HARTCROWSER

Earth and Environmental Technologies

Independent Remedial Action Report
Alaska Marine Lines Parcel
Duwamish Shipyards
Seattle, Washington

Prepared for
Duwamish Shipyards, Inc.

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INDEPENDENT REMEDIAL ACTION REPORT
ALASKA MARINE LINES PARCEL
DUWAMISH SHIPYARDS
SEATTLE, WASHINGTON

EXECUTIVE SUMMARY

During August 1993, Environmental Services Limited (ESL) examined an area of the Duwamish Shipyards, Inc. (DSI) property to assess the extent of petroleum hydrocarbons discovered in the subsurface soil during site improvement activities. The source of these petroleum hydrocarbons is unknown. Five test pits and five soil borings were installed. Four of the soil borings were converted to groundwater monitoring wells. Selected soil and groundwater samples were analyzed for petroleum hydrocarbons, volatile organics, and semivolatile organics. Petroleum hydrocarbon constituents were detected in many of the soil samples analyzed. Benzene and benzo(a)pyrene were detected in one test pit soil sample at concentrations exceeding the MTCA Method A Industrial and C Industrial cleanup levels, respectively. Gasoline and fuel hydrocarbons were not detected in groundwater above detection limits of 0.20 mg/L and 1.0 mg/L, respectively. Diesel fuel was detected above the 0.50 mg/L screening level in groundwater samples from two wells at 0.98 and 1.0 mg/L in wells MW-3 and MW-4, respectively.

On October 25 and 26, 1993, Hart Crowser oversaw excavation of accessible soil which contained petroleum hydrocarbon constituents. Approximately 1,000 cubic yards of soil containing petroleum hydrocarbons were located on site. During remediation, 650 cubic yards, or 65% of the total volume of soil containing concentrations of petroleum hydrocarbons that exceed MTCA cleanup levels, were excavated and sent to the Holman, Inc., Seattle plant to be recycled into concrete. The soil that was removed contained concentrations of petroleum hydrocarbons ranging from 750 to 2,250 mg/kg. Eight of 12 soil verification samples collected from the side walls and bottom of the excavation did not contain petroleum hydrocarbons above the MTCA Method A industrial cleanup levels. None of the 12 soil samples collected exceed the MTCA Method C Industrial cleanup levels for semivolatile constituents. Additional excavation could not be accomplished because of the presence of a pad-mounted transformer, a 26 KV buried utility line, and the foundation of the graving dock. Deeper excavation was not feasible because of groundwater seepage into the excavation at a depth of approximately 6.5 feet below grade.

Additional site characterization was undertaken in January 1994. The downgradient extent of petroleum hydrocarbons in the soil and groundwater was defined by Hart Crowser soil borings B-1 and B-2, and monitoring well MW-5. The areas where soils were left in-place and exceed MTCA cleanup levels were capped with asphalt.

Groundwater under the site flows toward the northeast at a gradient of approximately 0.01 ft/ft and is affected by tidal fluctuation. A 25% decrease in concentration of diesel fuel in groundwater was found in well MW-4 after the remedial action. Downgradient wells MW-4 and MW-5 do not contain petroleum constituents at concentrations that would pose a threat to the Duwamish Waterway.

If in the future site activities call for soil excavation in the area where soils were left in-place, petroleum hydrocarbon-containing soils should be excavated for proper treatment and/or disposal. Institutional controls will be required by Ecology to ensure continued protection of human health and the environment. Additional groundwater monitoring should be performed in the future to assess trends in groundwater quality.

1.0 INTRODUCTION

This report presents the results of the independent remedial action and additional site characterization performed by Hart Crowser at the Alaska Marine Lines (AML) leased parcel of the Duwamish Shipyards, Inc. (DSI) property in Seattle, Washington (Figure 1).

1.1 Objectives

The objectives of this work were as follows:

- Excavate and remove accessible soils above the water table containing petroleum hydrocarbon compounds above the MTCA cleanup levels. Some soils containing petroleum hydrocarbons along the north and northeastern excavation boundary could not be excavated due to the presence of a transformer, a buried utility line, the graving dock, and crane tracks.

- Characterize the petroleum hydrocarbon-containing soil and groundwater along the downgradient boundary which remained under these utilities after excavation activities.

- Install an asphalt cap over remaining soils that exceed applicable MTCA cleanup levels.

- Write a report summarizing the excavation activities and the findings of the additional site characterization.

1.2 Scope of Work

The scope of work included the following steps:

- Oversee the excavation of petroleum hydrocarbon-containing soils from the area of the property illustrated on Figure 2. Identify soils containing petroleum hydrocarbons in the field by visual observation and field screening with a photoionization detector (PID).

- Segregate stockpiles of petroleum hydrocarbon-containing soils from those without apparent petroleum hydrocarbon content. Place stockpiles on plastic liner and cover stockpiles.

- Collect verification soil samples from the side walls and bottom of the excavation to verify that petroleum hydrocarbon-containing soils were removed from the excavation to the maximum practicable extent and to document the concentrations of petroleum hydrocarbons remaining in the soil. Analyze verification samples for diesel fuel by Ecology method WTPH-D extended and five samples for gasoline by Method WTPH-G/8020 and Polynuclear Aromatic Hydrocarbons (PAHs) by EPA Method 8310.

- Designate soil stockpile waste by collecting soil samples and analyzing each sample for diesel fuel by Ecology Method WTPH-D and analyzing up to five samples for PAHs by EPA Method 8310.

- Assist DSI with arrangements for disposal of stockpiled soil.

- Oversee placement of backfill material into excavation. Provide geotechnical density testing of backfill material during and after placement.

- Install three soil borings to a total depth of 16.5 feet downgradient of the excavated area. Place soil borings to attempt to define the lateral and vertical extent of the petroleum hydrocarbon-containing soils remaining in place after completing the excavation. Field screen soil samples with a PID to select samples for laboratory analysis. Analyze selected soil samples for diesel fuel by Ecology Method WTPH-D, PAHs by EPA Method 8310, Total Organic Carbon (TOC) by EPA Method 9060. Additionally analyze two soil samples using the Synthetic Precipitation and Leaching Potential (SPLP) test (EPA

Method 1312) to evaluate the mobility of petroleum hydrocarbons in remaining site soils.

- Convert one soil boring to a groundwater monitoring well to replace MW-3 which was damaged and removed during excavation. Upgrade the existing wells to bring the well casing to grade, provide locking caps, and install flush-mounted monuments.

- Survey elevations of new and existing groundwater monitoring wells. With consideration of potential tidal influence, collect groundwater elevation measurements to assess the direction of groundwater flow.

- Develop and sample new and existing groundwater monitoring wells. Analyze groundwater samples for diesel fuel by Ecology Method WTPH-D extended, PAHs by EPA Method 8310, volatile organic compounds by EPA Method 8020, and total dissolved solids by EPA Method 160.1.

- Prepare this report of the results of the excavation activities and the findings of the additional site characterization work.

1.3 Report Organization

Following the **EXECUTIVE SUMMARY** and this **INTRODUCTION**, Section **2.0 PROJECT BACKGROUND** discusses the property location and history, regulatory records, site geology and hydrogeology, and the results of previous investigations at the site. Section **3.0 MTCA CLEANUP LEVELS** discusses the appropriate MTCA cleanup levels and cleanup action objectives for the site. Section **4.0 EXCAVATION AND SUBSURFACE EXPLORATIONS METHODS** presents field exploration methods used during this work, while Section **5.0 FINDINGS** describes the results of the excavation activities and additional site characterization. Section **6.0 COMPLIANCE WITH MTCA** discusses the MTCA requirements and the extent that site remediation has achieved compliance as well as recommendations for additional actions. A discussion of the report **LIMITATIONS** is presented in Section 7.0.

Tables which summarize the chemical constituents that were detected in site soil, soil stockpiles, and groundwater, from both previous work and Hart Crowser work are found at the end of the text. Figures which illustrate site conditions described in the text follow the tables. Appendix A includes reports of the previous investigation at the site. Appendix B includes a detailed discussion of the site sampling activities along with soil boring logs and groundwater monitoring well installation details. Appendix

C includes the quality assurance /quality control (QA/QC) review of the laboratory data along with the laboratory certificates of analysis.

2.0 PROJECT BACKGROUND

2.1 Site Location

The DSI site is located at 5658 West Marginal Way SW in Seattle, Washington. It is bounded on the east by the Duwamish Waterway, on the north by the Alaska Marine Lines property, on the south by the Lonestar cement batch plant, and on the west by the Burlington Northern Railroad tracks and west Marginal Way SW. Figure 1 illustrates the area in the vicinity of the property. Figure 2, the Site Plan, illustrates prominent site features.

2.2 Site Use and History

The property comprises approximately 7.5 acres. DSI presently utilizes 5.2 acres for shipyard operations. The eastern 2.5 acres of the property is currently leased to AML for container shipping and storage (Figure 2). The shipyard specializes in repair and conversion of ships and steel fabrication activities. Facilities found on site include two floating drydocks, a graving dock, a marine railway, a crane service, and a machine shop. The property also houses an office building, an electrical shop, paint shop and paint storage buildings, a warehouse, and numerous sheds. As illustrated on Figure 2, the dry docks and graving docks are found on the east and north sides of the property, respectively, nearest the Duwamish Waterway, while the other support facilities are found in the central area of the property.

This property has been the site of DSI since 1941. The source of the petroleum hydrocarbons discovered in the subsurface is unknown. This area was not a previous location of an above-ground or underground storage tank. Past spills or releases of petroleum hydrocarbons that may have occurred in this area were not documented. However, the site investigation indicates that the gravel fill was not contaminated with TPH. Based on this observation, the gravel fill that was found above the TPH-affected soils was emplaced more than 22 years ago, making the TPH release older than 22 years.

2.3 Regulatory Records/Permits

The DSI facility holds the following permits:

National Pollution Discharge Elimination System (NPDES) Permit Number WA-003093-1 for the discharge of process wastewater and storm water.

The facility generates dangerous wastes and is identified by Dangerous Waste Generator ID Number WAD00924497.

Air contaminant sources are registered with the Puget Sound Air Pollution Control Authority (PSAPCA), registration number 10654.

2.4 Regional Geology and Hydrogeology

Regional Geology

The Duwamish River Valley is identified as a separate physiographic unit in the Geology and Groundwater Resources of Northwestern King County (Water Supply Bulletin No. 20, Washington Department of Conservation, 1963). Much of the valley has been mapped as "modified area" where extensive excavation, filling, or construction activities have greatly modified or obscured the original geology and topography. Thickness of fill can be extensive in these modified areas. Undifferentiated sediments, deposited by the Duwamish River after the Vashon glacial period, have been identified to depths of 340 feet below the modified areas. These undifferentiated sediments consist of interfingered beds of clay, sand, gravel and possibly extensive peat deposits.

Regional Hydrogeology

Groundwater is found at shallow depths, 5 to 20 feet below grade, in the fill and undifferentiated sediments. The water available in the coarser grained sediments has been historically used for industrial and irrigation supply, although yield is sometimes not sufficient for industrial purposes. Groundwater found in the fine-grained peat and muck sediments is generally not suitable for use, as the sediments provide humic acid and iron to the water; making it corrosive and contributing color and taste. Groundwater discharges to the Duwamish River and is influenced by tidal fluctuation.

2.5 Previous Investigations

During August 1993, Environmental Services Limited (ESL) examined an area of the DSI property to assess the extent of petroleum hydrocarbons discovered in the subsurface soil during site improvement activities. The area under examination was in the northcentral portion of the property, southwest of the graving dock as illustrated on Figures 2 and 3.

Soil Exploration Results

ESL excavated five test pits (TP-1 through TP-5) to depths of from 5 to 7 feet, drilled five soil borings and converted four of them to groundwater monitoring wells (SB-1 and MW-1 through MW-4, respectively). The location of these test pits, soil borings, and groundwater monitoring wells are illustrated on Figure 3. One soil sample from test pits TP-1, TP-2, TP-4, and TP-5 and from soil boring SB-1 was screened for the presence of petroleum hydrocarbons by Ecology Method WTPH-HCID. Two samples each from TP-3 and MW-4, and three soil samples from wells MW-2 and MW-3 were also screened for petroleum hydrocarbons by Ecology Method WTPH-HCID. Soil from well MW-1 was not screened for the presence of petroleum hydrocarbons. One soil sample each from test pits TP-1 and TP-3 was analyzed for volatile organic compounds (VOCs) by EPA Method 8240 and semivolatile organic compounds by EPA Method 8270.

Soil samples from test pits TP-1 and TP-3, the soil boring, and monitoring wells MW-2, MW-3, and MW-4 contained petroleum hydrocarbons above the screening level detection limits of 20 mg/kg for gasoline, 50 mg/kg for diesel fuel, and 100 mg/kg for heavy oil. Various VOCs and PAHs were also detected in the soil samples analyzed. Benzene and benzo(a)pyrene were detected in test pit TP-3 at concentrations exceeding the MTCA Method A Industrial and Method C Industrial cleanup levels of 0.5 and 18.0 mg/kg, respectively. The results of the analysis of these soil samples are summarized in Table 1A and 1B. Figure 4 illustrates the distribution of petroleum hydrocarbons in soils as detected by Method WTPH-HCID. Appendix A includes the reports completed by ESL.

Groundwater Exploration Results

Four groundwater monitoring wells (MW-1 through MW-4) were installed in the locations illustrated on Figure 3. Boring logs were included in the report provided to DSI, but groundwater monitoring well construction details were not included. Groundwater elevation measurements and resultant potentiometric surface maps were also not included in the report. Groundwater samples from each of the four wells were screened for the presence of petroleum hydrocarbons by Ecology Method WTPH-HCID. Gasoline and fuel hydrocarbons were not detected above the analytical detection limit in samples from these wells. Diesel fuel was detected at concentrations of 0.98 and 1.0 mg/L in samples from wells MW-3 and MW-4, respectively. Groundwater samples were not analyzed for VOCs or PAHs. The results of the analysis of the groundwater samples collected by ESL are summarized in Table 1C.

Based on the results of soil and groundwater sampling, Ecology was notified of the discovery of petroleum hydrocarbon-containing soils by DSI on January 31, 1994. This report was acknowledged by Ecology as report number 14926.

3.0 MTCA CLEANUP LEVELS

Sections 173-340-700 through 173-340-745 of the Washington Administrative Code (WAC) were reviewed to evaluate potential soil and groundwater cleanup levels for this site. Soil cleanup level alternatives were evaluated assuming the site meets all criteria for industrial sites as listed in WAC 173-340-745 including:

- The site is currently zoned for industrial purposes and has a history of use for industrial purposes;
- The adjacent properties are currently used for industrial purposes; and
- The site is expected to be used for industrial purposes for the foreseeable future.

Substitute Senate Bill 6123, also known as the 'Ports Bill', recently amended the MTCA to encourage reuse of industrial property for industrial purposes. Under the MTCA, qualifying industrial properties are allowed to use industrial site use assumptions and correspondingly higher cleanup levels than residential or commercial sites. The original MTCA statute contained a narrow definition of industrial property. This narrow definition had the net effect of discouraging purchase and reuse of historical industrial property because very few sites could qualify for industrial cleanup levels. Lending institutions and prospective purchases were reluctant to redevelop historical industrial properties because of the cost and liabilities associated with cleanup of industrial property to residential standards. The intent of the 'Ports Bill' is to encourage reuse and development of industrial properties by broadening the definition of industrial property. This will reduce industrial development on virgin land that is free from environmental contamination typically associated with industrial use.

Although the MTCA regulations have not been amended to reflect changes in the law, the DSI property is an example of the type of property that the State Legislature intended to be covered under the 'Ports Bill'. Thus, we have assumed that the DSI property qualifies for industrial use cleanup levels. MTCA cleanup levels used for soil at the DST site include:

- Method A industrial cleanup levels were considered for cPAHs and TPH such as gasoline, diesel fuel, and oil;

- Method C industrial cleanup levels were selected to address direct soil contact exposures for comparison of individual petroleum hydrocarbon constituents (e.g., VOAs) remaining in site soils.

Groundwater cleanup levels were evaluated under the following assumptions:

- Method A cleanup levels were considered for TPH such as gasoline, diesel fuel, and oil, where cleanup levels for the compounds cannot be calculated using Method B procedures. The Method A TPH groundwater cleanup levels were established to protect against secondary aesthetic effects in drinking water (e.g., taste and odor). As such, use of the Method A cleanup levels for groundwater is overly conservative in our opinion because groundwater at the DSI site is not a current or potential drinking water source (see below). A more appropriate groundwater cleanup level would be based on protection of surface water but no standards exist for TPH in surface water. State Water Quality Guideline No. 9 (September 1987) specifies total oil and grease discharge limits of 10 mg/L (daily average) with no single sample exceeding 15 mg/L, with no visible sheen. The limits set in the guideline are probably more appropriate cleanup levels for groundwater at the DSI site. However, we selected the Method A groundwater cleanup level (i.e., 1.0 mg/L) at the DSI site because Ecology's position regarding use of oil and grease discharge limits to establish MTCA cleanup levels is unclear.

- Method B cleanup levels were selected to use for comparison to the individual petroleum hydrocarbon constituents detected in site groundwater. Groundwater at this site does not serve as a current source of drinking water or is not a likely potential future source of drinking water due to its quality and proximity to the Duwamish River. We believe that the groundwater at the DSI site would not make a suitable source of drinking water for the following reasons:

  - Background water quality of shallow groundwater in peat and silty sediments is generally not suitable for drinking water due to taste, odor, and corrosivity;

  - If a well was located between the river and the affected area and pumped at a reasonable rate, it is likely that the well would soon be producing brackish water from the Duwamish Waterway;

- Municipal water is readily available in the area; and
- This is consistent with Ecology decisions at nearby properties along the Duwamish Waterway (e.g., Harbor Island and Great Western Chemical).

The highest beneficial use of the groundwater at this site is recharge of the Duwamish Waterway. The Duwamish Waterway is classified as a class B fresh water, not suitable as a domestic supply. As such, surface water quality criteria which are protective of human health due to consumption of organisms taken from that water body were used as the cleanup levels for groundwater at this site. These cleanup levels represent the highest beneficial use and reasonable maximum exposure to occur under current and potential future groundwater use scenarios. This is also adequately protective of aquatic life due to acute and chronic exposures (i.e., human health water quality criteria are more stringent than acute and chronic aquatic life criteria).

Table 2 summarizes the soil and groundwater cleanup levels used to evaluate the petroleum hydrocarbon compounds remaining in site soil after excavation activities and those detected in site groundwater.

3.1 Cleanup Action Objectives

Cleanup action objectives for groundwater at the DSI site are:

- MTCA Method A cleanup levels for TPH; and
- Method B cleanup levels for protection of human health due to ingestion of aquatic organisms for PAHs and VOCs.

Cleanup action objectives for soil are the Method A industrial cleanup levels for TPH and cPAHs and the Method C industrial cleanup levels for all other constituents. Our soil cleanup action consisted of removing soil that exceeded one or more cleanup level between the surface and the water table. Soil exceeding cleanup levels that could not be excavated due to underground utilities or surface structures were remediated by capping with asphalt to reduce the potential for leaching to the groundwater due to rainfall percolation through unsaturated soil.

See Section 6.0 for additional explanation and rationale for selection of cleanup action objectives.

4.0 EXCAVATION AND ADDITIONAL SITE CHARACTERIZATION METHODOLOGY

4.1 Excavation of Petroleum Hydrocarbon-Containing Soils

The following discussion summarizes the activities that took place on site on October 25 through 27, 1993, during excavation of petroleum hydrocarbon-containing soils and backfilling of the excavation. Detailed information regarding these field activities can be found in Appendix B.

Excavation began on October 25, 1993. Soils were removed in two-foot increments beginning in the northeast corner and working toward the southeast. The top 3 feet of material was composed of clean crushed road rock base. This material was segregated on clean soil and used as backfill for the excavation. Soils below 3 feet were excavated and loaded into a dump truck and were placed on plastic in the stockpile area. Soil stockpiles were covered with plastic upon completion of the excavation. Four soil samples were collected from the northeast, southeast, and east side walls. Groundwater seeped into the excavation at approximately 6.5 feet below grade; the bottom of the excavation was completed at about 7.5 feet below grade. The groundwater contained an oil-like sheen due to TPH-containing soil sloughing into the excavation. This oily sheen was removed from the excavation with absorbent material. Approximately 500 cubic yards of material were removed on October 25.

On October 26, 1993, the excavation resumed in the northwest corner and clean soils were found just 8 feet west of the prior days stopping point. Twelve soil samples were collected from the south, southeast, west southwest, northwest and western side walls; the bottom of the excavation; and the clean and dirty soil stockpiles. Approximately 150 additional cubic yards of material were removed on October 26.

On October 26 and 27, Hart Crowser representatives observed the backfilling of the excavation. The excavation was backfilled with 2 feet of 6-inch minus rock, 3 feet of imported moist gravelly sand, and 2 feet of crushed rock. Backfill was placed and compacted in 6- to 12-inch lifts with a John Deere 400 G bulldozer and an Ingersoll Rand DD-25 dual drum vibratory roller.

Hart Crowser performed eight field density tests on the backfill during the two days using a Campbell nuclear densimeter. We tested a sample of the imported gravelly sand to determine the maximum dry density and optimum moisture content. Based on this information, we established that compaction of the gravelly sand ranged from 93 to 97 percent of maximum dry density.

Excavation activities required the removal of well MW-3. This well does not appear to be necessary to effectively monitor the site and has not been replaced.

4.2 Additional Site Characterization

On January 11, 1994, soil borings B-1 and B-2 and monitoring well MW-5 were installed at the locations illustrated on Figure 3. The three explorations were drilled to a total depth of 16.5 feet. Soil samples were collected at 2.5-foot-depth intervals and were described using the modified ASTM Method D 2488 as depicted on Figure B-1. Soil samples were screened with a PID to assist in selecting samples for laboratory analysis.

Selected soil samples were analyzed for diesel fuel by Ecology Method WTPH-D, PAHs by EPA Method 8310, and total organic carbon (TOC) by EPA Method 9060. Two additional soil samples were also analyzed by the Synthetic Precipitation Leaching Potential (SPLP) test, EPA Method 1312, to evaluate the mobility of petroleum hydrocarbons in remaining site soils.

One soil boring was converted to a groundwater monitoring well (MW-5). The existing wells (MW-1, MW-2, and MW-4), installed by ESL, were upgraded to bring the well casing to grade, provide locking caps, and install flush-mounted monuments. Elevations of new and existing groundwater monitoring wells were surveyed to 0.01 foot by DSI.

New and existing groundwater monitoring wells were developed and sampled. Groundwater samples were analyzed by Analytical Technologies Inc., for diesel fuel by Ecology Method WTPH-D extended, PAHs by EPA Method 8310, volatile organic compounds by EPA Method 8020, and total dissolved solids (TDS) by EPA Method 160.1.

Groundwater elevation measurements were collected from different phases of the tidal cycle on February 4, 8, and 14, 1994, to assess the direction of groundwater flow during tidal changes.

5.0 FINDINGS

5.1 Excavation and Disposal of Petroleum Hydrocarbon-Containing Soils

Approximately 650 cubic yards of soil were excavated from the site, 65 percent of the soils above the water table that contain elevated TPH concentrations. These soils were found to contain concentrations of petroleum hydrocarbons ranging from 750 to 2,250 mg/kg as measured in

the soil stockpiles by Ecology Method WTPH-HCID. These soils were stockpiled on plastic, covered with plastic, protected with ecology blocks, and were recycled for use in cement at the Holman, Inc., Seattle plant on February 12 and 19 and March 5, 1994.

Of the twelve soil samples that were submitted for chemical analysis to confirm the concentrations of petroleum hydrocarbons remaining in the subsurface in the area of the excavation, four contained petroleum hydrocarbons which exceeded the MTCA Method A Industrial cleanup levels for TPH. These samples included NE-W4-0, E-W4-NE30, from the northeast corner and east side wall of the excavation, sample N-W4 from the north side wall, and C-B7 from the center bottom. None of the 12 soil samples exceed the MTCA Method C Industrial cleanup levels for volatile and semivolatile constituents. The results of the verification sampling are summarized in Tables 3 and 4. Figure 5 illustrates the concentration of petroleum hydrocarbon remaining in site soils at the conclusion of excavation activities.

5.2 Additional Site Characterization

The following discussion summarizes the findings of the additional site characterization that was performed on the site.

