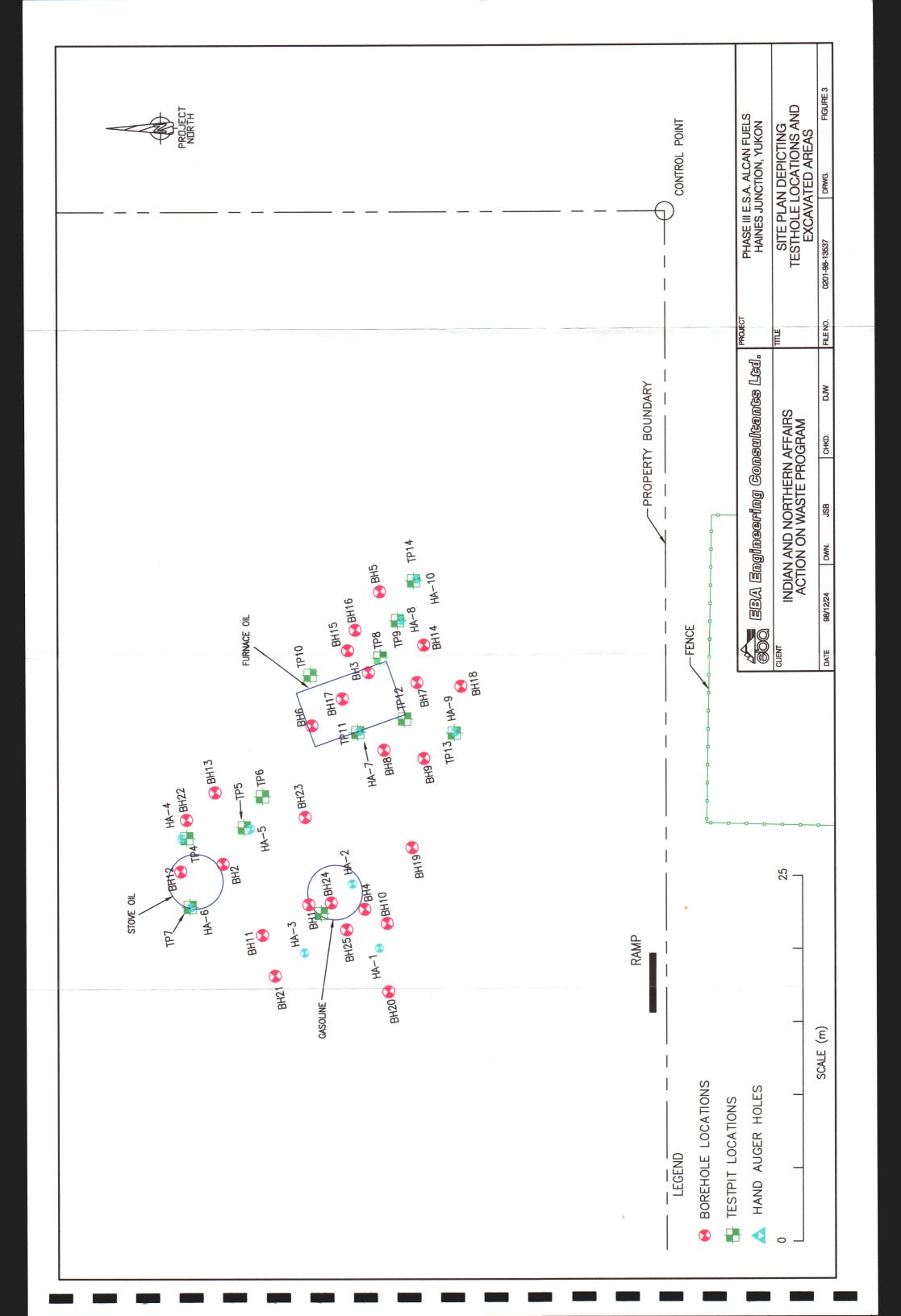
The client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

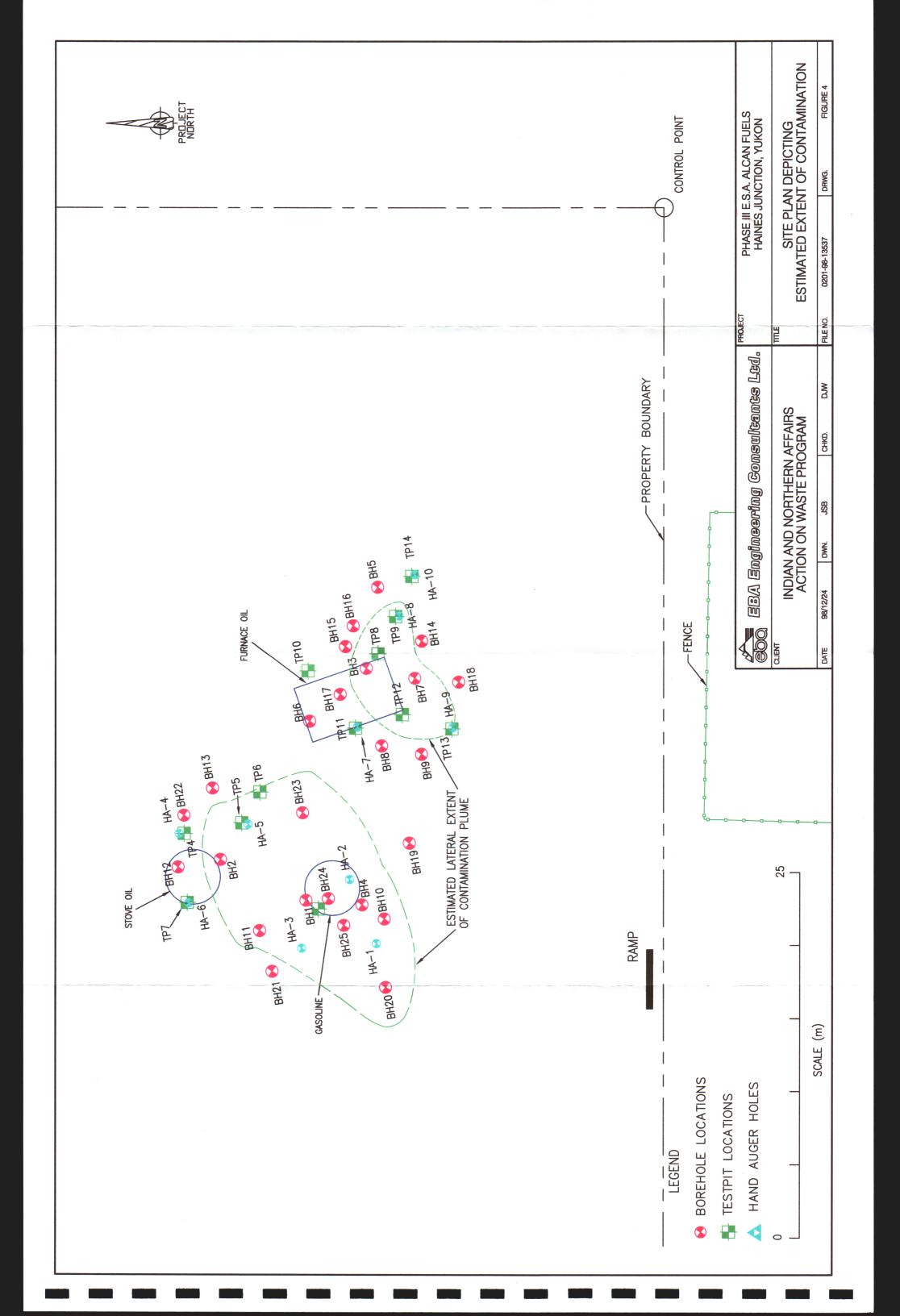
A.9 OWNERSHIP OF INSTRUMENTS OF SERVICE

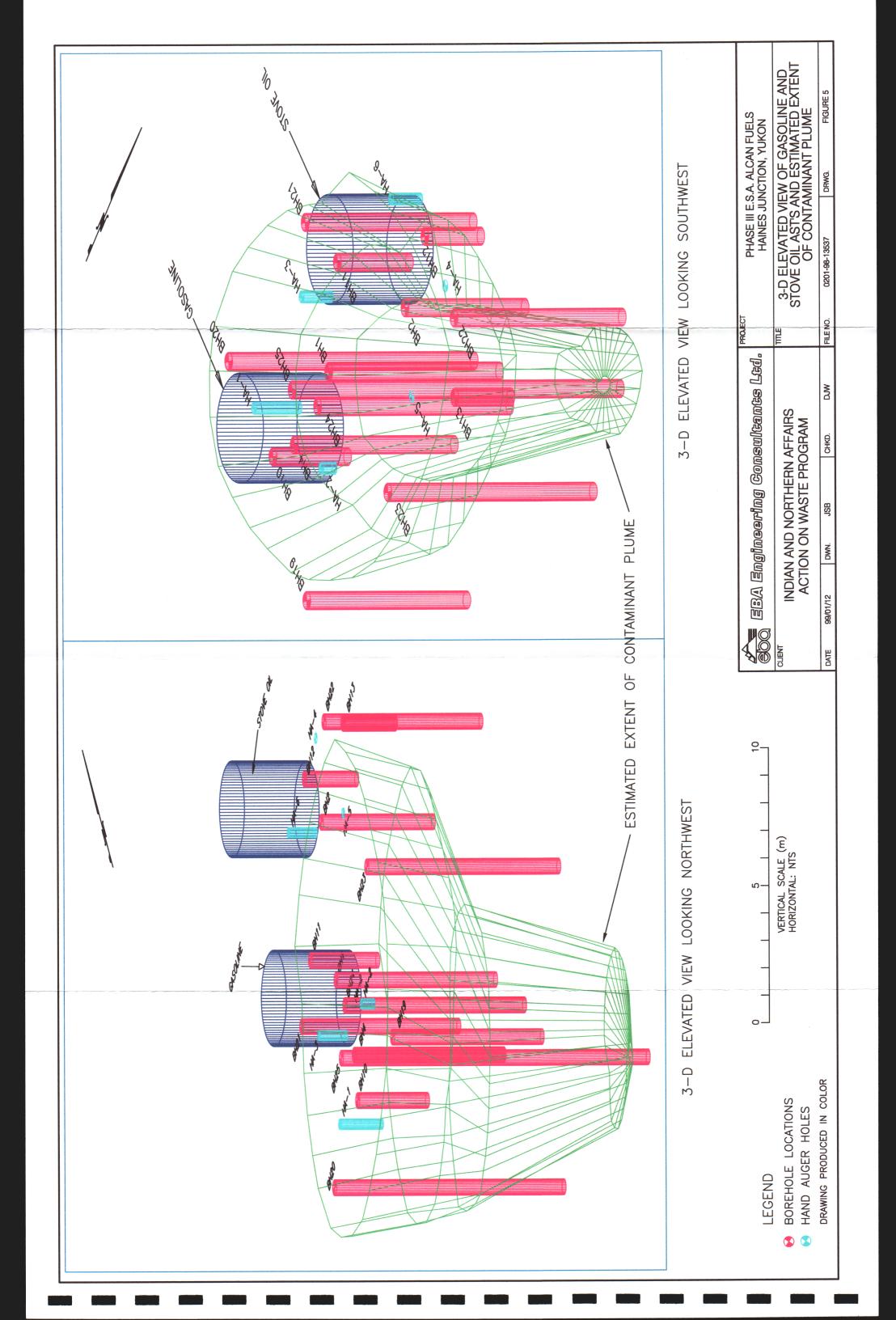
The client acknowledges that all reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

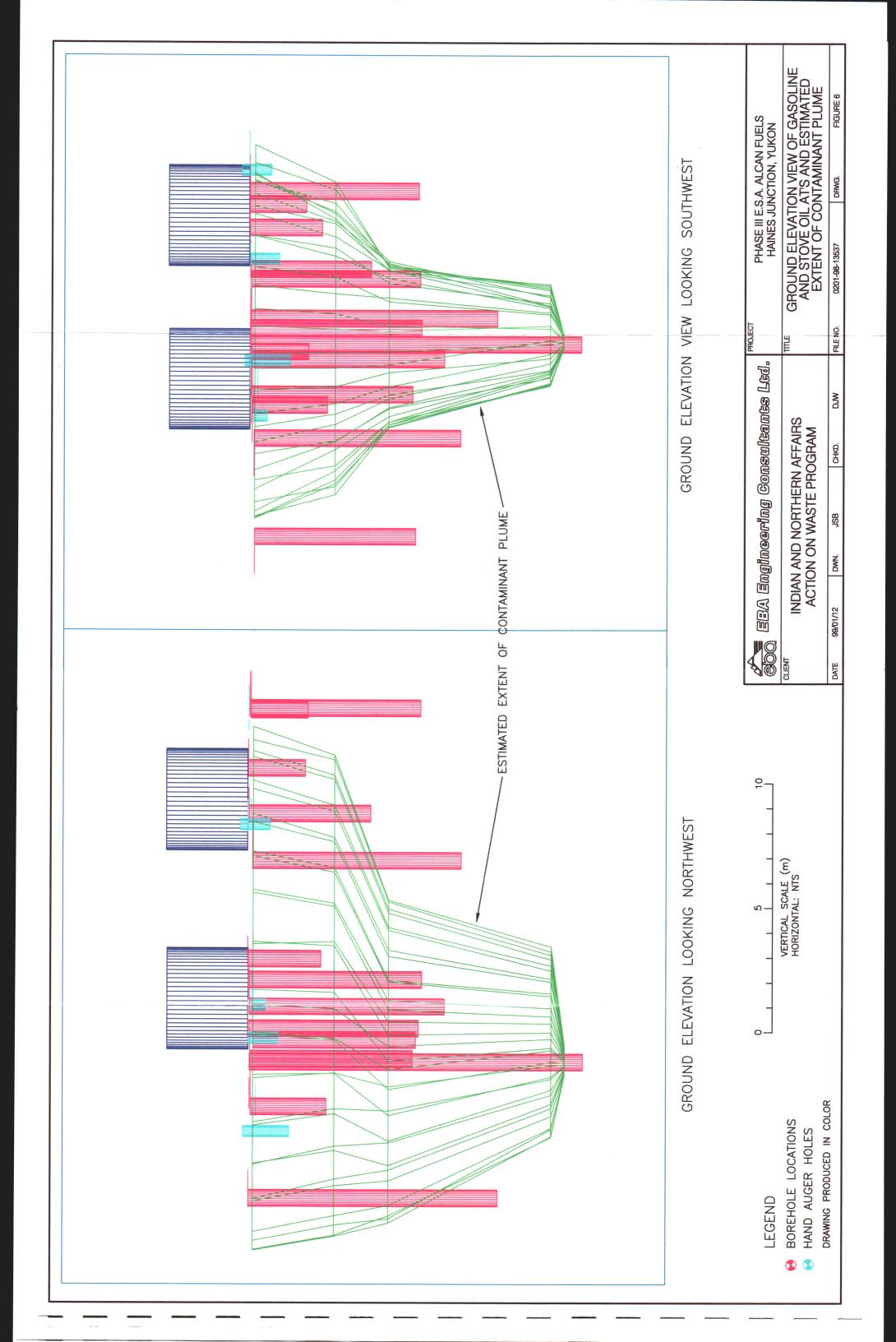


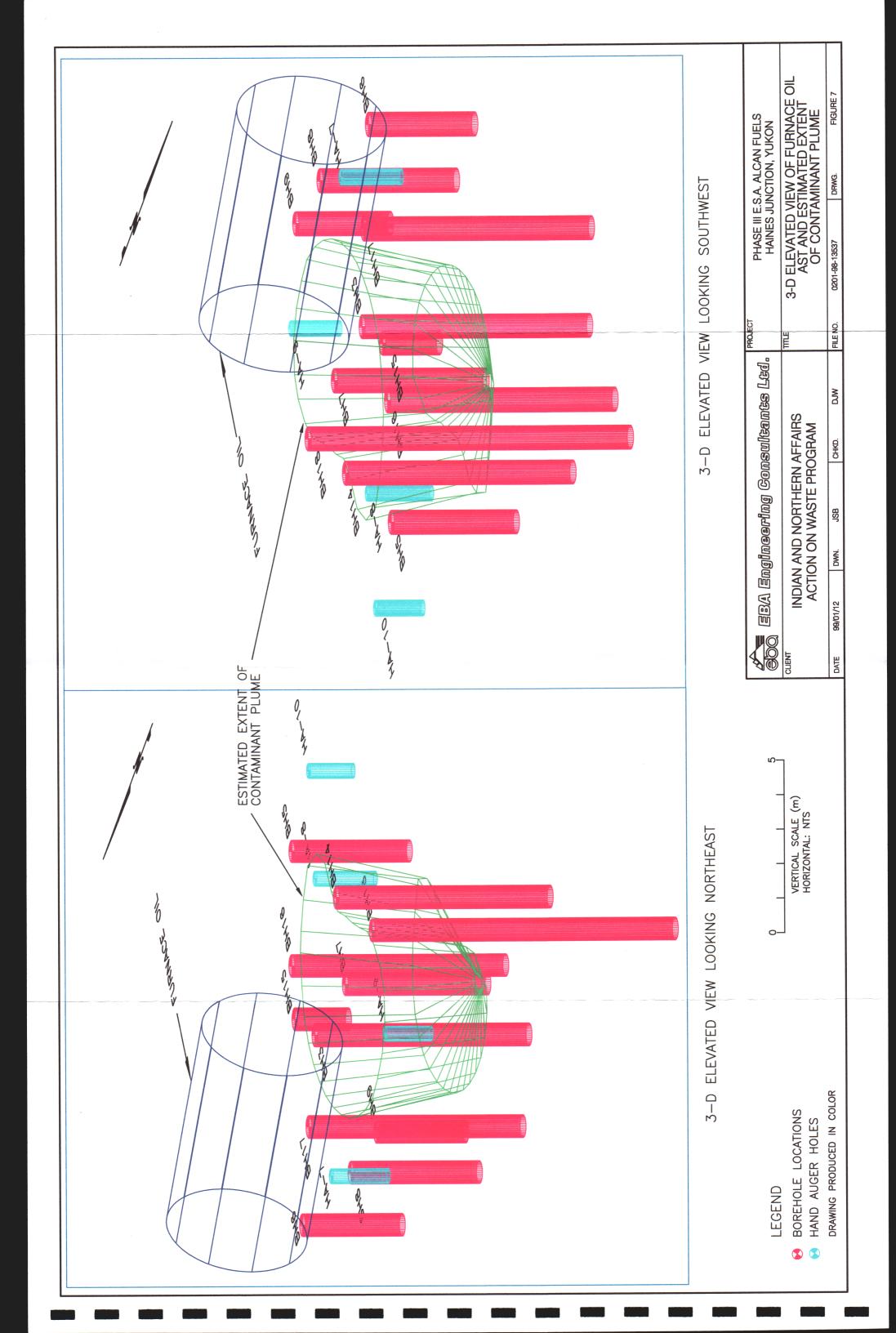


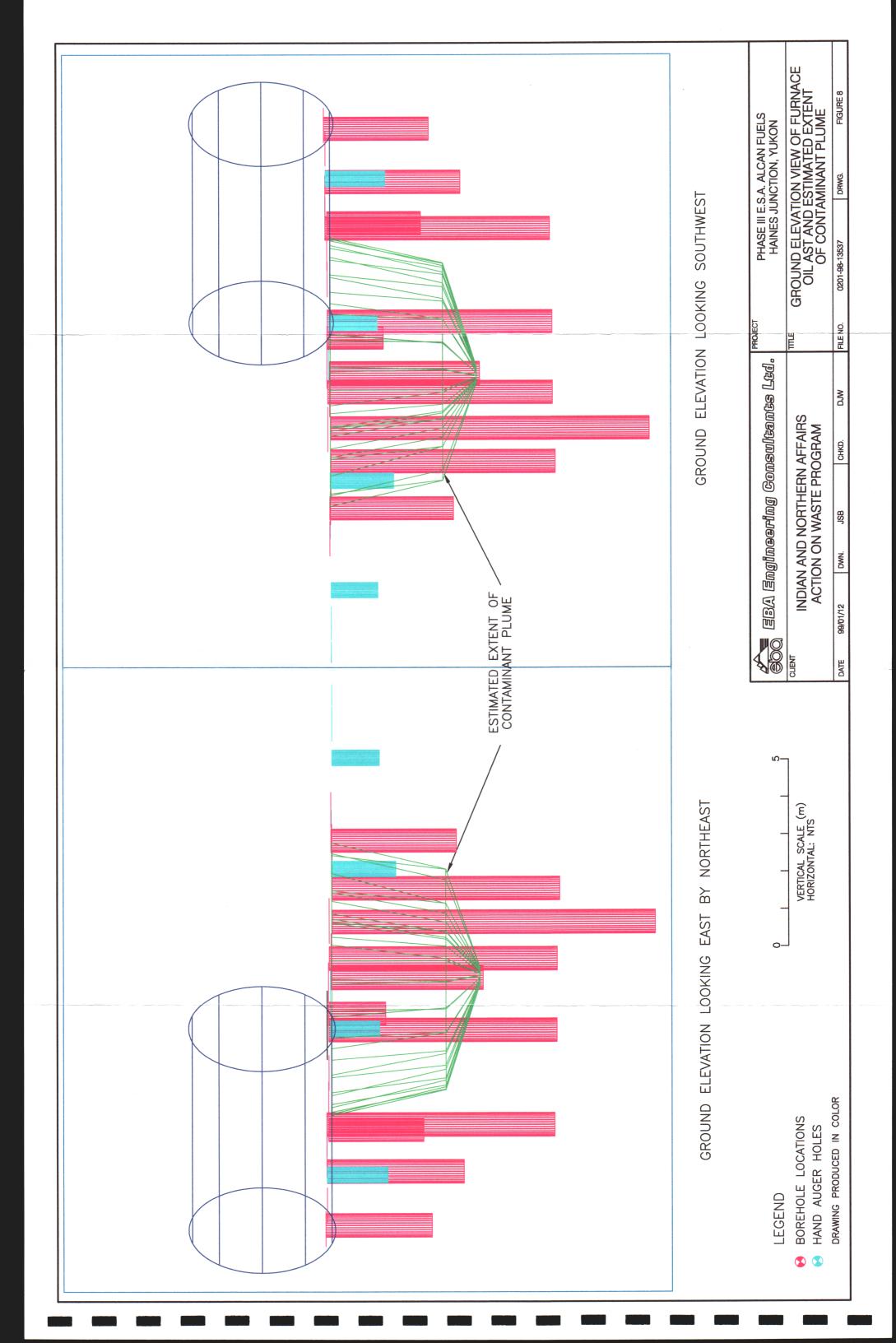


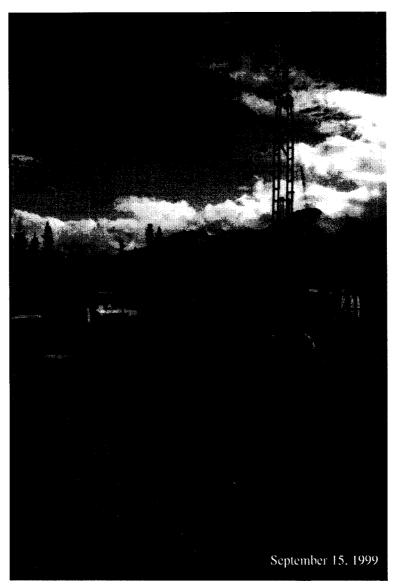






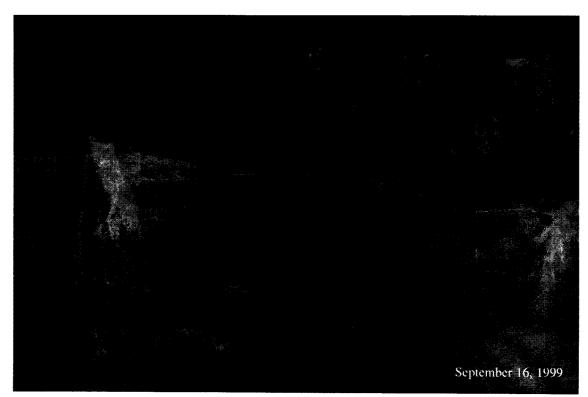




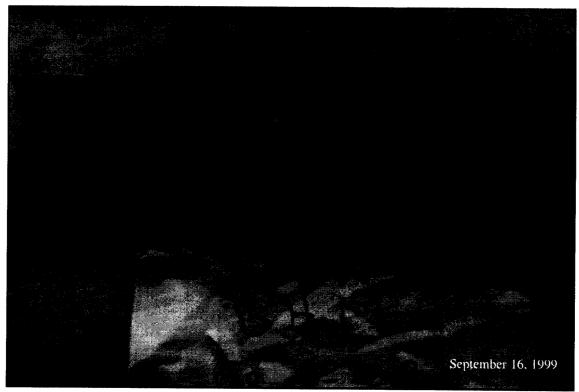


Photograph 1: Drill rig drilling near former Furnace Oil AST location.