5.2.1 Soil Stratigraphy

Four generalized soil horizons were encountered during this most recent field exploration program. From the ground surface down these included the following:

- Pavement overlying medium dense, slightly gravelly, silty SAND to silty, sandy GRAVEL (FILL). FILL was the uppermost horizon encountered and varied in thickness from 5 to 5½ feet at B-1 and B-2, to 9 feet at MW-5. The lower portion of the FILL horizon at MW-5 was saturated.

- Medium dense, slightly gravelly, silty, fine SAND to SAND mixed with silt and peat. At boring locations B-1 and B-2, the FILL horizon was underlain by this material. This horizon is about 5½ feet thick and is found at a depth of about 11 feet in B-2 and increases in thickness to 9½ feet at a depth of 14½ feet in B-1. The lower portion of this soil horizon appears to be the shallow water-bearing zone at these two locations. This horizon was not encountered at MW-5.

- Very soft to medium stiff, laminated SILT and PEAT. This horizon may act as a confining layer to groundwater movement because of its

tight, fine-grained nature. The bottom of the borings B-1 and B-2 were completed in the SILT and PEAT. At MW-5, the boring was advanced through this horizon which was 5 feet thick. The moisture content of this horizon appeared to vary between moist and wet.

- Medium dense, slightly silty to silty SAND. Underlying the SILT and PEAT horizon at MW-5, we encountered a saturated, slightly silty to silty, fine SAND. The bottom of boring MW-5 was drilled 2.5 feet into this horizon.

Generalized subsurface cross sections (Figure 6) schematically illustrate our interpretation of soil conditions beneath the site. Cross section locations are presented on Figure 3. Boring logs for the five ESL soil borings (MW-1, MW-2, MW-3, MW-4, and SB-1) were briefly reviewed and compared to site lithology encountered by Hart Crowser. The lithologic descriptions provided by ESL were incorporated where possible into the geologic cross sections on Figure 6.

5.2.2 Groundwater Occurrence

Static groundwater levels measured beneath the project site during the January and February 1994 field program ranged to depths of between 4 and 10 feet below the ground surface. Two different water-bearing zones were encountered during drilling B-1, B-2, and MW-5. The upper water-bearing zone was encountered in the silty SAND to SAND mixed with silt and peat horizon in B-1 and B-2 and at MW-5, the uppermost occurrence of saturated soils was in the FILL horizon. This upper water-bearing zone was under water table (i.e., unconfined) conditions. The depth of this upper water-bearing zone at our three boring locations appears to be controlled by the top of the SILT and PEAT horizon. At MW-5, which was advanced through the SILT and PEAT horizon, a second, lower groundwater zone was encountered in the silty SAND horizon. The screen interval of MW-5 was set in the lower groundwater zone. The lower groundwater zone appears to be a separate water-bearing unit beneath the SILT and PEAT horizon, at this location.

Based on static water level data, it appears that monitoring wells MW-1, MW-2, and MW-4 are screened in the upper water-bearing zone with MW-4 being the downgradient compliance point in that zone. However, well construction details provided by ESL are not sufficient to confirm this. From these three points, a northeasterly gradient of 0.01 ft/ft gradient was observed for the groundwater table, beneath the project site. Figure 7 illustrates relative groundwater elevation contours interpreted from water levels measured on February 8, 1994, during low tide and February 14, 1994, during high tide.

The static water level measured at MW-5 was consistently 4 to 5 feet lower than the water-table surface. Since we believe that this well is screened in a different water-bearing zone than the other wells on site, the data from this well were not included in the groundwater elevation contour map presented on Figure 7. Monitoring in that zone is appropriate to demonstrate the lack of effects in the second water-bearing zone.

Both groundwater zones appeared to be tidally influenced. Water levels in monitoring wells MW-1, MW-2, and MW-4, fluctuated up to one-half foot during tidal cycles, and at MW-5 the static water level fluctuated up to 1½ feet.

5.2.3 Soil Quality

Table 5 summarizes the soil chemical analysis results and Appendix C includes the QA/QC review of the laboratory data and the laboratory certificates of analysis. An estimate of petroleum hydrocarbons remaining in site soils above MTCA Method A Industrial Cleanup levels is shown on Figure 5.

Field Screening. Soil samples were field screened by noting visual or olfactory indications of chemical contamination and PID readings. Volatile organic vapors were detected in soil samples B-1,S-1 through B-1,S-4, collected from the 5- to 14.5-foot-depth interval, in boring B-1. PID readings ranged from 3 to 18 HNU units. A hydrocarbon-like odor and sheen on the soils were also reported over this depth interval. There were no field screening indications of soil contamination observed for the soil sample B-1,S-5, at this location. None of the other samples from the other two borings (B-2 and MW-5) contained measurable organic vapors using the PID. Sample B-2,S-1 (5- to 6.5-foot-depth interval) was noted to have a slight hydrocarbon-like odor.

Petroleum Hydrocarbons. Only three of the eight soil samples submitted for laboratory analysis contained TPH concentrations above method detection limits and two of the soil samples exceeded MTCA Method A industrial soil cleanup levels (Table 5). Hydrocarbon compounds were not detected in the soil samples from MW-5. At boring B-1, sample B-1,S-2 contained 3,400 mg/kg diesel-range hydrocarbons and B-1,S-4 contained 430 mg/kg diesel range. No hydrocarbon compounds were detected in soil sample S-5 collected from B-1. Only the uppermost soil sample S-1 from boring B-2 contained detectable concentrations of TPH at 33 and 79 mg/kg for diesel- and oil-range hydrocarbons, respectively.

Polynuclear Aromatic Hydrocarbons. Seven of the eight soil samples submitted for PAHs analysis by method 8310, contained low concentrations

of these constituents. None of the concentrations exceeded the Method C industrial cleanup levels for soils.

Total Organic Carbon. All eight soil samples were analyzed for TOC by EPA Method 906. TOC concentration ranged from 0.13 to 2.5%.

Soil Leachate. Soil samples B-1,S-2 and B-2,S-1 were submitted for soil leachate extract analysis by SPLP (EPA Method 1312). Petroleum hydrocarbons or PAH compounds were not detected in the leachate extract from sample B-2,S-1 which contained low concentrations of PAHs (Table 6). Leachate from sample B-1,S-2, which contained higher concentrations of PAHs, contained 2.2 mg/L diesel-range hydrocarbons, although concentrations of diesel fuel at downgradient groundwater compliance points MW-4 and MW-5 did not exceed MTCA Method A cleanup levels. PAH constituents detected in the SPLP leachate ranged from 1.4 ug/L pyrene to 37 ug/L 1-methylnaphthalene. The concentrations of PAHs detected in the leachate did not exceed Method B groundwater cleanup levels. No cPAHs were present in the B-1,S-2 leachate above laboratory detection limits.

The SPLP test is considered a conservative indication of constituent leachability in soil relative to site conditions because the test procedures require agitation of the sample, thereby allowing more rigorous contact of the water and constituents in the soil. This test procedure is not representative of site conditions because surface recharge does not percolate through unsaturated soil in this manner.

Data presented in Table 6 indicate that TPH and PAHs concentrations in the leachate ranged between 1,000 and 10,000 times lower than the total constituent concentrations in the same soil sample. This is consistent with our experience with TPH constituents at other sites with similar soil conditions. One sample, B-1,S-2, contained TPH concentrations in the leachate (2.2 mg/L) that exceeded the conservative groundwater cleanup level used in our evaluation (1.0 mg/L). However, post-remediation groundwater data indicate that TPH left at the site is adequately protective of groundwater. In addition, the asphalt cap over residual TPH further reduces the potential for petroleum to leach to groundwater at concentrations that may exceed groundwater cleanup levels.

Electric Utility Vaults. In July 1993, electric utility vaults were installed at the site. These vaults are located as illustrated on Figure 3, east of the excavated area. There were no usual indications of petroleum hydrocarbons in the soils that were excavated for the utility vaults (personal communication w/Kyle McClarity, 6/3/94). This information, in

conjunction with soil data from MW-5, provides a boundary for TPH-containing soil along the eastern edge of the excavation.

5.2.4 Groundwater Quality

Groundwater samples were collected from monitoring wells MW-1, MW-2, MW-4, and MW-5 on February 8 and 14, 1993 (well MW-3 removed during excavation). The two sampling rounds were intended to monitor for changes in groundwater chemistry during high and low groundwater level conditions. During sample collection, field parameters (temperature, pH, and conductivity) were monitored and recorded.

Field Parameters. The groundwater temperature of samples MW-1, MW-2, and MW-3 was between 9 and 10°C during the first sampling round and dropped to between 6 and 7°C during the second round. The temperature and specific conductance measurements of groundwater samples from MW-5 were markedly different from the other three samples. The groundwater temperature at MW-5 remained constant at 11°C during both sampling rounds. Specific conductance, which is a measure of ionic strength, is generally proportional to the total concentration of salts present in groundwater. The specific conductance measurements at MW-1, MW-2, and MW-4 ranged between 100 and 740 umhos/cm, while MW-5 measured about 1,500 umhos/cm. The pH measurements were fairly consistent for all of the groundwater samples and ranged between 7.1 to 7.6.

Petroleum Hydrocarbons. Diesel-range hydrocarbons were not present above laboratory detection limits in samples from MW-1 or MW-5. Diesel-range hydrocarbon compounds were detected in MW-2 at concentrations 0.32 (low tide) and 0.39 mg/L (high tide), and in MW-4 from 0.66 (low tide) to 0.37 mg/L (high tide). No gasoline or long chain hydrocarbon compounds (oil) were detected in any of the groundwater samples.

Comparison of groundwater quality in downgradient well MW-4 before and after the remedial action indicates that the remedial action has had a positive effect on groundwater quality; diesel fuel was measured at 0.66 mg/L after the remedial action as compared with 1.0 mg/L prior to remedial action.

Polynuclear Aromatic Hydrocarbons. There were no PAHs detected in samples from MW-2 and MW-5. PAH compounds were detected in groundwater samples collected from monitoring wells MW-1 and MW-4. However, PAHs detected in groundwater were at least 100 times lower than the MTCA Method B groundwater cleanup levels. No cPAHs were detected in any of the groundwater samples collected during either round.

Volatile Organic Compounds. No BTEX compounds were detected in any of the groundwater samples.

6.0 COMPLIANCE WITH MTCA

The cleanup action at the DSI site is consistent with our understanding of the MTCA. Approximately 65 percent of the petroleum-containing soil located above the water table was removed from the site and was recycled into concrete. Reuse/recycling is the highest preference technology identified in the MTCA and is considered a permanent solution (WAC 173-340-360[4] and [5]). The residual petroleum-containing soil located adjacent to or under electrical utilities and the graving dock have been capped to prevent direct contact by site workers and to preclude rainfall from percolating through, and potentially mobilizing, the petroleum constituent remaining at the site.

The MTCA allows for selection of cleanup actions based on their relative practicability. A cleanup technology is not practicable if the cost is substantial and disproportionate to the degree of protection relative to a lower preference technology (WAC 173-340-360[5][d][vi]).

Additional excavation to the north and west direction was not practicable and could not be reasonably accomplished because of the presence of a pad-mounted transformer, an 26 KV buried utility line owned by the City, and the foundation of the graving dock. Deeper excavation was not practicable because of groundwater seepage into the excavation at an approximate depth of 6½ feet below grade. Additional excavation of petroleum hydrocarbon containing soils would have required:

- Shoring the graving dock;
- Dewatering the excavation (if feasible) and (possibly) shoring near the cuts in order to prevent cave in of soil on site workers during excavation;
- Shutting down and relocating the transformer; and
- Shutting down and relocating the high voltage utility line.

The additional (and substantial) costs that would have been required to remove TPH-affected soil to achieve MTCA cleanup levels are not warranted based on the added degree of protection that would have been achieved. Direct contact exposures have been eliminated with the asphalt cap. Groundwater samples indicate that groundwater is being adequately protected. No exceedences of MTCA groundwater cleanup levels (assuming protection of surface water) have been identified. Even before cleanup actions were implemented at the site, TPH was not identified in groundwater at concentrations that exceed 1.0 mg/L (See ESL data - Table 1C). These data indicate that residual petroleum contained in site soils is relatively immobile. Even the relatively mobile BTEX constituents have not been detected in groundwater (Table 7).

Based on available data, cleanup actions completed at the site appear to be adequately protective of adjacent surface waters, site workers, and the environment. Recommendations contained in the following subsection should be considered to ensure cleanup actions are adequate and to document conformance with the MTCA.

6.1 Recommendations for Additional Action

6.1.1 Groundwater Monitoring

Sixty-five percent of the petroleum hydrocarbon-containing soils was removed from the site. The remaining soils which contain petroleum hydrocarbons were capped in-place. These actions substantially reduce the volume of petroleum hydrocarbons in the soil which may be available to groundwater. In order to monitor the potential impact of the remaining soil which contain petroleum hydrocarbons, we recommend that additional groundwater samples be collected from site groundwater monitoring wells to continue to assess the concentration of petroleum hydrocarbon constituents in groundwater. At least two additional rounds of data should be collected in 1994 and annual samples should be collected thereafter for 5 years. These samples should be collected within one or two hours after low tide occurs at the site.

6.1.2 Future Soil Removal

If future activities at the site call for excavation in the area where soil containing petroleum hydrocarbons were left in-place, those soils should be excavated to the extent practical for proper treatment and/or disposal. Follow-up groundwater monitoring should be conducted in wells MW-4 and MW-5 to evaluate the effectiveness of this additional removal action.

6.1.3 Asphalt Cap Inspection and Maintenance

In order to ensure that the asphalt cap located over petroleum-containing soil maintains its integrity, we recommend that DSI develop and implement an inspection and maintenance program. The program should include an inspection schedule and procedures for repairing or replacing damaged asphalt. The intent of the program is to prevent surface water from migrating through cracks or breaks in the asphalt.

6.1.4 Institutional Controls

MTCA requires that institutional controls be used at sites where residual concentrations of "hazardous substances" exceed Method A or Method B cleanup levels (WAC 173-340-440). Institutional controls include fences and signs to limit activities which may result in exposure and administrative and legal mechanisms (e.g., deed restrictions) to maintain them over time. Since concentrations of petroleum hydrocarbons remain in soils at concentrations exceeding the MTCA Method A cleanup levels, Ecology will likely require institutional controls be applied to ensure continued protection of human health and the environment.

7.0 LIMITATIONS

Work for this project was performed, and this letter report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Duwamish Shipyards, Inc. for specific application to the referenced property. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

Any questions regarding our work and this letter report, the presentation of the information, and the interpretation of the data are welcome and should be referred to the project manager (the undersigned).

All MTCA cleanup levels included in this report are provided for comparison purposes only and are based on our understanding of cleanup levels required by Ecology for similar projects. They do not represent MTCA interpretations. By using them for comparison purposes, we are not implying that remedial actions at this site are required under MTCA. Specific MTCA interpretations may involve separate calculations and determinations upon which a range of cleanup standards may be established by Ecology.

We trust that this report meets your needs.

Sincerely,

HART CROWSER, INC.

TINA M. STOTZ
Senior Project Regulatory Specialist

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Table 1A – Pre-Remediation Data Collected by ESL – Petroleum Hydrocarbons in Soil

Sample ID:	TP-1	TP-2	TP-3	TP-3	TP-4	TP-5
Sample No.:	8269303	8269304	8269305	8279302	8279303	8279305
Sampling Date:	8/26/93	8/26/93	8/26/93	8/27/93	8/27/93	8/27/93
Method/Analyte						
Total Petroleum Hydrocarbons in mg/kg						
Gasoline Range Hydrocarbons	20.0 U	20 U	> 20.0	> 20.0	20 U	20 U
Diesel Range Hydrocarbons	> 50.0	50 U	> 50.0	> 50.0	50 U	50 U
Lube Oil and Related Products	> 100	100 U	> 100	> 100	100 U	100 U
Conventionals						
Total Solids in Percent	70.9		89.4			

Sample ID:	MW-2	MW-2	MW-2	SB	MW-3	MW-3	MW-3	MW-4	MW-4
Sample No.:	865214387	865214388	865214390	643955217	543786217	543786219	543786220	874236900	874236902
Sampling Date:	8/28/93	8/28/93	8/28/93	8/28/93	8/28/93	8/28/93	8/28/93	8/28/93	8/28/93
Method/Analyte									
Total Petroleum Hydrocarbons in mg/kg									
Gasoline Range Hydrocarbons	20.0 U	> 20.0	20.0 U	20.0 U	20.0 U	> 20.0	20.0 U	20.0 U	20.0 U
Diesel Range Hydrocarbons	> 50.0	> 50.0	> 50.0	50.0 U	> 50.0	> 50.0	50.0 U	50.0 U	50.0 U
Lube Oil and Related Products	> 100	> 100	100 U	> 100	> 100	> 100	100 U	> 100	100 U

Notes: U Not detected at the indicated detection limit.

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Table 1B - Pre-Remediation Data Collected by ESL - Petroleum Hydrocarbons Detected in Soil

	Sample ID:	TP-1		TP-3	
	Sample No:	8269303		8269305	
	Sampling Date:	8/26/93		8/27/93	
Method/Analyte					
Volatiles in mg/kg (EPA Method 8240)					
	Methylene chloride	0.004		ND	
	Acetone	0.018	B	0.66	B
	2-Butanone	ND		0.7	B
	Benzene	ND		1.3	
	Toluene	ND		4.3	
	Ethylbenzene	0.004		9	
	Total Xylene	0.005		12	
Semivolatiles in mg/kg (EPA Method 8270)					
	Naphthalene	ND		200	
	2-Methylnaphthalene	ND		250	
	Acenaphthylene	ND		28	
	Acenapthene	0.3		21	
	Dibenzofuran	ND		16	
	Fluorene	0.45		58	
	Phenanthrene	0.76		150	
	Anthracene	0.22		130	
	Carbazole	ND		55	
	Fluoranthene	0.074		21	
	Pyrene	0.25		38	
*	Benzo(a)anthracene	0.19		19	
*	Chrysene	0.19		28	
	Bis(2-ethylhexyl)phthalate	0.041	JB	ND	
*	Benzo(b)fluoranthene	0.059	T	15	T
*	Benzo(k)fluoranthene	0.059	T	15	T
*	Benzo(a)pyrene	0.076		18	
*	Indeno(1,2,3-cd)pyrene	0.012	J	9.2	J
*	Dibenzo(a,h)anthracene	ND		2.6	J
	Benzo(g,h,i)perylene	0.028	J	11	J

Notes:

U Not detected at the indicated detection limit.

B Detected in the method blank associated with the sample.

J Estimated value.

T The flagged values represent the sum of two co-eluting compounds.

* cPAH

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Table 1C – Pre-Remediation Data Collected by ESL – Petroleum Hydrocarbons in Groundwater

Sample ID:	MW-1	MW-2	MW-3	MW-4
Sampling Date:	8/30/93	8/30/93	8/30/93	8/30/93
Method/Analyte				
Total Petroleum Hydrocarbons in mg/L				
Gasoline Range Hydrocarbons	0.20 U	0.20 U	0.20 U	0.20 U
Diesel Range Hydrocarbons	0.50 U	0.50 U	0.98	1.0
Lube Oil and Related Products	1.0 U	1.0 U	1.0 U	1.0 U

Notes:

U Not detected at the indicated detection limit.

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Table 2 - MTCA Cleanup Levels for Soil and Groundwater

	Soil in mg/kg Industrial Site		Groundwater in µg/L
	Method A	Method C	Method B
Fuel Analysis			
Gasoline	100	-	-
Diesel	200	-	-
Oil	200	-	-
Volatile Organics			
Benzene	-	4,525	71
Ethylbenzene	-	350,000	6,900
Toluene	-	700,000	48,500
Xylene	-	7,000,000	500,000
Semivolatiles			
Naphthalene	-	14,000	988
1-Methylnaphthalene	-	-	-
2-Methylnaphthalene	-	-	-
Acenaphthylene	-	-	-
Acenapthene	-	210,000	643
Dibenzofuran	-	-	-
Fluorene	-	140,000	3,457
Phenanthrene	-	-	-
Anthracene	-	1,050,000	25,926
Fluoranthene	-	140,000	90
Pyrene	-	105,000	2,593
* Benzo(a)anthracene	-	-	0.031
* Chrysene	-	-	0.031
* Benzo(b)fluoranthene	-	-	0.031
* Benzo(k)fluoranthene	-	-	0.031
* Benzo(a)pyrene	-	18.0	0.031
* Indeno(1,2,3-cd)pyrene	-	-	0.031
* Dibenzo(a,h)anthracene	-	-	0.031
Benzo(g,h,i)perylene	-	-	0.031
Total cPAHs	20.0	-	0.1

- Not applicable or no data available to establish a cleanup level.
* cPAH

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Table 3 - Results of Soil Excavation Verification and Soil Stockpile Designation Sampling and Analysis - Petroleum Hydrocarbons

	NE-B7-0	NE-W4-0	SE-B7-0	E-W4-NE30	SP-D1	SP-D2	SE-W4	S-W4-SE20	MTCA Industrial Cleanup Level
Method/Analyte	Concentration in mg/kg								
Petroleum Hydrocarbons									
WTPH-HCID (1)	NA	NA	NA	NA	2,250	850	NA	NA	-
WTPH-D (2)	140	12,000	18	17,000	NA	NA	94	10 U	200
WTPH-G (1)	NA	570	10 U	NA	NA	NA	NA	10 U	100
Diesel (C12-C24) (1)	NA	NA	NA	NA	NA	NA	NA	NA	200
Oil (C24-C36) (1)	NA	NA	NA	NA	NA	NA	NA	NA	200
WTPH-418.1 Modified (2)	110	13,000	100 U	11,000	NA	NA	120	100 U	200
BTEX (EPA Method 8020) (1)									
Benzene	NA	50 U	50 U	NA	NA	NA	NA	50 U	4,525
Toluene	NA	50 U	50 U	NA	NA	NA	NA	50 U	350,000
Ethylbenzene	NA	350	50 U	NA	NA	NA	NA	50 U	700,000
Xylenes	NA	1,200	50 U	NA	NA	NA	NA	50 U	>1 M

Table 3 - Results of Soil Excavation Verification and Soil Stockpile Designation Sampling and Analysis - Petroleum Hydrocarbons

	W-W4-SW30	SW-W4-0	NW-W4-0	W-B7-SW-10	C-B7	N-W4	SP-C1	SP-C2	MTCA Industrial Cleanup Level
Method/Analyte	Concentration in mg/kg								
Petroleum Hydrocarbons									
WTPH-HCID (1)	NA	NA	NA	NA	NA	NA	760	NA	-
WTPH-D (2)	10 U	10 U	10 U	10 U	NA	NA	NA	NA	200
WTPH-G (1)	10 U	NA	10 U	NA	NA	NA	NA	NA	100
Diesel (C12-C24) (1)	NA	NA	NA	NA	68	20 U	NA	NA	200
Oil (C24-C36) (1)	NA	NA	NA	NA	68	50 U	NA	NA	200
WTPH-418.1 Modified (2)	100 U	100 U	100 U	100 U	1,100	480	NA	NA	200
BTEX (EPA Method 8020) (1)									
Benzene	50 U	NA	50 U	NA	NA	NA	NA	NA	4,525
Toluene	50 U	NA	50 U	NA	NA	NA	NA	NA	350,000
Ethylbenzene	50 U	NA	50 U	NA	NA	NA	NA	NA	700,000
Xylenes	50 U	NA	50 U	NA	NA	NA	NA	NA	>1 M

Note:
U Not detected at the detection limit.
NA Not Analyzed
(1) Analyzed by Hart Crowser
(2) Analyzed by North Creek Analytical
- Not applicable or no data available to establish a cleanup level.
M Million

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Table 4 - Results of Soil Excavation Verifcation and Soil Stockpile Designation Sampling and Analysis - Semivolatiles Sheet 1 of 2

	NE-W4-0		SE-B7-0		E-W4-NE30		SP-D1		S-W4-SE20		W-W4-SW30		NW-W4-0		MTCA Industrial Cleanup Level
Method (1)	Concentration in mg/kg														
N-Nitroso-Dimethylamine	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Phenol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Aniline	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Bis(2-Chloroethyl) ether	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
2-Chlorophenol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
1,3-Dichlorobenzene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
1,4-Dichlorobenzene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Benzyl Alcohol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
1,2-Dichlorobenzene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
2-Methylphenol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Bis(2-chloroisopropyl) ether	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
4-Methylphenol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
N-Nitroso-di-n-propylamine	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Hexachloroethane	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Nitrobenzene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Isophorone	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
2-Nitrophenol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
2,4-Dimethylphenol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Benzoic acid	4.60	U	1.1	U	5.5	U	1	U	1.1	U	1.3	U	0.88	U	-
Bis(2-Chloroethoxy) methane	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
2,4-Dichlorophenol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
1,2,4-Trichlorobenzene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Naphthalene	1.40		0.22	U	19		3.3		0.22	U	0.25	U	0.17	U	14,000
4-Chloroaniline	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Hexachlorbutadiene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
4-Chloro-3-Methylphenol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
2-Methylnaphthalene	10.00		0.22	U	30		3.2		0.22	U	0.25	U	0.17	U	NDA
Hexachlorocyclopentadiene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
2,4,6-Trichlorophenol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
2,4,5-Trichlorophenol	4.60	U	1.1	U	5.5	U	1	U	1.1	U	1.3	U	0.88	U	-
2-Chloronaphthalene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
2-Nitroaniline	4.60	U	1.1	U	5.5	U	1	U	1.1	U	1.3	U	0.88	U	-
Dimethylphthalate	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Acenaphthylene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
3-Nitroaniline	4.60	U	1.1	U	5.5	U	1	U	1.1	U	1.3	U	0.88	U	-
Acenaphthene	3.20		0.22	U	4.1		2.1		0.22	U	0.25	U	0.17	U	210,000
2,4-Dinitrophenol	4.60	U	1.1	U	5.5	U	1	U	1.1	U	1.3	U	0.88	U	-
4-Nitrophenol	4.60	U	1.1	U	5.5	U	1	U	1.1	U	1.3	U	0.88	U	-
Dibenzofuran	2.1		0.22	U	2.9		1.1		0.22	U	0.25	U	0.17	U	NDA
2,4-Dinitrotoluene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
2,6-Dinitrotoluene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Diethylphthalate	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
4-Chlorophenyl-phenylether	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Fluorene	6.80		0.22	U	8.9		2		0.22	U	0.25	U	0.17	U	140,000
4-Nitroaniline	4.60	U	1.1	U	5.5	U	1	U	1.1	U	1.3	U	0.88	U	-

Table 4 - Results of Soil Excavation Verifcation and Soil Stockpile Designation Sampling and Analysis - Semivolatiles Sheet 2 of 2

	NE-W4-0		SE-B7-0		E-W4-NE30		SP-D1		S-W4-SE20		W-W4-SW30		NW-W4-0		MTCA Industrial Cleanup Level
Method (1)	Concentration in mg/kg														
4,6-Dinitro-2-Methylphenol	4.60	U	1.1	U	5.5	U	1	U	1.1	U	1.3	U	0.88	U	-
N-Nitroso-diphenylamine	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
4-Bromophenyl phenyl ether	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Hexachlorobenzene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Pentachlorophenol	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Phenanthrene	17.00		0.22	U	24		4.9		0.22	U	0.25	U	0.17	U	NDA
Anthracene	5.20		0.22	U	9.3		1.2		0.22	U	0.25	U	0.17	U	1,050,000
Di-N-Butylphthalate	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
Fluoranthene	1.40		0.22	U	3		2.3		0.22	U	0.25	U	0.17	U	140,000
Benzidine	0.90	U	2.2	U	11	U	0.2	U	2.2	U	2.5	U	1.7	U	-
Pyrene	4.50		0.22	U	7.7		2.2		0.22	U	0.25	U	0.17	U	105,000
Buthylbenzylphthalate	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
3,3'-Dichlorobenzidine	1.80	U	0.45	U	2.2	U	0.41	U	0.44	U	0.51	U	0.35	U	-
* Benzo(A)Anthracene	1.60		0.22	U	3		0.67		0.22	U	0.25	U	0.17	U	NDA
Bis(2-Ethylhexyl)Phthalate	0.90	U	0.22	U	1.1	U	0.35		0.22	U	0.25	U	0.17	U	9,370
* Chrysene	2.50		0.22	U	4.3		0.76		0.22	U	0.25	U	0.17	U	NDA
Di-N-Octylphthalate	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	-
* Benzo(B)Fluoranthene	0.90	U	0.22	U	1	J	0.24		0.22	U	0.25	U	0.17	U	NDA
* Benzo(K)Fluoranthene	0.90	U	0.22	U	1.1	U	0.24		0.22	U	0.25	U	0.17	U	NDA
* Benzo(A)Pyrene	1.00		0.22	U	2		0.32		0.22	U	0.25	U	0.17	U	18.0
* Indeno(1,2,3-CD)Pyrene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	NDA
* Dibenz(A,H)Anthracene	0.90	U	0.22	U	1.1	U	0.2	U	0.22	U	0.25	U	0.17	U	NDA
Benzo(G,H,I)Perylene	0.90	U	0.22	U	0.8	J	0.2	U	0.22	U	0.25	U	0.17	U	-
Total cPAHs	5.1		ND		9.3		2.23		ND		ND		ND		20

Note: U Not detected at the detection limit.
J Compound detected below the reporting limit.
(1) Method 8270
- Constituent not detected - no cleanup level included.
NDA No data available to establish a cleanup level.
* cPAH
ND Not detected above the analytical detection limit.

C:\JOBS\3763\3763T3.WK1/KM

Table 5 - Results of Soil Boring Sampling and Analysis - Petroleum Hydrocarbons and PAHs

Method/Analyte Depth in Feet PID Screen in HNU Units	MW5-S1 5 - 6.5 0	MW5-S5 15 - 16.5 0	B1-S2 7 - 8.5 18	B1-S4 12 - 13.5 5	B1-S5 15 - 16.5 0	B2-S1 5 - 6.5 0	B2-S3 10 - 11.5 0	B2-S5 15 - 16.5 0	MTCA Soil Cleanup Level
				Concentration in mg/kg					
Petroleum Hydrocarbons (WTPH-D ext)									
Diesel (C12-C24)	12 U	13 U	3400	430	14 U	33	14 U	16 U	200
Oil (C24-C36)	49 U	50 U	510 U	100	57 U	79	56 U	63 U	200
Total Organic Carbon (%)	0.14	0.18	0.13	0.51	1.9	2.5	0.39	2.0	-
Polynuclear Aromatic Hydrocarbons (EPA 8310)									
Naphthalene	0.10 U	0.10 U	2.1 U	0.12 U	0.12 U	0.11 U	0.54	0.13 U	14,000
Acenaphthylene	0.21 U	0.21 U	4.4 U	0.24 U	0.24 U	0.22 U	0.24 U	0.27 U	-
1-Methylnaphthalene	0.21 U	0.21 U	31	0.69	0.24 U	0.22 U	0.24 U	0.27 U	NDA
2-Methylnaphthalene	0.26	0.21 U	4.4 U	0.24 U	0.24 U	0.22 U	0.28	0.27 U	NDA
Acenaphthene	0.21 U	0.21 U	4.4 U	0.24 U	0.24 U	0.22 U	0.24 U	0.27 U	210,000
Fluorene	0.14	0.021 U	7.1	0.20	0.024 U	0.022 U	0.083	0.027 U	140,000
Phenanthrene	0.87	0.012	22	0.46	0.067	0.029	0.032	0.013 U	NDA
Anthracene	0.16	0.010 U	6.1	0.16	0.012 U	0.011 U	0.012 U	0.013 U	1,050,000
Fluoranthene	1.3	0.021 U	0.44 U	0.024 U	0.024 U	0.079	0.025	0.027 U	140,000
Pyrene	0.61	0.021 U	5.4	0.024 U	0.024 U	0.057	0.024 U	0.027 U	105,000
* Benzo (a) anthracene	0.36	0.021 U	2.7	0.024 U	0.024 U	0.027	0.024 U	0.027 U	NDA
* Chrysene	0.34	0.021 U	5.0	0.024 U	0.024 U	0.030	0.024 U	0.027 U	NDA
* Benzo (b) fluoranthene	0.26	0.021 U	0.44 U	0.024 U	0.024 U	0.022 U	0.024 U	0.027 U	NDA
* Benzo (k) fluoranthene	0.16	0.021 U	0.44 U	0.024 U	0.024 U	0.022 U	0.024 U	0.027 U	NDA
* Benzo (a) pyrene	0.31	0.021 U	0.73	0.031	0.024 U	0.026	0.024 U	0.027 U	18.0
* Dibenzo(a,h)anthracene	0.042 U	0.043 U	0.87 U	0.047 U	0.049 U	0.044 U	0.047 U	0.053 U	NDA
Benzo (g,h,i) perylene	0.19	0.021 U	1.6	0.024 U	0.024 U	0.022 U	0.024 U	0.027 U	NDA
* Indeno (1,2,3-cd) pyrene	0.20	0.021 U	0.44 U	0.024 U	0.024 U	0.022 U	0.024 U	0.027 U	NDA
Total cPAH	1.63	ND	8.43	0.031	ND	0.083	ND	ND	20

Notes: U - Not detected at detection limit
* cPAH
NDA No data available to calculate a cleanup level.
ND Not detected above the analytical detection limit.

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Table 6 - Results of Soil and Soil-Leachate Sampling and Analysis - Petroleum Hydrocarbons and PAHs

Method/Analyte	B1-S2		B2-S1		MTCA Cleanup Levels	
	Soil	Leachate	Soil	Leachate	Industrial Soil	Groundwater Method B(1)
Petroleum Hydrocarbons (WTPH-D ext)						
Soil concentration in mg/kg						
Leachate concentration in mg/L						
Diesel (C12-C24)	3400	2.2	33	0.25 U	200	1.0
Oil (>C24)	510 U	0.75 U	79	0.75 U	200	1.0
Polynuclear Aromatic Hydrocarbons (EPA 8310)						
Soil concentration in mg/kg						
Leachate concentration in µg/L						
Naphthalene	2.1 U	1.7 U	0.11 U	1.7 U	14,000	988
Acenaphthylene	4.4 U	3.3 U	0.22 U	3.3 U	-	-
1-Methylnaphthalene	31	37	0.22 U	1.7 U	-	NDA
2-Methylnaphthalene	4.4 U	3.2	0.22 U	1.7 U	-	NDA
Acenaphthene	4.4 U	3.3	0.22 U	1.7 U	210,000	643
Fluorene	7.1	6.9	0.022 U	0.33 U	140,000	3457
Phenanthrene	22	9.0	0.029	0.17 U	-	NDA
Anthracene	6.1	2.8	0.011 U	0.17 U	1,050,000	25926
Fluoranthene	0.44 U	0.33 U	0.079	0.33 U	140,000	90
Pyrene	5.4	1.4	0.057	0.33 U	105,000	2593
* Benzo (a) anthracene	2.7	0.33 U	0.027	0.33 U	-	0.031
* Chrysene	5.0	0.33 U	0.030	0.33 U	-	0.031
* Benzo (b) fluoranthene	0.44 U	0.33 U	0.022 U	0.33 U	-	0.031
* Benzo (k) fluoranthene	0.44 U	0.33 U	0.022 U	0.33 U	-	0.031
* Benzo (a) pyrene	0.73	0.33 U	0.026	0.33 U	18.0	0.031
* Dibenzo(a,h)anthracen	0.87 U	0.67 U	0.044 U	0.67 U	-	0.031
Benzo (g,h,i) perylene	1.6	0.33 U	0.022 U	0.33 U	-	0.031
* Indeno (1,2,3-cd) pyr	0.44 U	0.33 U	0.022 U	0.33 U	-	0.031
Total cPAH	8.43	ND	0.083	ND		0.1

U Not detected at the detection limit.

- Constituent not detected - no cleanup level included.

(1) Based on protection of surface water, except for TPH.

NDA No data available to establish a cleanup level.

* cPAH

ND Not detected above the analytical detection limit.

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Table 7 - Results of Groundwater Sampling and Analysis -
Petroleum Hydrocarbons and BTEX

	MW-1		MW-2		MW-4		MW-5		MTCA
	02/08/94	02/14/94	02/08/94	02/14/94	02/08/94	02/14/94	02/08/94	02/14/94	Cleanup
Relative Water Level	low	high	low	high	low	high	high	low	Level(1)
Field Parameters									
Temperature (C°)	10	7	10	7	9	6	11	11	< 21°C
pH	7.2	7.2	7.2	7.6	7.5	7.4	7.2	7.1	6.5-8.5
Conductivity (umhos)	740	550	740	110	370	190	1610	1450	NDA
Total Dissolved Solids in	4000	340	380	77	110	130	1100	1100	NDA
Petroleum Hydrocarbons (WTPH-D ext) in mg/L									
Diesel (C12-C24)	0.25 U	0.25 U	0.32	0.39	0.66	0.37	0.25 U	0.25 U	1.0
Oil (C24-C36)	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	1.0
BTEX (EPA 8010) in μg/L									
Benzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	71
Toluene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	48,500
Ethylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	6,900
Xylene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	500,000

Table 7 - Results of Groundwater Sampling and Analysis - PAHs

	MW-1		MW-2		MW-4		MW-5		MTCA
	02/08/94	02/14/94	02/08/94	02/14/94	02/08/94	02/14/94	02/08/94	02/14/94	Cleanup
Relative Water Level	low	high	low	high	low	high	high	low	Level(1)
Polynuclear Aromatic Hydrocarbons (EPA 8310) in µg/L									
Naphthalene	0.49 U	0.48 U	0.49 U	0.48 U	8.9	0.97	0.49 U	0.48 U	988
Acenaphthylene	0.98 U	0.96 U	0.97 U	0.96 U	3.4	1.4	0.97 U	0.96 U	NDA
1-Methylnaphthalene	0.49 U	0.48 U	0.49 U	0.48 U	1.8	0.55	0.49 U	0.48 U	NDA
2-Methylnaphthalene	0.49 U	0.48 U	0.49 U	0.48 U	4.8	4.1	0.49 U	0.48 U	NDA
Acenaphthene	0.90	0.88	0.49 U	0.48 U	4.2	2.8	0.49 U	0.48 U	643
Fluorene	0.098 U	0.096 U	0.097 U	0.096 U	4.8	3.3	0.097 U	0.096 U	3,457
Phenanthrene	0.049 U	0.11	0.049 U	0.048 U	1.7	1.2	0.049 U	0.048 U	NDA
Anthracene	0.049 U	0.048 U	0.049 U	0.048 U	0.20	0.15	0.049 U	0.048 U	25,926
Fluoranthene	0.098 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	90
Pyrene	0.098 U	0.096 U	0.097 U	0.096 U	0.097 U	0.13	0.097 U	0.096 U	2,593
* Benzo (a) anthracene	0.098 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.031
* Chrysene	0.098 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.031
* Benzo (b) fluoranthene	0.098 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.031
* Benzo (k) fluoranthene	0.098 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.031
* Benzo (a) pyrene	0.098 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.031
* Dibenzo(a,h)anthracene	0.2 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.031
Benzo (g,h,i) perylene	0.098 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.031
* Indeno (1,2,3-cd) pyrene	0.098 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.097 U	0.096 U	0.031
Total cPAH	ND	ND	ND	ND	ND	ND	ND	ND	0.1

U Not detected at the detection limit.

- Constituent not detected - no cleanup level included.

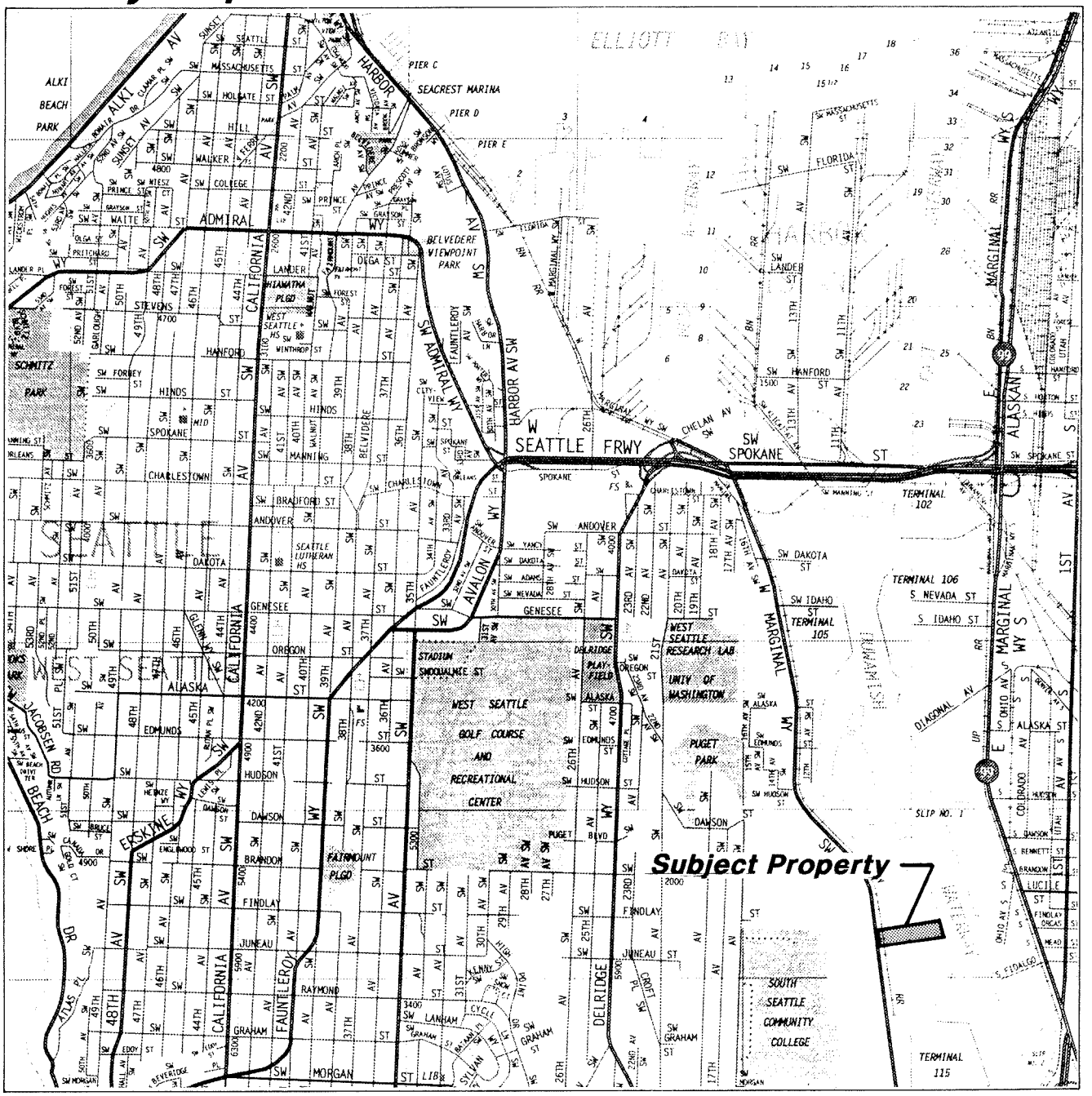
(1) Based on protection of surface water.

NDA No data available to calculate a cleanup level.

* cPAH

ND Not detected above the analytical detection limit.

Vicinity Map



0 1/2 1

Scale in Miles

N

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J-3763-04 6/94

Figure 1

JCH 6/6/94 1=200 HC.pcp
37630401

Site Plan

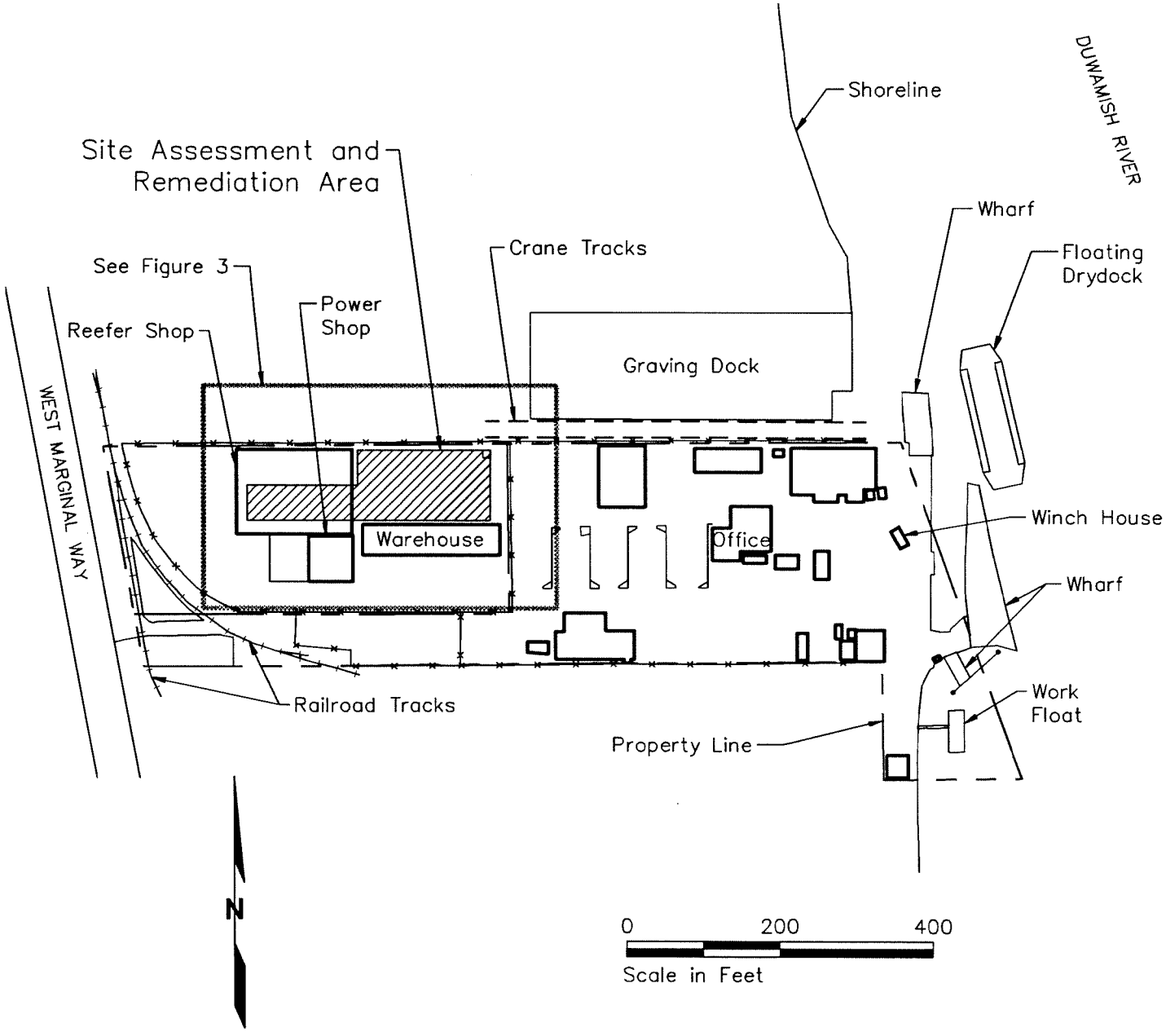

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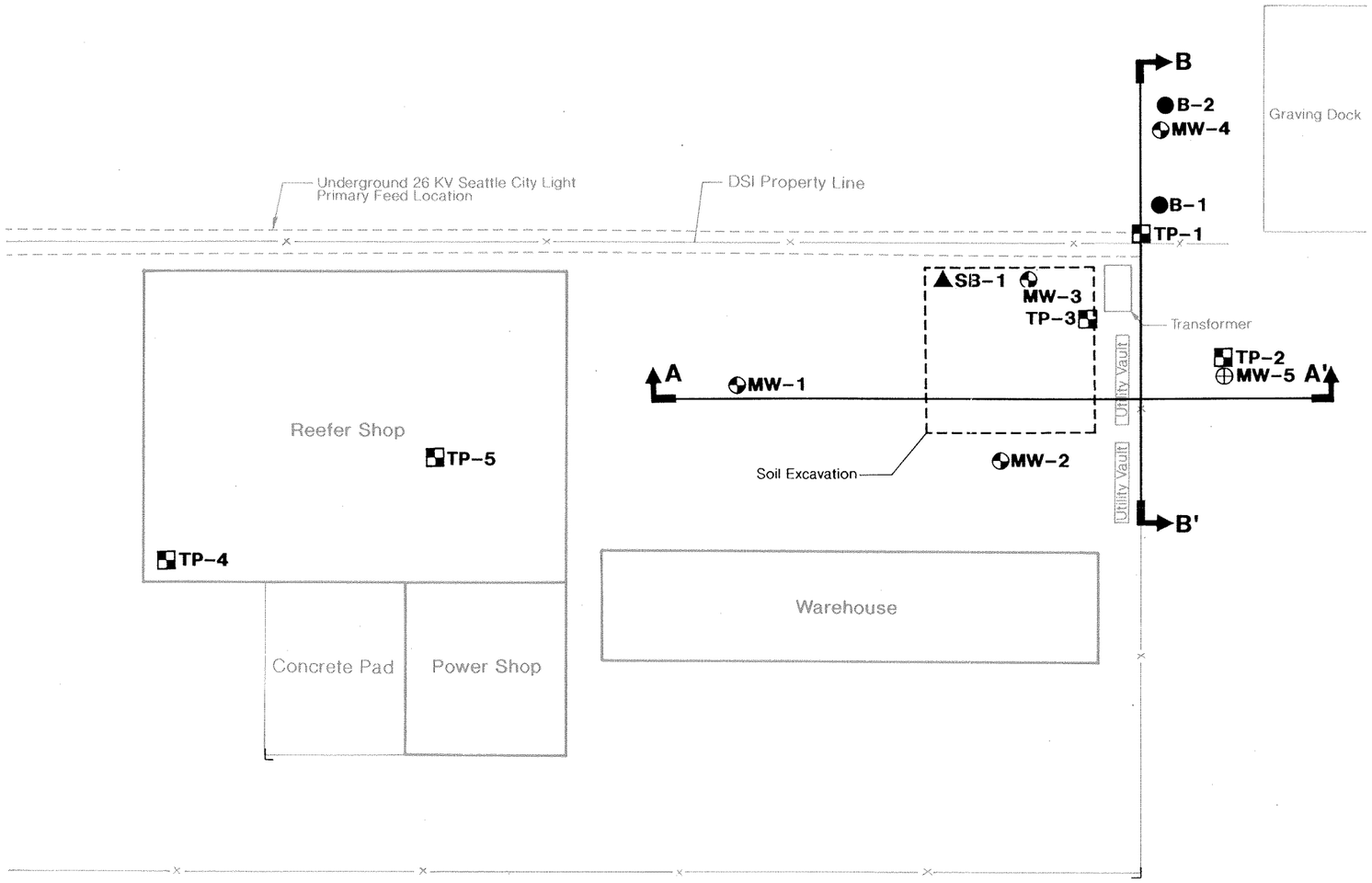
Figure 2