Photograph 2: Split spoon sample showing silt and clay till and organic inclusions.



Photograph 3: Split spoon sample showing silt and clay till, note some gravel.



LEGEND FOR TABLES 1 TO 4		
COME	Canadian Council of Ministers of the Environment Recommended Guidelines 1997, Commercial Land Use	
CSR	Contaminated Sites Regulations Standards, Commercial Land Use	
PID	Photoionization Detector	
ND	Not Detected	
	No Data Available	
130	Concentrations which exceed the CCME guidelines	
130	Concentrations which exceed the CSR standards	
BH01	Borehole Number	
HA01	Hand Auger Hole Number	
TP01	Test Pit Number	

•

All results presented in ppm unless otherwise stated Extractablet Petroleum Hydrocarbons (C10-C18) Extractablet Petroleum Hydrocarbons (C19-C32) Borehole Number/Hand Auger Volatile Petroleum Hydrocarbons Sample Number Ethylbenzene PID Readings EnvrioGard Depth (m) Benzene Toluene Xylenes COME 5 0.8 20 7 20 2.5 200 2000 5000 CSR 0.04 BH01 1.3-1.5 176 1 2 2.0-2.2 537 ESA (13413) 3 2.8-3.0 715 33 130 59 210 390 1100 72 4 3.8-4.0 355 5 5.3-5.5 610 700 150 43 220 440 5200 340 6 6.2-6.4 21 a 617 10 24 2 34 3 tomin Phase 67 **BH10** 12 1.0-1.2 150 >1250 >1250 13 2.5-2.8 395 45 190 38 246 ND 2200 220 BH20 35 1.5-1.8 220 --ND ND 36 3.0-3.3 920 0.19 5.5 37 2100 ND 4.5-4.8 200 37 --38 6.0-6.4 ND 340 390 --ND 0.12 0.94 9.5 ND 39 6.7-7.2 190 40 7.5-7.7 550 >1250 41 8.2-8.5 300 ND ND ND ND 1.6 32 ND 42 9.0-9.2 30 <250 ND ND ND ND ND ND 2.1 3 0-3 3 416 114 N D N_B 0.07 2,0 44 BH21 N D) No. (B) 6.0-6.3 ND BH22 45 250,<12! ND 45 3.0-3.3 ND ND 0.06 1 75 ND ESA (13537) 46 4.5-4.8 24 47 6.0-6.3 16 <250 2000 28 F27(6) F61 5(0) Œ 320 (i) ND) ΝĐ), ო ND. Phase BH24 3.0-3.3 850 51 57 6.0-6.4 1650 BH25 52 178 9.73103 10.5/10/9 **61** 2-160 NO. HA01 1 1.6-1.7 160 125,<625) (44.0) S 533 HA02 0.5 0 3 1.0-1.1 51 <25 1.5 150 4 1.6-1.7 100 >625 810 HA03 470 5 1.0-1.1 <25

30

<25

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1.5-1.6

					All res	ults prese	nted i	n ppm ι	<u>unless</u>	otherwi	se stated		
		Borehole/Hand Auger/Test Pit Number	Sample Number	Depth (m)	PID Readings	EnvrioGard	ഗ Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractablet Petroleum Hydrocarbons (C10-C18)	Extractablet Petroleum Hydrocarbons (C19-C32)
١	COME							0.8	20				
ŀ	CSR						0.04	2.5	7	20	200	2000	5000
Phase 2	ESA (13413)	ВН02	7 8 9	1.3-1.5 2.5-2.8 4.3-4.5	50 625 190	 	3.8	31	2.5	13	60	1500	130
		BHILLS) ((4) (5) (4)		25) 425) 425)	512500		b 12				4 4	
ł		BH12	16	1.2-1.3	160	<250							
		SINKE.	17	2.0-2.1 0.7-0.9	147		ND	0.07	ND	0.39	4.1	160	16
		lo leitice.		2.02	2240 2240	250	3.31		0.00		ALKD.	1004	ND 1
1	37)	BH22	45	3.0-3.3	45	250,<12!	ND	ND	ND	0.06	1	75	ND
	(13537)		46	4.5-4.8	24								
-	A .	isiskki s	47 448	6.0-6.3	16 2000	<250	23	120	27	150	e se video		
	ESA		4.0					120	27	0.45		100000000000000000000000000000000000000	8500 ND
	က	100	5,0	1995		3	. (1)	VB.	80	(4)			MD
	Phase												
	ᄒ	TP04 TP05	7 - 8	0.3	7.4 4.123	<25	- VCV-						
		TP06	9	0.3	2	625 	ψŪ,	0,16		0.77	State Liberty	3600	## 2 404
		TP07	9 040_	0.3	0.8								
		HA04					47.00			7304			
-		HA05 Y		A				1		48.	+ + 3		
L		HA06	11	1.0-1.1	65	<25							

			All re	sults p	resented	in pp	m unles	s othe	rwise st	ated		
	Borehole Number/Hand Auger	Sample Number	Depth (m)	PID Readings	EnvrioGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractablet Petroleum Hydrocarbons (C10-C18)	Extractablet Petroleum Hydrocarbons (C19-C32)
COME CSR						5 0.04	0.8 2.5	20 7	17 20	200	 2000	 5000
Phase 2 ESA (13413)	BH03	10 11 12 13 14	0.5-0.7 1.3-1.5 2.3-2.5 3.5-3.7 4.5-4.7	399 433 125 105 130	 	2.6 0.16	9.5 0.47	4.2 0.08	4.7	47 6.2	20000 1700	100
	BH05	15 12 3 4	5.5-5.7 1.0-1.3 3.0-3.8 1.0-1.3 2.5-2.8	76 16 6 6 5 46 27.7	 <250 <250 <250	ND	o (19 Spains ND	NB ND	ND ND	3.7	150	ND
	BH07 BH08	5 6 7 8	2.0 2.2 3 9 2.2-2.4 3.5 3.6	975 595 292 85	- 14 >√250 <250			0.46		(A)	, 387 194 195 195 195 195 195 195 195 195 195 195	44
	BH14	9 103 113 20 21	3.5-3.6 0.7-1.0 1.0-1.3 1.6-1.7 4.5-4.6	140 64 103 46	 <250	ND ND ND	ND ND	ND ND 0.2	0.1 ND 3 1.82	1.6 No 26	ND ND 1000	ND ND 98
	BH15 BH16 BH17 km y	22 23 24 25 26	5.8-5.9 1.6-1.7 3.1.5-1.6 4.5-4.6	5 M 14 4 6 6 3 C	 	ND ND	ND ND	59 59 50	0.0g ND 3.5	ND ND	ND 384	ND ND NO
3 ESA (13537)	BH18	27 28 29 30	5.0.6.3 3.0-3.3 4.5-4.8 6.0-6.3	46 49 58	 <250 	ND.	ND	ND ND	ND ND	ND ND	2:8°	ND ND
Phase			1 5 1 6 4 3 0 7 6 8 7 4 5 4 8 6 0 6 6 3		26) to 1 22 E 0 36 S		(1) (1) (1) (2) (3) (1) (3) (4) (1) (4) (4)	(0) (10) 2 (4) 3 (3) 3 (4) 4 (5)	0.876 0.39 3 (ND)	7.83 ND: ND	ND (10) (10)	
	HA07	12 19 13	0.5 1.0-1.1 1.2-1.3 1.5-1.6		 <25 125,<625 >25,<125		ND	ND	0.47	13	150	37
	HA09	14 15 21	1.0-1.1	115 115	125.462 125.4625 >625	9.	0.09	0.1	0.9	9.4	3900 420	290 100
	TP08		1.2-1.3 0.5	120 355								
	TP09 TP10		0.5 0.5	1.3 150							T	
	18587.HA10 137.J	116			14 (A) (A)			2,000				

Table 4: Analyical PAH Results for Soil Samples from Alcan Fuels, Haines Junction, Yukon.

All units expressed in µg/g (ppm) unless stated otherwise.

	ATH UNITED FAN	All ullits capitossed in hg/g (ppin) ullicss stated outer wise.	II) ulitoss stated ou	CI WISC.			
PARAMETER		TESTPIT, SAN	TESTPIT, SAMPLE NUMBER AND DEPTH	AND DEPTH		CCME**	CSR*
Borehole	13537 BH10	13537-BH14	13537-BH20	137537-BH23	13537-BH25		
Sample #	13	20	36	48	54		
Depth (m)	(2.5-2.8)	(1.6-1.7)	(3.0-3.3)	(3.0-3.3)	(10.5-10.9)		
Polycyclic Aromatic Hydrocarbon (PAH)	•	•	•	•	-		•
Naphthalene	12	0.2	4.9	5.6	3.9	22	50
Acenaphthylene	0.1	QN	0.1	ND	0.1		,
Acenaphthene	0.1	QN	ND	0.1	0.1		•
Fluorene	0.5	QN	0.1	0.6	0.7		,
Phenanthrene	8.0	0.7	0.8	0.9	3.1		20
Anthraene	ND	ND	ND	0.1	0.1		•
Fluoranthene	ND	ND	ND	ND	ON		10
Pyrene	0.1	ND	ND	0.1	ND		100
Benzo(a)anthrecene	ND	ND	ND	ND	ND		10
Chrysene	ND	ND	ND	ND	ND		•
Benzo()fluoranthene	ND	ND	ND	ND	ND		10
Benzo(a)pyrene	ND	ND	ND	ND	ND	0.7	10
Indeno(1,2,3-c,d)pyrene	ND	ND	ND	ND	ND		10
Dibenz(a,h)anthracene	ND	ND	ND	ND	ND		10
Benzo(g,h,i)perylene	ND	ND	ND	ND	QN		10

^{* →} Contaminated Sites Regulations (Yukon, 1996). Soil standards are for commercial/industrial land use.
** → CCME Recommended Canadian Soil Quality Guidelines (1997).



Chart 1: Comparison of Field Screening and Laboratory Analytical Results

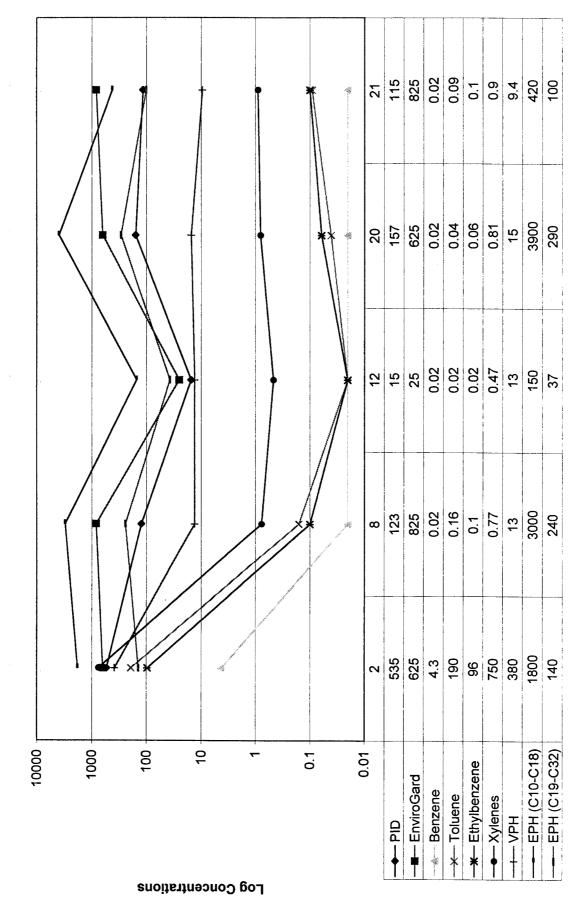
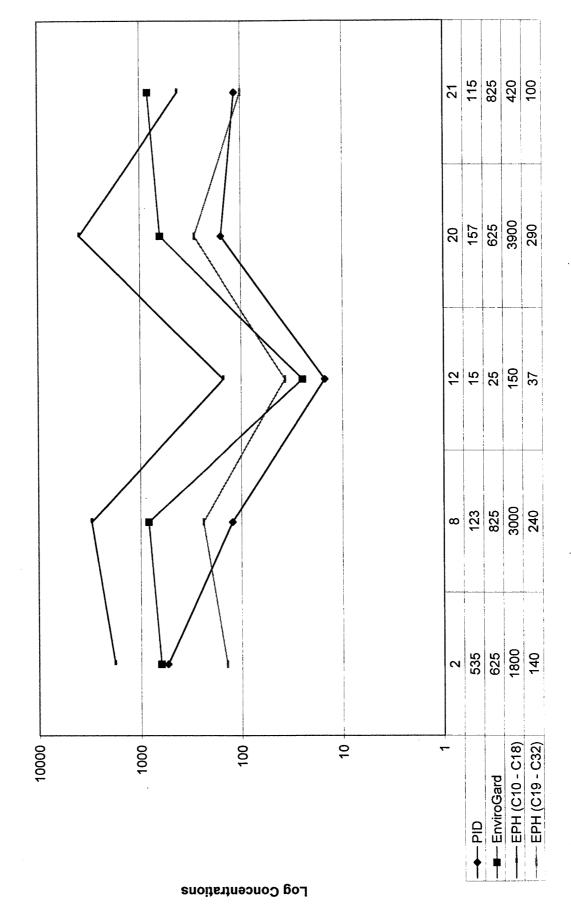


Chart 2: Comparison of Field Screening and Extractable Petroleum Hydrocarbon Concentrations



APPENDIX A

Borehole Logs and Grain Size Analyses



HYDRO								SOURCE MOTO							BO	REHO	LE N	0: 1	3413	-Bl	11
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HAINE								IE: 8 N67382	57 E	362	104				ELE	VATIO)N: 1	01.25	m		
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Ĺ'	!	'																			1.5 F
·					SILT & CLAY (TILL) - do	ımp, dark grey,	- 7														Ī
[7	'		slight hydrocarbon a	dour															- ⊢
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.			.]		END OF BOREHOLE @ 4.5	⇒ m														F	-
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- 5.0	.			.	1			<u>-</u>			ļļ.			 .					ļļ <u>.</u>		5.0
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HYDRO						1 11 12 1	CLIENT: SOURCE MO): 1			
					16 ALASKA	HWY	DRILLING METHOD: S					S						0201	-98-	13413	3
SAMP			TION,		AD 041515	Clus osos -	UTM ZONE: 8 N673										N: 10)1 m			
<u> </u>					AB SAMPLE	NO RECOVE					SPO	NC			L BAR						
BACK	TILL	L 11	PE	BLI	ntonite T	PEA GRAVEL	SLOUGH	<u>. •</u>	GR	DUT				ORILL	CUTT			SAND			
	F			9		~~									20	PERC 4		RAVEL ■	I 30	S	~
l æ		8	ري ا	SYMBOL		SO	<u> </u>		♦10 120		BLE V 10 3	apouf 360	≀S. ♦ 480		20		CENT S	SAND •	30	TATI	N S
Depth(m)	SAMPLE TYPE	RUN NO	OSC	L S		DESCRI	рπі∩м	PI.	STIC		M.C.		LIQU	IV	▲ PE	RCENT	SILT	OR FINE		JAE DAT	ATIC
	S			SOIL		DESCIVI	FIION	' '	10110		W.C.			" -	20			<u>30 8</u> CLAY�	30	INSTRUMENTATION DATA	ELEVATION(m)
_ 0.0	-	 -	ļ	-	CII T & CE	DAVEL /EILL\			12	2	4	36	48	\perp	20			30 8	30	Z	_ 101.0
-					medii	um arev. sliaht	some sand, dry, nydrocarbon odour														- 101.0
_							•							,							Ē
-		10			SAND (FIL	L) — fine grain hydrocarbon od	ed, dry, grey,					•									_
- - 1.0					Silgit	. Hydrocdroon od	nour														
ļ "."																					100.0 -
F		11			SILT & SA	AND (FILL) - fin	e grained sand,	\dashv					•								-
E					\ dry, c	grey, slight hydr	ocarbon odour												ļķ		-
) – moist, med	. grey, slight														
— 2.0 C					riyaro	ocarban adour												 	ļ		99.0 -
E		12																			-
F		<u>'</u>			SILT (TILL) — some grave	el to 30 mm											·	ļ <u>.</u>		_
F					diame	eter, moist, grey															- -
3.0					hydro	carbon odour													ļ		98.0
-																					
F		13																ļļ	ļļ		- -
E		13			_ low	v plastic, moist,	medium		•					1							_
- 4.0						very slight hydr						.]j							ļ <u>.</u>		_ 97.0 .
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F		14							•												_
- - 5.0																					-
ļ																					— 96.0 □
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E		15							>												-
<u> </u>																					
6.0					END OF E	BOREHOLE @ 6.0) m										\$		-		— 95.0 -
E																					<u> </u>
F																					_
E																					-
7.0		-										-							ļ <u>.</u>		94.0
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8.0										.ļ		ļļ									93.0
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				0	,	orse, Yukon		KEVI		ת מ)	r: JR	<u> </u>				LUMP	LEIE:	06/1		ogne '	l of 1
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			n inve				CLIENT: SOURCE MOTO)RS			BOREH	OLE NO	: 1341	3-BI	
					016 ALASKA H		DRILLING METHOD: SO						0201-98-		
			TION, Y				UTM ZONE: 8 N67382				ELEVAT	ION: 10	1.23 m		
SAMP BACK		-			RAB SAMPLE	NO RECOVERY			mm SPOON		el Barrel				
DAUN	TILL	- 11	Pt.	T Dr.	ENTONITE	PEA GRAVEL	SLOUGH	GROU	UT	DRIL	L CUTTINGS		SAND		
_	PE	. _ '		١ă		O O T	_				20	RCENT GR 40 6	0 80	NO	=
h(m		≥ -	OSC	SYMBOL		SOI	L	◆ION 120	NZABLE VAPOU 240 360	JRS ♦ 480		ERCENT S	AND •		5 l
Depth(m)	SAMPLE TYPE	RUN NO	ĭ			DESCRIF	סייז∩אז	PLASTIC	M.C.	LIQUID	▲ PERCE	ENT SILT C	R FINES A	INSTRUMENTATION DATA	ELEVATION(m)
	SA	- '		SOIL		DEOCIMI	TIOIN	 			20	40 6 ERCENT C	0 80	SIR	LEZ
0.0	+	 	-	+	CANID & GE	RAVEL (FILL) – r		12	24 36	48	20		0 80	Ž	<u> </u>
ŧ	'	'			sand, d	dry. no odour	nealum gruineu								101.0
ļ-	!	'			SILT & GRA	AVEL (FILL) — gr	ravel to 20 mm,	1							-
E	!	1			dry, gre	rey, no odour									F 1
] '													E
‡		16				— low plastic, m	oist, dark		•						<u> </u>
ļ.	'	1 1			grey, no	no odour									100.0 E
Ė		1 '			- slight	nt hydrocarbon o	odour @ 1.5 m								F
E		17				ne sand, dry, dar				•					E
2.0 -			'	'	hydrocc	arbon odour	k grey, siigile								F
F	!		'	'											99.0
E		18	ļ	'											E
Ē.		"	'	'	SILT (TILL)	— some gravel,	trace of sand.	-		T					L 1
3.0	1		!	'	dry, dar	ork grey, slight h									F
E			!	'	odour	• ,	,								98.0
Ē		19	!	1											[]
ţ		1	!	'	– easie	er drilling, lost n	most of			Ĭ				"	F
- - - 4.0		1	<u>'</u>	'	sample		THOSE OF								F
4.0			'	'											Ē þ
† '			'	'											97.0
F			<u>'</u>		- very	slight hydrocarb	pon odour							-	F
E '			'	'		• .									Ē
— 5.0 -			1	'											F [
F '		20	1 '	'											96.0
F '		20	1 '							•					Ē
E			1	'											<u> </u>
6.0		[]	l '		25.00										F
F '			ı '		END OF ROP	REHOLE @ 6.0 r	η							Ϊ Ι	95.0
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<u>'</u>		1 1	ı '											"	F
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─ 7.0 -		1	1 '											.	Ē
Ē'		1. 1	ı '												94.0
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- - 8.0		1 1	1 '												Ī.
Ē'		1.1	ı '												- 93.0
<u> </u>	\coprod	Ш	L'	\square											F
Ī	EJ	RA	En	øir	neering	Consulta		LOGGED BY					DEPTH: 6		
ĺ	٠.	J				se, Yukon	mod.	REVIEWED	BY: JKI		COM	PLETE:	06/10/98		·F 1
99/05/06 1	10:08/	M (PIDE	<u></u>		HILLCHOLD	2C, IUNUII								Page 1	01 1

PHASE							CLIENT: DIAND							BOF	EH0	LE N	0:	13537	7-BH	
ALCAN							DRILL: CME 750 c/w											1-98-		
HAINE							UTM ZONE: 8 N6738)N: 1	00.9	2 m		
SAMP					AB SAMPLE	NO RECOVER	<u> </u>				POON		ш	EL BAR		·				
BACKI	· LL	. IY	PE	BEI	NTONITE	PEA GRAVEL	SLOUGH	4.	GRO	UT			DRIL				SAN			
	밁													20		CENT (GRAVEL 60	. III	NO.	
(E)	\succeq	9	ပ	SYMBOL		SOI	L		◆ION 120	IIZABL 240	E VAP 360	DURS	♦ 30		• PEI	RCENT	SAND	9	TAT	N(n
Depth(m)	SAMPLE TYPE	RUN NO	OSC	S		עבמטוו	אר אות או	DI A	STIC					▲ PE	RCEN	t silt	60 OR FI	_80 NES ▲	INSTRUMÉNTATION DATA	ELEVATION(m)
Ď	SAV	Œ		SOIL		DESCRIE	FION	1		A	4.C. ●		Liquid 1	20	4	10 RCENT	60	80		LEV.
0.0				_	ODANIEL /EILI		***	1	12	24	36	4	8	20		10	60	80	ž	لبا
- "					GRAVEL (FILL	L) – sandy, sa	ome siit, dry, brown, no													[
ļ				l	hydrocal	rbon odour	dry, brown, no	1												-
-					CLAY & SILT	`(FILL) − som	e gravel & sand,	1												-
-						tic, sub-round										ļļ				-
[aamp, g odour	reyish brown,	no hydrocarbon													-
-					ououi															
1.0																				-100.0
- 1.0					CLAY & SILT	(TILL) - som	e gravel & sand,	1. 1							:					[
-		1				tic, sub-round		•												
L					aamp, g odour	ireyish brown,	no hydrocarbon													-
<u> </u>					0000.						<u>.</u>					ļļ				
-																				-
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-								•												99.0
2.0																<u>.</u>			,	-
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-																				[
<u> </u>																				F
F					– moist	, no hydrocart	oon odour													
-								•												[
Ĺ																				-
- 3.0																ļļ.				98.0
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-					1	REHOLE @ 3.3														Ļ
-						ion references (Property pin)														-
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}																				
4.0																				97.0
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5.0	ليا درر	D A	<u>. </u>			0 11	I- T13	LOG	GED E	3Y: C	PC	!	:i		COM	PLETI	ON D	EPTH: 3	.3 m	1
	Ľl	ΒA	Ľn	gır			ants Ltd.		EWED									/09/14		
99/05/06	08-55/	M (DIO)			Whitehors	se, Yukon]					Page :	1 of 1