Site and Exploration Plan



Exploration Location and Number

- B-1 Soil Boring (January 1994, Hart Crowser)
- MW-5 Monitoring Well (January 1994, Hart Crowser)
- TP-1 Test Pit (August 1993, ESL)
- MW-1 Monitoring Well (August 1993, ESL)
- SB-1 Soil Boring (August 1993, ESL)
- A A' Cross Section Location and Designation (See Figure 5)

0 50 100
Scale in Feet

N

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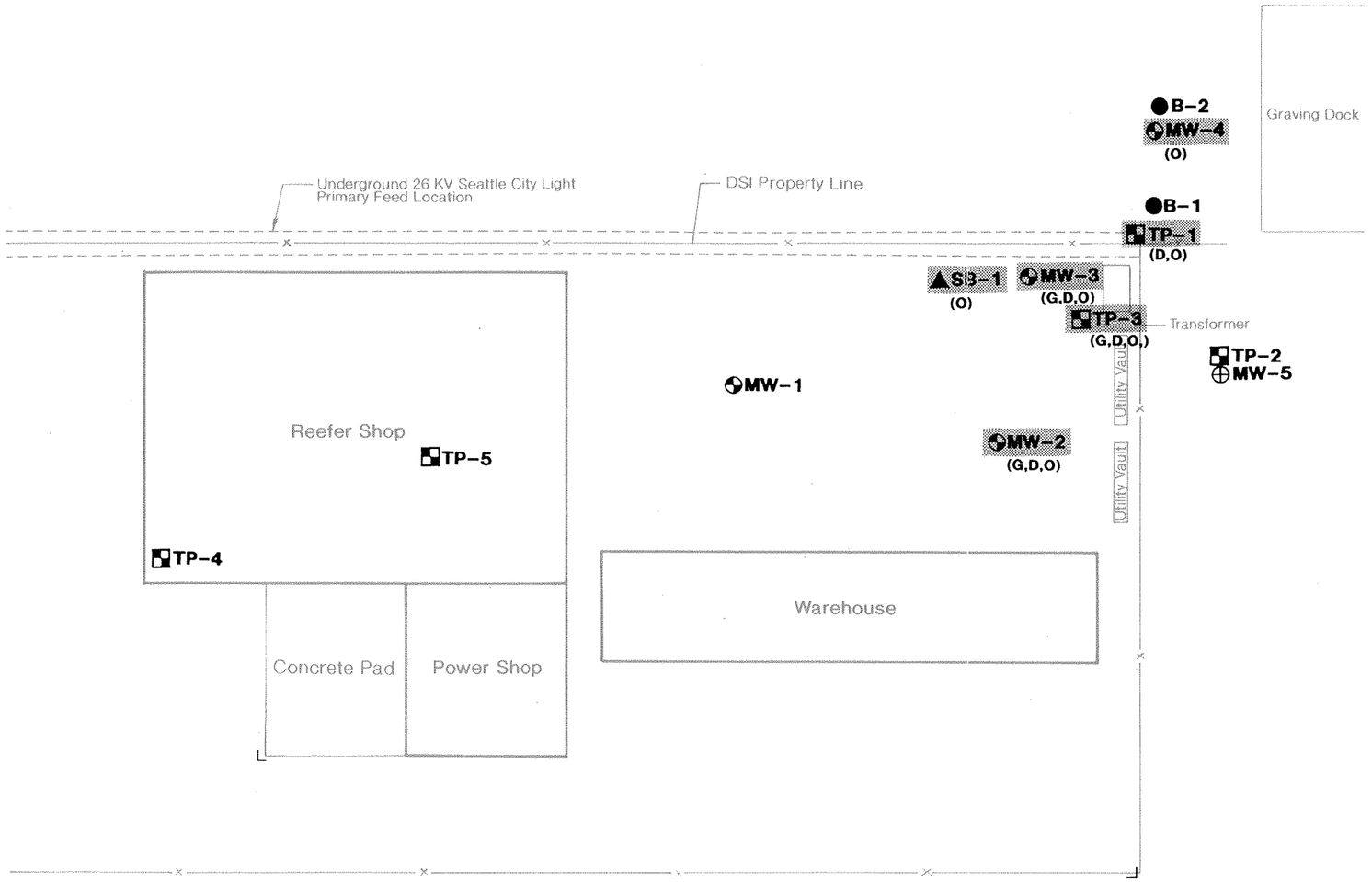
Figure 3

Petroleum Hydrocarbon Constituents Detected in Soil

August 1993



Exploration Location and Number

- **B-1** Soil Boring (January 1994, Hart Crowser)
- **MW-5** Monitoring Well (January 1994, Hart Crowser)
- **TP-1** Test Pit (August 1993, ESL)
- **MW-1** Monitoring Well (August 1993, ESL)
- **SB-1** Soil Boring (August 1993, ESL)

MW-2 Exploration where Petroleum Hydrocarbons were Detected by Method WTPH-HCID in Soil as Follows:

- **(G)** Gasoline >20 mg/kg
- **(D)** Diesel Fuel >50 mg/kg
- **(O)** Oil >100 mg/kg

0 50 100
Scale in Feet

N

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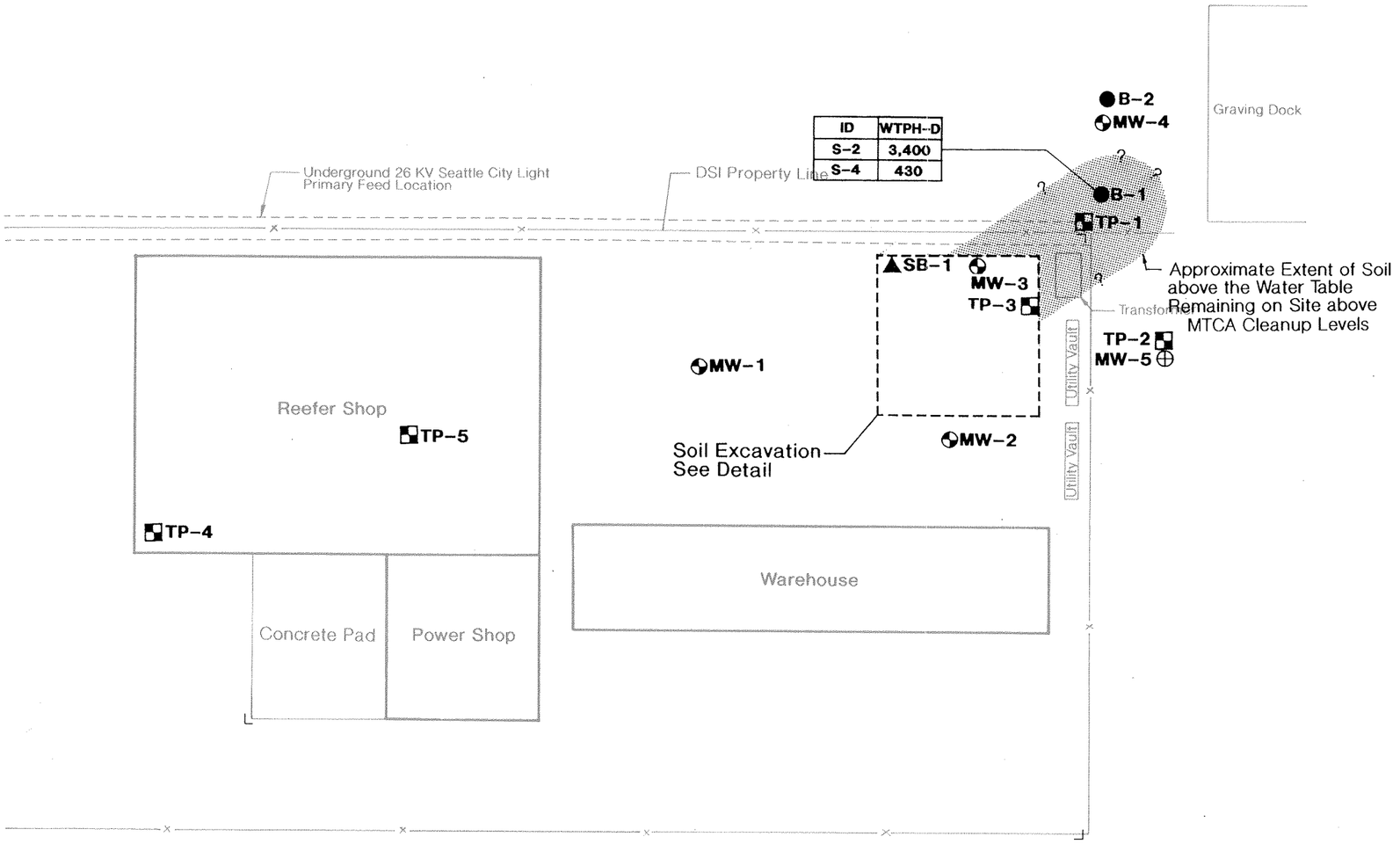
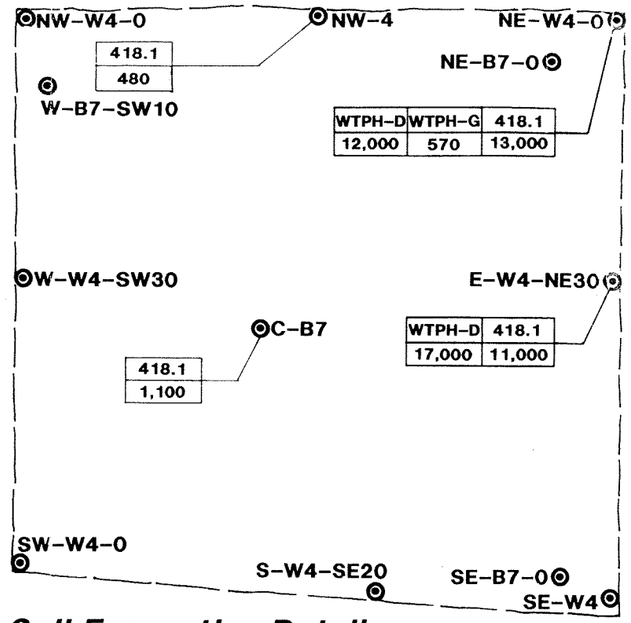
Figure 4

Petroleum Hydrocarbons above the MTCA Method A Industrial Cleanup Level Remaining in Site Soils





Soil Excavation Detail

Exploration Location and Number

- **B-1** Soil Boring (January 1994, Hart Crowser)
- **MW-5** Monitoring Well (January 1994, Hart Crowser)
- **TP-1** Test Pit (August 1993, ESL)
- **MW-1** Monitoring Well (August 1993, ESL)
- **SB-1** Soil Boring (August 1993, ESL)
- **NW-4** Soil Verification Sample

ID	WTPH-D	WTPH-G	418.1
①	②	③	④

① Sample Number

② Diesel-Range Hydrocarbon Concentration in mg/kg (WTPH-D)

③ Petroleum Hydrocarbon Concentration in mg/kg (WTPH-G)

④ Oil Concentration in mg/kg (WTPH-418.1)

N

0 50 100

Scale in Feet

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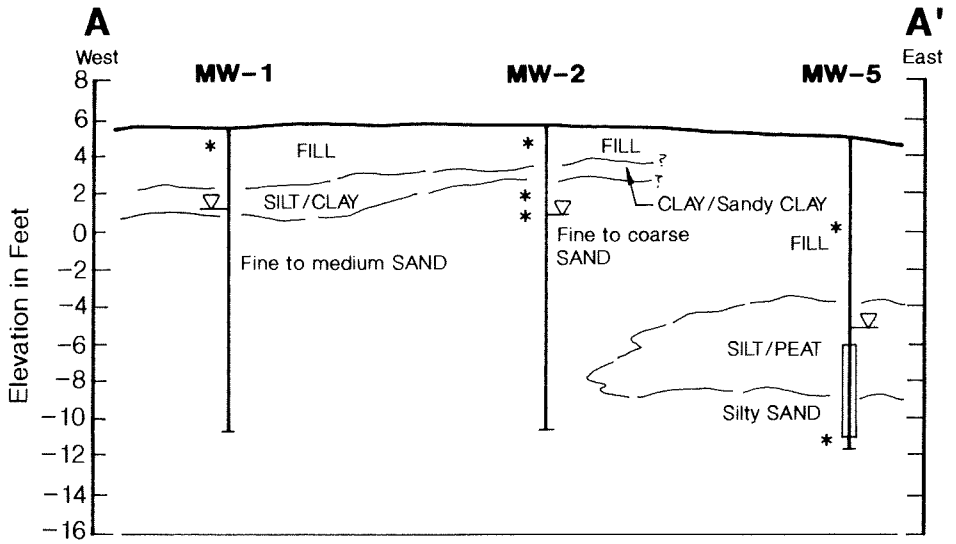
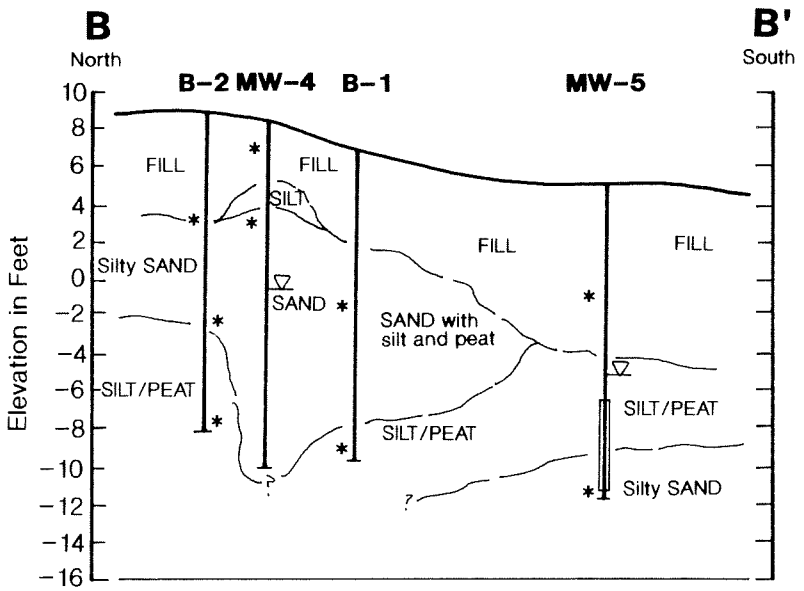
Figure 5

Generalized Subsurface Cross Section A–A' and B–B'





MW-1 Well Number

B-1 Boring Number

Exploration Location

Water Level (2/14/94)

Sample Location Submitted for Analysis

Screened Interval

Note: Contacts between soil units are based upon interpolation between borings and represent our interpretation of subsurface conditions based on currently available data.

See Figure 3 for cross section locations

Horizontal Scale in Feet

0 50 100

0 10 20

Verical Scale in Feet

Vertical Exaggeration x 5

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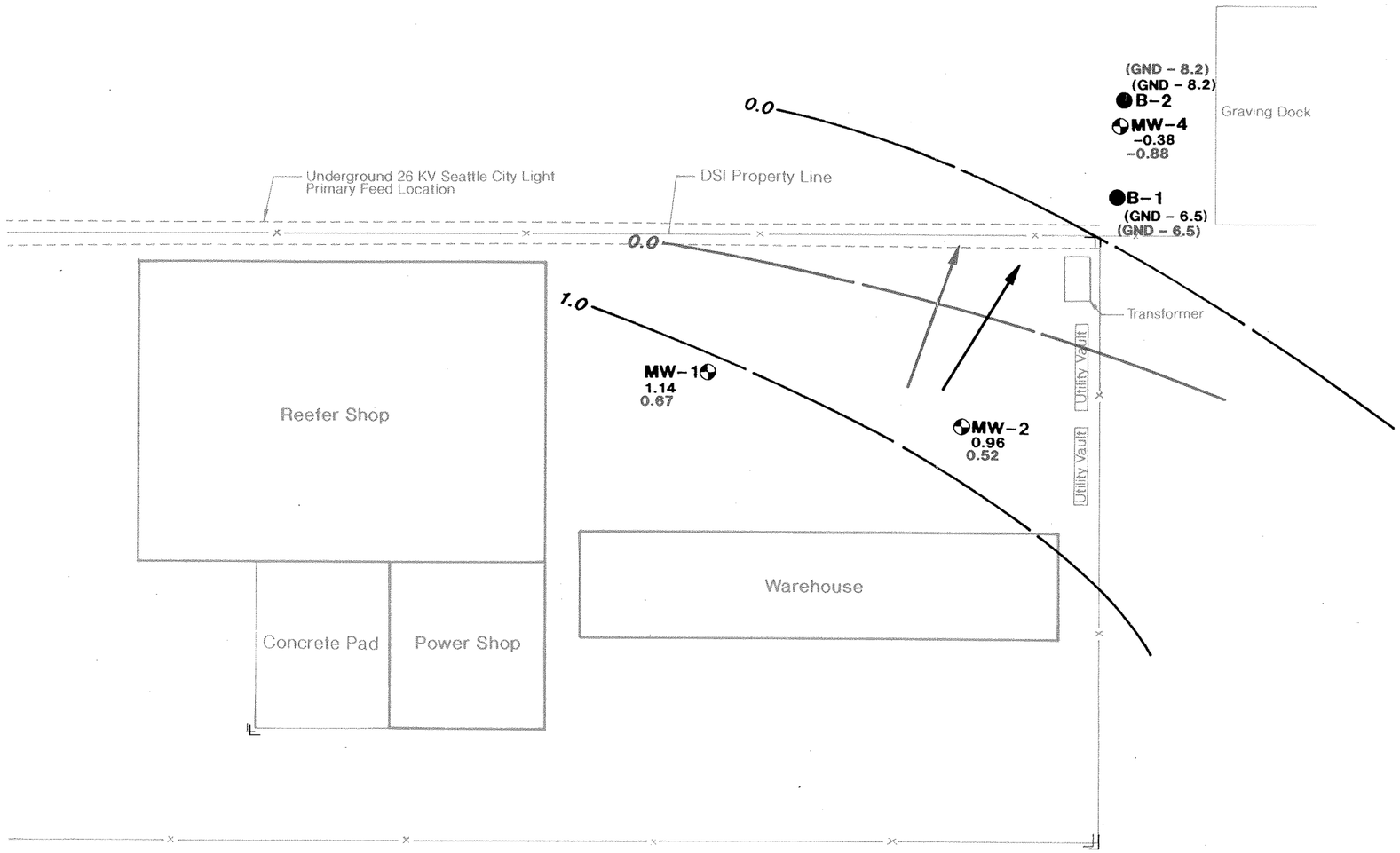
Figure 6

Groundwater Elevation Contour Map



MW–1 Monitoring Well Location and Number

B–1 Soil Boring Location and Number

Groundwater Elevation in Feet

1.14 High Tide 0.67 Low Tide

Groundwater Elevation Contour in Feet

—1.0— High Tide —0.0— Low Tide

Groundwater Flow Direction

High Tide Low Tide

Note: High tide was measured at 19:28 on 2/14/94. High tide groundwater measurements were collected between 16:30 and 18:00.

Low tide was measured at 14:37 on 2/8/94. Low tide groundwater measurements were collected between 14:48 and 15:00.

0 50 100

Scale in Feet

N

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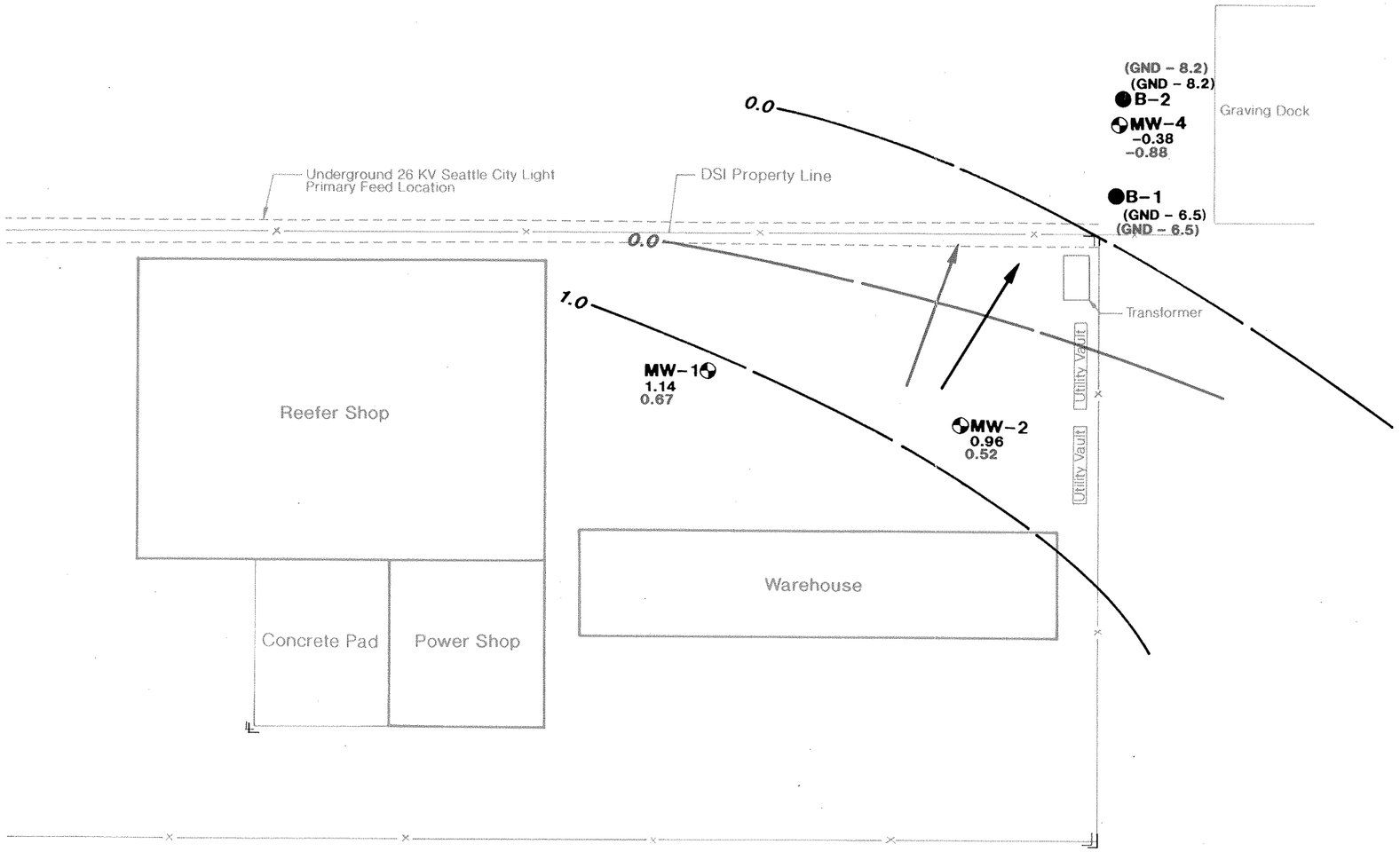
J–3763–04 6/94

Figure 7

Groundwater Elevation Contour Map



MW–1 Monitoring Well Location and Number

B–1 Soil Boring Location and Number

Groundwater Elevation in Feet

1.14 High Tide 0.67 Low Tide

Groundwater Elevation Contour in Feet

—1.0— High Tide —0.0— Low Tide

Groundwater Flow Direction

High Tide Low Tide

Note: High tide was measured at 19:28 on 2/14/94. High tide groundwater measurements were collected between 16:30 and 18:00.