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PHASE							CLIENT: DIAND							BO	REH	OLE	NO:	13.	537	-BH	16
ALCAN							DRILL: CME 750 c/v	SOLIC	STE	EM .										3537	
HAINES				T			UTM ZONE: 8 N673	8253 1	<u> 362</u>	116								.07 n			•
SAMPL				GRA	AB SAMPLE	∠NO RECOVERY		ı E	75	mm :	SPOON	П	CRR	EL BA							
BACKF	ILL	<u>. TY</u>	PE	BEN	NTONITE [PEA GRAVEL	SLOUGH	4	GRO	OUT		P	DRIL	L CUT	TINGS	5	s	AND			
	ابي							\top							■ PE	RCENT	T GRA	VEL ■		z	
Depth(m)	┨	9		SYMBOL		SOI	Ţ., ·			NIZABI	LE VAP(. }		:0 ● PI	40 ERCEN	60 IT SAN	80 √D ●		INSTRUMENTATION DATA	ELEVATION(m)
oth (닏	RUN NO	nsc	SX	_			-	120	240	360	480)		.0	40	60	80		E E	NO.
De	SAMPLE	₹		SOIL		DESCRIF	PTION	PL	ASTIC		M.C.	LI	QUID		.0	40	60	Fines 80	^	20	VA
	0			(C)				'	12	24	36	48	-	2	♦ P	ercen 40	NT CL/ 60	4Y ♦ 80		IS	
0.0			-			VEL (FILL) - s				T		10				40	00	- 00			-101.0
-					sub-ang	ular particles,	dry, brown,													}	-
					CLAY & SILT	<u>drocarbon odo</u> (TILL) — trace	our of cand &	4												1	-
-					gravel, la	w-plastic, su	b-rounded			ļļ											-
-					particles,	damp, greyis	h brown													ŀ	-
_																					-
.																					.
1.0					– slight	hydrocarbon o	odour.			ļļ										}	-
		3			Silgiti	nyarocarbon (Xour	•												ļ	-100.0
.																					-
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-																				Ì	_
-																				-	-
					- trace	of hydrocarbo	n odour													}	-
- 2.0					udce	or nydrocdrbo	ii oddai	•												Į	-
- 2.0																					99.0
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-		4			– slight	hydrocarbon o	odour	•													-
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-						EHOLE @ 2.8														ŀ	.
− 3.0						on referenced Property pin)														ŀ	
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- 4.0																					
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	ĽŁ	3A	En				ants Ltd.	REVIE						-				8/09/		/ 111	
9/05/06 08	:SRAI	(PIDA)			<u>Whitehors</u>	e, Yukon														age 1	of 1

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PHASE					· · ·			: DIAND							BO	REHO	LE N	10:	1353	7-BI	17
ALCAN						···		CME 750 c/w							PR	OJEC	T NO	: 02	01-98	-1353	7
HAINE								ONE: 8 N6738						w	ELI	EVATION	ON:	100.9	2 m		
SAMP					AB SAMPLE	NO RECOVER		Standard Pen				SPOO	DN		REL BA						
BACK		- IY	PE	BE	ntonite	PEA GRAVEL		SLOUGH	<u> </u>	GRC	DUT			DRI				SAI			
	PE			4			_								2	■ PER	CENT 40	GRAVE 60	L ≡ 80	S	-
(E)	≱	운	ں	SYMBOL		SOI	L			◆10. 120	NIZAE	BLE V/ 0 3	₩0UF 660	RS ♦ 480		● PE	RCENT	SAND	•		г)N
Depth(m)	SAMPLE TYPE	RUN NO	nsc	S]	חביפפטזו	חייז	\ \T	DI	ASTIC	<u> </u>	M.C.				PERCEN		60 OR F	80 INES ▲	INSTRUMENTATION DATA	ELEVATION(m)
	SA	Ľ		SOIL]	DESCRIE		MΛ	[4311C 		M.∪. —◆-		LIQUID ——	2		40 RCENT	60	80		LEV.
0.0	Н			ļ	CAND 0 ODA	ארו /רווו\		111		12	24	<u> </u>	36	48	2	0	40	60	80	Ž	Ш
-					SHIP-and	VEL (FILL) — : Jular particles,	some s	silt, rown													
					SILT (FILL) -	- some wood	partick	es. drv.	-												-
ŀ					black, st	trong hydrocar	bon oc	dour													
															ļ	<u>.</u>					-
F																					_
-																					_
1.0																					-100.0
F		5			SILT (TILL) -	no wood par	ticles,	damp,													
-		,			prown, r	moderate hydro	ocarbo	n odour						1							-
	П																				-
-											-				ļ						-
t																					-
[-
}																					— 99.0
2.0		6			- some	hydrocarbon	odour				<u> </u>										-
}		ľ			CLAV & CUT	(TILL) +		0-	4					`							_
-					aravel.	(TILL) — traci ow plastic, dai	e or so mp. da	ınorex rk													-
					grey	on plactic, dai	np, aa	110			ļļ.		ļļ				ļļ.				-
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3.0															ļ				<u>-</u>		- 50.0
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-																					
-																					-
		7			- slight	hydrocarbon	odour					•									07.0
4.0					END OF DOD	EHOLE @ 4.0					ļļ.				ļ	ļļ	ļļ.				97.0
-					1	ion referenced		ntrol													-
F						(Property pin)															
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5.0																					— 96.0
	\mathbf{E}	BĀ	En	øir	neering	Consult	ants	: I.t.d		GED									EPTH:		
	اد است	-/ 1 3	11	Ø**	Whitehors		MII OK	, nod.	KEV	IEWE	7 R.	: DJ\	N			COM	PLE [.: 98	/09/1	4 Page	1 of 1
99/05/06	08:56/	AM (PIDA)		HITTCHOLD	o, runun		 								<u></u>				i uye	, (1 1

PHASE				*		CL	IENT: DIAND		,					BORE	HOLE	NO:	1.3	5.37	 RF	18
ALCAN							ILL: CME 750 c/w					1811		PROJ						
HAINE							M ZONE: 8 N6738							ELEVA						
SAMP					AB SAMPLE	NO RECOVERY	STANDARD PEN.				POON			BARRE						
BACK	Т	Г		BE	ntonite T	PEA GRAVEL	SLOUGH	<u>i.</u>	GRO	υT			RILL	CUTTIN		[:::]s				
	띮			님		~ ~ ~ ~							i	■ F 20	ERCEN 40	IT GRA	VEL.■ 80		Z	
m H		2	nsc	SYMBOL		SOIL			◆ION 120	IIZABLE 240	E VAPO 360	URS ♦ 480			PERCE	NT SA	ND •	-	TATI	E)
Depth(m)	핕	≅	当	LS		DESCRIPT	ION.	PLA!			.c.	LIQUI		▲ PER	<u>40</u> Ent s	60 ILT OF		<u>'</u>	MEN	TIOI
	S	RUN NO		SOIL		DESCRIPT	ION	F			•—		ا ا	20	40 PERCE	60 NT (1		-	INSTRUMENTATION DATA	ELEVATION(m)
0.0					CRAVEL & S	SAND (FILL) — som	a ailt	 	12	24	36	48		20	40	60			ž_	
_					sub-an	igular particles, dr	ie siit, /. brown													101.0 -
-													:						}	-
-					CLAY & SIL	T (FILL) — trace o low plastic, dry, gi	f sand &												ļ	-
-					giuvei,	iow piastic, ary, gi	еу					1		ļ						_
_																			}	-
-																			İ	-
1 <i>.</i> 0																			-	-
-					CLAY & SILI	T (TILL) – trace of	sand &													—100.0
_					giuvei,	damp, brownish gr	еу												. [-
-																			}	-
					– mois	t, strong hydrocarl	non odour									ļļ			ļ	_
-					5.5	a, barong nyaroodii	John Baloar												-	-
-																			}	-
- 2.0																				-
2.0 																			-	- 99.0
- !					– slight	t hydrocarbon odoi	IP.												ŀ	-
-		8			Silyin	i nyarocarbon odol	ar .	•											-	
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-		9		İ	- stron	g hydrocarbon odd REHOLE @ 3.6 m	our		•										ŀ	-
-						TEHULE @ 3.6 m tion references to													-	
-						(Property pin) on													ŀ	
 4.0					,	, , ,	•		ļļ.			ļļļ.				ļļ				- 97.0
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	ΕI	BA	En	gin	eering	Consultan		LOGGE REVIE									DEPTH		m	
			,	_		se, Yukon		IZE VIE	WLU	ot: L	V14A			100	MYLE	IE: 9	8/09/		iqe 1	of 1
9/05/06 0	B:56A	VI (PID4)				_,												ΓÜ	ige I	VI I

PHASE							CLIENT: DIAND							BORE	HOL	E NO:	13!	537-BI	- 19
ALCAN			211 1			·	DRILL: CME 750 c/w							PRO.	ECT	NO: 0	201-	98-1353	7
HAINES							UTM ZONE: 8 N6738									l: 100	.99 n	1	
SAMPLI					AB SAMPLE	NO RECOVER	<u> </u>			mm S	POON			L BARR					
BACKFI	ഥ	111	<u>'</u> E	BFI	ntonite T	PEA GRAVEL	SLOUCH	<u>•</u>	GRO	IUT			RILL	CUTTIN			AND		
	뷘			님		~~	· -							20	40	NT GRA 60	80	NO.	-
ا گ		2	OSC	SYMBOL		S01	.L		◆101 120	Nizabl 240	e vapo 360	URS.◆ 480		20	PERC 40	ENT SAI	VD ●	MIAI	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
Depth(m)	SAMPLE IYPE	KUN NO	23	L S		DESCRI	סייו∩או	PI	ASTIC		1.C.	LIQU	ın	▲ PEF	CENT	SILT OF	FINES	▲	ELEVATION(m)
	쥙)	_		SOF		DESCIVI.	LIION	'			•		" -	20	40 ▶ PFR(ENT CL		— STRI	E
0.0	+	_			CRAVEL &	SAND (FILL) -	some allt		12	24	36	48		20	40	60	80	<u> </u>	 " -
					sub-an	igular particles	. drv. brown												-
-					SILT & ORG	igular particles SANICS (FILL) -	some wood	1											
-					particle	s, dry, black													-

-					CLAV & CIL	T (TILL) – trac	on of nand le	-											-
	1	ا ۱۵			aravel.	low plastic, dr	v. arev.	•											-
1.0					slight h	ydrocarbon od	our				ļļ	<u>.</u>			ļļ.				100.0
-																			}
-																			-
_					— thin	gravel layer, n	o hydrocarbon	•	•				ľ						-
-					odour														}
2.0											ļļ	ļļļ							99.0
-																			-
-	1	11							•										}
					END OF BO	REHOLE @ 2.5	m		••••			†							
-						tion references													F
					point CP01	(Property pin)	on Site plan												<u> </u>
3.0										ļ	<u>.</u>	ļļļ		<u>į</u> <u>į</u>	ļļ.				98.0
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5.0				<u> </u>			***												96.0
Ī	ζR	Ā	En	øir	neering	Consult	ants Ltd.	LOG	GED I	BY: C	PC							1: 2.5 m	•
1	ردر	4 1	**	Ø		se, Yukon	uliuo nuu.	REV	EWEC	BY:	DJW			C	OMPL	ETE: 9	18/09,		1 of 1
99/05/06 08:	57AM	(PID4)			umrellol.	oc, runuli												Page	i VI I

ALCAN FUELS DRILL: CME 750 c/w SOLID STEM PROM HAINES JUNCTION, YT UTM ZONE: 8 N6738253 E362101 ELEV SAMPLE TYPE GRAB SAMPLE NO RECOVERY STANDARD PEN. 75 mm SPOON CREEL BARF	EHOLE NO: 13537—BH10 JECT NO: 0201—98—13537 VATION: 101.21 m
SAMPLE TYPE GRAB SAMPLE NO RECOVERY STANDARD PEN. 75 mm SPOON CREL BARF	/ATION: 101 21 m
Zamini a con il onne pan	
DIALCHI TYPE	
BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTI	
	PERCENT GRAVEL ■ 8 6 6
(E) 43	PERCENT SAND • LEVEL SAND • LEV
	RCENT SILT OR FINES A WES
DESCRIPTION PLASTIC M.C. LIQUID APPLICATION	40 60 80 ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥ ≥
0.0 GRAVEL & SILT (FILL) — some silt, sub	40 60 80
angular particles, dry brown	
CLAY & SILT (FILL) — some sand, dry,	-101
grey, some hydrocarbon odour	
- less sand, strong hydrocarbon odour	
CLAY & SILT (TILL) — same sand, dry, grey, some hydrocarbon odour	
- very dense	-100
-	
_ 2.0	
- moist	99,
13	-
TND OF PODELIOLE & 2.9	
END OF BOREHOLE @ 2.8 m Note: Elevation referenced to Control	
point CP01 (Property pin) on Site plan	
	98,
-	
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	-
-4.0	
	97.0
5.0 I CCCED BY CPC	YOURDI ETION DEDTU. 2 2
FRA Engineering Consultants Itd LOGGED BY: CPC C	COMPLETION DEPTH: 2.8 m COMPLETE: 98/09/14

PHASE							CLIENT: DIAN								BOI	SEH0	LE NO	: 1.	3537	'-B	111
ALCAN		_					DRILL: CME 7								PR()JEC	T NO:	0201			
HAINE				_			UTM ZONE:										ON: 10	1.31	m		
SAMP				=-	AB SAMPLE	NO RECOVE	<u> </u>	DARD PEN.			mm S	P001		CRI							
BACKI		_ 11	PE	BE	NTONITE	PEA GRAVEL	∭SLOU	GH	4	GRO	UT			DRI				SAND			
	PE			님		~ ~									20	■ PER(Cent G 10 (RAVEL ■	I 30	NO	(1
E.		9	ب	SYMBOL		SO:	lL			◆10h 120	VIZABLI 240	E VAF 36	OURS	. ♦ 180	20	◆ PEF	RCENT S	AND •	^	ITATI	N(n
Depth(m)	SAMPLE TYPE	RUN NO	nsc	S		DESCRI	דאר איז		DI /	ASTIC		1.C.	~	LIQUID				OR FINE	30 S.	INSTRUMENTATION DATA	ELEVATION(m)
	SA	LL		SOIL		NEOCUI	LIION	:		WIIV	IY	lı√ı ⊕			20) 4	<u>10 (</u> RCENT (30 8	10	STRU	LEV
0.0			ļ		ODAVEL 4. 4	CAND (FILL)	411			12	24	30	6	48	20) 4		30 8	30	Ž	Ш
-					Sub-an	SAND (FILL) — Jaular particles	some siit,														-
					CLAY & SIL	igular particles T — some san	d, low plastic.														-
-					dry, gre	ey, strong hyd	rocabon odoui	r													—101.0 -
t																	ļļ	ļ <u>.</u>	ļļ		-
-																					-
F																					_
- - 1.0																					-
- 1.3		14	}		CLAY & SIL	T (TILL) — trad	ce of sand, lo	w			•										_
_					plastic, odour	dry, grey, str	ong hydrocarb	on													-
_					odour																 100.0
-												ļ		ļļ			ļ .	ļ <u>ļ</u>	ļļ		_
-																					-
					- very	dense															-
-																					-
2.0 _					- some	e gravel						·		1		·	····	ļ <u>ļ</u>			-
-						J															-
-																					— 99.0
																					-
-		15			— sligh	t hydrocarbon	odour				•										-
Ĺ					END OF BO	REHOLE @ 2.7	m														-
-			i		Note: Eleva	tion reference:	to Control														_
3.0					point CP01	(Property pin)	on Site plan					ļ					ļ <u>.</u>				-
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-																					- 98.0
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SAMPLE TYPE GRAB SAMPLE NO RECOVERY STANDARD PEN. To mm SPOON CREEL BARREL BACKFILL TYPE BENTONITE PEA GRAVEL SOUGH SOIL SOIL OUN FERCENT GRAVEL 20 40 60 80 80 120 240 360 480 20 40 60 80 80 80 80 80 80 80 80 80 80 80 80 80	-
BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH SOIL SOIL SOIL SOIL SOIL PERCENT GRAVEL 20 40 60 80 2	-
SOIL	-
SOIL SOIL	-
GRAVEL & SAND (FILL) — some silt, sub—angular particles, dry, brown CLAY & SILT (FILL) — some sand, low	-
GRAVEL & SAND (FILL) — some silt, sub—angular particles, dry, brown CLAY & SILT (FILL) — some sand, low	-
GRAVEL & SAND (FILL) — some silt, sub—angular particles, dry, brown CLAY & SILT (FILL) — some sand, low	-
GRAVEL & SAND (FILL) — some silt, sub—angular particles, dry, brown CLAY & SILT (FILL) — some sand, low	-
sub-angular particles, dry, brown CLAY & SILT (FILL) - some sand, low	- 101.0 - - -
	-101.0 - - - -
- piastic, ary, grey	-
	-
	-
	-
-1.0	-
	-
16 CLAY & SILT (TILL) — some sand, damp, ◆	- 100.0
brownish grey, very slight hydrocarbon	-100.0
- odour	-
sub-rounded particles	
	-
_ 2.0	
- very slight hydrocarbon odour END OF BOREHOLE @ 2.1 m	[
END OF BOREHOLE @ 2.1 m	
- Elevation references to Control	99.0
point CP01 (Property pin) on Site plan	-
— Noticeable roots & rotting organics on auger № 1.2 m in depth	
On dager & 1.2 m in depth	[-
_ 3.0	-
	-
	98.0
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	-
-4.0	-
	[
	97.0
	-
5.0	
EBA Engineering Consultants Ltd. LOGGED BY: CPC	
Whitehorse, Yukon Pag	

PHASE							CLIENT: DIAND												537-B	
ALCAN			1011	<u> </u>	 		DRILL: CME 750 c/w												98-1353	37
HAINE					ND 044-01-		UTM ZONE: 8 N673						m		EVATI	ON:	101.	21 m	1	
SAMP					AB SAMPLE	NO RECOVER	KY				SP00			REL BAI		- F				
BACK	- ILL	. 17	rt	RFI	ntonite I	PEA GRAVEL	SLOUGH	<u>(4. °</u>	GRO	Uľ			DRI				SA			T
	녱	_		点		0.01	T								PEF	40	60	80	INSTRUMENTATION	F
Depth(m)	SAMPLE TYPE	RUN NO	OSC	SYMBOL		S01	L		◆101 120	11/AB 24(LE VA	Pours 60	180	2		rcent 40	SANI 60	0. ⊕ 80	N A	ELEVATION(m)
ept	맆	RUN	Š	SOILS		DESCRI	PTION	PLA	STIC		M.C.		LIQUID	A F	ercei O	IT SIL 40	T 0R 60	FINES 80		KATI N
	æ			ကြ		DEDOIM.	1 11011			0.4	•-		 -		◆ PE	RCEN	F CLA	Y 🔷	ISI	ELE
0.0					GRAVEL &	SAND (FILL) -	some silt, sub	+	12	24	3	6	48	2	.0	<u>40</u>	60	80	\top	+
-					angulo	ır particles, dry	brown	_												101.0
}					SILI (FILL)	- sandy, fine	grained, dry, drocarbon odour													-
					greyisi	n brown, no nye	nocarbon agour			,		ļ <u>.</u>			ļļ			<u>.</u>		
ŀ																				-
t		18																		-
-		10																		
1.0				1	CLAY & SI	LT (TILL) – trad	ce of sand, low			<u>i</u> .		ļ ļ		ļ	<u> </u>			. <u></u>		+
F					plastic	, dry, dark grey														100.6
}					hydrod	carbon odour														-
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}																				+
-																	:			F
2.0		19			_ slig	ht hydrocarbon	odour			•	·									-
}					END OF B	OREHOLE @ 2.1	m													- 99.0
 					1	ation referenced 1 (Property pin)														-
_					point of o	i (i roporty pin,	7 on oite plan			ļļ.		ļ <u>.</u>			ļļ					-
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5.0																				<u> </u>
	F	R۸	En	gir	perino	Consult	ants Ltd.	LOGO											H: 2.1 m	
	J.	מת	1111	511		rse, Yukon	allos nou.	REVI	LWE) BY	: DJY	٧			COM	IPLET	L: 9	8/09		1 of 1
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PHASE						CLIENT: DIAND						BC	REH	1 JOH	10:	135	537-B	3H14
ALCAN			FIONL N			DRILL: CME 750 c/w H						PF	ROJE	CT NC	: 020	01-9	98-135	37
HAINE					AD GALIELE	UTM ZONE: 8 N67382				,		EL	EVAT	TION:	100.9	m		
SAMP					AB SAMPLE NO RECOVER		_=		mm S	POON	∭CR					-		
BACK	TILL		PE	BE	NTONITE PEA GRAVEL	SLOUGH	4	GRO	JUT		DR	LL CU	ITING	s 🗄	SAN	4D		-
	닖			7		_							■ PE 20	RCENT 40	GRAVE 60	L ■ 80	Z	
E.	⊨	2	ں	SYMBOL	SOI	L		♦10 120	NIZABLI	E VAPO 360			• P	ERCENT	SAND	•	— <u>¥</u>	E
Depth(m)	딢	RUN NO	OSC	S	DEGCDII	אר אוו					480		20 PERCE	<u>40</u> Ent sili	60 FOR F	80 INFS	NSTRUMENTATION	ELEVATION(m)
Ŏ	S	12		SOIL	DESCRIF	TION	ן אי	ASTIC	M	I.C.	LIQUID		20	40	60	80	<u>, 15</u> ,	₹
_ 0.0	_							12	24	36	48		. ◆ P	ercent 40	r Clay 60	* 80	INS	
- 0.0				E	GRAVEL & SAND (FILL) - :	some silt, sub												-
_					\ angular particles, dry, SILT (FILL) — some sand,	Drown												E
_					dry, black	inic grainea,	****				·		ļ					-
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1.0 -										ļļ	ļļ							100.0
-																		[
										ļļ	ļļ		ļļ.					-
_		20			– organic layer, spruc	e needles,												-
- 2.0					strong hydrocarbon od	lour				<u> </u>	<u> </u>							99.0
					CLAY & SILT (TILL) — trace plastic, dry, greyish br													[
-					hydrocarbon adour	own, some												_
-					,					*! -	\$} 		ļ				****	-
-																		F
— 3.0 -					— moist, slight hydroci	arbon odour				ļļ	ļļ			-				98.0
-						J. 50.0	•											E
_					 dense drilling 					ļ								-
					i I													-
- 4.0										<u> </u>								97.0
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_																		_
-		21			— slight hydrocarbon o	odour, no odour												-
-					after 4.6 m													- 05.0
— 5.0 -																	<u></u>	96.0
-																		
_	ı																	-
- -																		-
- 6.0					THE AT POPULATE A A 7												<u></u>	95.0
-					END OF BOREHOLE @ 6.3 r Note: Elevation referenced													-
<u>-</u> [point CP01 (Property pin)											i		<u> </u>
-					1	on one pran												-
-																		94.0
7.0 -													···					-
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•					Whitehorse, Yukon	TION LICE.	EVIE	WED	BY: C	JW			COM	PLETE	: 98/	09/		
9/05/06 10]:1 4/ 4	A (PIDE)			manucatorac, 1 UKUII												Page	1 10 1