Low tide was measured at 14:37 on 2/8/94. Low tide groundwater measurements were collected between 14:48 and 15:00.

0 50 100

Scale in Feet

N

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J-3763-04 6/94

Figure 7

APPENDIX A
EXCERPTS FROM PREVIOUS INVESTIGATIONS
ENVIRONMENTAL SERVICE, LTD.

Environmental Services, Ltd.
Project 3062 - Duwamish Shipyard, Inc.
Alaska Marine Lines lease
Table of lab test results

09/29/93

3062\GO1RAL93

SOURCE	ESL SPL #	TYPE	LAUCKS SPL #	TEST #	KIND	GASOLINE ppm	DIESEL ppm	HEAVY ppm	NOTES
√ Exc #1	08269303	Soil	9308934-01		WTPH-HCID	<20.0	>50.0	>100	PDP
			9308934-01A	SW8240					AT, E, MC, X
			9308934-01C	SW8270					AC, AN, BA, BF, BP, C, F, FL, P, PH
√ Exc #2	08269304	Soil	9308934-02		WTPH-HCID	<20.0	<50.0	<100	
√ Exc #3	08269305	Soil	9308934-06		WTPH-HCID	>20.0	>50.0	>100	PDP, GP
			9308934-06A	SW8240					AT, B, BU, E, S, T, X
			9308934-06C	SW8270					AC, AN, AY, BA, BF, BP, C, CA, D, FL, M, N, P, PH
	08279302	Soil	9308934-03		WTPH-HCID	>20.0	>50.0	>100	PDP, WGP
√ Exc #4	08279303	Soil	9308934-04		WTPH-HCID	<20.0	<50.0	<100	
√ Exc #5	08279304	Soil	9308934-05		WTPH-HCID	<20.0	<50.0	<100	
Soil bore	643955217	Soil	9308962-04		WTPH-HCID	<20.0	<50.0	>100	
MW-1	874321966	Soil							
	275631864	Water	9308988-01		WTPH-HCID	<0.20	<0.50	<1.0	
MW-2	865214387	Soil	9308962-01		WTPH-HCID	<20.0	>50.0	>100	PDP, HHI
	865214388	Soil	9308962-02		WTPH-HCID	>20.0	>50.0	>100	PDP, NGP, HHI
	865214390	Soil	9308962-03		WTPH-HCID	<20.0	>50.0	<100	NDP, UDE
	741186304	Water	9308988-02		WTPH-HCID	<0.20	<0.50	<1.0	
MW-3	543786217	Soil	9308962-05		WTPH-HCID	<20.0	>50.0	>100	PDP, HHI
	543786219	Soil	9308962-06		WTPH-HCID	>20.0	>50.0	>100	PDP, HHI, NGP
	543786220	Soil	9308962-07		WTPH-HCID	<20.0	<50.0	<100	
	315564322	Water	9308988-03		WTPH-HCID	<0.20	>0.50	<1.0	UDE
					WTPH-D		0.98		UDE
MW-4	874236900	Soil	9308962-08		WTPH-HCID	<20.0	<50.0	>100	
	874236902	Soil	9308962-09		WTPH-HCID	<20.0	<50.0	<100	
	615327641	Water	9308988-04		WTPH-HCID	<0.20	>0.50	<1.0	PDP
					WTPH-D		1.0		UDE

ABBREVIATIONS

GP	gasoline pattern
HHI	heavy hydrocarbon range response increased by diesel range hydrocarbons
NDP	no diesel pattern
NGP	no apparent gasoline pattern
PDP	partial diesel pattern
UDE	unresolved envelope of material in diesel range
WGP	weathered gasoline pattern

AC	acenaphthene	BF	benzofluoranthene	E	ethylbenzene	P	pyrene
AN	anthracene	BP	benzopyrene	F	fluorene	PH	phenanthrene
AT	acetone	BU	2-butanone	FL	fluoranthene	S	styrene
AY	acenaphthylene	C	chrysene	M	2-methylnaphthalene	T	toluene
B	benzene	CA	carbazole	MC	methylene chloride	X	xylene
BA	benzoanthracene	D	dibenzofuran	N	naphthalene		

BUWAMISH SHIPYARD INC.
5658 W. MARGINAL WAY S.W. • SEATTLE, WA 98136 • (206) 767-4880 • FAX: (206) 767-5867

DATE: October 15, 1993

TO: David Templeton
HartCrowser

FROM: Don Meberg

Here is the information which you requested. Please give me a call if you have any questions.

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063
Chemistry, Microbiology, and Technical Services

Certificate of Analysis

CLIENT: Environmental Services, Ltd.
5653 42nd Avenue S.W.
Seattle, WA 98136-1510

ATTN : Dick Lyon

Work Order# : 93-08-988
DATE RECEIVED : 08/31/93
DATE OF REPORT: 09/28/93
CLIENT JOB ID : 3062

Work ID : Duwamish West
Taken By : Client
Transported by: Hand Delivered
Type : Water

SAMPLE IDENTIFICATION:

	Sample Description	Collection Date
01	MW-1	08/30/93 07:00
02	MW-2	08/30/93 08:00
03	MW-3	08/30/93 05:00
04	MW-4	08/30/93 04:00

FLAGGING:

The flag "U" indicates the analyte of interest was not detected, to the limit of detection indicated.

ATTACHMENTS:

Following presentation of sample results, the following appendices are attached to this report:

Appendix A: Method Blank and Surrogate Recoveries Report
Appendix B: Matrix Spike/Duplicate Report
Appendix C: Blank Spike Recovery Report
Appendix D: Chromatograms
Appendix E: Chain-of-Custody

Laucks 85 Years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

CLIENT : Environmental Services, Ltd.

Certificate of Analysis

Work Order# : 93-08-988

Unless otherwise instructed all samples will be discarded on 10/18/93

Respectfully submitted,
Laucks Testing Laboratories, Inc.

J. M. Owens

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308988-01 Date Collected: 08/30/93
Client Sample ID: MW-1 Date Received : 08/31/93

---------- WTPH-HCID ----------

Analysis Date : 09/03/93

	Result	
Gasoline Range Hydrocarbons...	<0.20	mg/L
Diesel Range Hydrocarbons.....	<0.50	mg/L
Lube Oil and Related Products.	<1.0	mg/L

Surrogate recoveries	% Rec	LCL	UCL
2-Fluorobiphenyl	84	50	150
p-Terphenyl	90	50	150

Comments:

Key: < = Result is less than screening level.
> = Result exceeded the screening level.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308988-02 Date Collected: 08/30/93
Client Sample ID: MW-2 Date Received : 08/31/93

---------- WTPH-HCID ----------

Analysis Date : 09/03/93

	Result	
Gasoline Range Hydrocarbons...	<0.20	mg/L
Diesel Range Hydrocarbons.....	<0.50	mg/L
Lube Oil and Related Products.	<1.0	mg/L

Surrogate recoveries	% Rec	LCL	UCL
2-Fluorobiphenyl	89	50	150
p-Terphenyl	92	50	150

Comments:

Key: < = Result is less than screening level.
> = Result exceeded the screening level.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308988-03 Date Collected: 08/30/93
Client Sample ID: MW-3 Date Received : 08/31/93

---------- WTPH-HCID ----------

Analysis Date : 09/03/93

	Result	
Gasoline Range Hydrocarbons...	<0.20	mg/L
Diesel Range Hydrocarbons.....	>0.50	mg/L
Lube Oil and Related Products.	<1.0	mg/L

Surrogate recoveries	% Rec	LCL	UCL
2-Fluorobiphenyl	86	50	150
p-Terphenyl	90	50	150

Comments: There is an unresolved envelope of material in the diesel range.

Key: < = Result is less than screening level.
> = Result exceeded the screening level.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063
Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308988-04
Client Sample ID: MW-4

Date Collected: 08/30/93
Date Received : 08/31/93

---------- WTPH-HCID ----------

Analysis Date : 09/03/93

	Result	
Gasoline Range Hydrocarbons...	<0.20	mg/L
Diesel Range Hydrocarbons.....	>0.50	mg/L
Lube Oil and Related Products.	<1.0	mg/L

Surrogate recoveries	% Rec	LCL	UCL
2-Fluorobiphenyl	89	50	150
p-Terphenyl	100	50	150

Comments: There is a partial diesel pattern present.

Key: < = Result is less than screening level.
> = Result exceeded the screening level.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308988-03 Date Collected: 08/30/93
Client Sample ID: MW-3 Date Received : 08/31/93

---------- WTPH-D ----------

Preparation Date: 09/17/93
Analysis Date : 09/18/93

	Result	SDL
Diesel Range.....	0.98	0.25 mg/L

Surrogate recoveries	% Rec	LCL	UCL
2-Fluorobiphenyl	99.6	50	150
p-Terphenyl	106	50	150

Comments: There is an unresolved envelope of material in the diesel range.

Laucks 85 YEARS
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308988-04 Date Collected: 08/30/93
Client Sample ID: MW-4 Date Received : 08/31/93

---------- WTPH-D ----------

Preparation Date: 09/17/93
Analysis Date : 09/18/93

	Result	SDL
Diesel Range.....	1.0	0.25 mg/L

Surrogate recoveries	% Rec	LCL	UCL
2-Fluorobiphenyl	103	50	150
p-Terphenyl	108	50	150

Comments: There is an unresolved envelope of material in the diesel range.

MW-1

FORM: ESC-11E

Environmental Services Ltd.

4201 TUDOR CENTRE DRIVE, SUITE 307
ANCHORAGE, ALASKA 99508
(907) 563-1912 FAX (907) 562-1824

ESC PROJECT NO: 5062
PROJECT TITLE: DUWAMISH
MW-1

WELL, PIT, & BORING LOG

PAGE 1 of 1

PROJECT MGR: E ROSS	HOLE #: 674321966
LOGGER: [illegible]	TYPE: AUGER
CONTRACTOR: CASCADE	
EQUIPMENT: CME	START: 9:05 AM
	FINISH: 9:22 AM
HAMMER WEIGHT: 140 LB	SURFACE ELEVATION
DROP: 30"	COLLAR ELEVATION
WEATHER: PARTLY CLOUDY	TOTAL DEPTH: 20 FT
	SAMPLING METHOD:
DECONTAMINATION OF EQUIPMENT	SPLIT SPOON

WATER LEVEL					
FIRST ENCOUNTERED			EQUILIBRIUM		
DATE	TIME	DEPTH	DATE	TIME	DEPTH
8.28.93					

DEPTH	GRAPHIC	GEOLOGIC DESCRIPTION	SAMPLE No.	PENETRATION	RECOVERY	ORGANIC VAPOR
2"		3" LIGHT GRAY GRAVEL, ANGULAR 9" FN-MED/GR SAND, SALT + PEPPER, A FEW RUST STREAKS, LOOSE, NO ODOR	966			
24"						
30"		2" SAND FN-MED/GR SOFT NO ODOR. 2" PIECE [illegible] WOOD, [illegible] WOOD [illegible] 4" GRAY SILT/CLAY W/ BLACK TO BRN ORGANICS				
48"						
60"		FN-MED/GR SAND, SOFT 5-10% RED GRAINS, SALT + PEPPER, MED GRAY				
72"		F/GR SALT + PEPPER GRAY SAND, 5% RED GRAINS, NO ODOR WET				
84"						

REMARKS:

MW-2

FORM: ESL-111

Environmental Services Ltd.

420 K TUDOR CENTRE DRIVE, SUITE 307
ANCHORAGE, ALASKA 99503
(907) 561-1972 FAX (907) 562-1826

ESL PROJECT NO: 13062

PROJECT TITLE: Dynamis H

MW-2

WELL PIT & BORING LOG

PAGE 1 OF 1

PROJECT MGR: KROSS	HOLE #: 865214387
LOGGER: SELTON	TYPE:
CONTRACTOR: CASCADE	
EQUIPMENT: CME	START:
	FINISH:
HAMMER WEIGHT: 140 LB	SURFACE ELEVATION:
DROP: 30"	COLLAR ELEVATION:
WEATHER:	TOTAL DEPTH:
	SAMPLING METHOD:
DECONTAMINATION OF EQUIPMENT	18" SPLIT SPOON

WATER LEVEL					
FIRST ENCOUNTERED			EQUILIBRIUM		
DATE	TIME	DEPTH	DATE	TIME	DEPTH
8.28.93					

DEPTH	GRAPHIC	GEOLOGIC DESCRIPTION.	SAMPLE No.	PENETRATION	RECOVERY	ORGANIC VAPOR
12"		FN-MED/GR SAND, SLIGHT OIL ODOR, LOOKS FAINTLY OIL-STAINED, SOME BRN CLAY LENSES, TOP 1/2" GRAVELLY	387	40		
24"				48		
				41		
25"		6" CLAY - SANDY CLAY, GRAY, OIL-STAINED STRONG ODOR	388	0		
		12" SAND, MED-CRS/GR, SALT & PEPPER, NO ODOR, CLEAN & SOFT		24		
48"			389	32		
		SAND, FN-CRS/GR, CLEAN, OCCASIONAL BRN CLAY. SAND IS GRAY SALT & PEPPER, SOFT	390			
60"						
66"						

REMARKS:

Environmental Services Ltd.

4200 TUDOR CENTRE DRIVE, SUITE 307
ANCHORAGE, ALASKA 99508
(907) 563-1972 FAX (907) 562-1824

FORM ESC-11

MW 2

ESC PROJECT NO: 8062

PROJECT TITLE: DUWAMISH

MW #3

PAGE 1 OF 1

WELL, PIT, & BORING LOG

PROJECT MGR: K ROSS	HOLE #: 543786217
LOGGER: DYON	TYPE: AUGER
CONTRACTOR: CASCADE	
EQUIPMENT:	START:
	FINISH:
HAMMER WEIGHT: 140 LB	SURFACE ELEVATION
DROP: 30"	COLLAR ELEVATION:
WEATHER:	TOTAL DEPTH:
	SAMPLING METHOD:
DECONTAMINATION OF EQUIPMENT	18" SPLIT SPOON

WATER LEVEL					
FIRST ENCOUNTERED			EQUILIBRIUM		
DATE	TIME	DEPTH	DATE	TIME	DEPTH
8.24.93					

DEPTH	GRAPHIC	GEOLOGIC DESCRIPTION	SAMPLE No.	PENETRATION	RECOVERY	ORGANIC VAPOR
12"						
24"		GRAY SILT, SOME BROWN MED/CR SAND, VERY FAINT ODOR	217	18 15	6"	
36"		8" SILT - BEDDED, GRAY CLAY LENSES, SOME COBBLES		16 17		
48"		10" BROWN SAND, MED/CR, OIL STAINED, ODOR	218	17 25		
60"		SAND, FN/CR, FREE OIL, STRONG ODOR	219	11 11		
72"		BASE OF SAND LOOKS CLEAN OF HC CONTAMINATION		11		

REMARKS:

AMW-4

Environmental Services Ltd.

FORM: ESL-111

4201B TUDOR CENTRE DRIVE, SUITE 307
ANCHORAGE, ALASKA 99508
(907) 563-1821, FAX (907) 562-1824

ESC PROJECT NO: 3062
PROJECT TITLE: DUTCH MILL

WELL PIT & BORING LOG

PAGE 1 OF 1

PROJECT MGR: KROSS	HOLE #: 7.42369.00
LOGGER: RYAN	TYPE: DUGER
CONTRACTOR: CASCADE	
EQUIPMENT:	START: 12:35 PM
	FINISH:
HAMMER WEIGHT: 140 LB	SURFACE ELEVATION:
DROP: 30"	COLLAR ELEVATION:
WEATHER: SUNNY	TOTAL DEPTH:
	SAMPLING METHOD:
DECONTAMINATION OF EQUIPMENT:	18" SPLIT SPOON

WATER LEVEL					
FIRST ENCOUNTERED			EQUILIBRIUM		
DATE	TIME	DEPTH	DATE	TIME	DEPTH
8.28.93	1:00 P	7 FT			

DEPTH	GRAPHIC	GEOLOGIC DESCRIPTION	SAMPLE Nos.	PENETRATION	RECOVERY	ORGANIC VAPOR
12"						
24"		FN-MED/CR SAND, GRAY-BRN, INTERBEDDED GRAY AND BRN SILT, NO ODOR	00	15		
				15		
36"				21		
		SILT - GRAY; VERY FN/GR SAND, NO ODOR	01	8		
48"				12		
				23		
60"		SAND - MED/CR, BRN SALT & PEPPER WITH FN/GR GRAY SAND. NO ODOR	02	19		
72"				21		
				25		
		SAND, FN-MED/CR	03	8		
84"				12		
				15		
96"						

REMARKS:

Environmental Services Ltd.

FORM: ESL-1

4201 TUDOR CENTRE DRIVE, SUITE 307
ANCHORAGE, ALASKA 99508
(907) 561-1812 FAX (907) 562-1824

ESL PROJECT NO: 3062

PROJECT TITLE: DUMAMISH SOIL BORING

PAGE 1 OF 1

WELL PIT & BORING LOG

PROJECT MGR: KROSS	HOLE # 6439 5521 T
LOGGER: LYON	TYPE: AUGER - SOIL BORING
CONTRACTOR: CASCADE	
EQUIPMENT	START 11:00 AM
	FINISH 11:15 AM
HAMMER WEIGHT 140 LB	SURFACE ELEVATION
DROP 30"	COLLAR ELEVATION
WEATHER CLOUDY	TOTAL DEPTH
	SAMPLING METHOD
DECONTAMINATION OF EQUIPMENT	SPLIT SPOON

WATER LEVEL					
FIRST ENCOUNTERED			EQUILIBRIUM		
DATE	TIME	DEPTH	DATE	TIME	DEPTH
8-31-93		4½'-5'			

DEPTH	GRAPHIC	GEOLOGIC DESCRIPTION	SAMPLE No.	PENETRATION	RECOVERY	ORGANIC VAPOR
12"		¼ F/G SAND, CLAYEY, GRAY - GRADING TO BROWN AT BASE. 10" SAMPLE RECOVERY PRESLY AT TOP. NO ODOR	NONE	30	10"	
24"				32		
36"				35		
48"		SAMPLE FROM BROWN CLAY AND CLEAN BROWN SAND AT BIT AND FROM DRILL FLIGHT NEAR BASE.	217	18	0	
60"				32		
				26		

REMARKS:

FILE MEMO

DATE: October 5, 1993

RE: Project 3062
Duwamish Shipyard, Inc.
Test pit and well/soil boring lithology & samples

FROM: Dick Lyon

3062\MO8RAL93

Mon Well, Excav or Soil Brng	Date	Depth	Sample Number	Description
Exc. #1	8/26/93	5' - 7'	SS08269301	Fine to med grained "salt and
			SS08269302	pepper" gray sand, subrnd, wet,
		+01	SS08269303	fairly uniform lithology, bleeds med brn HC, smells like diesel, some irridescence looks metallic.
				Note: hole started in dug depression about 4 ft below general ground surface.
Exc. #2				1' brown sandy gravel
				2' f/gr silty sd, compact, holds face
	8/26	7'	02 SS08269304	4' fn to med grained sand; water table at about 6-1/2', water runs strongly after a few min. Material caves from about 3' down. No HC evident
Exc. #3				1' - 1-1/2' brown sandy cobbly gravel
	8/26	1-1/2'	*06 SS08269305	1' sd & silty sd, banded, stiff,
	8/27	1-1/2'	SS08179301	oil saturated, woody debris. Some of tarry material creeps overnight, forming lobes. Holds face.
	8/27	9'	03 SS08279302	7' sand, gray, stained brown with oil, med gr. No strength - will not hold face. No water.
Exc. #4				1/2' - 1' gravel
				1' silty sand and sand
	8/27	6'	04 SS08279303	4' loose sd (caves & runs), fn to med gr, gray, clean, soft, about 5% red grns (as have othr f-m/g sds here). Water entry @ 6'.
Exc. #5				1/2' - 1' coarse gravel
	8/27	6-1/2'	05 SS08279305	7' fn to med/gr sand, no HC,
		8'	SS08279304	water level 6-1/2 ft. Sand caves & runs.

Soil Boring #1					1' gravel 18" v fn gr sand, clayey; gray, grading to brn at base, pebbly at top, no odor 18" unk
	8/28	04	48" - 66"	643955217	1' (?) brown clay, clean brown sand and (sample from bit and drill flight near base) Water table 4-1/2' to 5'
MW-1					1' unk (prob. gravel) 3" lt gy ang gravel
	8/28		15" - 24"	874321966	9" fn to med gr sand, gray, salt & pepper, a few rust streaks, no odor, loose. 1' unk 8" sand, fn to med gr, soft, no HC odor, 2" piece fresh wood with strong wood odor 4" gray silt & clay with blk to brn organics 1' unk 2' fn to med/grained sd, med gray salt & pepper, 5% or more red grns, soft, water saturated at TD
MW-2					1' unk (prob. gravel)
01	8/28	01	12" - 24"	865214387	1' fn to med gr sand, slight oil odor, looks faintly oil-stained. Some brown clay lenses. Top 1-1/2" gravelly. 6" unk
		02	30" - 36"	865214388	6" clay & sandy clay, gray, oil-stained, strong odor
			36" - 48"	865214389	1' sand, med to crs grn, salt & pepper, clean, soft, no odor
		03	48" - 66"	865214390	18" sand, fn to crs grn, clean, salt & pepper gray, soft; occ brn clay
MW-3					2' unk
	8/28	05	24" - 42"	543786217	18" gray silt, some brown med gr sand, very faint HC odor (based on 6" recovery in interval) 8" silt, gray, bedded, gray clay lenses, some cobbles
			50" - 60"	543786218	10" med gr sand, brn, HC odor, oil-stained
		06	60" - 72"	543786219	18" sand, fine grained: upper part has free oil and strong HC

		07	72" - 78" 543786220	odor; base of sand looks clean of HC contamination.
MW-4				2' unk
	8/28	08	24" - 42" 874236900	3' interbedded v fine to med grained gray to gray-brn sand
			42" - 60" 874236901	and gray to brown silt, no HC odor
		09	60" - 78" 874236902	3' fine to med grained gray
			78" - 96" 874236903	sand, salt & pepper, no odor
				Water table 7 ft.