PHASE							CLIENT: DIAND): 13			
ALCAN							DRILL: CME 750 c/w									0201-		3537	
HAINE							UTM ZONE: 8 N673								ON: 10	00.99	m		
SAMP					AB SAMPLE	NO RECOVER	<u> </u>			nm SF	NOOr	CR			2.1				
BACK	- <u> </u>	<u>. IY</u>	PE.	BEI	ntonite	PEA GRAVEL	SLOUGH	<u>. • · · · · · · · · · · · · · · · · · · </u>	GRO	Л		DR	ILL CU			SAND			
	뛴													20	40 (RAVEL.■ 80 8	0	S	<u>ڪ</u>
(E)	Σ	9	ري	SYMBOL		SOI	L		◆ION 120	IZABLE 240	VAPOL 360	IRS ♦ 480		● PE	RCENT S	SAND GO 8	^	TAT	N N
Depth(m)	SAMPLE TYPE	RUN NO	OSC	S		עהמטחוו	זאַרעת	DIA	STIC		.C.	LIQUID	A	PERCEN	IT SILT	OR FINE	y S.▲	NSTRUMENTATION DATA	EVATION(m)
ľ	SAIV	æ		SOIL		DESCRII	FION	104			.v.		-			30 8 CLAY�	0	STRI	ELEV
0.0					ODM/FL 4. C	AND (FULL)	411 4	+-	12	24	36	48	ļ				0	≥	ш.
- "						particles, dry,	some silt, sub											}	-
					SILT (FILL)	- some sand	& gravel, sub	1											-
}						particles, dry,												-	-
F					grey								·					ŀ	-
																			_
-																		-	-
1.0																		ļ	- —100.0
- 1.0					CLAV A CUT	· /mu \ .		_											100.0 -
†						(TILL) — trac ow plastic, da												ŀ	-
					slight h	drocarbon od	our												-
F																		}	-
t																		ŀ	-
-		22																	-
}					FND OF BOE	REHOLE @ 1.9	m	\dashv										ŀ	-
2.0					Note:	TENOLE & TO	•••												99.0 -
-						tion referenced												ļ	-
t					point Ch	201 (Property	pin) on Site plan letal was drilled											t	-
F						ed of hole, dep												[_
-					undeteri													}	-
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-																		ŀ	-
3.0											<u></u>		·					Ì	— 98 <i>.</i> 0
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PHAS							CLIENT: DIAND						BOR	EHOL	E NO	: 13	5.37	'— RI-	116
ALCAI							DRILL: CME 750 c/w									0201-			
			TION, `				UTM ZONE: 8 N6738								N: 10	0.97 r	'n		-
SAMP					AB SAMPLE	NO RECOVER				mm SF	00N	CRR							
\vdash	Τ-	T		BE	ntonite I	PEA GRAVEL	Srongh	<u> </u>	GRO	VT		DRIL				SAND		,	
_	ME	RUN NO		ğ		COI	т						20	40	0 6	AVEL ■ 0 80)	NO NO	
<u>+</u>	E I	ΙŽ	nsc	SYMBOL		SOI	L		◆101 120	VIZABLE 240	VAPOU 360	IRS ◆ 480	20	PER 4(CENT S	AND ● 0 80	<u> </u>	VIAI	Š
Depth(m)	MP	2	5	SOILS		DESCRI	סייורא	PLA	STIC	М	.C.	LIQUID	▲ PE 20	RCENT	SILT C	R FINES	A	INSTRUMENTATION DATA	ELEVATION(m)
	5			S		DECOLVII	11011	}					-	◆ PER	D 6 CENT C	LAY 🍲	,	STR	ELE
- 0.0	<u> </u>				GRAVEL & S	SAND — some s	ilt, sub angular	+	12	_24	36	48	20	40) 6) <u>8</u> ()	=	_
E					\ particle:	s, dry, brown	·] [
-						- some sand a													
Ė					grey	particles, dry,	prownish												- -
1.0					- ,														100.0
-					CLAY & SILT	Γ (TILL) – trace	e of sand &												
E						low plastic, dar ydrocarbon odd													_
-	=					e, stiffer drilling		•											Ē
2.0																			99.0
-																			Ē
E					_ again	r drilling													<u></u>
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3.0								•											98.0
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Ė																			<u>-</u>
Ē					- hard	drilling													Ē
- 4.0					- easie	r drilling													97.0
E					– more	gravel, no hyd	rocarbon odour												-
-																			<u>-</u>
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- - 5.0																			_ — 96.0
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E 6.0		23						•											95.0
ļ ""						REHOLE @ 6.0												}	- 33.0
E						ion referenced (Property pin)													_
-					F 5. 5.	/	on one plan												-
- 7.0																		ŀ	- 94.0
- /.0																			94.0
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ļ.																			-
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	لند	υM	الم	$\overline{}$	_		uito liu.	REVIE	WED	BY: C	λM		C	OMPL	ETE:	98/09			
99/05/06	10:094	M (PIDE)		Whitehors	sc, iukon		1									Р	age 1	of 1

PHASE							CLIENT: DIAND						BO	REH0	LE N	0: 1	353	7-BI	H17
ALCAN							DRILL: CME 750 c											-1353	
HAINE							UTM ZONE: 8 N6	-)N: 1	01.04	1 m		
SAMP				=_	AB SAMPLE	NO RECOVER					SPOON		REL BAF		<u>-</u>				
BACKI		_	PE	BE:	ntonite T	PEA GRAVEL	SLOUGH	<u> </u>	GR	OUT		DRI				SANI			
Depth(m)	SAMPLE TYPE	RUN NO	osn	IL SYMBOL		SOI DESCRIF		Pt	◆ I(120 ASTIC	240	LE VAPO 360 M.C.	URS ◆ 480 LIQUID	2	D 4 ◆ PEI D 4 ERCEN	10 RCENT 10 T SILT	OR FII	80 80 NES A	INSTRUMENTATION DATA	ELEVATION(m)
	₹			SOIL		DHOOM	11011				•	——				60 CLAY∢	80	STR	
0.0 			•		angular CLAY & SILT	AND (FILL) — : particles, dry, (FILL) — som dry, greyish b	greyish brown e sand, fine		12	24	36	48	2			60	80		101.0
1.0		24			brownish	n grey	e sand, damp,		•										
2.0 		:			odour		, 1, 4, 004, 001												- - - 99.0 - - - -
- - - - - - - - - - - -		2 5			SAND & GR/ graded, odour	AVEL (TILL) — s dry, grey, hyd	some silt, well rocarbon	 •											- 98.0
4.0 		26			– grind	y drilling, grave	el layer	 •											- 97.0 - - - - -
																			- - - 96.0
6.0 - - - - -		27			END OF BOF	slight hydrocar	m				•								- - - 95.0
7.0						ion referenced (Property pin)													- - - - - 94.0
- - - 8.0																			93.0
	\mathbf{E}	BA	En.	gir	eering	Consulta	ants Ltd.			BY: C							PTH: (
				O	Whitehors			KEV	ic.W.E	D BY:	Π/IM			LUMI	LEIL	: <u>48/</u>	09/15		1 / 6 1
99/05/06	0:09/	M (PIDB)		MITTOCHOLS	o, iukuli		1										Page	1 of 1

PHASE						CLIENT: DIAND						BORE	HOLE	NO:	135	537-	-BH	18
ALCAN						DRILL: CME 750 c/w H	IOLLO	w st	EM						201-9			
HAINE				<u>/T</u>		UTM ZONE: 8 N67382	42 E3	621	14			ELEV.	ATION	: 100	.89 m)		
SAMP				GR	AB SAMPLE \times NO RECOVER	STANDARD PEN.		75 m	m SPO	ON	CRR	EL BARR	EL					
BACK	FILL	<u>. TY</u>	PΕ	BEI	NTONITE PEA GRAVEL	SLOUGH	4.	GROU	Γ		DRIL	L CUTTIN	IGS	S.	and			
	سِا											20	PERCEN			-	<u> </u>	
(m)	Ë	9		SYMBOL	SOI	Ţ,		► IONIZ	ZABLE V	/APOUR		4	PERCE	00 Nac The	08 • (IV		2	<u>E</u>)
Depth(m)	PE	RUN NO	OSC	λ						360	480	20 ▲ PFF	40	60	80 FINES		A L	<u></u>
ථ	SAMPLE TYPE	<u>a</u> .		SOIL	DESCRIE	TION	PLAS	TIC	M.C.	•	LKQUID	20	40	60	80		DATA	ELEVATION(m)
	Ľ			, ,				12	24	36	48	20	PERCE 40	ENT CL/ 60		1	2	ᆸ
- 0.0		:			GRAVEL (FILL) — sandy, so	me silt, sub-												
_		i			angular particles, dry, CLAY & SILT (FILL) — som	brown)	ļ	ļķ									-	-
- [damp, grey, some hyd	e graver & sana, rocarbon odour											Ė	:
 1.0					- wood particles, blac	k snil	ļ <u>.</u>	ļļ									Ė	-100.0
<u>-</u>					CLAY & SILT (TILL) - som												Ė	<u> </u>
_ -					damp, brownish grey,	some hydrocarbon											Ė	:
2.0					odour	,	<u> </u>										Ė	99.0
-																	F	
_								ļ <u>i</u>					ļļ				F	-
3.0																	F	
— 3.0 -		28			— trace to some grave	el & sand, damp to	•			+					- 		F	98.0
_					moist, slight hydrocart												F	<u> </u>
- - -																	-	
4.0								ļ <u>ļ</u>					ļļ	ļļ			F	97.0
_																	Ē	
4.0		29			- gravels, 40 mm in a	liameter, sub-		ļ .						- 			Ē	-
- 5.0					angular particles													96.0
-					 slow smooth drilling 	some											Ė	
- - - -					hydrocarbon odour			ļļ					<u> </u>				E	-
-																	E	
6.0	=	30						 					ļļ				E	95.Ω
-		0															E	_
-													····				Ė	[]
																	E	94.0
- '''																	F	
-					- organisa wood fibr	na manathh. a		•	,				ļļ				F	- [
-					 organics, wood, fibrotree, slight hydrocarbo 	es, possibly a n adour											E	
— 8.0 -					 very slow hard drilling 	ng, no		ļ <u>.</u>					<u> </u>				Ē	93.0
-					hydrocarbon odour	<i>J.</i>											E	_
-					END OF BOREHOLE @ 8.5								····	÷			Ė	
- 9.0		Ì			Note: Elevation referenced					<u>.</u>			<u>į</u> į	<u>.</u>	<u>.</u>			- 92.0
-					point CP01 (Property pin)	on Site plan											E	
<u>-</u> -													ļļ				Ė	- [
-																	F	- 91.0
10.0				!									<u> </u>	ł			Ę	-91.U
- ;																	E	-
-														†			Ė	
11.0									1= -								F	- 90.0
	ΕI	3A	En	gin	eering Consulta		LOGGE			A?					DEPTH		m	
				_	Whitehorse, Yukon		TEVILY	יבט 5	Y: DJI	77			MPLE	JE: 91	8/09/		ge 1	of 1
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		ESA			· · · · · · · · · · · · · · · · · · ·		CLIENT: D							BOF	REH0	LE N	0: 1	3537	7-BH	119
ALCAN				_				E 750 c/w H										-98-		
HAINE:			_	_				: 8 N67382	50 E	362	105			ELE	VATIO)N: 1	01.11	m	-	
SAMP				=-	AB SAMPLE	NO RECOVER		andard pen.			mm SI	² 00N	CRI	REL BAR	REL					
BACK	-ILL	. IY	PE I	BE	NTONITE	PEA GRAVEL		OUGH	4.	GRO	UT		DRI	LL CUTT	INGS		SAND			
	PE													20			ravel 60	80	N _O	
Depth(m)	SAMPLE TYPE	RUN NO	ري	SYMBOL		SOI	L			◆10N 120	NZABLE	VAPOL			PEF	RCENT	SAND 4)	INSTRUMENTATION DATA	ELEVATION(m)
bg.	PLE	S	OSC	\S.	,			-			240	360	480	20 ▲ PE			60 OR FIN	80 ES ▲	A A	I)
ă	SAM	œ		SOIL	ا	DESCRIF	TION		MLA	STIC	M	.C.	LIQUID ———	20) 4	10	60	80	13. 13.	
0.0				ļ.,					'	12	24	36	48	20			CLAY ◆ 60	80	SE	
- 0.0						_) — sandy, so		ub-												101.0
E .					SILT (FILL) -	particles, dam - some gravel	ip, brown	damp.												_
E					brown	Source graver	œ suriu,	uump,				****				ļ 				<u> -</u>
ļ .				Ì																-
— 1.0 -												<u> </u>				ļļ				[—100, 0
[:																				- 100.0
<u> </u>		7-1			CLAY & SILT	(TLL) — trace	of sand	k	ļļ			ļļ		ļi.		ļļ	ļļ			-
-	Ħ	31			gravel, d	lense, damp, g	g rey , stror	ng					•							-
2.0					hydrocar	bon odour	, ,.	,	ļ			ļļ				ļķ	.ļļ			_
E																				— 99.0 -
L.												ļļ				ļ				-
-																				E
																				-
5.0		32				gravel, trace		noist,			•	•	····							98.0
-	Ħ				grey, slig	ght hydrocarbo	on odour													Ė
-				:												ļ				E
-																				-
4.0												ļļ				ļ				
-																				— 97. 0
Ė.						l			ļ			ļļ				ļ				_
E		34				ly, moist, grey bon adour	, no		•	•										-
- 5.0					– grindy															-
-						th drilling														96.0
F						-3														-
E																				_
_																				-
6.0		33																		95.0
F	Ħ	33			END OF DOD	EHOLE @ 6.3														- ***
F						on referenced		point	ļ <u>.</u>					 -						<u>-</u>
-						erty pin) on Sit		Ponit												<u></u>
- 7.0					' '		•		ļ							ļļ	ļļ			<u> </u>
F																				94.0
E																				Ė
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─ 8.0 -																				- 93.0
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	Ľŀ	3A	Ľn			Consulta	ants I				BY: [09/16	<u> </u>	
99/05/06 1	0.00	u (nee			Whitehors	<u>e, Yukon</u>						•							age	of 1

PHASE III ESA	CLIENT: DIAND		BOREHOLE NO: 13537-BH2	20
ALCAN FUELS	DRILL: CME 750 c/w H	IOLLOW STEM	PROJECT NO: 0201-98-13537	
HAINES JUNCTION, YT	UTM ZONE: 8 N67382	55 E362097	ELEVATION: 101.29 m	*******
	recovery Standard Pen.	75 mm SPOON CRREE	L BARREL	
BACKFILL TYPE BENTONITE .: PEA	GRAVEL SLOUGH	GROUT DRILL	CUTTINGS SAND	
			■ PERCENT GRAVEL ■ 20 40 60 80 ≦	_
Depth(m) NO USC OIL SYMBOL STANDING OIL SYMBOL OIL SYMBOL OIL SYMBOL OIL SYMBOL OIL SYMBOL OIL SYMBOL OIL SYMBOL OIL SYMBOL OIL SYMBOL OIL SYMBOL	SOIL	♦IONIZABLE VAPOURS ♦ 120 240 360 480	● PERCENT SAND ●	Ē
			20 40 60 80 IN Y S	
Depth(m) Run NO USC SOIL SYMBOI	CRIPTION	PLASTIC M.C. LIQUID	20 40 60 80 NO NO NO NO NO NO NO NO NO NO NO NO NO	ELEVATION(m)
		12 24 36 48	◆ PERCENT CLAY◆ 20 40 60 80	딥
GRAVEL (FILL) — so	ndy, some silt, sub-		F	1010
rounded particle	es, ary, brown sand & gravel, damp,		F	-101.0
	sand & graver, during,			-
E brown				
				-100.0
SILT (TILL)	— some gravel, trace of	•		
E 2.0 sana, dense, ad bydrocarbon od	imp, grey, some		<u> </u>	-
- I I I III III III III III III III III	our		<u> </u>	- 99.0
= 3.0				-
=		•		00.0
E med-dense, str E - smooth drillin	ong hydrocarbon odour		F	- 98.0
	ıg			-
- 4.0				
				97.0
37		•		
5.0			<u> </u>	-
			E	- 96.0
6.0				-
38 - some hydroc	arbon odour	•		
				- 95.0
				-
7.0 39				
				94.0
- grindy drilling	— cobble damp, brownish grey	•		
- 8.0 - Some sund, V	idilip, brownian grey		<u> </u>	-
			<u> </u>	- 93.0
- sand & grave	elly, damp, brownish	Y		
grey, slight hyd	ocarbon odour			-
9.0 42 no_hydrocarb		•		
END OF BOREHOLE			<u> </u>	- 92.0
Note: Used 1 bag o	f bentonite to plug			
	to Control point CP01		<u> </u>	
(Property pin) on S			<u> </u>	- 91.0
- 11.0			<u> </u>	-
EBA Engineering Cons		LOGGED BY: CPC	COMPLETION DEPTH: 9.2 m	
Whitehorse, Yul	l i	REVIEWED BY: DJW	COMPLETE: 98/09/16	vt 4
99/05/06 09:00AM (PID10) WITHCHTOTSE, I UI	7011		Page 1 c	OT I

PHASE III ESA CLIENT: DIAND		BOREHOLE NO: 13537-BH21
	50 c/w HOLLOW STEM	PROJECT NO: 0201-98-13537
	N6738262 E362101	ELEVATION: 101,31 m
SAMPLE TYPE GRAB SAMPLE NO RECOVERY STAND	ARD PEN. ■75 mm SPOON □□CRREL	BARREL
BACKFILL TYPE BENTONITE PEA GRAVEL SLOUG	H GROUT DRILL	CUTTINGS SAND
		DERCENT CDAVEL
SOIL SAMPLE TYPE SOIL SAMBOL SYMBOL SOIL SOIL SYMBO	♦IONIZABLE VAPOURS◆	20 40 60 80 NO VEL VI VI VI VI VI VI VI VI VI VI VI VI VI
SOIL DESCRIPTION	120 240 360 480	20 40 60 80
DESCRIPTION	PLASTIC M.C. LIQUID	A PERCENT SILT OR FINES A 20 40 60 80 20 5
	12 24 36 48	A PERCENT CLAY ♦
GRAVEL (FILL) — sandy, some silt, sub-	12 24 36 48	20 40 60 80 =
F rounded particles, dry, brown	1	10
SILT (FILL) — some sand, fine grained,		!
damp, greyish brown		
E-1.0		
		10
CLAY & SILT (TILL) — some sand & gra	(a)	+
med-dense, damp, grey, no hydroc	arbon	
-2.0 odour		<u>i i i i i i i i i</u> F
		F
F		F-9
F		
F.		
- 3.0 =		
- fine sand lenses 50 mm apart, s	ome 🗼	
E		
- 4.0		<u> </u>
F 📙		i i i i i i i i i i i i i i i i i i i
- no more sand lenses, no hydroco	rbon 🔶	
odour odour		
-5.0		
F		
E		<u> </u>
E		
E-6.0 -		
E *** 44	•	
END OF BOREHOLE @ 6.3 m		<u> </u>
Note: Elevation referenced to Control		
point CP01 (Property pin) on Site plan		1 E
-7.0		<u> </u>
F		
F		
F		
[
-8.0		
[
<u> </u>		-9 -9
EBA Engineering Consultants Ltd	LOGGED BY: CPC	COMPLETION DEPTH: 6.3 m
,	REVIEWED BY: DJW	COMPLETE: 98/09/16
Whitehorse, Yukon		Page 1 of

PHASE						CLIENT: DIAND							BC	REH	DLE N	10:	135	37-B	H22
ALCAN						DRILL: CME 750 c/w H						****	PF	ROJEC	T NO	: 020	<u>9</u> ;	8-1353	7
HAINE						UTM ZONE: 8 N67382	63	E36	211	3			EL	EVAT.	ON: 1	01.2	6 m		
SAMP					AB SAMPLE NO RECOVER					1 SPC	ЮИ	∭CRF	REL BA	RREL					
BACK	- ILL	_ Y 	PE	BE	ntonite Pea gravel	[[[]]SLOUGH	<u>į.</u>	GR	OUT			DRI	L CUT	TINGS		SAN	√D		
	H			占									,	■ PEI	RCENT 40	GRAVE 60	L ■ 80	Z	
(m)	∠	용	U	SYMBOL	l SOI	L			ONIZ	ABLE \	/APOU			● PE	RCENT	SAND	•	—I¥I	E)
Depth(m)	PLE	RUN NO	OSC		DEGADII	ישו באד	-	120			360	480			40 NT SILT	60 OR F	80 INES ▲	- E	
ă	SAMPLE TYPE	82		SOIL	DESCRI	TION	ן אין	ASTIC		M.C	•	LIQUID		20	40	60	80	INSTRUMENTATION	ELEVATION(m)
_ 0.0					CRUE (TILL)			12	2	24	36	48	2		RCENT 40	CLAY 60	♦ 80	SS	
- 0.0					GRAVEL (FILL) - sandy, so	ome silt, sub-													
- -					rounded particles, dry,	Drown													-101.0
- ,					SILT (FILL) — some sand a	k arayel dama	1												Ė
- -					greyish brown	a gravor, durity,													-
— 1.0 -									·	ļ <u>.</u>				ļ <u>.</u>					-
-																			100.0
<u> </u>		. !			CLAY & SILT (TILL) - som	e sand trace of				ļ				ļ					[
-					gravel, damp, grey, sli														<u> </u>
- 2.0					odour	,	ļ			ļļ				ļ					-
-																			99.0
- 	ı									ļļ.,									- 99.0
-																			-
- 3.0																			F
-		45			 some gravel, moist, 	med-dense,	•												E
-	\exists				slight hydrocarbon odd	our													98.0
-															<u></u>				-
-																			F
4.0 -					3		ļ		· ‡ · · · ·	ļ <u>.</u>					ļļ				E
4.0 																			97.0
-							ļ <u>.</u> .			ļ <u>.</u>					ļļ				-
-		46					•												E
- — 5.0							ļ		<u>.</u>	ļ <u>.</u>									-
-	1																		
-																			96.0
-																			
- ,,																			F
- 6.0 -		47					•		Ť										F
- -	=			ŀ	END OF BOREHOLE @ 6.3	m	ľ												95.0
-		ļ			Note: Elevation referenced											-			-
-					point CP01 (Property pin)														-
- 7.0		:							ļ										E
-																			94.0
-							<u>i</u>		<u>.</u>										
-																			
8.0		ļ																	E
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.		İ																	93.0
	<u></u> דקן				coming Cara11	-1-111	LOGGED BY: CPC							СОМ	<u>: </u>	::::: 10 N(-РТН-	6.3 m	<u> </u>
	Ľİ	δA	ru{		eering Consulta					(: DJ	₩						<u>/09/1</u>		
9/05/06 0	9:Q1AI	vi (PIDB)			Whitehorse, Yukon													Page	1 of 1

PHASE							CLIENT: DIAND							BOF	REHO	LE N(D: 1	3537	-BH	123
ALCAN					· · · · · · · · · · · · · · · · · · ·		DRILL: CME 750 c/w											-98-		
HAINE							UTM ZONE: 8 N67382	256 E	362	110	-			ELE	VATIC	N: 10	01.14	m		
SAMP					AB SAMPLE	NO RECOVERY	<u> </u>			mm S	1009E	٧	CRF							
BACK	-ILL	<u>- TY</u>	PE	BEI	NTONITE	PEA GRAVEL	SLOUGH	4.	GRO	IUT			DRIL	T CALL	INGS		SAND			
	PE						_							20		ENT G	RAVEL I	■ 80	S	
Depth(m)	TYPE	RUN NO	ب	SYMBOL		SOI			♦101 120	NIZABL 240	E VAF		S. ♦ 480	20	◆ PER	CENT :	SAND	B0	INSTRUMENTATION DATA	ELEVATION(π)
l tda	SAMPLE	NN.	OSC	S	-	עהמטטור	ויי וייי	DIA	STIC		M.C.	<u></u>			RCEN	T SILT	OR FINI		MEN	410
ľ	₹	LE.		SOIL		DESCRIF	TION	1 -0	10110	<u>-</u>	M.L.		LIQUID	20) 4	0 :		80	JE _	LE%
- 0.0	_				ODANEL /EU		40.	<u> </u>	12	24	36	<u> </u>	48	20) 4	0		80	ž	Ш
F "					CHAVEL (FILI	L) — sand <mark>y,</mark> so particles, dry,	me silt, sub-	1												-101.0
F					SILT (FILL) -	- some sand, a	damp, arevish	/ <u>.</u>		ļļ							.ļ			F
F					brown		p, g.oy.on													- -
1.0																				E ─100.0
E								ļ <u>.</u>		<u>.</u>										Ē
E	F				- layer	of organics, we	ood chips,						•							F
2.0						ome <u>hydrocar</u> b		$\downarrow \downarrow$												Ē
Ē					SILI (IILL) - brown	- some sand, a	lamp, greyish													99.0
Ē					DIOWII															Ē
3.0																				Ē
-		48	•		CLAY & SILT	(TILL) – some	sand & gravel,						4	>						98.0
E			·			nse, wet, gr <mark>ey,</mark> rbon odour	strong										ļļ	ļ		
Ė					i ijaiocai	DOII OQOQI														-
- 4.0																				97.0
Ė																				
E					- moist	, some hydroco	arbon odour						•							-
5.0																	ļļ	ļļ		
Ē																				96.0
-								-			-							ļ <u>.</u>		
6.0																				<u>-</u>
£ ""		49			- slight	hydrocarbon o	dour				•									95.0
Ė																	ļļ			
E																				
7.0					:						+							ļ <u>.</u>		94.0
Ē																				
Ē		50			SILT - s	some sand, der	nse, damp,	•												-
8.0					brownish	i grey, no hydr	ocarbon odour	Ŋ		ļļ								ļļ		-
E						REHOLE @ 7.7 r														93.0
E					Note: Used bottom of h	1 bag of bento ale	nite to plug				-									
F 9.0							ntrol point CP01													<u>-</u> -
£ "."						n) on Site plan														92.0
E								ļ												-
E																				-
10.0					!															91.0
F																				- VI.V
F																				
11.0																				-
	\mathbf{E}	BA	En	gin	eering	Consulta	ints Ltd.	LOGO REVIE								********		TH: 7.	7 m	
				_	Whitehors			VCAIF	_WEU	01;	UUW				JUMP	בבוב:	98/0		age 1	of 1
99/05/06 0	9:01A	M (PID10	5}		1,11100110110	o, runun							•••						ugo 1	VI I

PHASE							CLIENT: DIAND							BOR	EHOL	E NO:	1.	3537	7—BI	124
ALCAN							DRILL: CME 750 c/w	HOLL	OW S	TEM		****				NO: (
HAINES							UTM ZONE: 8 N673		362	104				ELE\	/ATIO	N: 10	1.25	m	·	
SAMPI					AB SAMPLE	NO RECOVERY				nm S	POON			L BARI						
BACKE	- ILL	. <u> Y</u>	PŁ.	BFI	NTONITE [PEA GRAVEL	SLOUGH	<u> i </u>	GRO	UT			DRILI	L CUTTI			SAND			
~	'nE.	_		٦ ا		COTT	-						ļ	20		ent Gr 0 60		I 10	NO	_
h(m	E	2	OSC	SYMBOL		SOII			◆ION 120	IIZABLI 240	E VAP(360	OURS ♦ 480		20		CENT SA	ND •	۸.	TATI). N
Depth(m)	SAMPL	RUN NO	Š		Ţ	DESCRIP	יתרות	PLA	STIC		 I.C.		DIUK	▲ PE	RCENT	SILT O	R FINE	SA	JAE PAT A	ATIC
	S			SOIL	1	TOOTH	11011				•—		+	20) 6(CENT CI		0	NSTRUMENTATION DATA	ELEVATION(m)
0.0	Н				GRAVEL (FILL	.) - sandy, sor	me silt dry	-	12	24	36	48	-	20				0	<u> </u>	
-					\brown															- 101.0
-							race of gravel,	- -			ļļ									
-					damp, bi	rownish grey														
1.0											ļļ									-
-																				100.0
-					CLAV & CUT	(TU I)		_			ļļ									
					sand, da	(IILL) – some mp. arev	gravel, trace of													
- 2.0					aana, sa	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					ļļ									-
																				99.0
-																				- 33.0
-																				-
- 3.0																				
		51	*			dense, strong	hydrocarbon						•							-
-					odour															98.0
·					– grindy	drilling														_
				ļ																-
4.0			Ì		- smoot	h drillina					:		1							-
:					OHIOV	ii ummiy														— 97.0 -
- :																				- - -
: _																				-
5.0											å									-
.																				96.0
-											ļļ	·								-
																				-
6.0		_							-		ļ <u>.</u>									-
		57											•							95.0
-								ļ <u>i</u>												
																				_
- 7.0					- verv h	ard grindy drill	ina	ļ .			ļļ									-
				ŀ	\ - refusal	l, very large bo	oulder	1												94.0
-					FUD OF ROLF	HOLE @ 7.2 n	n	-			ļļ	ļļ	.ļļ.							-
	l				Note:	on referenced	to Control												}	-
- 8.0							in) on Site plan				ļļ	.ļļ			<u>.ļļ</u> .					-
					— A plast	tic bottle was o	drilled up side													93.0
					***************************************	depth undetern		1,000		V 65										-
	EI	3A	Eng	gin	eering (Consulta	nts Ltd.	LOGG REVIE								ETION ETE: 9			2 m	
					Whitehorse			INLVIE	.17 LU	וווו	70 84		**		UMPL	LIL S	0/ US		age 1	of 1
1/05/06 0	9:01A	r (PIDE)																	- 1 - '	النسنا

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PHASI						CLIENT: DIAND										REHOLE NO: 13537-BH25							
ALCAN			10N N	л		DRILL: CME 750 c/w F															-13537	<u>'</u>	
HAINE SAMP					AB SAMPLE NO RECOVE	UTM ZONE: 8 N67382 RY STANDARD PEN.	256				ON	П	Поп)N: 	101	1.25	m			
BACK					AR SAMPLE NO RECOVE		F	75 GR0		SPU	XON		DRI		BARI		 [-	· · · · · ·					
DACK		- ''	T L.	DLI	TOMIC FEA GRAVEL	Щогооси	<u> </u>	Jorg	101				∆nkıı						SAND AVEL		<u> </u>		
~	PE			ğ	an	тт		A 10	LH741	D) F \	мплі	IDC 4		_	20		40	60	8 (30	_ ₹	E	
h(m	ET	Z	OSC	SYMBOL	S0	lL.		120	NI ZAI	OLE V	/APOL 360	#54l 48		20 40 60 80					00	_KN ₹	NO		
Depth(m)	SAMPLE TYPE	RUN NO	Š		DESCRI	PTION	PL	ASTIC		M.C		L	KQUID		▲ PE 20		it sil 40	LT OF 60	R FINE	S ▲ 30	INSTRUMENTATION DATA	ELEVATION(m)	
	SA			SOL		1 11011				•			-			♦ PE	RCEN	NT CL	_AY♠	-	NS TELE		
_ 0.0	 				DRILLED DOWN TO 9.0 m	STARTED SAMPLING	+	12		4	36	48	<u> </u>		20	1 .	40 : :	60	8	30	+	-	
ııLı					THERE	ON WILL ON WILL ENTO			ļ			ļļ								ļ <u>.</u>		-101.0	
1,0																							
																					1	100.0	
1.0												†····	******										
2.0																				ļ <u>.</u>		Ē	
<u> </u>																				ļļ		99.0	
3.0																						<u>-</u>	
3.0																					Ϊ	98.0	
<u>-</u>																						E	
4.0																		ļļ		ļļ		Ē	
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Ę ,																							
5.0																						96.0	
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6.0							ļ					-		ļ								Ē	
Ē		ļ					ļļ		<u>.</u>			ļ						ļļ		ļļ.		95.0	
Ē -,	İ																					E	
7.0																						94.0	
F												-		· ····				•		1	***		
E-8.0																		ļ				E 07.0	
Ē									.ļ	ļļ								ļ				93.0	
Ē.,																						E	
9.0		52			SILT (TILL) — sand & gr				♦													92.0	
Ē	L]			damp, brownish grey hydrocarbon odour	, slight							****	-				†····				E	
10.0	E	53			nyarocarbon odour		ļ	♦					<u> </u>	·				1				F	
E	L									ļļ					ļ			ļ		1		91.0	
Ē.,,	_	54			- sand lense, some	gravel, trace of						•										Ē	
F-11.0	<u> </u>	55			silt, fine to medium	grained, very		•														90.0	
F]			dense, brown, some	hydrocarbon								1							"	E	
E- 12.0	╞	56			odour - some sand & gro	vol von dense									ļ!			-	<u>.</u>			E	
Ē.					dry, brown, no hydro		/			ļļ					ļ				ļļ			89.0	
Ē .,,		-			END OF BOREHOLE @ 12	2.3 m																E	
E 13.1	7				Note: Used 3 bags of b	entonite to plug	[88.0	
<u>-</u>					bottom of hole Elevation referenced to	Control point CPN1		<u>.</u>														-	
E 14,1	۱ د				(Property pin) on Site p				<u>.</u>	-		<u></u>							ļļ			Ē	
						Ţ	1.0	1055	<u> </u>							001	ID! F	TIA		DTU	10.7	87.0	
	EBA Engineering Consult				tants Ltd.		GED											98/0		12.3 m 7	1		
				_	Whitehorse, Yukon																	1 of 1	
99/05/0	6 09:0	2AM (PI	014)																				

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APPENDIX B

Raw Data Tables

Enviro•Test Chemical Analysis Report

Norwest Labs Chemical Analysis Reports



	Borehole/Hand Auger Number	Sample Number	Depth (m)	northing (m)	easting (m)	PID Readings	EnvrioGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractablet Petroleum Hydrocarbons (C10-C18)	Extractablet Petroleum Hydrocarbons (C19-C32)
	COME							5	0.8	20	17			
	CSR							0.04	2.5	7	20	200	2000	5000
	BH01	1	1.3-1.5	6738257	362104	176								
		2	2.0-2.2	6738257	362104	537								
		3	2.8-3.0	6738257	362104	715		33	130	59	210	390	1100	72
1		4	3.8-4.0	6738257	362104	355	. 							ļ
1		5	5.3-5.5	6738257	362104	610								
1		6	6.2-6.4	6738257	362104	700		21	150	43	220	440	5200	340
ESA (13413)	BH02	7	1.3-1.5	6738262	362109	50								
8	1	8	2.5-2.8	6738262	362109	625		3.8	31	2.5	13	60	1500	130
=	· 	9	4.3-4.5	6738262	362109	190								
&	вноз	10	0.5-0.7	6738248	362118	399								
		11	1.3-1.5	6738248	362118	433		2.6	9.5	4.2	31	47	20000	100
Phase 2		12	2.3-2.5	6738248	362118	125		0.16	0.47	0.08	4.7	6.2	1700	<5
las	1	13	3.5-3.7	6738248	362118	105								
<u>ء</u> ا		14	4.5-4.7	6738248	362118	130								
		15	5.5-5.7	6738248	362118	76								
	BH04	16	1.0-1.2	6738254	362103	330								.
		17	1.7-1.9	6738254	362103	955		32	230	83	330	640	1500	10
		18	2.5-2.7	6738254	362103	676								
		19	3.4-3.6	6738254	362103	953	•							
L	<u> </u>	20	5.3-5.5	6738254	362103	876		1.4	10	3.7	21	36	160	28

			_											
	Borehole/Hand Auger Number	Sample Number	Depth (m)	northing (m)	easting (m)	PID Readings	EnvrioGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractablet Petroleum Hydrocarbons (C10-C18)	Extractablet Petroleum Hydrocarbons (C19-C32)
	ш <u>г</u>		U		<u> </u>		ш		<u> </u>		×	<u>> I</u>	<u> </u>	шІ
	COME CSR							5 0.04	0.8 2.5	20 7	17 20	 200	 2000	 5000
	BH05	1	1.0-1.3	6738245	362122	16	<250	ND	0.19	ND	ND	ND	ND	ND
	1	2	3.0-3.3	6738245	362122	6.5	<250							
	BH06	3	1.0-1.3	6738253	362116	46		ND	ND	ND	ND	3.7	150	ND
		4	2.5-2.8	6738253	362116	27.7	<250							
	BH07	5	1.0-1.3	6738245	362116	975								
		6	2.0-2.2	6738245	362116	595	>1250							
		7	3.7-3.9	6738245	362116	292		ND	ND	0.16	0.53	12	550	44
	BH08	8	2.2-2.4	6738249	362112	85	<250							' '
		9	3,5-3.6	6738249	362112	140		ND	ND	ND	0.1	1.6	ND	ND
	BH09	10	0.7-1.0	6738246	362111	34					0.1	1.0	10	TWD
		11	1.0-1.3	6738246	362111	103		ND	ND	ND	ND	ND	ND	ND
	BH10	12	1.0-1.2	6738253	362101	150	>1250				10	140	IND	, v e
		13	2.5-2.8	6738253	362101	395	>1250	45	190	38	246	ND	2200	220
5	BH11	14	1.0-1.1	6738261	362104	250	>1250	. •		•	0	10	2200	220
(13537)		15	2.5-2.7	6738261	362104	251	>1250							
≝	BH12	16	1.2-1.3	6738265	362110	160	<250							
ESA		17	2.0-2.1	6738265	362110	147		ND	0.07	ND	0.39	4.1	160	16
ļω	BH13	18	0.7-0.9	6738261	362114	44			0.07		0.00	4.1	100	' '
6		19	2.0-2.1	6738261	362114	240	<250	0.31	0.74	0.09	0.51	ND	ND	ND
Phase	BH14	20	1.6-1.7	6738243	362118			ND.	ND	0.2	1.82	26	1000	98
Ē	1	21	4.5-4.6	6738243	362118	46	<250	, .		0.2	1.02	20	1000	30
	BH15	22	1.7-1.8	6738245	362122	51		ND	ND:	ND	0.06	1	ND	ND
	BH16	23	5.8-5.9	6738247	362120	14		ND	ND	ND	ND	ND	ND	ND
	BH17	24	1.6-1.7	6738250	362117	66		ND	ND	ND	0.55	1.7	38	ND ND
		25	3.1-3.2	6738250	362117	30	<250	. —		. 42	0.00		00	140
1		26	4.5-4.6	6738250	362117	11	<250	ND	0.03	ND	0.22	ND	ND	ND
		27	6.0-6.3	6738250	362117	273		ND	ND	ND	ND	ND	28	ND
1	BH18	28	3.0-3.3	6738242	362114	46	••			. 42		140	20	(10)
1		29	4.5-4.8	6738242	362114	49	<250							,
1		30	6.0-6.3	6738242	362114	58		ND	ND	ND	ND	ND	ND	ND
1	BH19	31	1.5-1.8	6738250	362105	1300		ND	0.13	0.09	0.87	7.8	ND ND	
1		32	3.0-3.3	6738250	362105	298	<250	0.08	0.13	ND	0.87	7.8 ND		ND
		34	4.5-4.8	6738250	362105	82	<250	0.00	0.18	IND	0.38	IND	ND	ND
		33	6.0-6.4	6738250	362105	35		0.06	ND	ND	ND	ND	ND	, <u>,</u>
<u> </u>	4			3.00200	302103	0.0		0.00	IND	IND	ND	ND	ND	ND

	Borehole/Hand Auger Number	Sample Number	Depth (m)	northing (m)	easting (m)	PID Readings	EnvrioGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractablet Petroleum Hydrocarbons (C10-C18)	Extractablet Petroleum Hydrocarbons (C19-C32)
Ì	COME							_	0.0					
	CSR							5 0.04	0.8 2.5	20 7	17		••	
-	BH20	35	1.5-1.8	6738255	362097	220		0.04	2.5		20	200	2000	5000
		36	3.0-3.3	6738255	362097	920		ND	ND	0.19	5.5	0.7	0400	
		37	4.5-4.8	6738255	362097	200		, 2	IW	0.19	5.5	37	2100	ND
		38	6.0-6.4	6738255	362097	390		ND	ND	0.12	0.94	9.5	340	ND
		39	6.7-7.2	6738255	362097	190				0.12	0.54	9.5	340	NED
ĺ		40	7.5-7.7	6738255	362097	550	>1250							
		41	8.2-8.5	6738255	362097	300		ND	ND	ND	ND	1.6	32	ND
5		42	9.0-9.2	6738255	362097	30	<250	ND	ND	ND	ND	2.1	ND	ND ND
ESA (13537)	BH21	43	3.0-3.3	6738262	362101	114		ND	ND	ND	0.07	2.9	450	44
Ë		44	6.0-6.3	6738262	362101	24		ND	ND	ND	ND	ND	ND	ND
l S	BH22	45	3.0-3.3	6738263	362113	45	>250,<1250	ND	ND	ND	0.06	1	75	ND
		46	4.5-4.8	6738263	362113	24						•	, •	, •
Phase 3		47	6.0-6.3	6738263	362113	16	<250							i
las	BH23	48	3.0-3.3	6738256	362110	2000		23	120	27	150	ND	35000	3500
<u>a</u>		49	6.0-6.3	6738256	362110	320		0.25	0.52	0.11	0.46	ND	170	ND
		50	7.5-7.7	6738256	362110	30		ND	ND	ND	0.05	ND	11	ND ND
	BH24	51	3.0-3.3	6738256	362104	850								-
1		57	6.0-6.4	6738256	362104	1650								-
	BH25	52	9.0-9.3	6738256	362102	178								i
	·	53	9.7-10.1	6738256	362102	115	<250							
		54	10.5-10.9	6738256	362102	450		ND	ND	0.11	0.91	7.3	4800	380
		55	11.2-11.4	6738256	362102	140		ND	ND_	ND	0.08	ND	210	18

	Borehole/Hand Auger Number	Sample Number	Depth (m)	northing (m)	easting (m)	PID Readings	EnvrioGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractablet Petroleum Hydrocarbons (C10-C18)	Extractablet Petroleum Hydrocarbons (C19-C32)
	COME							5	0.8	20	17			
	CSR							0.04	2.5	7	20	200	2000	5000
	HA01	1	1.6-1.7	6738254	362100	160	>125,<625	0.04	2.0		20	200	2000	3000
	TP01	2	0.4-0.5	6738257	362104	535	>125,<625	4.3	190	96	750	380	1800	140
1	HA02	_	0.5	6738254	362105	0		4.0	100	30	750	300	1000	140
		3	1.0-1.1	6738254	362105	51	<25							
			1.5	6738254	362105	150								
		4	1.6-1.7	6738254	362105	100	>625							
	VPH	•	0.5			810								
	наоз	5	1.0-1.1	6738259	362102	470	<25							
		6	1.5-1.6	6738259	362102	30	<25							
į	TP04	7	0.3	6738263	362112	7.4	<25							
	TP05	8	0.3	6738259	362111	123	>625	ND	0.16	0.1	0.77	13	3000	240
	TP06	9	0.3	6738257	362112	2				٠.,	0.77	, 0	0000	240
_	TP07	10	0.3	6738265	362108	0.8								•
37	HA04			6738263	362112									
Phase 3 ESA (13537)	HA05			6738259	362111									j
`_	HA06	11	1.0-1.1	6738265	362108	65	<25							
%	HA07		0.5	6738250	362114	21								
E		12	1.0-1.1	6738250	362114	15	<25	ND	ND	ND	0.47	13	150	37
l g		19	1.2-1.3	6738250	362114	350	>125,<625				• • • •	. •	, , ,	· ,
la Ta		13	1.5-1.6	6738250	362114	15	>25,<125							
-	HA08	20	0.5	6738244	362120	157	>125,<625	ND	0.04	0.06	0.81	15	3900	290
		14	1.0-1.1	6738244	362120	150								
		15	1.6-1.7	6738244	362120	185	>125,<625							
	HA09	21	1.0-1.1	6738244	362112	115	>625	ND	0.09	0.1	0.9	9.4	420	100
			1.2-1.3	6738244	362112	120								, , ,
	TP08		0.5	6738246	362118	355	*-							
	TP09		0.5	6738244	362120	1.3								
1	TP10		0.5	6738251	362118	150								
	HA10		1.0-1.1	6738242	362122	9								İ
			1.0-1.1	6738242	362122	9								
1		16	1.3-1.4	6738242	362122	40	<25							
		17	1.25-1.3	6738242	362122									
		1.8	1.2-1.25	6738242	362122					·				



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Western Canada Fax: 1-800-286-7319

CHEMICAL ANALYSIS REPORT

FAS GAS OIL LTD 236 4919 59 ST **RED DEER AB T4N 6C9**

DATE: June 24, 1998

ATTN: SIM KOOPMANS

Lab Work Order #:

E806640

Sampled By:

DJW

Project Reference:

NOT SUBMITTED

Date Received:

06/15/98

Project P.O.#:

806650

Comments:

APPROVED BY:

Doug Johnso Project Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY. ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ACCREDITATIONS: STANDARDS COUNCIL OF CANADA (SCC), IN COOPERATION WITH THE CANADIAN ASSOCIATION FOR ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL): FOR SPECIFIC TESTS AS REGISTERED BY THE COUNCIL (EDMONTON, CALGARY)

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA): FOR INDUSTRIAL HYGIENE ANALYSIS (EDMONTON)

AGRICULTURE CANADA: UNDER THE CANADIAN FERTILIZER QUALITY ASSURANCE PROGRAM (SASKATOON)

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

						EVEDAGES	ANALYZED	PV
LAB ID	SAMPLE ID	TEST DESCRIPTION	RESULT	D.L.	UNITS	EXTRACTED	ANALYZED	BY
806640-0 Sample Typ Collected:0	1 13413 BH-1 be:SOIL 6/10/98	#3						
_		BTEX/VPH/LEPH/HEPH in Soil % Moisture	18.6	٥	%		06/18/98	тнт
		BTEX and VPH in Soil Benzene	33	0.02	ug/g (ppm)	06/17/98	06/23/98	THT
		Toluene Ethylbenzene	130 59	0.02 0.02	ug/g (ppm) ug/g (ppm)	06/17/98 06/17/98	06/23/98 06/23/98	THT
		Xylenes Volatile Petroleum Hydrocarbon	210 390	0.02 0.5	ug/g (ppm) ug/g (ppm)	06/17/98 06/17/98	06/23/98 06/23/98	THT
		Heavy Extractables (Soil) Light Extractables (Soil)	72 1100	5 5	ug/g (ppm) ug/g (ppm)	06/17/98 06/17/98	06/19/98 06/19/98	THT
E806640-0 Sample Typ Collected:0	02 13413 BH-1 pe:SOIL 06/10/98	. #6						
_		BTEX/VPH/LEPH/HEPH in Soil % Moisture	12.1	0	%		06/18/98	тнт
		BTEX and VPH in Soil Benzene	21	0.02	ug/g (ppm)	06/17/98	06/22/98	THT
		Toluene Ethylbenzene	150 43	0.02 0.02	ug/g (ppm) ug/g (ppm)	06/17/98 06/17/98	06/22/98 06/22/98	THT
_		Xylenes Volatile Petroleum Hydrocarbon	220 440	0.02 0.5	ug/g (ppm) ug/g (ppm)	06/17/98 06/17/98	06/22/98 06/22/98	THT
		Heavy Extractables (Soil) Light Extractables (Soil)	340 5200	5 5	ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98	06/20/98 06/20/98	CAH CAH
E806640-0 Sample Ty Collected:0	03 13413 BH- pe:SOIL 06/10/98	2 #2						
		BTEX/VPH/LEPH/HEPH in Soil % Moisture	23.2	0	%		06/18/98	тнт
		BTEX and VPH in Soil Benzene	3.8	0.02	ug/g (ppm)	06/17/98	06/22/98	THT
		Toluene Ethylbenzene	31 2.5	0.02 0.02	ug/g (ppm) ug/g (ppm)	06/17/98 06/17/98	06/22/98 06/22/98	뺉
		Xylenes Volatile Petroleum Hydrocarbon	13 60	0.02 0.5	ug/g (ppm) ug/g (ppm)	06/17/98 06/17/98	06/22/98 06/22/98	THT
		Heavy Extractables (Soil) Light Extractables (Soil)	130 1500	5 5	ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98	06/18/98 06/18/98	THT
E806640- Sample Ty Collected:	04 13413 BH- ype:SOIL 06/10/98	3 #2						
		BTEX/VPH/LEPH/HEPH In Soll % Moisture	21.6	0	%		06/18/98	THT
F .		BTEX and VPH in Soil Benzene	2.6	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH
		Toluene Ethylbenzene	9.5	0.02	ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98	06/20/98 06/20/98	CAH
		Xylenes Volatile Petroleum Hydrocarbon	31 47	0.02	ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98	06/20/98 06/20/98	CAH CAH
		Heavy Extractables (Soil) Light Extractables (Soil)	100 20000	5	ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98	06/18/98 06/18/98	THT
Sample T	-05 13413 BH ype:SOIL :06/10/98	-3 #3						
		BTEX/VPH/LEPH/HEPH In Soil % Moisture	21.1		%		06/18/98	ТНТ
T		BTEX and VPH in Soil Benzene	0.16		ug/g (ppm)	06/16/98	06/20/98	CAH
		Toluene Ethylbenzene	0.47	0.02	ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98	06/20/98 06/20/98	CAH
		Xylenes Volatile Petroleum Hydrocarbon	4.7	0.02	ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98	06/20/98 06/20/98	CAH
1		Heavy Extractables (Soil) Light Extractables (Soil)	1700	5 5	ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98	06/18/98 06/18/98	THT
		ridire rumantanion famil						
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ENVIRO-TEST CHEMICAL ANALYSIS REPORT

LAB ID SAMPLE	ID TEST DESCRIPTION	RESULT	D.L.	UNITS	EXTRACTED	ANALYZED	BY
E806640-06 13413 Bi Sample Type:SOIL Collected:06/10/98	H-4 #2					7.4.7.2.2.2	
	BTEX/VPH/LEPH/HEPH in Soil % Moisture BTEX and VPH in Soil	22.2	o	%		06/18/98	тнт
	Benzene Toluene Ethylbenzene Xylenes Volatile Petroleum Hydrocarbon Heavy Extractables (Soil) Light Extractables (Soil)	32 230 83 330 640 10 1500	0.02 0.02 0.02 0.02 0.5 5	ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98 06/16/98 06/16/98 06/16/98 06/16/98 06/16/98	06/23/98 06/23/98 06/23/98 06/23/98 06/23/98 06/19/98	MTL MTL MTL MTL MTL THT THT
E806640-07 13413 BI Sample Type:SOIL Collected:06/10/98	H-4 #5						
	BTEX/VPH/LEPH/HEPH in Soil % Moisture BTEX and VPH in Soil	13.1	0	%		06/18/98	тнт
	Benzene Toluene Ethylbenzene Xylenes Volatile Petroleum Hydrocarbon Heavy Extractables (Soil) Light Extractables (Soil)	1.4 10 3.7 21 36 28 160	0.02 0.02 0.02 0.02 0.5 5	ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm)	06/17/98 06/17/98 06/17/98 06/17/98 06/17/98 06/16/98 06/16/98	06/22/98 06/22/98 06/22/98 06/22/98 06/22/98 06/17/98	THT THT THT THT THT CAH CAH
E806640-08 13413 B Sample Type:SOIL Collected:06/10/98	H-5 #2						
	BTEX/VPH/LEPH/HEPH in Soil % Moisture BTEX and VPH in Soil Benzene Toluene Ethylbenzene Xylenes Volatile Petroleum Hydrocarbon Heavy Extractables (Soil) Light Extractables (Soil)	22.5 < 0.02 0.15 0.08 0.86 0.8 12 53	0.02 0.02 0.02 0.02 0.05 5	% ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98 06/16/98 06/16/98 06/16/98 06/16/98 06/16/98	06/18/98 06/20/98 06/20/98 06/20/98 06/20/98 06/20/98 06/17/98	CMS CAH CAH CAH CAH CAH CAH CAH
E806640-09 13413 B Sample Type:SOIL Collected:06/10/98	H-6 #1						
	BTEX/VPH/LEPH/HEPH in Soil % Moisture BTEX and VPH in Soil Benzene Toluene Ethylbenzene Xylenes Volatile Petroleum Hydrocarbon Heavy Extractables (Soil) Light Extractables (Soil)	22.7 < 0.02 0.05 < 0.02 0.10 < 0.5 < 5	0.02 0.5 5	% ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm) ug/g (ppm)	06/16/98 06/16/98 06/16/98 06/16/98 06/16/98 06/16/98 06/16/98	06/18/98 06/20/98 06/20/98 06/20/98 06/20/98 06/20/98 06/17/98	CMS CAH CAH CAH CAH CAH CAH
N.D NOT DETECT	ED, LESS THAN THE DETECTION LIMIT						
THIS IS THE FINAL	PAGE OF THE REPORT						
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Appendix A Test Methodologies

TEX and VPH in Soil

PREPARATION METHOD: Methanol extraction with purge and trap analysis.