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

Certificate of Analysis

CLIENT: Environmental Services, Ltd.
5653 42nd Avenue S.W.
Seattle, WA 98136-1510

ATTN : Dick Lyon

Work Order# : 93-08-934
DATE RECEIVED : 08/27/93
DATE OF REPORT: 09/24/93
CLIENT JOB ID : Job #: 3062

Work ID : Duwamish - West
Taken By : Client
Transported by: Hand Delivered
Type : Soil

SAMPLE IDENTIFICATION:

	Sample Description	Collection Date
01	08269303 Excav #1	08/26/93 12:35
02	08269304 Excav #2	08/26/93 12:50
03	08279302 Excav #3	08/27/93 08:45
04	08279303 Excav #4	08/27/93 09:10
05	08279305 Excav #5	08/27/93 09:30
06	08269305 Excav #3	08/26/93 01:10

COMMENTS ON SEMIVOLATILE ANALYSIS:

Samples 9308934-01 and -06 both contained high levels of hydrocarbons. Sample 9308934-06 was extracted at the medium sample size of 1.0 gram as opposed to the low level sample size of 30 grams due to the level of hydrocarbons present in the sample. The extract for sample 9308934-06 was further diluted by a factor of 10 prior to anaysis. The smaller sample volume and dilution factor combined to give the higher detection limits for this sample.

COMMENTS ON MATRIX SPIKE/MATRIX SPIKE DUPLICATE ANALYSIS:

The RPD values for 4-chloro-3-methylphenol and toluene exceeded the upper control limits. No corrective action was deemed necessary since all other data were within control limits.

Laucks 85 years
Testing Laboratories, Inc.
340 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

CLIENT : Environmental Services, Ltd.

Certificate of Analysis

Work Order# : 93-08-934

ATTACHMENTS:

Following presentation of sample results, the following appendices are attached to this report:

Appendix A: Method Blanks & Surrogate Recoveries Reports
Appendix B: MS/MSD & Duplicate Reports
Appendix C: Chain-of-Custody

Unless otherwise instructed all samples will be discarded on 10/15/93

Respectfully submitted,
Laucks Testing Laboratories, Inc.

John M. Buerger

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

USING OUR REPORTS

Laucks uses an electronic Laboratory Information Management System that produces both our reports and invoices. The following information and definitions will help you understand our reports, and we encourage you to call us if your questions are not answered here.

SAMPLE IDENTIFICATION - Sample IDs are recorded as they appear on your sample containers or chain-of-custody documents.

TEST RESULTS - Analyses that result in a single data point are shown in alphabetical order in the body of the report. Tests that yield multiple results are generally reported on separate pages, on a sample-by-sample basis.

MEASUREMENT UNITS - The reporting units are shown to the right of the analyte name. In the event that a different unit was more appropriate to a specific sample, that exception is shown immediately beneath the test result. Units commonly employed are mg/kg (solids) or mg/L (liquids), comparable to parts per million; ug/kg (solids) or ug/L (liquids), comparable to parts per billion; and percent (%).

METHODS OF ANALYSIS - The EPA or Standard Methods method number is shown in parentheses after the analyte name when field size allows; or, for analyses that yield multiple data points, in the header information on the individual report page.

ABBREVIATIONS - Several abbreviations can appear in our reports. The most commonly employed abbreviations are:

U : The analyte of interest was not detected, to the limit of detection indicated.

B : The analyte of interest was detected in the method blank associated with the sample, as well as in the sample itself. The B flag is applied without regard to the relative concentrations detected in the blank and sample.

J : The analyte of interest was detected below the routine reporting limit. This value should be regarded as an estimate.

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

T : The flagged values represent the SUM of two co-eluting compounds. The SUM of these two values is shown as though it were a result for each of them. The two figures should not be added together.

E : The flagged value was reported from an analysis which exceeded the linear range of the instrument. See additional comments for further discussion of the circumstances. Values so flagged should be considered estimates.

D : The value reported derives from analysis of a diluted sample or sample extract.

P : When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, we report the lower value.

SDL : Sample Detection Limit. The SDL can vary from sample to sample, depending on sample size, matrix interferences, moisture content and other sample-specific conditions.

PQL : Practical Quantitation Limit. This limit is drawn from the test method and usually represents the SDL multiplied by a matrix-specific factor.

CRQL : Client Requested Quantitation Limit, usually the limit of detection specified at your request. Might also be referred to as Contract Required Quantitation Limit.

DB : Dry Basis. The value reported has been back-calculated to normalize for the moisture content of the sample.

AR : As-Received. The value has NOT been normalized for moisture.

Other abbreviations, used in special applications, are defined where they appear.

DISPOSAL DATE - Our reports now include the date on which we will dispose of your samples. (In limited instances, we may require that the samples be returned to your custody.) If you wish to have the samples back, or would like to have them stored for a longer period, please notify us before the disposal date.

Laucks 85 years
Testing Laboratories, Inc.
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Chemistry, Microbiology, and Technical Services

CLIENT : Environmental Services, Ltd.

Certificate of Analysis

Work Order # 93-08-934

TESTS PERFORMED AND RESULTS:

Analyte	Units	01	06
Total Solids	%	70.9	89.4

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Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308934-01 Date Collected: 08/26/93
Client Sample ID: 08269303 Excav #1 Date Received : 08/27/93

---------- WTPH-HCID ----------

Preparation Date: 08/27/93
Analysis Date : 08/29/93

	Result	
Gasoline Range Hydrocarbons...	<20.0	mg/kg AR
Diesel Range Hydrocarbons.....	>50.0	mg/kg AR
Lube Oil and Related Products.	>100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	99.4	50	150
2-Fluorobiphenyl	101	50	150
p-Terphenyl	109	50	150

Comments: Sample demonstrated a partial diesel pattern.

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

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Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308934-02
Client Sample ID: 08269304 Excav #2

Date Collected: 08/26/93
Date Received : 08/27/93

---------- WTPH-HCID ----------

Preparation Date: 08/27/93
Analysis Date : 08/29/93

	Result	
Gasoline Range Hydrocarbons...	<20.0	mg/kg AR
Diesel Range Hydrocarbons.....	<50.0	mg/kg AR
Lube Oil and Related Products.	<100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	99.4	50	150
2-Fluorobiphenyl	114	50	150
p-Terphenyl	110	50	150

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

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Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308934-03 Date Collected: 08/27/93
Client Sample ID: 08279302 Excav #3 Date Received : 08/27/93

---------- WTPH-HCID ----------

Preparation Date: 08/27/93
Analysis Date : 08/29/93

	Result	
Gasoline Range Hydrocarbons...	>20.0	mg/kg AR
Diesel Range Hydrocarbons.....	>50.0	mg/kg AR
Lube Oil and Related Products.	>100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	122	50	150
2-Fluorobiphenyl	100	50	150
p-Terphenyl	105	50	150

Comments: Sample demonstrated a partial diesel pattern and a partial gas pattern.

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

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Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308934-04 Date Collected: 08/27/93
Client Sample ID: 08279303 Excav #4 Date Received : 08/27/93

---------- WTPH-HCID ----------

Preparation Date: 08/27/93
Analysis Date : 08/29/93

	Result	
Gasoline Range Hydrocarbons...	<20.0	mg/kg AR
Diesel Range Hydrocarbons.....	<50.0	mg/kg AR
Lube Oil and Related Products.	<100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	96.2	50	150
2-Fluorobiphenyl	111	50	150
p-Terphenyl	107	50	150

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

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Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308934-05 Date Collected: 08/27/93
Client Sample ID: 08279305 Excav #5 Date Received : 08/27/93

---------- WTPH-HCID ----------

Preparation Date: 08/27/93
Analysis Date : 08/29/93

	Result	
Gasoline Range Hydrocarbons...	<20.0	mg/kg AR
Diesel Range Hydrocarbons.....	<50.0	mg/kg AR
Lube Oil and Related Products.	<100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	95.6	50	150
2-Fluorobiphenyl	110	50	150
p-Terphenyl	104	50	150

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

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Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308934-06 Date Collected: 08/26/93
Client Sample ID: 08269305 Excav #3 Date Received : 08/27/93

---------- WTPH-HCID ----------

Preparation Date: 08/27/93
Analysis Date : 08/29/93

	Result	
Gasoline Range Hydrocarbons...	>20.0	mg/kg AR
Diesel Range Hydrocarbons.....	>50.0	mg/kg AR
Lube Oil and Related Products.	>100	mg/kg AR

Surrogate recoveries	% Rec		LCL	UCL
Bromofluorobenzene	170	*	50	150
2-Fluorobiphenyl	172	*	50	150
p-Terphenyl	95.0		50	150

Comments: Sample demonstrated a partial diesel pattern and a partial gas pattern. Two surrogates were above control limits due to matrix interference.

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

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Chemistry, Microbiology, and Technical Services

REPORT ON SAMPLE: 9308934-01A
Client Sample ID: 08269303 Excav #1

Date Received : 08/27/93
Date Extracted : N/A
Test Code : LXTCVS

Collection Date : 08/26/93
Date Analyzed : 08/31/93
Test Method : SW8240

Compound	Result (ug/Kg DB)	SDL (ug/Kg DB)	Compound	Result (ug/Kg DB)	SDL (ug/Kg DB)
Chloromethane	1 U	1	Bromodichloromethane	1 U	1
Bromomethane	1 U	1	1,2-Dichloropropane	1 U	1
Vinyl chloride	1 U	1	Trichloroethene	1 U	1
Chloroethane	4 U	4	Benzene	1 U	1
Methylene chloride	4	1	Dibromochloromethane	4 U	4
Acetone	18 B	4	1,1,2-Trichloroethane	1 U	1
Carbon disulfide	1 U	1	Bromoform	1 U	1
1,1-Dichloroethene	1 U	1	4-Methyl-2-pentanone	4 U	4
1,1-Dichloroethane	1 U	1	2-Hexanone	4 U	4
trans-1,2-Dichloroethene	1 U	1	1,1,2,2-Tetrachloroethane	4 U	4
cis-1,2-Dichloroethene	1 U	1	Tetrachloroethene	1 U	1
Total 1,2-Dichloroethene	1 U	1	Toluene	1 U	1
Chloroform	1 U	1	Chlorobenzene	4 U	4
2-Butanone	4 U	4	trans-1,3-Dichloropropene	4 U	4
1,2-Dichloroethane	1 U	1	Ethylbenzene	4	1
1,1,1-Trichloroethane	1 U	1	cis-1,3-Dichloropropene	4 U	4
Carbon tetrachloride	1 U	1	Styrene	1 U	1
Vinyl acetate	1 U	1	Total Xylene	5	1

Surrogate Recovery Report

Surrogate Compound	Percent Recovery	Limits: Min.	Max.
1,2-Dichloroethane d4	104	76	121
Toluene d8	104	74	128
p-Bromofluorobenzene	99	72	118

* Surrogate recovery is outside of control limits. See comments.

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Chemistry, Microbiology, and Technical Services

REPORT ON SAMPLE: 9308934-06A
Client Sample ID: 08269305 Excav #3

Date Received : 08/27/93
Date Extracted : N/A
Test Code : LXTCVS

Collection Date : 08/26/93
Date Analyzed : 08/31/93
Test Method : SW8240

Compound	Result (ug/Kg DB)	SDL (ug/Kg DB)	Compound	Result (ug/Kg DB)	SDL (ug/Kg DB)
Chloromethane	140 U	140	Bromodichloromethane	140 U	140
Bromomethane	140 U	140	1,2-Dichloropropane	140 U	140
Vinyl chloride	140 U	140	Trichloroethene	140 U	140
Chloroethane	420 U	420	Benzene	1300	140
Methylene chloride	140 U	140	Dibromochloromethane	420 U	420
Acetone	660 B	420	1,1,2-Trichloroethane	140 U	140
Carbon disulfide	140 U	140	Bromoform	140 U	140
1,1-Dichloroethene	140 U	140	4-Methyl-2-pentanone	420 U	420
1,1-Dichloroethane	140 U	140	2-Hexanone	420 U	420
trans-1,2-Dichloroethene	140 U	140	1,1,2,2-Tetrachloroethane	420 U	420
cis-1,2-Dichloroethene	140 U	140	Tetrachloroethene	140 U	140
Total 1,2-Dichloroethene	140 U	140	Toluene	4300	140
Chloroform	140 U	140	Chlorobenzene	420 U	420
2-Butanone	700 B	420	trans-1,3-Dichloropropene	420 U	420
1,2-Dichloroethane	140 U	140	Ethylbenzene	9000	140
1,1,1-Trichloroethane	140 U	140	cis-1,3-Dichloropropene	420 U	420
Carbon tetrachloride	140 U	140	Styrene	740	140
Vinyl acetate	140 U	140	Total Xylene	12000	140

Surrogate Recovery Report

Surrogate Compound	Percent Recovery	Limits: Min.	Max.
1,2-Dichloroethane d4	101	76	121
Toluene d8	100	74	128
p-Bromofluorobenzene	100	72	118

* Surrogate recovery is outside of control limits. See comments.

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REPORT ON SAMPLE: 9308934-01C
Client Sample ID: 08269303 Excav #1
Collection Date : 08/26/93
Date Received : 08/27/93
Date Extracted : 08/27/93
Date Analyzed : 08/30/93

Test Code : LXTCSS
Test Method : SW8270
Extraction Method : SW3550

Analyte	Result (ug/kg DB)	SDL (ug/kg DB)	Analyte	Result (ug/kg DB)	SDL (ug/kg DB)
Phenol	47 U	47	3-Nitroaniline	240 U	240
Aniline	240 U	240	Acenaphthene	300	47
Bis(2-chloroethyl)ether	47 U	47	2,4-Dinitrophenol	470 U	470
2-Chlorophenol	47 U	47	4-Nitrophenol	470 U	470
1,3-Dichlorobenzene	47 U	47	Dibenzofuran	47 U	47
1,4-Dichlorobenzene	47 U	47	2,4-Dinitrotoluene	94 U	94
Benzyl alcohol	47 U	47	Diethyl phthalate	47 U	47
1,2-Dichlorobenzene	47 U	47	4-Chlorophenyl phenylether	47 U	47
2-Methylphenol	47 U	47	Fluorene	450	47
Bis(2-chloroisopropyl)ether	47 U	47	4-Nitroaniline	94 U	94
4-Methylphenol	47 U	47	4,6-Dinitro-2-methylphenol	470 U	470
N-Nitroso-di-n-propylamine	47 U	47	N-Nitrosodiphenylamine	47 U	47
Hexachloroethane	94 U	94	1,2-Diphenylhydrazine	94 U	94
Nitrobenzene	47 U	47	4-Bromophenyl phenylether	94 U	94
Isophorone	47 U	47	Hexachlorobenzene	94 U	94
2-Nitrophenol	94 U	94	Pentachlorophenol	470 U	470
2,4-Dimethylphenol	47 U	47	Phenanthrene	760	47
Benzoic acid	1200 U	1200	Anthracene	220	47
Bis(2-chloroethoxy)methane	47 U	47	Carbazole	47 U	47
2,4-Dichlorophenol	94 U	94	Di-n-butyl phthalate	47 U	47
1,2,4-Trichlorobenzene	47 U	47	Fluoranthene	74	47
Naphthalene	47 U	47	Pyrene	250	47
4-Chloroaniline	47 U	47	Benzidine	1200 U	1200
Hexachlorobutadiene	47 U	47	Butylbenzylphthalate	47 U	47
4-Chloro-3-methylphenol	94 U	94	3,3'-Dichlorobenzidine	470 U	470
2-Methylnaphthalene	47 U	47	Benzo(a)anthracene	190	47
Hexachlorocyclopentadiene	94 U	94	Chrysene	190	47
2,4,6-Trichlorophenol	94 U	94	Bis(2-ethylhexyl)phthalate	41 JB	47
2,4,5-Trichlorophenol	94 U	94	Di-n-octyl phthalate	47 U	47
2-Chloronaphthalene	47 U	47	Benzo(b)fluoranthene	59 T	47
2-Nitroaniline	94 U	94	Benzo(k)fluoranthene	59 T	47
Dimethyl phthalate	47 U	47	Benzo(a)pyrene	76	47
Acenaphthylene	47 U	47	Indeno(1,2,3-cd)pyrene	12 J	47
2,6-Dinitrotoluene	94 U	94	Dibenzo(a,h)anthracene	47 U	47
			Benzo(g,h,i)perylene	28 J	47

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Chemistry, Microbiology, and Technical Services

GC/MS ABN surrogate recovery report for sample 9308934-01C

Surrogate	Percent Recovery	Limits: Min.	Max.
2-Fluorophenol	94	25	106
d5-Phenol	104	28	108
d4-2-Chlorophenol ...	99	20	130
d5-Nitrobenzene	98	32	102
2-Fluorobiphenyl	98	42	113
d4-1,2-Dichlorobenzene	91	20	130
2,4,6-Tribromophenol	119	22	128
d14-p-Terphenyl	76	48	124

* = Surrogate recovery outside control limits

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Chemistry, Microbiology, and Technical Services

REPORT ON SAMPLE: 9308934-06C
Client Sample ID: 08269305 Excav #3
Collection Date : 08/26/93
Date Received : 08/27/93
Date Extracted : 08/27/93
Date Analyzed : 08/30/93

Test Code : LXTCSS
Test Method : SW8270
Extraction Method : SW3550

Analyte	Result (ug/kg DB)	SDL (ug/kg DB)	Analyte	Result (ug/kg DB)	SDL (ug/kg DB)
Phenol	11000 U	11000	3-Nitroaniline	56000 U	56000
Aniline	56000 U	56000	Acenaphthene	21000	11000
Bis(2-chloroethyl)ether	11000 U	11000	2,4-Dinitrophenol	110000 U	110000
2-Chlorophenol	11000 U	11000	4-Nitrophenol	110000 U	110000
1,3-Dichlorobenzene	11000 U	11000	Dibenzofuran	16000	11000
1,4-Dichlorobenzene	11000 U	11000	2,4-Dinitrotoluene	22000 U	22000
Benzyl alcohol	11000 U	11000	Diethyl phthalate	11000 U	11000
1,2-Dichlorobenzene	11000 U	11000	4-Chlorophenyl phenylether	11000 U	11000
2-Methylphenol	11000 U	11000	Fluorene	58000	11000
Bis(2-chloroisopropyl)ether	11000 U	11000	4-Nitroaniline	22000 U	22000
4-Methylphenol	11000 U	11000	4,6-Dinitro-2-methylphenol	110000 U	110000
N-Nitroso-di-n-propylamine	11000 U	11000	N-Nitrosodiphenylamine	11000 U	11000
Hexachloroethane	22000 U	22000	1,2-Diphenylhydrazine	22000 U	22000
Nitrobenzene	11000 U	11000	4-Bromophenyl phenylether	22000 U	22000
Isophorone	11000 U	11000	Hexachlorobenzene	22000 U	22000
2-Nitrophenol	22000 U	22000	Pentachlorophenol	110000 U	110000
2,4-Dimethylphenol	11000 U	11000	Phenanthrene	150000	11000
Benzoic acid	280000 U	280000	Anthracene	130000	11000
Bis(2-chloroethoxy)methane	11000 U	11000	Carbazole	55000	11000
2,4-Dichlorophenol	22000 U	22000	Di-n-butyl phthalate	11000 U	11000
1,2,4-Trichlorobenzene	11000 U	11000	Fluoranthene	21000	11000
Naphthalene	200000	11000	Pyrene	38000	11000
4-Chloroaniline	11000 U	11000	Benzidine	280000 U	280000
Hexachlorobutadiene	11000 U	11000	Butylbenzylphthalate	11000 U	11000
4-Chloro-3-methylphenol	22000 U	22000	3,3'-Dichlorobenzidine	110000 U	110000
2-Methylnaphthalene	250000	11000	Benzo(a)anthracene	19000	11000
Hexachlorocyclopentadiene	22000 U	22000	Chrysene	28000	11000
2,4,6-Trichlorophenol	22000 U	22000	Bis(2-ethylhexyl)phthalate	11000 U	11000
2,4,5-Trichlorophenol	22000 U	22000	Di-n-octyl phthalate	11000 U	11000
2-Chloronaphthalene	11000 U	11000	Benzo(b)fluoranthene	15000 T	11000
2-Nitroaniline	22000 U	22000	Benzo(k)fluoranthene	15000 T	11000
Dimethyl phthalate	11000 U	11000	Benzo(a)pyrene	18000	11000
Acenaphthylene	28000	11000	Indeno(1,2,3-cd)pyrene	9200 J	11000
2,6-Dinitrotoluene	22000 U	22000	Dibenzo(a,h)anthracene	2600 J	11000
			Benzo(g,h,i)perylene	11000 J	11000

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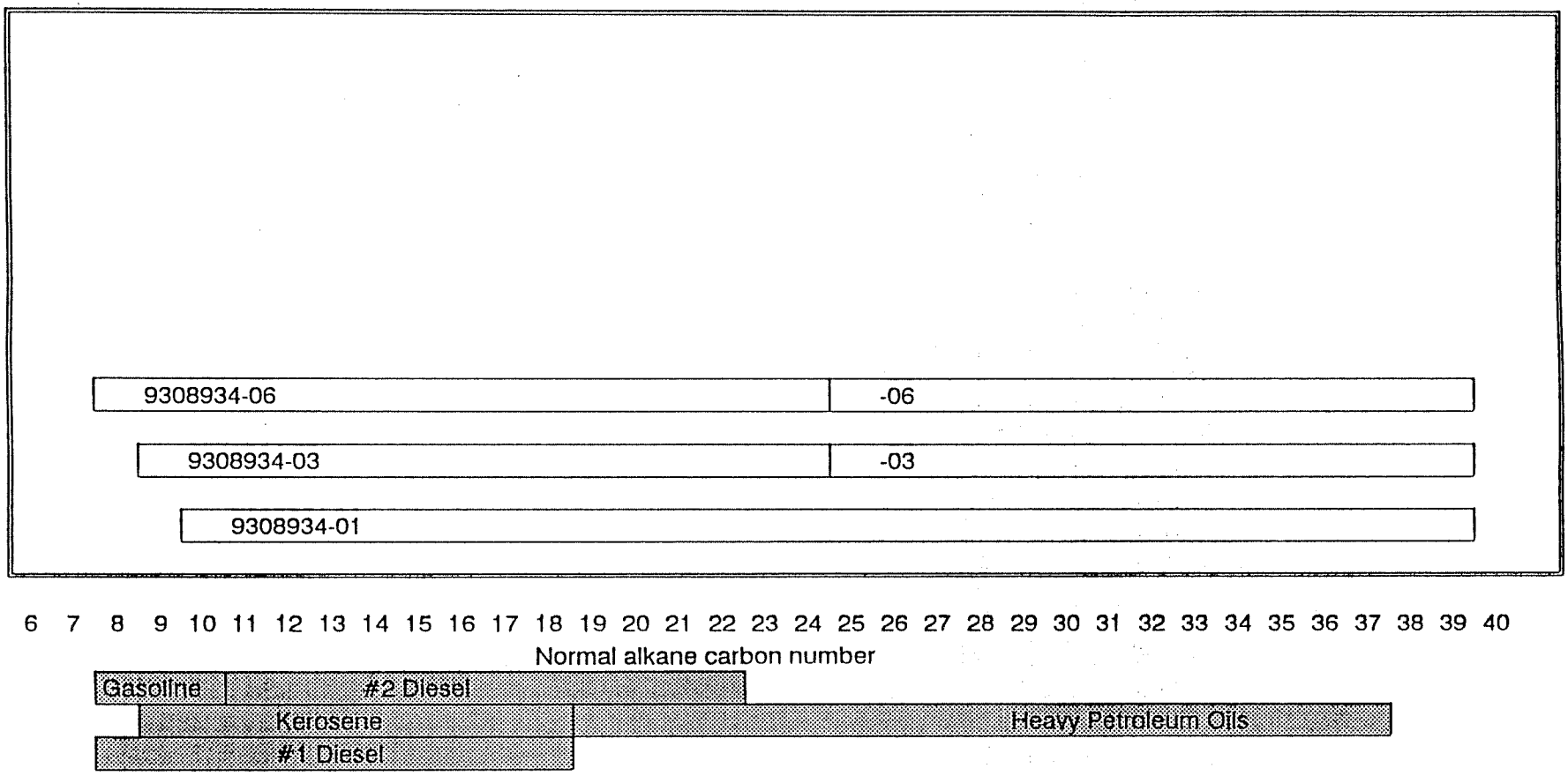
Chemistry, Microbiology, and Technical Services

GC/MS ABN surrogate recovery report for sample 9308934-06C

Surrogate	Percent Recovery	Limits: Min.	Max.
2-Fluorophenol	70	25	106
d5-Phenol	69	28	108
d4-2-Chlorophenol ...	74	20	130
d5-Nitrobenzene	78	32	102
2-Fluorobiphenyl	86	42	113
d4-1,2-Dichlorobenzene	83	20	130
2,4,6-Tribromophenol	85	22	128
d14-p-Terphenyl	68	48	124

* = Surrogate recovery outside control limits

Laucks Testing Laboratories
Petroleum Hydrocarbon Qualitative Assessment



This chart is a graphical summary of the elution range(s) of petroleum products present in the samples.