INSTRUMENTAL METHOD: GC/PID for BTEX.

GC/FID for VPH - summation of hydrocarbons from C5 to C9

carbon range and is calculated against m+p-Xylenes.

NOTE: Results based upon dry weight.

METHOD REFERENCE:

Modified SW-846 USEPA Method 5030 and 8015/8020.

BTEX QC SUMMARY:

Accuracy Precision 97% +/- 22%

NOTE: Accuracy is expressed as the average % recovery and Precision as the relative standard deviation (RSD) of fortifications made using certified standards (BTEX).

Moisture

Preparation Method: Sample is oven dried at 105 degrees C

Instrumental Method: Gravimetric analysis

Light Extractables (Soil)

PREPARATION METHOD: Shake and sonication extraction with organic solvent

INSTRUMENTAL METHOD: GC/FID - summation of hydrocarbons from C10 to C18 carbon

range (excluding benzene, toluene, ethylbenzene, and xylenes) and calculated against a calibrated n-decane standard. Result is not corrected for PAH concentration.

NOTE: Results based upon dry weight.

METHOD REFERENCE: Modified SW-846 USEPA Method 3550/3580 and 8000

Heavy Extractables (Soil)

PREPARATION METHOD: Shake and sonication extraction with organic solvent

INSTRUMENTAL METHOD: GC/FID - summation of hydrocarbons from C19 to C32 carbon

range (excluding benzene, toluene, ethylbenzene, and xylenes) and calculated against a calibrated n-eicosane standard. Result is not corrected for PAH concentration.

NOTE: Results based upon dry weight.

METHOD REFERENCE: Modified SW-846 USEPA Method 3550/3580 and 8000

MHIS IS THE LAST PAGE OF THE METHODOLOGY APPENDIX.

CLIENT I.D.: 13413 BH-1 #3

ETL

Data File:

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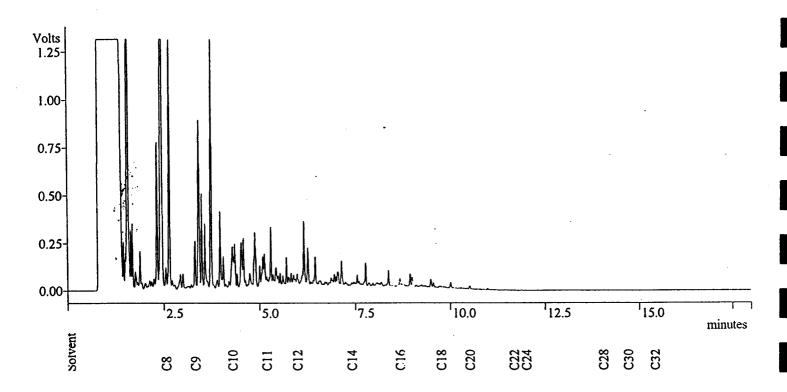
E806640-01A-10

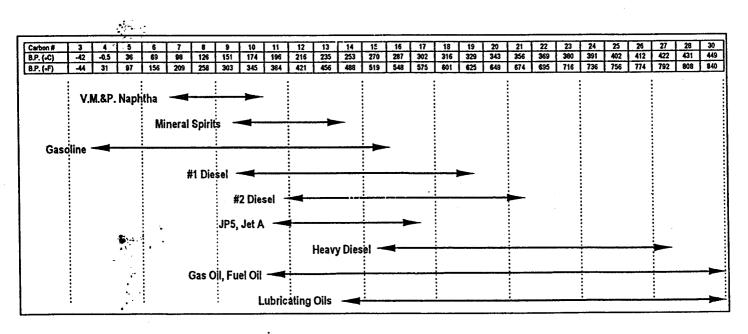
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06/19/98 05:38:52 AM

Instrument (Inj):

GC 3600 SIDE A





Boiling Point Distribution Range for Petroleum Based Fuel Products

Adapted from: Drews, A.W., ED; Manual on Hydrocarbon Anaysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA, 1989: p XVIII.

CLIENT I.D.: 13413 BH-1 #6

ETL

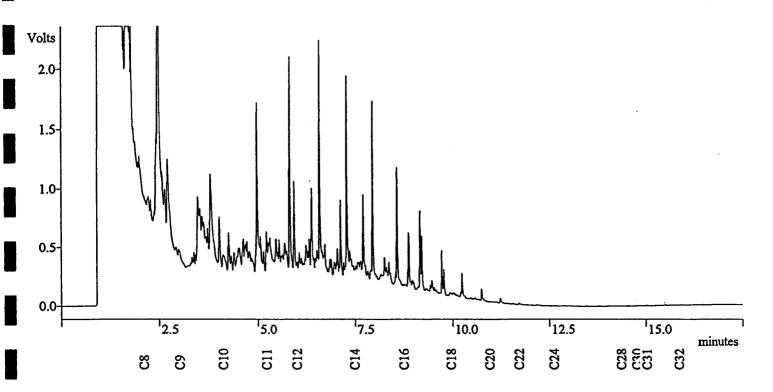
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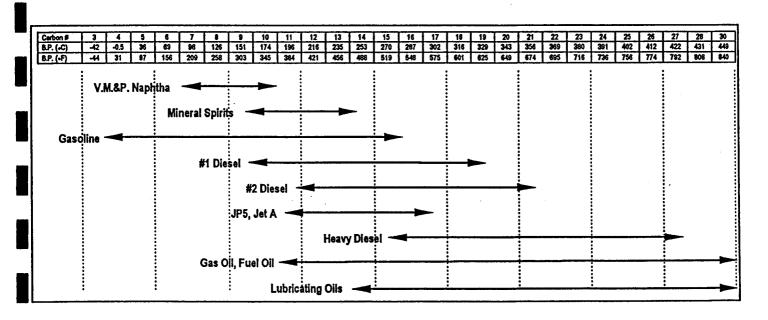
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Instrument (Inj):

Varian Star 3400CX





Boiling Point Distribution Range for Petroleum Based Fuel Products

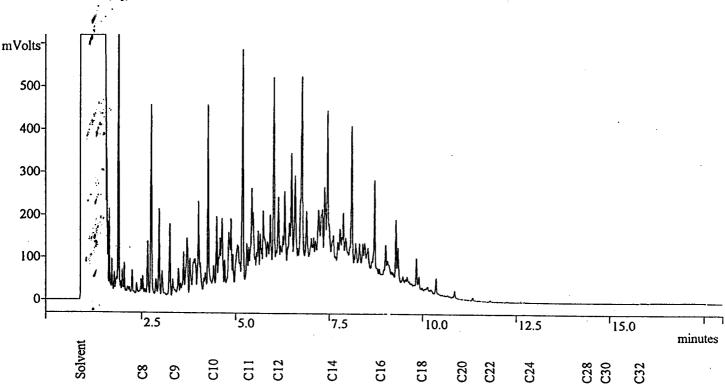
apted from: Drews, A.W.., ED; Manual on Hydrocarbon Anaysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA, 1989: p XVIII.

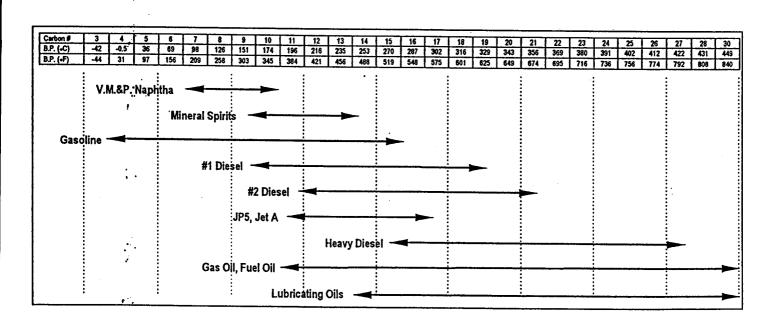
CLIENT I.D.: 13413 BH-2 #2



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Injection Date: 06/18/98 09:57:19 PM Instrument (Inj): GC 3600 SIDE B



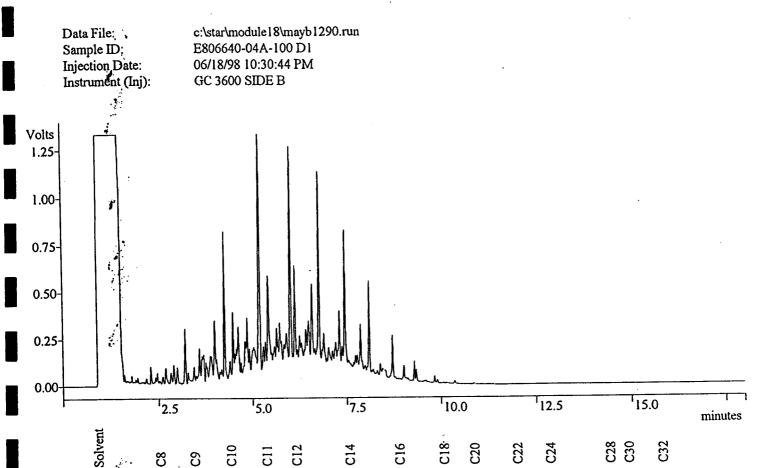


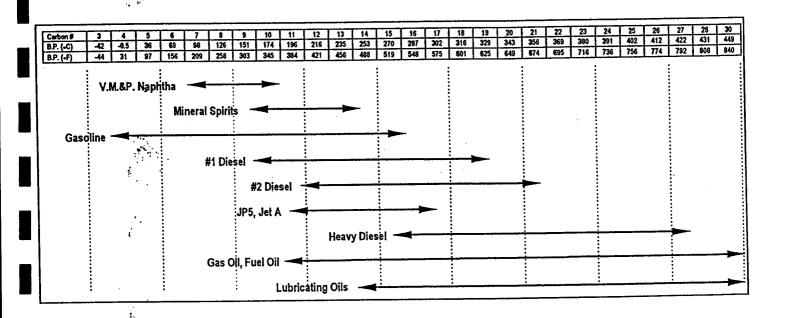
Boiling Point Distribution Range for Petroleum Based Fuel Products

Adapted from: Drews, A.W.., ED; Manual on Hydrocarbon Anaysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA, 1989: p XVIII.

CLIENT I.D.: 13413 BH-3 #2







Boiling Point Distribution Range for Petroleum Based Fuel Products

Adapted from: Drews, A.W., ED; Manual on Hydrocarbon Anaysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA, 1989: p XVIII.

CLIENT I.D.: 13413 BH-3 #2



Data File

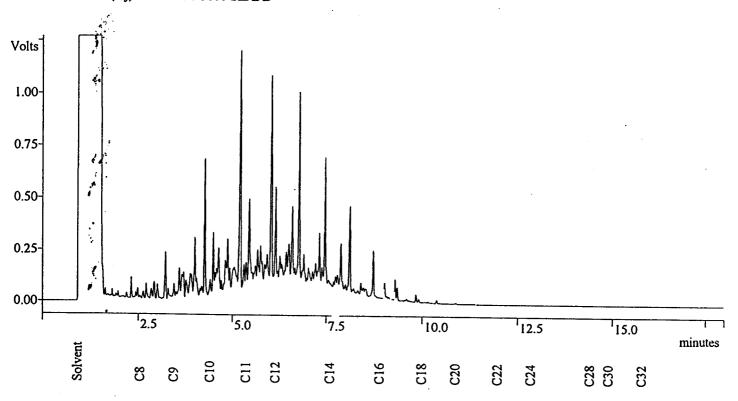
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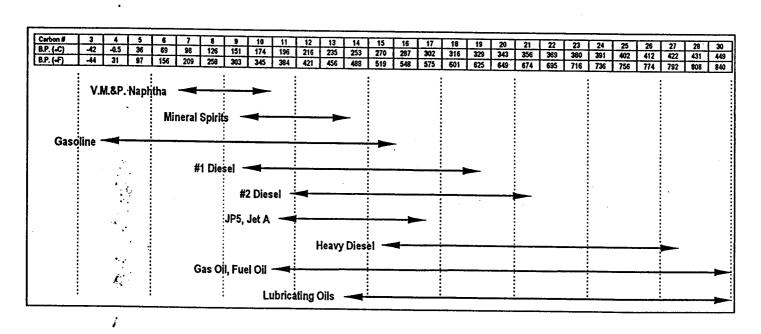
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E806640-04A-100 D2 06/18/98 11:03:47 PM

Instrument (Inj):

GC 3600 SIDE B





Boiling Point Distribution Range for Petroleum Based Fuel Products

Adapted from: Drews, A.W., ED; Manual on Hydrocarbon Anaysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA, 1989: p XVIII.

CLIENT I.D.: 13413 BH-3 #3



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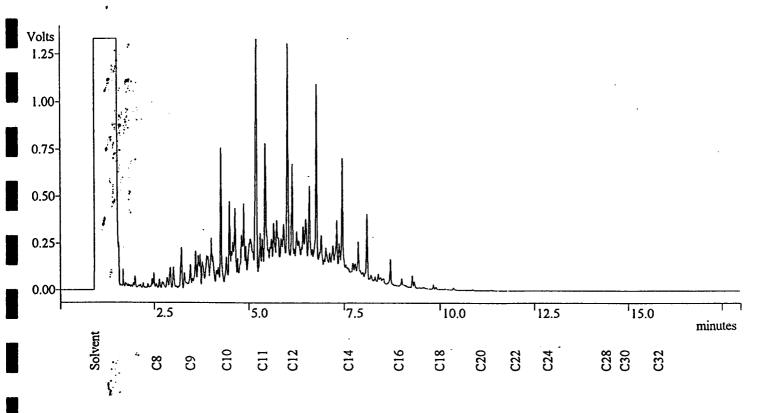
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E806640-05A-10 RR

Instrument (Inj):

06/18/98 11:36:46 PM GC 3600 SIDE B



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	Carbon #	Т	3	4	75	Т	6	7_	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
	B.P. (-C)	_	42	-0.5	36		6 9	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
Į٤	B.P. (+F)	نبل	-44	31	97		156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
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Boiling Point Distribution Range for Petroleum Based Fuel Products

Lapted from: Drews, A.W., ED; Manual on Hydrocarbon Anaysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA, 1989: p XVIII.

CLIENT I.D.: 13413 BH-4#2



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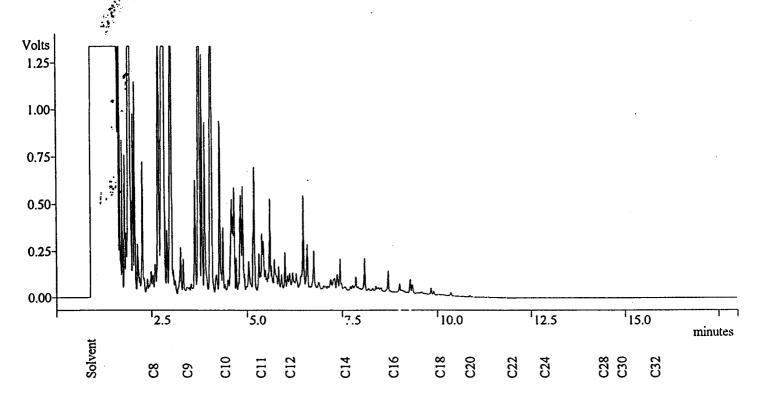
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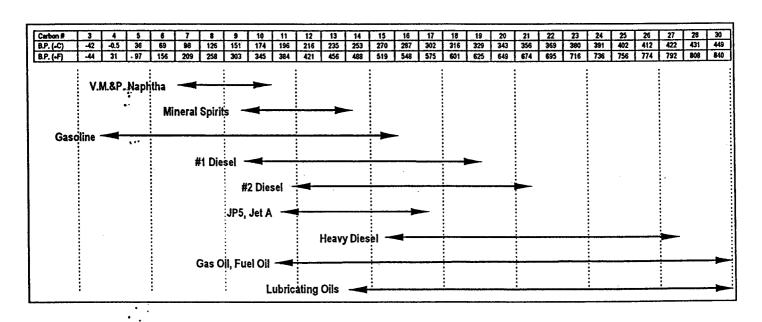
Sample ID:

E806640-06A-10 RR 06/19/98 12:09:48 AM

Injection Date: Instrument (Inj):

GC 3600 SIDE B





Boiling Point Distribution Range for Petroleum Based Fuel Products

Adapted from: Drews, A.W., ED; Manual on Hydrocarbon Anaysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA, 1989: p XVIII.

CLIENT I.D.: 13413 BH-4 #5

ETL

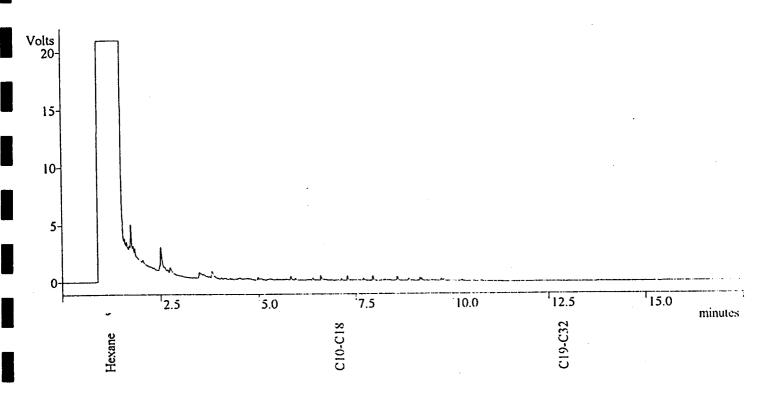
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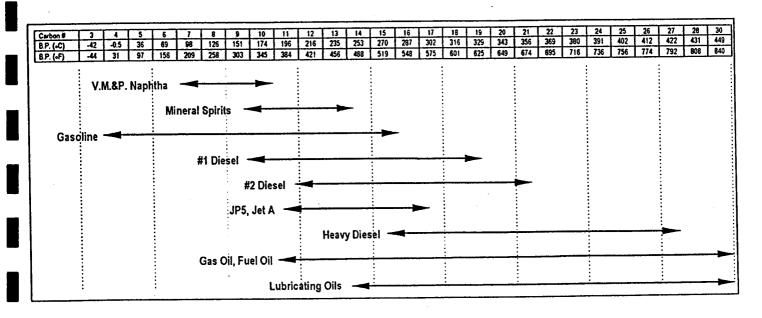
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Sample ID: Injection Date: E806640-07A-10 06/18/98 05:29:48 AM

Instrument (Inj):

Varian Star 3400CX





Boiling Point Distribution Range for Petroleum Based Fuel Products

Adapted from: Drews, A.W., ED; Manual on Hydrocarbon Anaysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA. 1989: p XVIII.

CLIENT I.D.: 13413 BH-5 #2

ETL

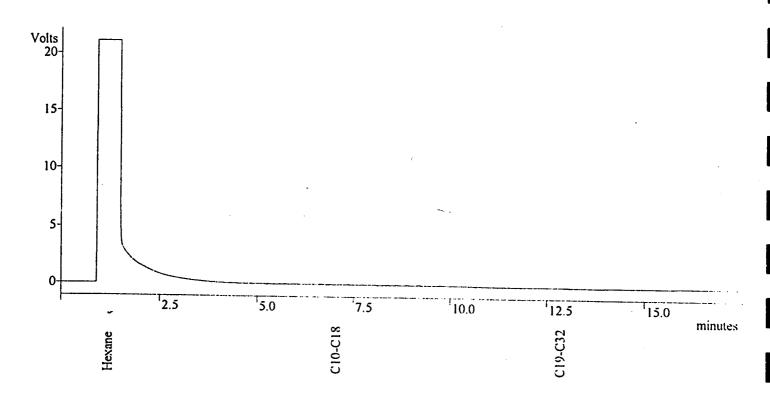
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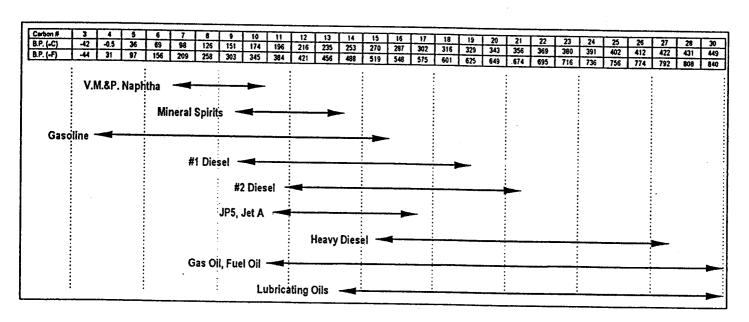
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Sample ID:

E806640-08A-10

Injection Date: Instrument (Inj): 06/18/98 06:26:45 AM Varian Star 3400CX





Boiling Point Distribution Range for Petroleum Based Fuel Products

Adapted from: Drews, A.W., ED; Manual on Hydrocarbon Anaysis, 4th ed.: American Society for Testing and Materials: Philadelphia, PA, 1989: p XVIII.

EAKA



Name: EBA ENGINEERING CONSULTANTS Address: UNIT 6-151 INDUSTRIAL ROAD

WHITEHORSE

YT

Y1A 2V3

Att'n: DONALD WILSON Phone: 867 668-3068 Fax: 867 668-4349

Surrey Ph (604) 514-3322 FAX (604) 514-3323 Edmonton Ph (403) 438-5522 FAX (403) 438-0396 Calgary Ph (403) 291-2022 FAX (403) 291-2021 Lethbridge Ph (403) 329-9266 FAX (403) 327-8527 Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

WO (Surrey): 38034

Quote No.: WO (Other):

PO Num: 0201-98-13537 Project: ALCON FUELS

Date Sampled: 27-Aug-98 Date Received: 31-Aug-98 Date Reported: 02-Sep-98

Petroleum Hydrocarbons

38034-1

13537 #2

BTEX in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	4.3	0.02	mg/kg
Toluene	190	0.02	mg/kg
Ethylbenzene	96	0.02	mg/kg
m,p-Xylene	520	0.05	mg/kg
o-Xylene	230	0.03	mg/kg

EPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
EPH (C10-C18)	1800	10	mg/kg
EPH (C19-C32)	140	10	ma/ka

140 mg/kg 10 VPH in Soil Detection **Analyte** <u>Limit</u> Result **Units** VPH (C5-C10)

380

mg/kg

38034-2 13537 #8

BTEX in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	0.16	0.02	mg/kg
Ethylbenzene	0.1	0.02	mg/kg
m,p-Xylene	0.26	0.05	mg/kg
o-Xylene	0.51	0.03	mg/kg

EPH in Soil		Detection	
<u>Analyte</u>	<u>Result</u>	Limit	<u>Units</u>
EPH (C10-C18)	3000	10	mg/kg
EPH (C19-C32)	240	10	mg/kg
VPH in Soil		Dotostion	

Detection <u>Limit</u> **Analyte** Result <u>Units</u> VPH (C5-C10) mg/kg



Name: EBA ENGINEERING CONSULTANTS

Address: UNIT 6-151 INDUSTRIAL ROAD

WHITEHORSE

YT

Y1A 2V3

Att'n: DONALD WILSON Phone: 867 668-3068 Fax: 867 668-4349

Surrey Ph (604) 514-3322 FAX (604) 514-3323 Edmonton Ph (403) 438-5522 FAX (403) 438-0396 Calgary Ph (403) 291-2022 FAX (403) 291-2021 Lethbridge Ph (403) 329-9266 FAX (403) 327-8527 Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

> WO (Surrey): 38034

Quote No.: WO (Other):

PO Num: 0201-98-13537 Project: ALCON FUELS Date Sampled: 27-Aug-98

Date Received: 31-Aug-98 Date Reported: 02-Sep-98

₿8034-3 13	3537	#19
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	Detection	
Result	<u>Limit</u>	<u>Units</u>
Not Detected	0.02	mg/kg
Not Detected	0.02	mg/kg
Not Detected	0.02	mg/kg
0.25	0.05	mg/kg
0.22	0.03	mg/kg
	Not Detected Not Detected Not Detected 0.25	Result Limit Not Detected 0.02 Not Detected 0.02 Not Detected 0.02 0.25 0.05

PH in Soil **Detection** <u>Limit</u> **Analyte** Result

<u>Units</u> EPH (C10-C18) 150 10 mg/kg EPH (C19-C32) 37 10 mg/kg

VPH in Soil **Detection Analyte** <u>Limit</u> Result

<u>Units</u> VPH (C5-C10) 13 mg/kg

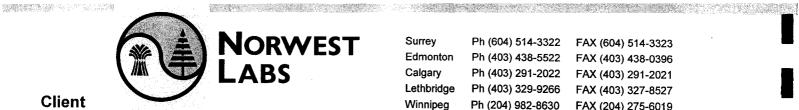
B8034-4 13537 #20

BTEX in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	0.04	0.02	mg/kg
Ethylbenzene	0.06	0.02	mg/kg
m,p-Xylene	0.38	0.05	mg/kg
o-Xylene	0.43	0.03	mg/kg

EPH IN SOII		Detection	-
Analyte	Result	<u>Limit</u>	<u>Units</u>
EPH (C10-C18)	3900	10	mg/kg
EPH (C19-C32)	290	10	ma/ka

VPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
VPH (C5-C10)	15	1	mg/kg

Initials: Rh



Name: EBA ENGINEERING CONSULTANTS Address: UNIT 6-151 INDUSTRIAL ROAD

WHITEHORSE

YT

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WO (Surrey): 38034

Quote No.: WO (Other):

PO Num: 0201-98-13537

Project: ALCON FUELS

Date Sampled: 27-Aug-98 Date Received: 31-Aug-98 Date Reported: 02-Sep-98

38034-5

13537 #21

BTEX in Soil

		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	0.09	0.02	mg/kg
Ethylbenzene	0.1	0.02	mg/kg
m,p-Xylene	0.5	0.05	mg/kg
o-Xylene	0.4	0.03	mg/kg

EPH in Soil

Analyte	Result	Limit	<u>Units</u>
EPH (C10-C18)	420	10	mg/kg
EPH (C19-C32)	100	10	mg/kg

VPH IN SOII		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
VPH (C5-C10)	9.4	1	mg/kg

QA/QC Results

Method	Compound	Recov	<u>rery</u>	<u>Date</u>	<u>Analyst</u>
BTEX in Soil	Benzene	91	%	02-Sep-98	M. Lakha
	Toluene	103	%		
	Ethylbenzene	96	%		
	m,p-Xylene	95	%		
	o-Xylene	98	%		
	Average:	97	-		200
EPH in Soil	TEH (C10-C30)	103	%	01-Sep-98	D. Dykstra
	Average:	103	-		

Detection

Approved By:

Ralph Hindle, B.Sc. Supervisor, Organics Lab

Page 3 of 3



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WO (Surrey): 38034

Quote No. : WO (Other) :

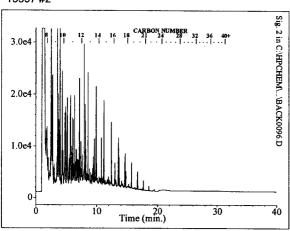
PO Num: 0201-98-13537

Project: ALCON FUELS
Date Sampled: 27-Aug-98
Date Received: 31-Aug-98
Date Reported: 02-Sep-98

Qualitative Fuel Assessment Report

Method: EPH in Soil Sample No. 38034-1

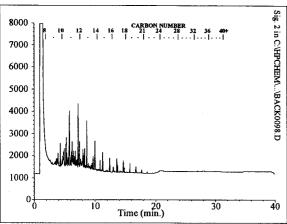
13537 #2



Method: EPH in Soil Sample No. 38034-3

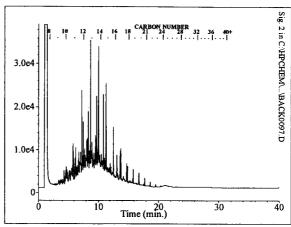
13537 #19

SANDARY CHARGOS

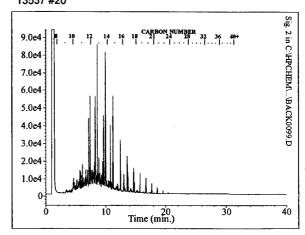


Method: EPH in Soil Sample No. 38034-2

13537 #8



Method: EPH in Soil Sample No. 38034-4 13537 #20



Initials: M



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WO (Surrey): 38034

Quote No.: WO (Other):

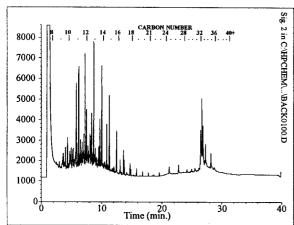
PO Num: 0201-98-13537 Project: ALCON FUELS Date Sampled: 27-Aug-98

Date Received: 31-Aug-98 Date Reported: 02-Sep-98

Qualitative Fuel Assessment Report

Method: EPH in Soil Sample No. 38034-5

13537 #21



Initials:



Name: EBA ENGINEERING CONSULTANTS

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WO (Surrey): 38034

Quote No.:

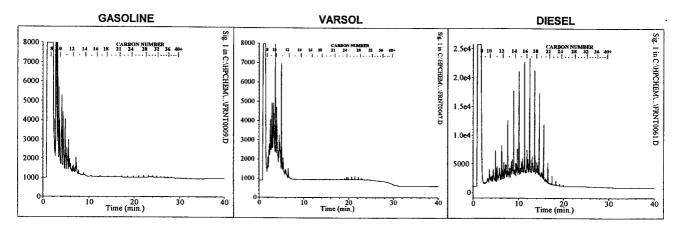
WO (Other):

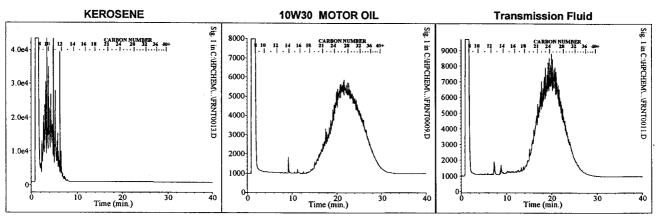
PO Num: 0201-98-13537 Project: ALCON FUELS

Date Sampled: 27-Aug-98 Date Received: 31-Aug-98 Date Reported: 02-Sep-98

Qualitative Fuel Assessment Report

TYPICAL PRODUCT CHROMATOGRAMS





Product Carbon Number Ranges

Gasoline: C4 - C12 Diesel:

C8 - C22

Varsol:

C8 - C12

Lubricating Oils: C20 - C40

Kerosene: C7 - C16

Crude Oils:

C3 - C60+

Approved By:

Ralph Hindle, B.Sc.

Supervisor, Organics Lab

Page 3 of 3

Accredited By: CANADIAN ASSOCIATION FOR ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL) For specific tests registered with the Association



Environmental Sample Information Sheet

NOTE Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: R	eport To:	Copy of		To:					Co	ру с	of in	voic	:e:		
Company: REST Engineering Consultant Address: Unit 6 151 Industrial CA	ts Ldd.	Compar										o this			·
Address: Unit 6 151 Industrial QA	/QC Report	Address	3 :						add	iress	for a	ppro	val	<u></u>	
Whikhorse, YT. YIA 2V3															
Attention: Don wilson	Report Result:	Attention	n:									Re	port	Res	ult:
Phone: 867-668-3065	Fax V	Phone:											ах		
Fax: 867-668-4349	Mail Courier	Fax:											1ail		
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Information to be included on	RUSH	Please con	tact the la	boratory to	Sa	amp	le Cı	usto	dy (Plea	se F	rint)) .		
Report and Invoice	confirm rush da			submitting		-			•			,		0.	_
Project ID: 0201-98-13537	Upon filling ou	samples t this section.		ents that	ш		ed by:								
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Special Instructions / Comments	Norwest Autho	onzation			No	rwes	t Labs	3	-	1	Da	ate			
Results by Fri. S discussions with	Nicole	+ 6	ruo fe	:	Number of Containers	C 76H 2									
Sample Identification Location		Date / Time Sampled	Matrix	Sampling Method	Į	En	ter tes	ts ab	ove ((✔ rel	evani	sam	ples	belc	w)
1 /3537 日 2 从丁		980827	Soil	Hond aug	er l	/			41		1				
2 /3537 # 8 H.J.		/		1					4.5						
3 13537 419 H.J.	ł	7			,	/		T							
4 13537 \$ 20 H.J.						/			-						
5 13537 621 H.J.	_	V	V	V	,	1						-			
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NOTE: All hazardous samples must be labe	elled according t	o WHMIS	guidelin	es.				 -	<u></u>	Page			of		



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WO (Surrey): 38570 Quote No. :

WO (Other) : PO Num : Consultante la Williamo La

020 -98-13537 MAR 1 9 1999

Project: 0
Date Sampled:

Date Received: 21-9

ep-MECEIVE

Date Reported :

: 28-Sep

Petroleum Hydrocarbons

38570-1 ALCAN FUELS, HAINES JUNCTION, YT 13537#1 980914

BTEX in Soil	·	Detection	•
<u>Analyte</u>	<u>Result</u>	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	0.19	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

 EPH in Soil
 Detection
 Limit
 Units

 Analyte
 Result
 Limit
 Units

 EPH (C10-C18)
 Not Detected
 10
 mg/kg

 EPH (C19-C32)
 Not Detected
 10
 mg/kg

 VPH in Soil
 Detection

 Analyte
 Result
 Limit
 Units

 VPH (C5-C10)
 Not Detected
 1
 mg/kg

38570-2 ALCAN FUELS, HAINES JUNCTION, YT 13537#3 980914

BTEX in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

 EPH in Soil
 Detection

 Analyte
 Result
 Limit
 Units

 EPH (C10-C18)
 150
 10
 mg/kg

 EPH (C19-C32)
 Not Detected
 10
 mg/kg

 VPH in Soil
 Detection

 Analyte
 Result
 Limit
 Units

 VPH (C5-C10)
 3.7
 1
 mg/kg

Initials:



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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

8570-3	ALCAN FUELS, HAINES	JUNCTIO	N,YT 13537#7 981914
BTEX in Soil		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	0.16	0.02	mg/kg
m,p-Xylene	0.26	0.05	mg/kg
o-Xylene	0.27	0.03	mg/kg
EPH in Soil		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
EPH (C10-C18)	550	10	mg/kg
EPH (C19-C32)	44	10	mg/kg
VPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
VPH (C5-C10)	12	1	mg/kg

88570-4	ALCAN FUELS, HAINES	JUNCTIO	DN,YT 13537#9 980914
BTEX in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	0.1	0.03	mg/kg
EPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg
VPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
VPH (C5-C10)	1.6	1	mg/kg

Initials:





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WO (Surrey): 38570

Quote No. : WO (Other) : PO Num :

Project: 0201-98-13537

Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

8570-5	ALCAN FUELS, HAINES JUNCTION, YT 13537#11 980914
	,

BTEX in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

EPH in Soil Detection Analyte Result Limit Units EPH (C10-C18) Not Detected 10 mg/kg

EPH (C19-C32)	Not Detected	10	mg/kg
VPH in Soil		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

88570-6 ALCAN FUELS, HAINES JUNCTION,YT 13537#13 980914

BTEX in Soil	Detection					
<u>Analyte</u>	Result	Limit	<u>Units</u>			
Benzene	45	0.02	mg/kg			
Toluene	190	0.02	mg/kg			
Ethylbenzene	38	0.02	mg/kg			
m,p-Xylene	180	0.05	mg/kg			
o-Xvlene	66	0.03	ma/ka			

EPH in Soil		<u>Detection</u>	
<u>Analyte</u>	Result	<u>Limit</u> <u>Units</u>	
EPH (C10-C18)	2200	10 mg/kg	ı
EPH (C19-C32)	230	10 mg/kg	ı

VPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Initials: A4



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WO (Surrey): 38570

Quote No. : WO (Other) : PO Num :

Project: 0201-98-13537

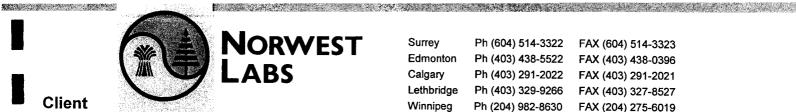
Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

8570-7	ALCAN FUELS, HAINES	JUNCTIO	N,YT 13537;	/ 17 98091	4		
BTEX in Soil		Detection					
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>				
Benzene	Not Detected	0.02	mg/kg				
Toluene	0.07	0.02	mg/kg				
Ethylbenzene	Not Detected	0.02	mg/kg				
m,p-Xylene	0.25	0.05	mg/kg				
o-Xylene	0.14	0.03	mg/kg				
EPH in Soil		Detection		***		 No.	
<u>Analyte</u>	<u>Result</u>	Limit	<u>Units</u>				
EPH (C10-C18)	160	10	mg/kg				
EPH (C19-C32)	16	10	mg/kg				
VPH in Soil		Detection				 	
<u>Analyte</u>	Result	Limit	<u>Units</u>				
VPH (C5-C10)	4.1	1	mg/kg				

88570-8	ALCAN FUELS, HAINES JUNCTION,YT 13537#19 980914					
BTEX in Soil		<u>Detection</u>				
<u>Analyte</u>	Result	<u>Limit</u>	<u>Jnits</u>			
Benzene	0.31	0.02	ng/kg			
Toluene	0.74	0.02	ng/kg			
Ethylbenzene	0.09	0.02	ng/kg			
m,p-Xylene	0.37	0.05	ng/kg			
o-Xylene	0.14	0.03	ng/kg			
EPH in Soil		Detection				
<u>Analyte</u>	Result	Limit	<u>Jnits</u>			
EPH (C10-C18)	Not Detected	10	ng/kg			
EPH (C19-C32)	Not Detected	10	ng/kg			
VPH in Soil		Detection				
<u>Analyte</u>	Result	Limit	<u>Jnits</u>			
VPH (C5-C10)	Not Detected	1	ng/kg			

Initials: #



β8570-9

VPH (C5-C10)

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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

			. ,	3331 #ZU 3003 [3	
BTEX in Soil		Detection			
<u>Analyte</u>	Result	Limit	<u>Units</u>		
Benzene	Not Detected	0.02	mg/kg		
Toluene	Not Detected	0.02	mg/kg		
Ethylbenzene	0.2	0.02	mg/kg		
m,p-Xylene	0.72	0.05	mg/kg		
o-Xylene	1.1	0.03	mg/kg		
EPH in Soil		Detection			
<u>Analyte</u>	Result	Limit	Units		
EPH (C10-C18)	1000	10	mg/kg		
EPH (C19-C32)	98	10	mg/kg		
VPH in Soil		Detection			
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>		
VPH (C5-C10)	26	1	mg/kg		
8570-10 <i>BTEX in</i> Soil	ALCAN FUELS, HAINES	Detection	N,YT 1	3537#22 980915	
<u>Analyte</u>	Result	Limit	<u>Units</u>		
Benzene	Not Detected	0.02	mg/kg		
Toluene	Not Detected	0.02	mg/kg		
Ethylbenzene	Not Detected	0.02	mg/kg		
m,p-Xylene	0.06	0.05	mg/kg		
o-Xylene	Not Detected	0.03	mg/kg		
EPH in Soil		Detection			
Analyte	Result	Limit	<u>Units</u>		
EPH (C10-C18)	Not Detected	10	mg/kg		
EPH (C19-C32)	Not Detected	10	mg/kg		
VPH in Soil		Detection			···
<u>Analyte</u>	Result	Limit	<u>Units</u>		
	Ivesuit		<u>91116</u>		

ALCAN FUELS, HAINES JUNCTION, YT 13537#20 980915

Initials: RH

mg/kg



Name: EBA ENGINEERING CONSULTANTS Address: UNIT 6-151 INDUSTRIAL ROAD

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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

38570-11	ALCAN FUELS, HAINES	JUNCTIO	N,YT 13	537#23 980915	
BTEX in Soil		Detection			
<u>Analyte</u>	<u>Result</u>	Limit	<u>Units</u>		
Benzene	Not Detected	0.02	mg/kg		
Toluene	Not Detected	0.02	mg/kg		
Ethylbenzene	Not Detected	0.02	mg/kg		
m,p-Xylene	Not Detected	0.05	mg/kg		
o-Xylene	Not Detected	0.03	mg/kg		
EPH in Soil		Detection			
<u>Analyte</u>	Result	Limit	<u>Units</u>		
EPH (C10-C18)	Not Detected	10	mg/kg		
EPH (C19-C32)	Not Detected	10	mg/kg		
VPH in Soil		Detection		-	
<u>Analyte</u>	Result	Limit	<u>Units</u>		
VPH (C5-C10)	Not Detected	1	mg/kg		

38570-12	ALCAN FUELS, HAINES	JUNCTIO	N,YT 135	37#24 980915		
BTEX in Soil		Detection				
<u>Analyte</u>	Result	Limit	<u>Units</u>			
Benzene	Not Detected	0.02	mg/kg			
Toluene	Not Detected	0.02	mg/kg			
Ethylbenzene	Not Detected	0.02	mg/kg			
m,p-Xylene	0.34	0.05	mg/kg			
o-Xylene	0.21	0.03	mg/kg			
EPH in Soil		Detection				
<u>Analyte</u>	Result	Limit	<u>Units</u>			
EPH (C10-C18)	38	10	mg/kg			
EPH (C19-C32)	Not Detected	10	mg/kg			
VPH in Soil		Detection				
<u>Analyte</u>	Result	Limit	<u>Units</u>			
VPH (C5-C10)	1.7	1	mg/kg	,		

Initials: A



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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

38570-13	ALCAN FUELS, HAINES JUNCTION, YT 13537#26 980915
BTEX in Soil	Detection

	<u>Detection</u>						
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>				
Benzene	Not Detected	0.02	mg/kg				
Toluene	0.03	0.02	mg/kg				
Ethylbenzene	Not Detected	0.02	mg/kg				
m,p-Xylene	0.14	0.05	mg/kg				
o-Xylene	0.08	0.03	mg/kg				

EPH in Soil		Detection	
<u>Analyte</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

EPH (C19-C32)	Not Detected	10	mg/kg
VPH in Soil		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

8570-14 ALCAN FUELS, HAINES JUNCTION, YT 13537#27 980915

BTEX in Soil		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

EPH in Soil		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
EPH (C10-C18)	28	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

VPH in Soil		Detection	
<u>Analyte</u>	<u>Result</u>	Limit	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Initials:



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Quote No. : WO (Other) : PO Num :

Project: 0201-98-13537

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Date Received: 21-Sep-98
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385/0-15	ALCAN FUELS, HAINES JUNCTION, YT 13537#30 980915
BTEX in Soil	Detection
Analyte	Result Limit Units

<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	ma/ka

EPH in Soil Detection

 Analyte
 Result
 Limit
 Units

 EPH (C10-C18)
 Not Detected
 10
 mg/kg

 EPH (C19-C32)
 Not Detected
 10
 mg/kg

VPH in Soil Detection

 Analyte
 Result
 Limit
 Units

 VPH (C5-C10)
 Not Detected
 1
 mg/kg

38570-16 ALCAN FUELS, HAINES JUNCTION, YT 13537#31 980916

BIEX III SOII		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	0.13	0.02	mg/kg
Ethylbenzene	0.09	0.02	mg/kg
m,p-Xylene	0.53	0.05	mg/kg
o-Xvlene	0.34	0.03	ma/ka

EPH IN SOII		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

VPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
VPH (C5-C10)	7.8	1	mg/kg

Initials:



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WO (Surrey): 38570

Quote No. : WO (Other) : PO Num :

Project: 0201-98-13537

Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

38570-17	ALCAN FUELS, HAINES JUNCTION, YT 13537#32 980916
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BIEX IN SOII		Detection	_
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
Benzene	0.08	0.02	mg/kg
Toluene	0.19	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.27	0.05	mg/kg
o-Xylene	0.12	0.03	mg/kg

EPH in Soil

Analyte Result

Detection
Limit

 Analyte
 Result
 Limit
 Units

 EPH (C10-C18)
 Not Detected
 10
 mg/kg

 EPH (C19-C32)
 Not Detected
 10
 mg/kg

 VPH in Soil
 Detection

 Analyte
 Result
 Limit
 Units

 VPH (C5-C10)
 Not Detected
 1
 mg/kg

8570-18 ALCAN FUELS, HAINES JUNCTION,YT 13537#34 980916

BIEX IN SOII		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
Benzene	0.06	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

EPH IN SOII		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

VPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Initials:



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Project: 0201-98-13537

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Date Received: 21-Sep-98 Date Reported: 28-Sep-98

8570-19	ALCAN FUELS, HAINES	JUNCTIO	N,YT 1
BTEX in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	0.19	0.02	mg/kg
m,p-Xylene	3	0.05	mg/kg
o-Xylene	2.5	0.03	mg/kg
EPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
EPH (C10-C18)	2100	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg
VPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
VPH (C5-C10)	37	1	mg/kg

38570-20	ALCAN FUELS, HAINES	JUNCTIO	N,YT 1
BTEX in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	0.12	0.02	mg/kg
m,p-Xylene	0.53	0.05	mg/kg
o-Xylene	0.41	0.03	mg/kg
EPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
EPH (C10-C18)	340	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg
VPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
VPH (C5-C10)	9.5	1	mg/kg

Initials: B





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Project: 0201-98-13537

Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

38570-21	ALCAN FUELS, HAINES JUNCTION, YT 13537#41 980916

DIEX III 30II		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

EPH in Soil Analyte Result Limit

 EPH (C10-C18)
 32
 10
 mg/kg

 EPH (C19-C32)
 Not Detected
 10
 mg/kg

VPH in Soil

Analyte Result Limit Units

 VPH (C5-C10)
 1.6
 1
 mg/kg

B8570-22 ALCAN FUELS, HAINES JUNCTION, YT 13537#42 980916

BTEX in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	ma/ka

EPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	ma/ka

VPH in Soil		Detection	
<u>Analyte</u>	<u>Result</u>	Limit	<u>Units</u>
VPH (C5-C10)	2.1	1	mg/kg

Initials:

Units



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Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

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8570-23	ALCAN FUELS, HAINES	JUNCTIO	N,YT 1:	3537#43 980916
BTEX in Soil		Detection		
<u>Analyte</u>	<u>Result</u>	Limit	<u>Units</u>	
Benzene	Not Detected	0.02	mg/kg	
Toluene	Not Detected	0.02	mg/kg	
Ethylbenzene	Not Detected	0.02	mg/kg	
m,p-Xylene	0.07	0.05	mg/kg	
o-Xylene	Not Detected	0.03	mg/kg	
EPH in Soil		Detection		
<u>Analyte</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	
EPH (C10-C18)	450	10	mg/kg	
EPH (C19-C32)	44	10	mg/kg	
VPH in Soil		Detection		
<u>Analyte</u>	<u>Result</u>	Limit	<u>Units</u>	
VPH (C5-C10)	2.9	1	mg/kg	

38570-24	ALCAN FUELS, HAINES JUNCTION, YT 13537#44
BTEX in Soil	Detection

		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg
EPH in Soil		Detection	

	*	<u>Detection</u>	
<u>Analyte</u>	Result	Limit	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

PH in Soil	!	Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
VPH (C5-C10) Not Detected	11	mg/kg
VPH (C5-C10) Not Detected	11	

Initials: A



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WO (Surrey): 38570

Quote No. : WO (Other) : PO Num :