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Chemistry, Microbiology, and Technical Services

Certificate of Analysis

CLIENT: Environmental Services, Ltd.
5653 42nd Avenue S.W.
Seattle, WA 98136-1510

ATTN : Dick Lyon

Work Order# : 93-08-962
DATE RECEIVED : 08/30/93
DATE OF REPORT: 09/21/93
CLIENT JOB ID : 3062

Work ID : Duwamish West
Taken By : Client
Transported by: Hand Delivered
Type : Soil

SAMPLE IDENTIFICATION:

	Sample Description	Collection Date
01	865214387	08/28/93 10:10
02	865214388	08/28/93 10:14
03	865214390	08/28/93 10:20
04	643955217	08/28/93 11:12
05	543786217	08/28/93 11:26
06	543786219	08/28/93 11:35
07	543786220	08/28/93 11:40
08	874236900	08/28/93 12:50
09	874236902	08/28/93 12:55

FLAGGING:

The flag "U" indicates the analyte of interest was not detected, to the limit of detection indicated.

ATTACHMENTS:

Following presentation of sample results, the following appendices are attached to this report:

Appendix A: Method Blanks & Surrogate Recoveries Reports
Appendix B: WTPH Chromatograms
Appendix C: Chain-of-Custody

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Chemistry, Microbiology, and Technical Services

CLIENT : Environmental Services, Ltd.

Certificate of Analysis

Work Order# : 93-08-962

Unless otherwise instructed all samples will be discarded on 10/17/93

Respectfully submitted,
Laucks Testing Laboratories, Inc.

J. M. Owens

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

01

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308962-01 Date Collected: 08/28/93
Client Sample ID: 865214387 Date Received : 08/30/93

---------- WTPH-HCID ----------

Preparation Date: 08/30/93
Analysis Date : 09/02/93

	Result	
Gasoline Range Hydrocarbons...	<20.0	mg/kg AR
Diesel Range Hydrocarbons.....	>50.0	mg/kg AR
Lube Oil and Related Products.	>100	mg/kg AR

Surrogate recoveries	% Rec		LCL	UCL
Bromofluorobenzene	75.0		50	150
2-Fluorobiphenyl	192	*	50	150
p-Terphenyl	79.4		50	150

Comments: The surrogate 2-Fluorobiphenyl is above control limits due to matrix interference. There is a partial diesel pattern present. The heavy hydrocarbon range response is increased by diesel range hydrocarbons.

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

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02

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308962-02 Date Collected: 08/28/93
Client Sample ID: 865214388 Date Received : 08/30/93

---------- WTPH-HCID ----------

Preparation Date: 08/30/93
Analysis Date : 09/02/93

	Result	
Gasoline Range Hydrocarbons...	>20.0	mg/kg AR
Diesel Range Hydrocarbons.....	>50.0	mg/kg AR
Lube Oil and Related Products.	>100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	64.4	50	150
2-Fluorobiphenyl	644 *	50	150
p-Terphenyl	91.9	50	150

Comments: The surrogate 2-Fluorobiphenyl is above control limits due to matrix interference. There is a partial diesel pattern present. The heavy hydrocarbon range response is increased by diesel range hydrocarbons. There is no apparent gas pattern.

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

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03

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308962-03 Date Collected: 08/28/93
Client Sample ID: 865214390 Date Received : 08/30/93

---------- WTPH-HCID ----------

Preparation Date: 08/30/93
Analysis Date : 09/02/93

	Result	
Gasoline Range Hydrocarbons...	<20.0	mg/kg AR
Diesel Range Hydrocarbons.....	>50.0	mg/kg AR
Lube Oil and Related Products.	<100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	76.9	50	150
2-Fluorobiphenyl	83.8	50	150
p-Terphenyl	81.9	50	150

Comments: There is no apparent diesel pattern. The response is a result of an unresolved envelope of material in the diesel range.

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

04

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308962-04 Date Collected: 08/28/93
Client Sample ID: 643955217 Date Received : 08/30/93

---------- WTPH-HCID ----------

Preparation Date: 08/30/93
Analysis Date : 09/02/93

	Result	
Gasoline Range Hydrocarbons...	<20.0	mg/kg AR
Diesel Range Hydrocarbons.....	<50.0	mg/kg AR
Lube Oil and Related Products.	>100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	73.8	50	150
2-Fluorobiphenyl	81.3	50	150
p-Terphenyl	83.1	50	150

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

Laucks 85 years
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940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

05

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308962-05 Date Collected: 08/28/93
Client Sample ID: 543786217 Date Received : 08/30/93

---------- WTPH-HCID ----------

Preparation Date: 08/30/93
Analysis Date : 09/02/93

	Result	
Gasoline Range Hydrocarbons...	<20.0	mg/kg AR
Diesel Range Hydrocarbons.....	>50.0	mg/kg AR
Lube Oil and Related Products.	>100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	70.6	50	150
2-Fluorobiphenyl	101	50	150
p-Terphenyl	88.8	50	150

Comments: There is a partial diesel pattern present. The heavy hydrocarbon range response is increased by diesel range hydrocarbons.

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

Laucks 85 years
Testing Laboratories, Inc.
340 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

06

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308962-06 Date Collected: 08/28/93
Client Sample ID: 543786219 Date Received : 08/30/93

---------- WTPH-HCID ----------

Preparation Date: 08/30/93
Analysis Date : 09/02/93

	Result	
Gasoline Range Hydrocarbons...	>20.0	mg/kg AR
Diesel Range Hydrocarbons.....	>50.0	mg/kg AR
Lube Oil and Related Products.	>100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	71.3	50	150
2-Fluorobiphenyl	223 *	50	150
p-Terphenyl	81.9	50	150

Comments: The surrogate 2-Fluorobiphenyl is above control limits due to matrix interference. There is a partial diesel pattern present. The heavy hydrocarbon range response is increased by diesel range hydrocarbons. There is no apparent gas pattern.

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

Laucks 85 YEARS
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

07

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308962-07 Date Collected: 08/28/93
Client Sample ID: 543786220 Date Received : 08/30/93

---------- WTPH-HCID ----------

Preparation Date: 08/30/93
Analysis Date : 09/02/93

	Result	
Gasoline Range Hydrocarbons...	<20.0	mg/kg AR
Diesel Range Hydrocarbons.....	<50.0	mg/kg AR
Lube Oil and Related Products.	<100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	75.6	50	150
2-Fluorobiphenyl	81.9	50	150
p-Terphenyl	83.1	50	150

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

Laucks 85 years
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

08

Chemistry, Microbiology, and Technical Services

Lab Sample ID : 9308962-08 Date Collected: 08/28/93
Client Sample ID: 874236900 Date Received : 08/30/93

---------- WTPH-HCID ----------

Preparation Date: 08/30/93
Analysis Date : 09/02/93

	Result	
Gasoline Range Hydrocarbons...	<20.0	mg/kg AR
Diesel Range Hydrocarbons.....	<50.0	mg/kg AR
Lube Oil and Related Products.	>100	mg/kg AR

Surrogate recoveries	% Rec	LCL	UCL
Bromofluorobenzene	76.3	50	150
2-Fluorobiphenyl	83.8	50	150
p-Terphenyl	84.4	50	150

Analysis performed in accordance with Washington State Department of Ecology method WTPH-HCID.

Key: < = Result is less than WTPH-HCID screening level.
> = Result exceeded WTPH-HCID screening level.
AR = As received.

If result exceeds the screening level it is recommended that the appropriate quantitative analysis be performed.

APPENDIX B
FIELD METHODS
BORING AND WELL LOGS

APPENDIX B
FIELD METHODS
BORING AND WELL LOGS

INTRODUCTION

This appendix provides a description of the specific activities and sampling procedures for data collection during the October 1993 soil excavation activities and the January and February 1994 additional site characterization on the DSI property, located in Seattle, Washington. The first part of the discussion includes a description of the methods used evaluate soils during the soil excavation activities. The second section describes the methods used during the additional site characterization.

SOIL EXCAVATION ACTIVITIES

The following section describes the methods used to identify and collect soil samples which would represent the boundaries of soil containing petroleum hydrocarbons in the excavation.

Field Screening Methods

The boundaries of soil containing petroleum hydrocarbons were initially defined by screening methods. Two screening methods were used for this work:

- **Observations of Stained Soils**. Staining caused by petroleum products is usually black for waste oils; and

- **Headspace Readings**. Volatile fractions in the headspace of a soil sample container were measured with an HNU Photoionization Detector (PID). The HNU meter used in the field was equipped with a 11.7 eV lamp and calibrated in accordance with manufacturer's guidelines. About 4 ounces of soil were placed in a container, jar or bag, shaken and sealed for 2 to 3 minutes. The probe of the HNU meter was then placed into the headspace above the soil and the maximum reading taken as the headspace concentration.

Sample Collection Procedures

Soil samples collected from the excavation were discrete random samples collected using a clean stainless steel spoon. The sample aliquot was transferred into a standard clean 4-ounce sampling jar, which was capped,

labeled and placed in a cooler. When samples from the side wall of the excavation could not be collected in a safe manner, the bucket of the backhoe was used to scrape a small amount off the wall and then sampled with a clean stainless steel spoon as a discrete sample. A chain of custody form, identifying the analytical method to be used for each individual sample, was transferred with the cooler of samples to the analytical laboratory.

Field Decontamination Procedures

Prior to collection of each sample, sampling equipment which came into contact with the sample was brushed off and rinsed with deionized water. Gloves were used to prevent cross contamination of the samples. The bucket of the excavator was brushed out in between samples and the sample aliquot was taken from the middle of the bucket to ensure a representative sample from the sample location.

ADDITIONAL SITE CHARACTERIZATION

Hart Crowser's explorations at the site included drilling three 16.5-foot-deep soil borings and completing one of the soil borings as a 2-inch-diameter groundwater monitoring well. Also, one existing monitoring well (MW-4) that was buried during site regrading activities was located and excavated by DSI staff, then Hart Crowser brought the well up to grade and installed a new surface monument. Analyses and testing included field screening and laboratory chemical analysis of soil and groundwater samples.

Interpretive logs and the monitoring well construction diagram are presented in this appendix on Figures B-2 through B-4. Figure B-1 is a key to the exploration logs. Figure 3 in the report text shows the exploration locations.

Drilling and Sampling Procedures

This section presents the field procedures used for hollow-stem auger drilling and sampling at the project site.

Holt Drilling of Puyallup, Washington, drilled three soil borings and installed one groundwater monitoring well on January 11, 1994, using a hollow-stem auger rig.

Soil samples were collected at 2.5-foot-depth intervals. Discrete soil samples were collected using a pre-cleaned, split-spoon sampler. Samples

were collected by lowering the sampler through the hollow-stem augers to the bottom of the boring. The sampler was driven 18 inches into the soil using a 140-pound hammer. The number of blows required to drive the sampler were recorded to provide a measure of the relative density of granular soils or the consistency of cohesive soils.

At each sample interval the on-site hydrogeologist performed the following tasks:

- Visually classified the soil samples recovered from the borings using the system shown on Figure B-1, Key to Exploration Logs, and prepared a log of soils encountered;
- Filled laboratory-supplied, clean sampling containers with soil from the split-spoon sampler and placed them in a cooled ice chest; and
- Used the remaining portion of soil to half fill a clean plastic jar, covered the jar mouth with foil, and capped for subsequent head space vapor measurement.

Soil samples for organic vapor concentration measurements were collected as described above. To assess the presence of organic vapors in the soil samples, the following procedure was used:

- The sample jar was allowed to offgas for at least 10 minutes and equilibrate with ambient air temperature;
- An HNU PID was used to take the measurements;
- The sample jar lid was unscrewed, and the tip of the PID was inserted through the foil covering into the headspace area of the jar;
- The maximum organic vapor reading was recorded on the field log for the appropriate sample. These values are presented on the exploration logs.

Groundwater Monitoring Well Installation

Groundwater monitoring well MW-5 was constructed with 2-inch-diameter, flush-threaded schedule 40 PVC casing and screen. The following procedure was used to install the well:

- Ten feet of 0.010-inch machine slotted PVC screen was attached to blank casing and placed through the auger flights to the specified depth in the boring;

- As the auger flight were slowly withdrawn from the borehole, silica sand was placed in the annular space from the bottom of the boring to a height of 1 foot above the top of the screen;

- A bentonite seal was placed above the sand pack to within two feet of the ground surface; and

- The well was completed with steel flush-mount surface monument set in concrete to seal the surface.

Boreholes B-1 and B-2 were abandoned by backfilling with bentonite chips and placing concrete surface seals in accordance with Washington State requirements.

Monitoring Well Repair

During site regrading activities, monitoring well MW-4 was buried and paved over. The well was later relocated and excavated by DSI staff. Hart Crowser then brought the well up to grade by riveting a PVC extension onto the existing well casing, backfilled the excavation, and completed the well by securing it in a steel flush-mount surface monument set in concrete.

Groundwater Monitoring Well Development

Monitoring wells MW-1, MW-2, MW-4, and MW-5 were developed before they were sampled. Monitoring wells are developed to improve their hydraulic connection with the water-bearing zones screened, and to remove accumulated fine-grained materials. A 2-inch-diameter PVC swab was used to surge water through the well screen and filter pack, suspending sediments in the well casing water. Then, a stainless steel, bottom filling bailer was used to remove the sediment and groundwater in the screened section of the monitoring well. Surging and bailing were continued until 5 to 10 casing volumes were removed. Well development data was documented on Hart Crowser's Field Well Development Data form.

Groundwater Sampling

Groundwater samples were collected in accordance with methods outlined in EPA document number 600/2-85/104, "Practical Guide for Groundwater Sampling." The following section summarizes the groundwater sampling procedure:

- Prior to sampling, three casing volumes of water were removed from the well using a stainless steel bailer;
- Laboratory-supplied, clean sample containers were filled slowly to minimize turbulence, and were quickly placed in a cooled ice chest;
- Temperature, pH, and electrical conductivity were measured in the field and recorded; and
- Groundwater sampling data was documented on Hart Crowser's Groundwater Sampling Data form.

Immediately after sampling, samples were appropriately labeled and stored in a cooled ice box. The samples selected for laboratory analysis were confirmed with the Hart Crowser Project Manager. The Hart Crowser hydrogeologist on site during sampling, initiated chain of custody procedures, and ensured that they were strictly maintained throughout sample acquisition, storage, and transportation.

Copies of the chain of custody records that accompanied the soil and groundwater samples submitted for chemical analysis is included with the laboratory certificates in Appendix C.

Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual–manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.
Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 – 4	Very soft	0 – 2	<0.125
Loose	4 – 10	Soft	2 – 4	0.125 – 0.25
Medium dense	10 – 30	Medium stiff	4 – 8	0.25 – 0.5
Dense	30 – 50	Stiff	8 – 15	0.5 – 1.0
Very dense	>50	Very stiff	15 – 30	1.0 – 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptable moisture
Damp	Some perceptable moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptable moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 – 5
Slightly (clayey, silty, etc.)	5 – 12
Clayey, silty, sandy, gravelly	12 – 30
Very (clayey, silty, etc.)	30 – 50

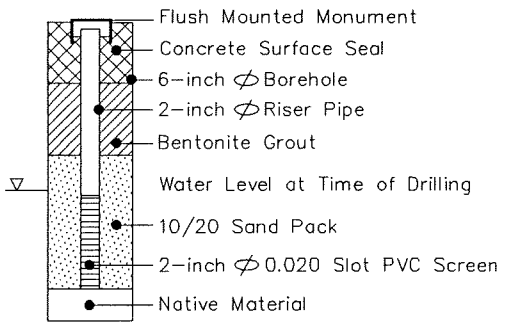
Legends

Sampling Test Symbols

BORING SAMPLES

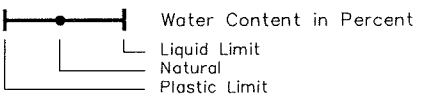
- ☒ Split Spoon
- ⧅ Shelby Tube
- ▥ Cuttings
- ◫ Core Run
- ✳ No Sample Recovery
- P Tube Pushed, Not Driven

Groundwater Observations



Test Symbols

GS	Grain Size Classification
CN	Consolidation
TUU	Triaxial Unconsolidated Undrained
TCU	Triaxial Consolidated Undrained
TCD	Triaxial Consolidated Drained
QU	QU
DS	Direct Shear
K	Permeabilty
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits
PID	Photoionization Reading
CA	Chemical Analysis



HARTCROWSER

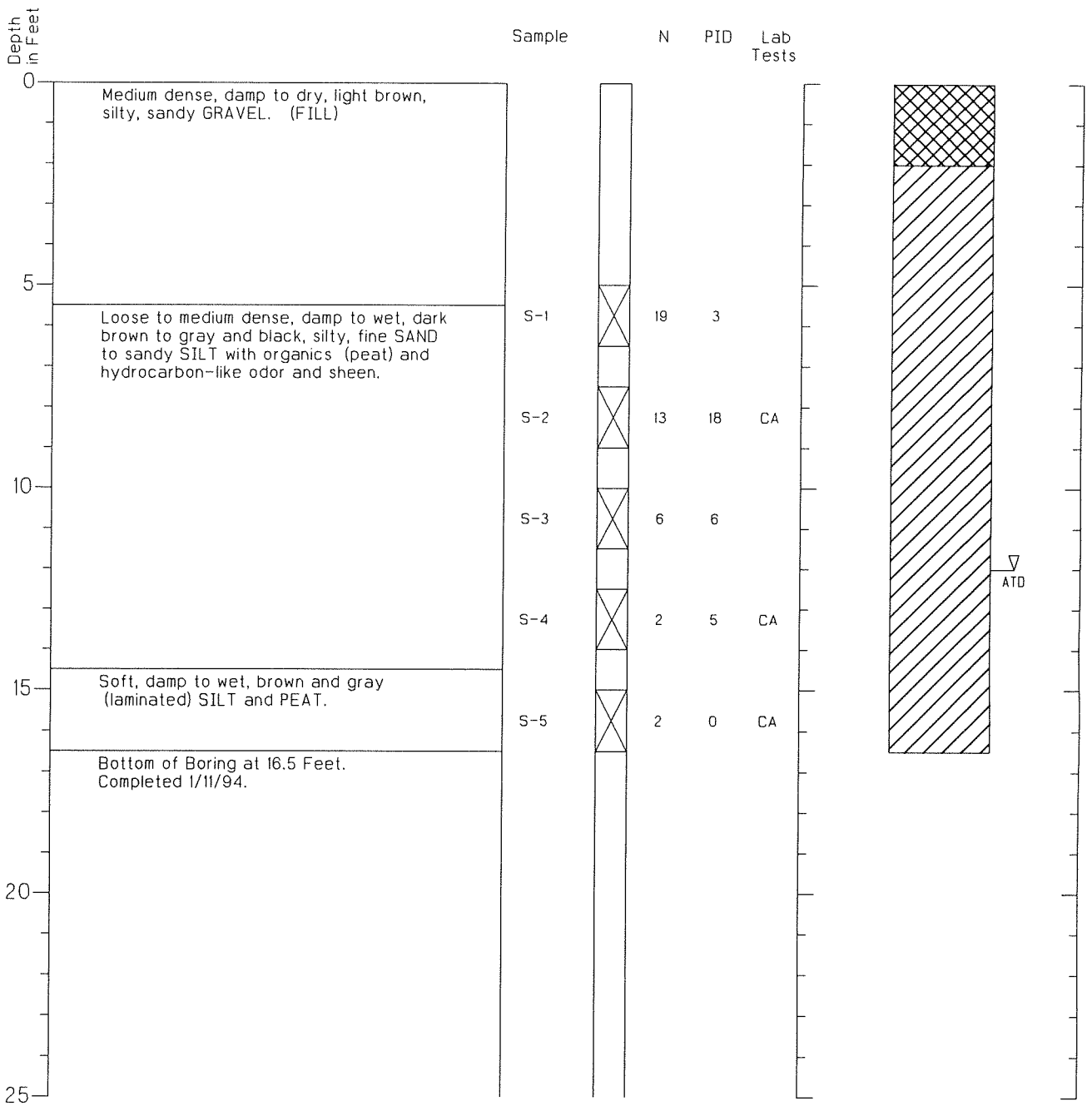
J–3763–04 6/94

Figure B–1

Boring Log B-1

Geologic Log

Backfilled Boring



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

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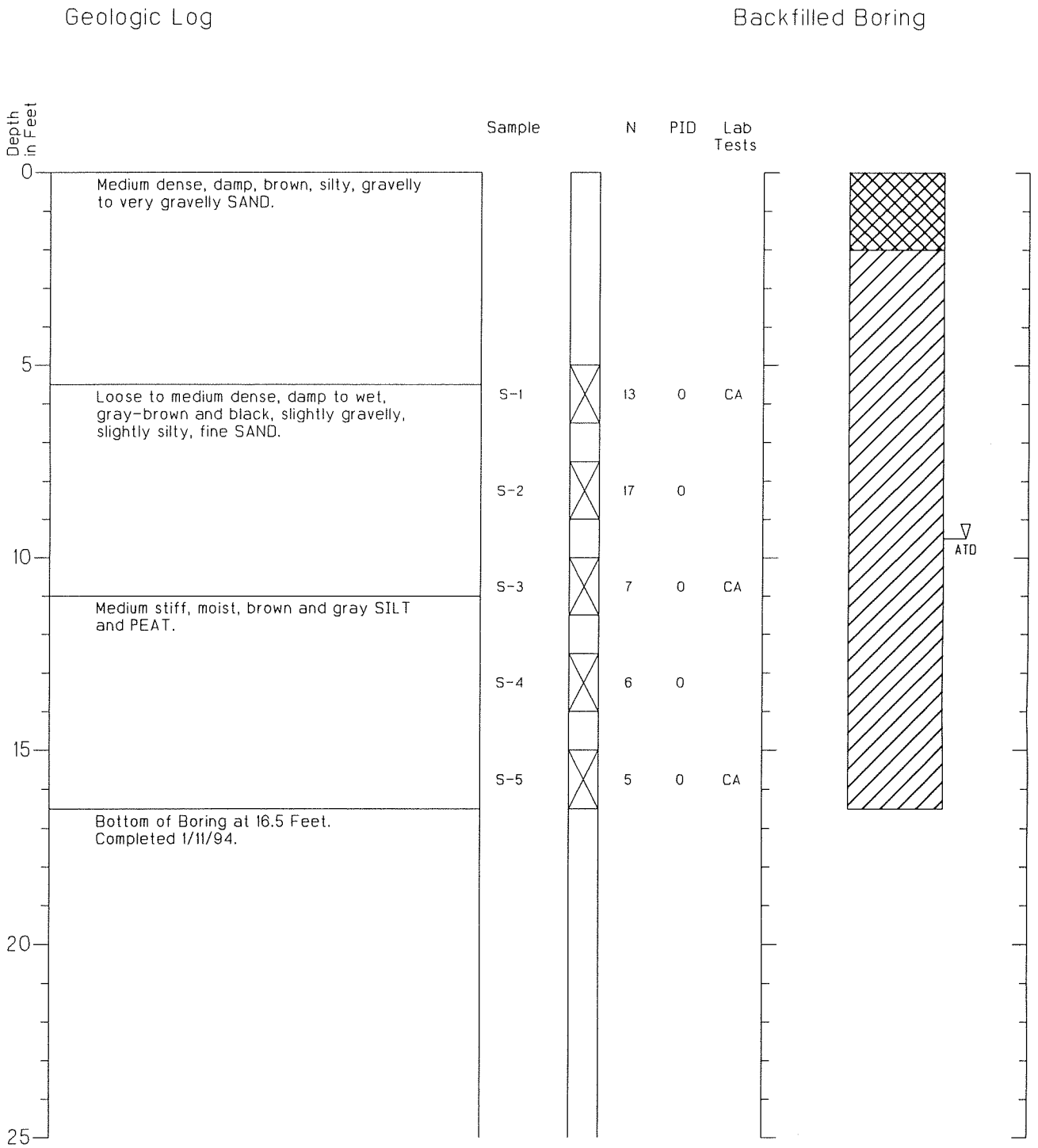
Figure B-2