Project: 0201-98-13537

Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

β8570-25	ALCAN FUELS, HAINES JUNCTION, YT 13537#45 980916
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BTEX in Soil		Detection	·
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.06	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

EPH in Soil Detection Analyte Result Limit Units EPH (C10-C18) 75 10 mg/kg EPH (C19-C32) Not Detected 10 mg/kg

LF11(019-032)	Not Detected	10	mg/kg
VPH in Soil		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
VPH (C5-C10)	1	1	mg/kg

8570-26 ALCAN FUELS, HAINES JUNCTION,YT 13537#48 980917

BTEX in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
Benzene	23	0.02	mg/kg
Toluene	120	0.02	mg/kg
Ethylbenzene	27	0.02	mg/kg
m,p-Xylene	110	0.05	mg/kg
o-Xylene	40	0.03	ma/ka

EPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
EPH (C10-C18)	35000	10	mg/kg
EPH (C19-C32)	3500	10	mg/kg

VPH in Soil		Detection	
<u>Analyte</u>	<u>Result</u>	Limit	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Initials:



o-Xylene

EPH in Soil

Analyte

EPH (C10-C18)

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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

Date Sampled:

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38570-27	ALCAN FUELS, HAINES	JUNCTIO	N,YT 1	3537#49 980917
BTEX in Soil		Detection	·	
<u>Analyte</u>	Result	Limit	<u>Units</u>	
Benzene	0.25	0.02	mg/kg	
Toluene	0.52	0.02	mg/kg	
Ethylbenzene	0.11	0.02	mg/kg	
m,p-Xylene	0.36	0.05	mg/kg	
o-Xylene	0.1	0.03	mg/kg	
EPH in Soil		Detection		
<u>Analyte</u>	Result	Limit	<u>Units</u>	
EPH (C10-C18)	170	10	mg/kg	
EPH (C19-C32)	Not Detected	10	mg/kg	
VPH in Soil		Detection		
<u>Analyte</u>	Result	Limit	Units	
VPH (C5-C10)	Not Detected	1	mg/kg	
38570-28	ALCAN FUELS, HAINES	JUNCTIO	N,YT 1	3537#50 980917
BTEX in Soil		Detection		
<u>Analyte</u>	Result	Limit	<u>Units</u>	
Benzene	Not Detected	0.02	mg/kg	
Toluene	Not Detected	0.02	mg/kg	
Ethylbenzene	Not Detected	0.02	mg/kg	
m,p-Xylene	0.05	0.05	mg/kg	

Not Detected	10	mg/kg
	Detection	
Result	Limit	<u>Units</u>
Not Detected	1	mg/kg
	Result	<u>Detection</u> <u>Result</u> <u>Limit</u>

Not Detected

Result

11

0.03

Detection

<u>Limit</u>

10

mg/kg

Units

mg/kg

Initials: A



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Quote No. : WO (Other) : PO Num :

Project: 0201-98-13537

Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

0-29	ALCAN FUELS, HAINES JUNCTION, YT 13537#54 980917
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	Detection	
Result	Limit	<u>Units</u>
Not Detected	0.02	mg/kg
Not Detected	0.02	mg/kg
0.11	0.02	mg/kg
0.53	0.05	mg/kg
0.38	0.03	mg/kg
	Not Detected Not Detected 0.11 0.53	Result Limit Not Detected 0.02 Not Detected 0.02 0.11 0.02 0.53 0.05

EPH in Soil		Detection	
<u>Analyte</u>	Result	Limit	<u>Units</u>
EPH (C10-C18)	4800	10	mg/kg
EPH (C19-C32)	390	10	ma/ka

VPH in Soil		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
VPH (C5-C10)	7.3	1	mg/kg

38570-30 ALCAN FUELS, HAINES JUNCTION,YT 13537#55 980717

BIEX IN SOII		Detection	
<u>Analyte</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.08	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

EPH in Soil		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
EPH (C10-C18)	210	10	mg/kg
EPH (C19-C32)	18	10	mg/kg

VPH in Soil		Detection	
<u>Analyte</u>	Result	<u>Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Approved By:

Ralph Hindle, B.Sc.

Supervisor, Organics Lab Page 15 of 16

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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

QA/QC Results

<u>Method</u>	Compound	Recovery	<u>Date</u>	<u>Analyst</u>
BTEX in Soil	Benzene	88 %	27-Sep-98	S. Ho
	Toluene	96 %		
	Ethylbenzene	90 %		
	m,p-Xylene	88 %		
	o-Xylene	87 %		
	Average:	90		

Approved By:

Refl Hail Ralph Hindle, B.Sc.

Supervisor, Organics Lab Page 16 of 16



Name: EBA ENGINEERING CONSULTANTS

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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

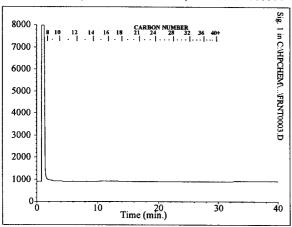
Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

Qualitative Fuel Assessment Report

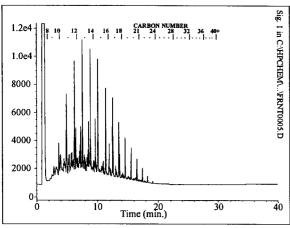
Method: EPH in Soil Sample No. 38570-1

ALCAN FUELS, HAINES JUNCTION, YT 13537#1 980914



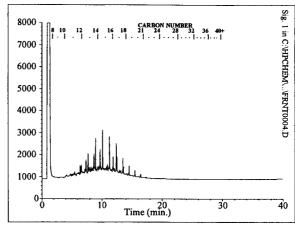
Method: EPH in Soil Sample No. 38570-3

ALCAN FUELS, HAINES JUNCTION, YT 13537#7 981914



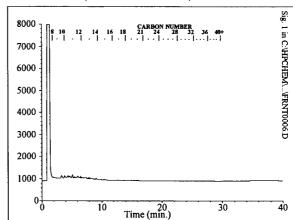
Method: **EPH in Soil** Sample No. 38570-2

ALCAN FUELS, HAINES JUNCTION, YT 13537#3 980914



Method: EPH in Soil Sample No. 38570-4

ALCAN FUELS, HAINES JUNCTION, YT 13537#9 980914



Initials: Rut





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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

Date Sampled:

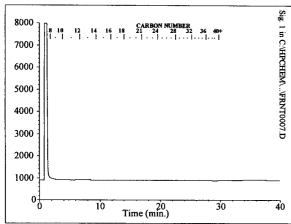
Date Received: 21-Sep-98 Date Reported: 28-Sep-98

Qualitative Fuel Assessment Report

Method: **EPH in Soil** Sample No. 38570-5

ALCAN FUELS, HAINES JUNCTION, YT 13537#11

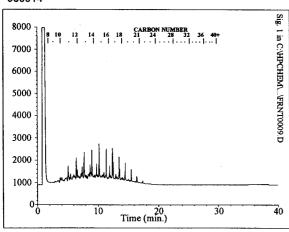
980914



Method: EPH in Soil Sample No. 38570-7

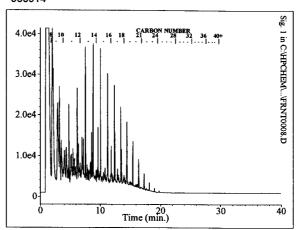
ALCAN FUELS, HAINES JUNCTION, YT 13537#17

980914



Method: EPH in Soil Sample No. 38570-6

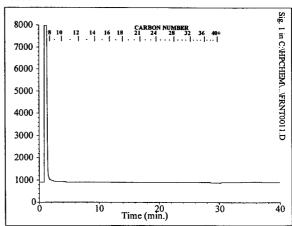
ALCAN FUELS, HAINES JUNCTION, YT 13537#13 980914

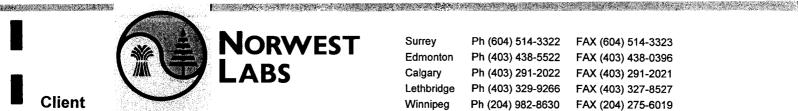


Method: **EPH in Soil** Sample No. 38570-8

ALCAN FUELS, HAINES JUNCTION, YT 13537#19

980914





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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

Date Sampled:

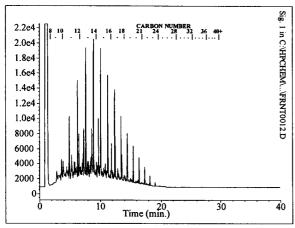
Date Received: 21-Sep-98 Date Reported: 28-Sep-98

Qualitative Fuel Assessment Report

Method: **EPH in Soil** Sample No. 38570-9

ALCAN FUELS, HAINES JUNCTION, YT 13537#20

980915

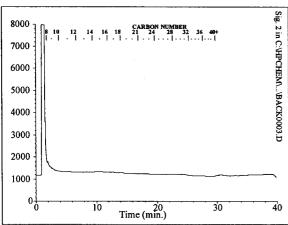


Method: EPH in Soil Sample No. 38570-11

ALCAN FUELS, HAINES JUNCTION, YT 13537#23

980915

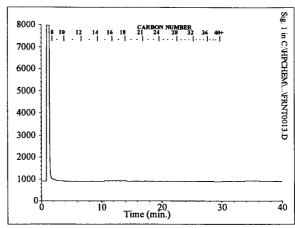
Mark Section 12



Method: **EPH in Soil** Sample No. 38570-10

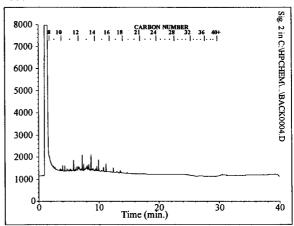
ALCAN FUELS, HAINES JUNCTION, YT 13537#22

980915

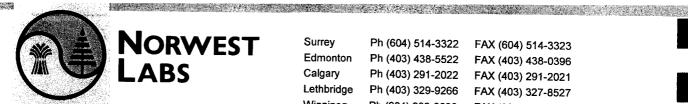


Method: **EPH in Soil** Sample No. 38570-12

ALCAN FUELS, HAINES JUNCTION, YT 13537#24 980915



Initials: KA



Name: EBA ENGINEERING CONSULTANTS Address: UNIT 6-151 INDUSTRIAL ROAD

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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

Date Sampled:

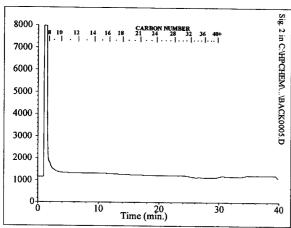
Date Received: 21-Sep-98 Date Reported: 28-Sep-98

Qualitative Fuel Assessment Report

Method: EPH in Soil Sample No. 38570-13

ALCAN FUELS, HAINES JUNCTION, YT 13537#26

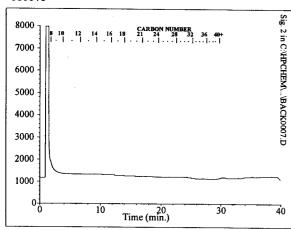
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Method: EPH in Soil Sample No. 38570-15

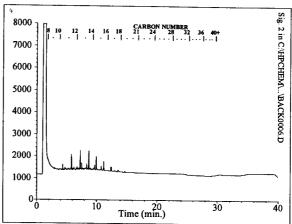
ALCAN FUELS, HAINES JUNCTION, YT 13537#30

980915



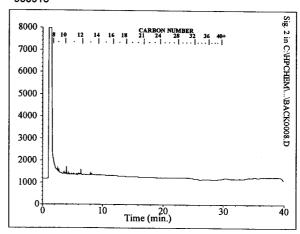
Method: **EPH in Soil** Sample No. 38570-14

ALCAN FUELS, HAINES JUNCTION, YT 13537#27 980915



Method: EPH in Soil Sample No. 38570-16

ALCAN FUELS, HAINES JUNCTION, YT 13537#31 980916



Initials: 4





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WO (Surrey): 38570

Quote No. : WO (Other) : PO Num :

Project: 0201-98-13537

Date Sampled:

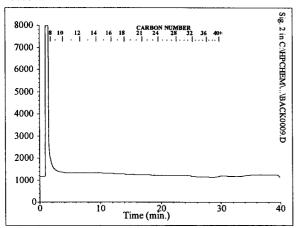
Date Received: 21-Sep-98 Date Reported: 28-Sep-98

Qualitative Fuel Assessment Report

Method: EPH in Soil Sample No. 38570-17

ALCAN FUELS, HAINES JUNCTION, YT 13537#32

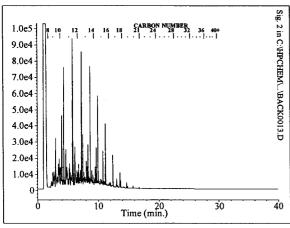
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Method: EPH in Soil Sample No. 38570-19

ALCAN FUELS, HAINES JUNCTION, YT 13537#36

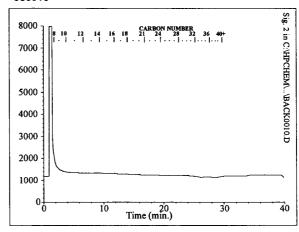
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Method: EPH in Soil Sample No. 38570-18

ALCAN FUELS, HAINES JUNCTION, YT 13537#34

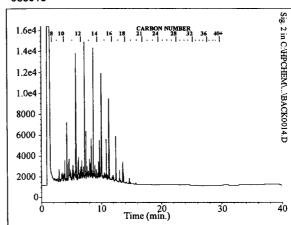
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Method: EPH in Soil Sample No. 38570-20

ALCAN FUELS, HAINES JUNCTION, YT 13537#38

980916



Initials: R4



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WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

Project: 0201-98-13537

Date Sampled:

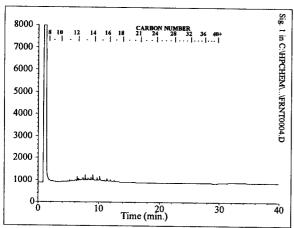
Date Received: 21-Sep-98 Date Reported: 28-Sep-98

Qualitative Fuel Assessment Report

Method: EPH in Soil Sample No. 38570-21

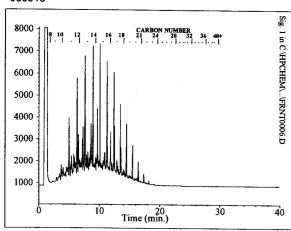
ALCAN FUELS, HAINES JUNCTION, YT 13537#41

980916



Method: **EPH in Soil** Sample No. 38570-23

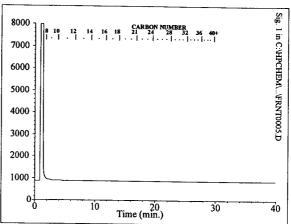
ALCAN FUELS, HAINES JUNCTION, YT 13537#43 980916



Method: **EPH in Soil** Sample No. 38570-22

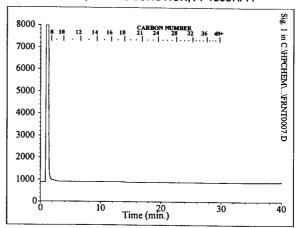
ALCAN FUELS, HAINES JUNCTION, YT 13537#42

980916



Method: **EPH in Soil** Sample No. 38570-24

ALCAN FUELS, HAINES JUNCTION, YT 13537#44



Initials: RH



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WO (Surrey): 38570

Quote No. : WO (Other) : PO Num :

Project: 0201-98-13537

Date Sampled:

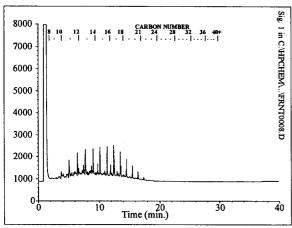
Date Received: 21-Sep-98 Date Reported: 28-Sep-98

Qualitative Fuel Assessment Report

Method: EPH in Soil Sample No. 38570-25

ALCAN FUELS, HAINES JUNCTION, YT 13537#45

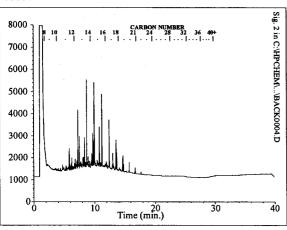
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Method: EPH in Soil Sample No. 38570-27

ALCAN FUELS, HAINES JUNCTION, YT 13537#49

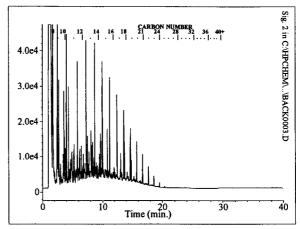
980917



Method: EPH in Soil Sample No. 38570-26

ALCAN FUELS, HAINES JUNCTION, YT 13537#48

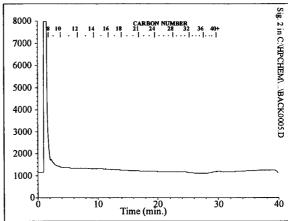
980917



Method: EPH in Soil Sample No. 38570-28

ALCAN FUELS, HAINES JUNCTION, YT 13537#50

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Initials: Ret

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WO (Surrey): 38570

Quote No. : WO (Other) : PO Num :

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Date Sampled:

Date Received: 21-Sep-98 Date Reported: 28-Sep-98

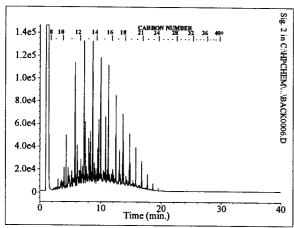
Qualitative Fuel Assessment Report

Method: EPH in Soil

Sample No. 38570-29

ALCAN FUELS, HAINES JUNCTION, YT 13537#54

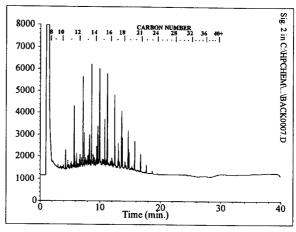
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Method: EPH in Soil Sample No. 38570-30

ALCAN FUELS, HAINES JUNCTION, YT 13537#55

980717





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> WO (Surrey): 38570

Quote No.: WO (Other): PO Num:

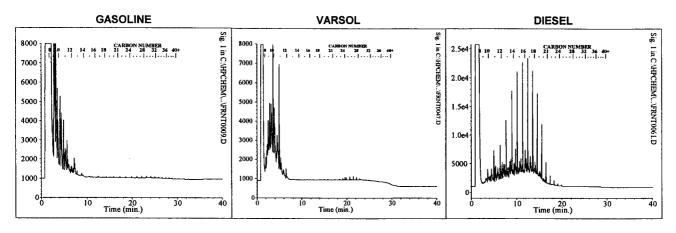
Project: 0201-98-13537

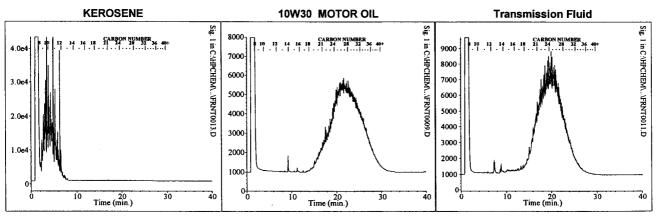
Date Sampled:

Date Received : 21-Sep-98 Date Reported: 28-Sep-98

Qualitative Fuel Assessment Report

TYPICAL PRODUCT CHROMATOGRAMS





Product Carbon Number Ranges

C4 - C12 Gasoline: C8 - C12 Varsol:

C8 - C22 Diesel: Lubricating Oils: C20 - C40

Kerosene: C7 - C16

Crude Oils:

C3 - C60+

Approved By:

Rofe Dull

Ralph Hindle, B.Sc. Supervisor, Organics Lab Page 9 of 9

Accredited By: CANADIAN ASSOCIATION FOR ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL)

For specific tests registered with the Association



Environmental Sample Information Sheet

NOTE Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

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Whitehouse yT YIA 2V3										
Attention: Dom wilson	Report Result:	 Attentio	ın·						Rep	ort Result
Phone: 867 668-3068	Fax 🗸	Phone:	•••						Fa	
Fax: 867 668-4345 Cell:	Mail Courier	Fax:							Ma	===
e-mail: dwilson@eba.ca	e-mail	Cell: e-mail:							Courie e-ma	
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Information to be included on	RUSH			aboratory to	Sample	e Custo	ody (Pl	ease F	Print)	
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Environmental Sample Information Sheet

NOTE Proper completion of this form is required in order to proceed with analysis See reverse for your nearest Norwest location and proper sampling protocol

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Environmental Sample Information Sheet

NOTE Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

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APPENDIX C

Remediation Options



POTENTIAL SITE RESTORATION

SELECTION OF TREATMENT OPTIONS

It is understood that should the site become property titled to other than the Government of Canada the Contaminated Sites Regulations would apply. This would mean that the eventual development of the property might be contingent upon a successful site restoration program such that the site would no longer be considered as contaminated under the Contaminated Sites Regulations. The remediation options have, therefore, been evaluated with consideration to restoring the site to standards established in these regulations.

Since the major sources of contamination are considered to be surface releases from the ASTs formerly on the site, these sources are no longer present. By treating the contaminated soil the potential for contaminant migration will also be removed. Information obtained in the Phase 2 and Phase 3 environmental site assessment is considered to reflect current site conditions. Over time the site conditions may change such that the assumptions which have been made, are not longer valid.

The discussions of treatment options are based on the following assumptions:

- 1. Two separate areas of hydrocarbon contamination are present on the site. One being the former location of the Furnace Oil AST the second being the area formerly occupied by the Gasoline and Stove Oil ASTs.
- 2. The hydrocarbon contamination is contained within the property boundaries.
- 3. The hydrocarbon contamination has not penetrated below 11.4 m.
- 4. The volume of soil contaminated in excess of the selected criteria is approximately 1050 m³.

In considering how to achieve restoration of the site *in situ* methods (treating the contamination in place) were excluded following consideration of the applicability of these types of treatments to the clay and silt matrix found through the site. The remaining restoration methods are generally referred to as *ex situ* treatments, which involve removing the contaminated soil for treatment. Within this category treatment can take place on-site or offsite. Given the location of the property and the limited space available, on-site methods are not considered viable. This leaves off-site treatment of the contaminated material.



SUGGESTED TREATMENT OPTION

Off-site treatment would restore the property in a timely fashion since contaminated material would be removed from the site and replaced with clean fill. Soil, which was removed, could be treated using either a landfarming system or a more aggressive approach such as bioremediation. A more intensive bioremediation approach (such as a static pile bioremediation system) is considered less economically feasible. This is due to the costs to provide water on-site, to develop a treatment cell, and for power requirements.

Given the nature of the contaminant being a combination of gasoline type product and heavier diesel type products both of which volatilize readily, a landfarming system is thought to be the most cost effective treatment method for the soils encountered on the site. It is assumed that some bulking agents would be required to reduce clumping and provide additional vapour space within the soil matrix.

A landfarming treatment system allows natural processes such as volatilization and microbial biodegradation to reduce the hydrocarbon contamination in the soil. The volatilization mechanism for hydrocarbon removal involves the contaminant leaving the soil in the vapour form. The biodegradation mechanism involves natural soil bacteria consuming the hydrocarbon as its carbon and energy source for growth. Although natural biodegradation will occur within the contaminated soil, the rate of hydrocarbon removal will be proportional to the extent to which treatments or additives are employed. The particular remediation system envisaged would involve a passive landfarming program, which does not include providing additives to promote accelerated rates of biodegradation. As such, volatilization is assumed to be the primary process for hydrocarbon removal.

The suitability for the landfarming type of remediation system is directly related to the soil and contaminant types. With respect to soil type, landfarming is most suitable for a soil with a high intrinsic permeability since there is an increased opportunity for air transmission through the soil pore volume. Air transmission is the most critical requirement to effect both volatilization and aerobic respiration of the contaminant. As discussed, the clay and silt matrix would require bulking agents to enhance the permeability of the soil, depending on the material selected this could also provide additional nutrients to the soil. The gravel and sand soils encountered below the clays and silts are suitable for the adoption of a landfarming operation due to the moderate intrinsic permeability which could be expected.



In relation to contaminant type, landfarming is suitable for those hydrocarbons with a relatively high vapour pressure since volatilization is dependent on the extent to which the contaminant will partition to the vapour phase. In this particular case, the gasoline and to a lesser extent the fuel oil contaminants consists of mixtures of organic chemicals with a range of relatively high vapour pressures. In general, these constituents will readily volatilize at normal (summer) temperatures and thus landfarming would be an appropriate configuration to effect volatilization. These hydrocarbons are also readily biodegradable by naturally occurring soil bacteria. Therefore, it can be expected that a small amount of microbial degradation will occur throughout the remediation program.