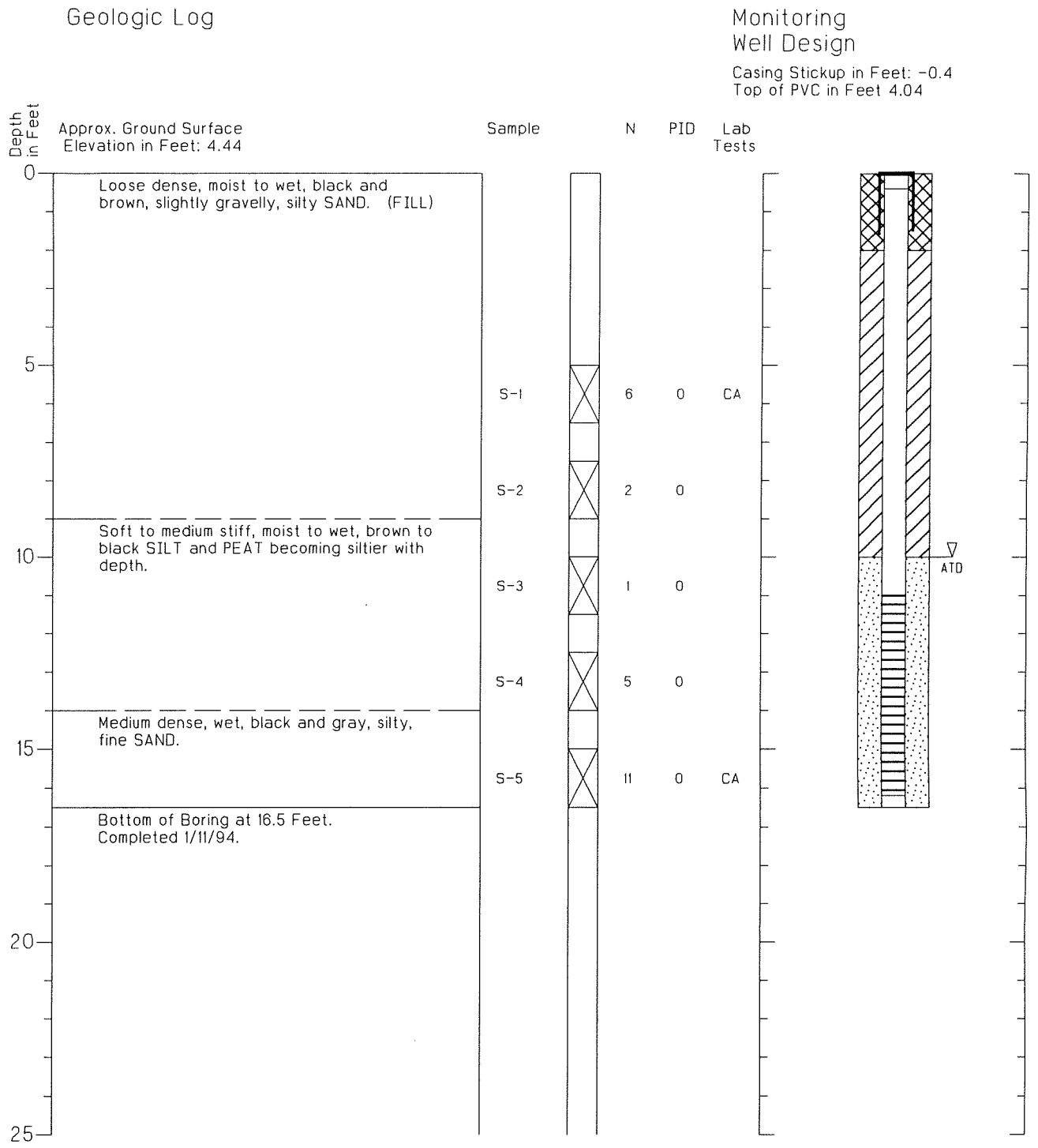
Boring Log B-2



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER
J-3763-04 1/94
Figure B-3

Boring Log and Construction Data for Monitoring Well MW-5



1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

J-3763-04 1/94

Figure B-4

APPENDIX C
DATA QUALITY REVIEW AND LABORATORY CERTIFICATES OF ANALYSIS

APPENDIX C
DATA QUALITY REVIEW AND LABORATORY CERTIFICATES OF ANALYSIS

This appendix presents the data quality review performed on the chemical analysis data from soil and groundwater samples collected from the Duwamish Shipyard. The data were reviewed with regard to the following, as appropriate to the particular analysis:

- Holding Times;
- Blanks;
- Detection Limits;
- Duplicates;
- Matrix Spike/Matrix Spike Duplicates (MS/MSDs); and
- Surrogate Recoveries.

Assessment of overall data quality was based upon quantitative (precision and accuracy) and qualitative (representativeness) quality assurance objectives.

For the purposes of this report, the quality review will be summarized in four sections. The data from soil and stockpile samples initially collected in October 1993, soil boring samples collected in January 1994, and two sets of monitoring well groundwater samples collected in February 1994 (2 packets).

Soil and Stockpile Samples Collected in October 1993

A total of sixteen soil samples were collected on October 26, 1993. Selected samples were analyzed by three different laboratories including: Hart Crowser Chemistry Lab; North Creek Analytical; and Analytical Technologies, Inc. (ATI). The data review for this section consisted of one review for each laboratory as described below.

Hart Crowser Chemistry Laboratory

Of the sixteen soil samples collected in October 1993, ten soil samples were analyzed by Hart Crowser Chemistry Laboratory for one or more of the following analyses; total petroleum hydrocarbons (TPH) by Ecology Method WTPH-HCID; TPH by Ecology Method WTPH-G; and benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8020.

In general, the overall data quality criteria were met, and no qualifiers were assigned. Xylene was detected in the method blank, but it was not

detected in the sample or the concentration in the sample was greater than 5 times the concentration in the blank; consequently no qualifiers were assigned. Additionally a few surrogates were out of control limits due to matrix interferences, but because the MS/MSD results and additional surrogates were in control, no qualifiers were assigned.

North Creek Analytical

Of the sixteen soil samples collected in October 1993, ten soil samples were submitted to North Creek Analytical for the following analyses: Ecology Methods WTPH-D and WTPH-418.1 modified.

In general, the overall data quality criteria were met, and no qualifiers were assigned. Surrogate recoveries for 2 samples were not available due to coelusion with other organics. No qualifiers were assigned since the MS/MSD results were acceptable.

Analytical Technologies, Inc.

Of the sixteen soil samples collected in October 1993, seven soil samples were submitted to ATI for semivolatile analysis by EPA Method 8270. The quality control criteria were met for all samples, and the data are acceptable for use as reported. The tentatively identified compounds were qualified as estimated due to presumptive evidence (JN).

Soil Boring Analytical Data Collected in January 1994

Eight soil samples from borings were submitted to ATI in Renton, Washington for analysis. The samples were analyzed for polynuclear aromatic hydrocarbons by EPA Method 8310, TPH by Ecology method WTPH-D, and total organic carbon (TOC). Two samples were also prepared using the synthetic precipitation leaching procedure (SPLC) and analyzed for the same analytes.

In general, the overall data quality criteria were met, and no qualifiers were assigned. During the 8310 and WTPH-D analyses, sample B-1,S-2 was diluted, causing the surrogate recovery to be out of control limits, and the detection limits were elevated. Since the MS/MSD results were acceptable, no qualifiers were assigned.

Monitoring Well Groundwater Data Collected in February 1994

Groundwater samples were collected from monitoring wells MW-1, MW-2, MW-4, and MW-5 on February 8 and 14, 1994, and submitted to ATI for analysis. The analysis was completed in two cases; ATI case numbers are

9402-125 and 9402-077. The samples were analyzed for PAHs (EPA Method 8310), BTEX (EPA Method 8020), and TPH (Ecology Method WTPH-D).

Case 9402-077

In general, the overall quality control criteria were met for PAH and TPH analyses. A project-specific MS/MSD was not analyzed with the 8020 analysis. The blank spike and duplicate percent recoveries were within control limits. The MS/MSD used was not representative of the project samples and contained higher levels of the analytes. Therefore, no qualifiers were assigned based on the MS/MSD results. The data are acceptable for use as reported.

Case 9402-125

The quality control criteria were met for all analyses. Therefore, the data are acceptable for use as reported.

Based on the information provided by the laboratory and gathered during this review, the data, as reported are acceptable for use for the purposes of this project.

QC'd 3/23/94

Analytical Technologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335
Karen L. Mixon, Laboratory Manager

ATI I.D. # 9402-125

March 8, 1994

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle WA 98102-3699

Attention : Victor Melbardis

Project Number : 3763-04

Project Name : Alaska Marine Lines

ear Mr. Melbardis:

On February 15, 1994, Analytical Technologies, Inc. (ATI), received five samples for analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Sincerely,

Tamara B. Jerome
Project Manager

TBJ/hal/ff

Enclosure

Analytical Technologies, Inc.

ATI I.D. # 9402-125

SAMPLE CROSS REFERENCE SHEET

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9402-125-1	MW-1	02/14/94	WATER
9402-125-2	MW-2	02/14/94	WATER
9402-125-3	MW-4	02/14/94	WATER
9402-125-4	MW-5	02/14/94	WATER
9402-125-5	TRIP BLANK	N/A	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	5

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125

ANALYTICAL SCHEDULE

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

ANALYSIS	TECHNIQUE	REFERENCE	LAB
POLYNUCLEAR AROMATIC HYDROCARBONS	HPLC/UV/FLUOR	EPA 8310	R
BETX	GC/PID	EPA 8020	R
TOTAL PETROLEUM HYDROCARBONS	GC/FID	WA DOE WTPH-D	R
TOTAL DISSOLVED SOLIDS	GRAVIMETRIC	EPA 160.1	R

R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PNR = ATI - Pensacola
FC = ATI - Fort Collins
UB = Subcontract

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

CASE NARRATIVE: POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS

Four (4) water samples were received by ATI on February 15, 1994, for the following analysis: EPA method 8310.

All corresponding quality assurance and quality control results defined as blank spike/blank spike duplicate (BS/BSD), method blank and surrogate recoveries were within the established control limits.

Analytical Technologies, Inc.

ATI I.D. # 9402-125

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/17/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 02/23/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.50
ACENAPHTHYLENE	<1.0
1-METHYLNAPHTHALENE	<0.50
2-METHYLNAPHTHALENE	<0.50
ACENAPHTHENE	<0.50
FLUORENE	<0.10
PHENANTHRENE	<0.050
ANTHRACENE	<0.050
FLUORANTHENE	<0.10
PYRENE	<0.10
BENZO(A)ANTHRACENE	<0.10
CHRYSENE	<0.10
BENZO(B)FLUORANTHENE	<0.10
BENZO(K)FLUORANTHENE	<0.10
BENZO(A)PYRENE	<0.10
DIBENZO(A,H)ANTHRACENE	<0.20
BENZO(G,H,I)PERYLENE	<0.10
INDENO(1,2,3-CD)PYRENE	<0.10

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	72 ✓	33 - 123

Analytical Technologies, Inc.

ATI I.D. # 9402-125-1

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/17/94
CLIENT I.D.	: MW-1	DATE ANALYZED	: 02/23/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.48
ACENAPHTHYLENE	<0.96
1-METHYLNAPHTHALENE	<0.48
2-METHYLNAPHTHALENE	<0.48
ACENAPHTHENE	0.88
FLUORENE	<0.096
PHENANTHRENE	0.11
ANTHRACENE	<0.048
FLUORANTHENE	<0.096
PYRENE	<0.096
BENZO(A)ANTHRACENE	<0.096
CHRYSENE	<0.096
BENZO(B)FLUORANTHENE	<0.096
BENZO(K)FLUORANTHENE	<0.096
BENZO(A)PYRENE	<0.096
DIBENZO(A,H)ANTHRACENE	<0.19
BENZO(G,H,I)PERYLENE	<0.096
INDENO(1,2,3-CD)PYRENE	<0.096

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	82 ✓	33 - 123

Analytical Technologies, Inc.

ATI I.D. # 9402-125-2

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/17/94
CLIENT I.D.	: MW-2	DATE ANALYZED	: 02/23/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.48
ACENAPHTHYLENE	<0.96
1-METHYLNAPHTHALENE	<0.48
2-METHYLNAPHTHALENE	<0.48
ACENAPHTHENE	<0.48
FLUORENE	<0.096
PHENANTHRENE	<0.048
ANTHRACENE	<0.048
FLUORANTHENE	<0.096
PYRENE	<0.096
BENZO(A)ANTHRACENE	<0.096
CHRYSENE	<0.096
BENZO(B)FLUORANTHENE	<0.096
BENZO(K)FLUORANTHENE	<0.096
BENZO(A)PYRENE	<0.096
DIBENZO(A,H)ANTHRACENE	<0.19
BENZO(G,H,I)PERYLENE	<0.096
INDENO(1,2,3-CD)PYRENE	<0.096

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	82 ✓	33 - 123

Analytical Technologies, Inc.

ATI I.D. # 9402-125-3

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/17/94
CLIENT I.D.	: MW-4	DATE ANALYZED	: 02/23/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	0.97
ACENAPHTHYLENE	1.4
1-METHYLNAPHTHALENE	0.55
2-METHYLNAPHTHALENE	4.1
ACENAPHTHENE	2.8
FLUORENE	3.3
PHENANTHRENE	1.2
ANTHRACENE	0.15
FLUORANTHENE	<0.096
PYRENE	0.13
BENZO(A)ANTHRACENE	<0.096
CHRYSENE	<0.096
BENZO(B)FLUORANTHENE	<0.096
BENZO(K)FLUORANTHENE	<0.096
BENZO(A)PYRENE	<0.096
DIBENZO(A,H)ANTHRACENE	<0.19
BENZO(G,H,I)PERYLENE	<0.096
INDENO(1,2,3-CD)PYRENE	<0.096

SURROGATE PERCENT RECOVERY			LIMITS
2-CHLOROANTHRACENE	81	✓	33 - 123

Analytical Technologies, Inc.

ATI I.D. # 9402-125-4

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/17/94
CLIENT I.D.	: MW-5	DATE ANALYZED	: 02/23/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.48
ACENAPHTHYLENE	<0.96
1-METHYLNAPHTHALENE	<0.48
2-METHYLNAPHTHALENE	<0.48
ACENAPHTHENE	<0.48
FLUORENE	<0.096
PHENANTHRENE	<0.048
ANTHRACENE	<0.048
FLUORANTHENE	<0.096
PYRENE	<0.096
BENZO(A)ANTHRACENE	<0.096
CHRYSENE	<0.096
BENZO(B)FLUORANTHENE	<0.096
BENZO(K)FLUORANTHENE	<0.096
BENZO(A)PYRENE	<0.096
DIBENZO(A,H)ANTHRACENE	<0.19
BENZO(G,H,I)PERYLENE	<0.096
INDENO(1,2,3-CD)PYRENE	<0.096

SURROGATE PERCENT RECOVERY			LIMITS
2-CHLOROANTHRACENE	75	√	33 - 123

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
EPA METHOD : 8310

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 02/17/94
DATE ANALYZED : 02/23/94
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<1.00	20.0	15.8	79	15.9	80	1
PHENANTHRENE	<0.0500	2.00	1.69	85	1.70	85	1
PYRENE	<0.100	2.00	1.81	91	1.82	91	1
BENZO(K)FLUORANTHENE	<0.100	2.00	1.79	90	1.80	90	1
DIBENZO(A,H)ANTHRACENE	<0.200	2.00	1.91	96	1.98	99	4

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	32 - 131	32
PHENANTHRENE	58 - 120	30
PYRENE	50 - 120	30
BENZO(K)FLUORANTHENE	50 - 120	29
DIBENZO(A,H)ANTHRACENE	56 - 129	26

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	78	76	33 - 123

Analytical Technologies, Inc.

ATI I.D. # 9402-125

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 02/15/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	105	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9402-125

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 02/16/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	103	76 - 120

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125-1

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-1	DATE ANALYZED	: 02/15/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
ETHYLBENZENE	<0.50
TOLUENE	<0.50
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	105 /	76 - 120

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125-2

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-2	DATE ANALYZED	: 02/15/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
ETHYLBENZENE	<0.50
TOLUENE	<0.50
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	106	76 - 120

Analytical**Technologies**, Inc.

ATI I.D. # 9402-125-3

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-4	DATE ANALYZED	: 02/15/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
ETHYLBENZENE	<0.50
TOLUENE	<0.50
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	105 ✓	76 - 120

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125-4

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-5	DATE ANALYZED	: 02/16/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
ETHYLBENZENE	<0.50
TOLUENE	<0.50
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY			LIMITS
BROMOFLUOROBENZENE	99	√	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9402-125-5

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: N/A
CLIENT I.D.	: TRIP BLANK	DATE ANALYZED	: 02/15/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY			LIMITS
BROMOFLUOROBENZENE	99	√	76 - 120

AnalyticalTechnologies,Inc.

ATI I.D. # 9402-125

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
EPA METHOD : 8020 (BETX)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 02/15/94
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.500	20.0	19.6	98	N/A	N/A	N/A
TOLUENE	<0.500	20.0	19.8	99	N/A	N/A	N/A
TOTAL XYLENES	<0.500	40.0	38.9	97	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
BENZENE	89 - 110	10
TOLUENE	89 - 113	10
TOTAL XYLENES	89 - 111	10

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	104	N/A	76 - 120

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
EPA METHOD : 8020 (BETX)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 02/16/94
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.500	20.0	19.5	98	N/A	N/A	N/A
TOLUENE	<0.500	20.0	19.7	99	N/A	N/A	N/A
TOTAL XYLENES	<0.500	40.0	38.9	97	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
BENZENE	89 - 110	10
TOLUENE	89 - 113	10
TOTAL XYLENES	89 - 111	10

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	102	N/A	76 - 120

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125

BETX - GASOLINE
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
EPA METHOD : 8020 (BETX)

SAMPLE I.D. # : 9402-123-1
DATE EXTRACTED : N/A
DATE ANALYZED : 02/15/94
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	4.54	20.0	23.6	95	23.3	94	1
TOLUENE	249	20.0	256	35G	245	20G	4
TOTAL XYLENES	150	40.0	182	80G	177	68G	3 ✓

CONTROL LIMITS	% REC.	RPD
BENZENE	86 - 113	10
TOLUENE	87 - 114	10
TOTAL XYLENES	85 - 113	10

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	105	105	76 - 120

G = Out of limits due to high level of target analytes in sample.

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/16/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 02/16/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	100	50 - 150

√

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/16/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 02/17/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	98	50 - 150

✓

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125-1

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/16/94
CLIENT I.D.	: MW-1	DATE ANALYZED	: 02/17/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	104	50 - 150

Analytical**Technologies,**Inc.

ATI I.D. # 9402-125-2

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/16/94
CLIENT I.D.	: MW-2	DATE ANALYZED	: 02/17/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	0.39
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
-TERPHENYL	92	50 - 150

√

Analytical Technologies, Inc.

ATI I.D. # 9402-125-3

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/16/94
CLIENT I.D.	: MW-4	DATE ANALYZED	: 02/17/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	0.37
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	98 √	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 9402-125-4

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/14/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/15/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/16/94
CLIENT I.D.	: MW-5	DATE ANALYZED	: 02/17/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	70 √	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 9402-125

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 02/16/94
DATE ANALYZED : 02/17/94
UNITS : mg/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	<0.250	2.50	2.22	89	2.06	82	7
CONTROL LIMITS				% REC.			RPD
DIESEL				70 - 114			20
SURROGATE RECOVERIES		SPIKE		DUP. SPIKE		LIMITS	
O-TERPHENYL		100		95		50 - 150	

Analytical Technologies, Inc.

ATI I.D. # 9402-125

GENERAL CHEMISTRY ANALYSIS

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

PARAMETER	DATE PREPARED	DATE ANALYZED
TOTAL DISSOLVED SOLIDS	02/16/94	02/17/94

Analytical Technologies, Inc.

ATI I.D. # 9402-125

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES UNITS : mg/L

ATI I.D. #	CLIENT I.D.	TOTAL DISSOLVED SOLIDS
9402-125-1	MW-1	340
9402-125-2	MW-2	77
9402-125-3	MW-4	130
9402-125-4	MW-5	1100
METHOD BLANK	-	<10

✓

Analytical Technologies, Inc.

ATI I.D. # 9402-125

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES UNITS : mg/L

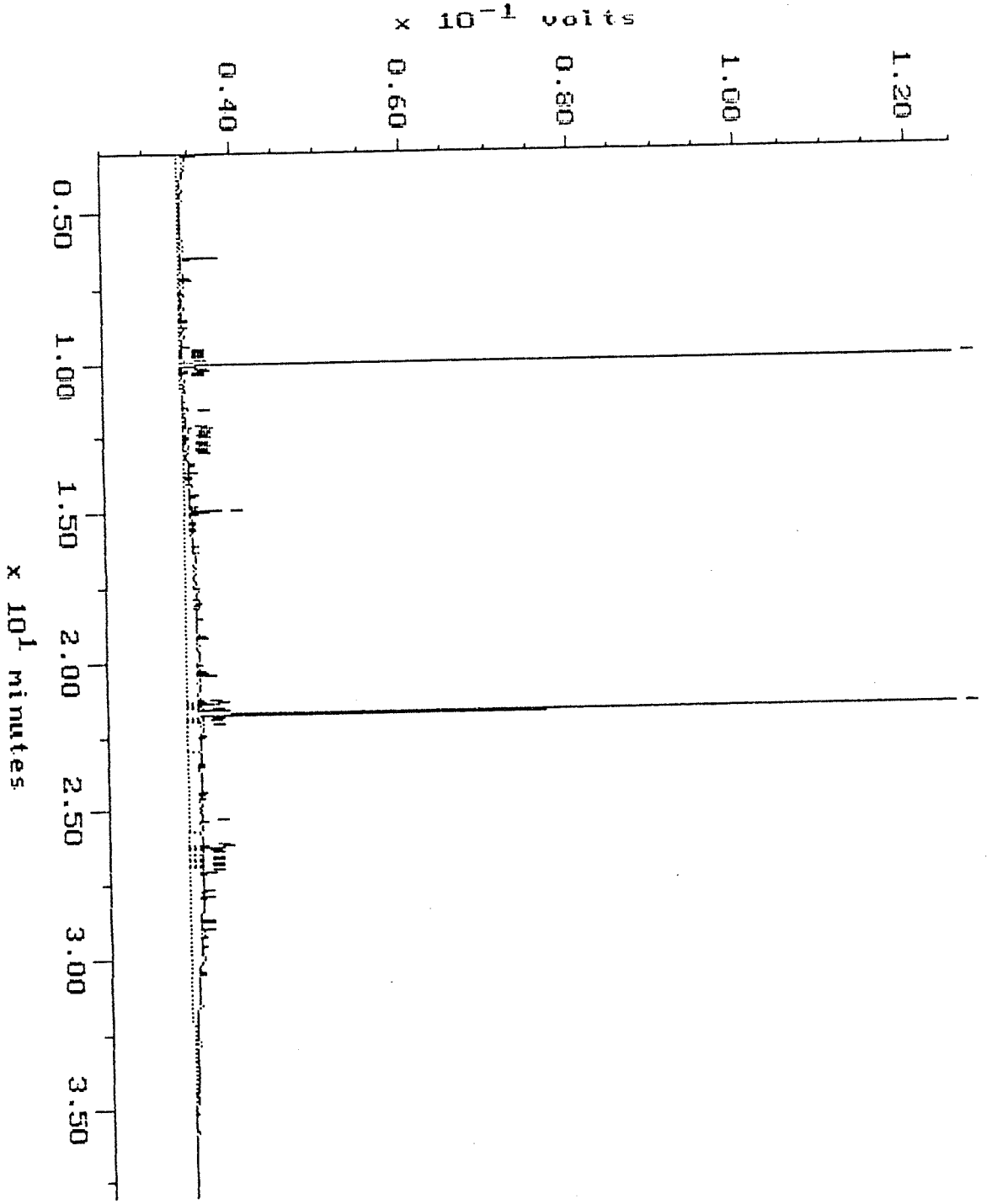
PARAMETER	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
TOTAL DISSOLVED SOLIDS	BLANK	<10	N/A	N/A	404	388	104 ✓
TOTAL DISSOLVED SOLIDS	9402-125-2	77	83	8	N/A	N/A	N/A

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

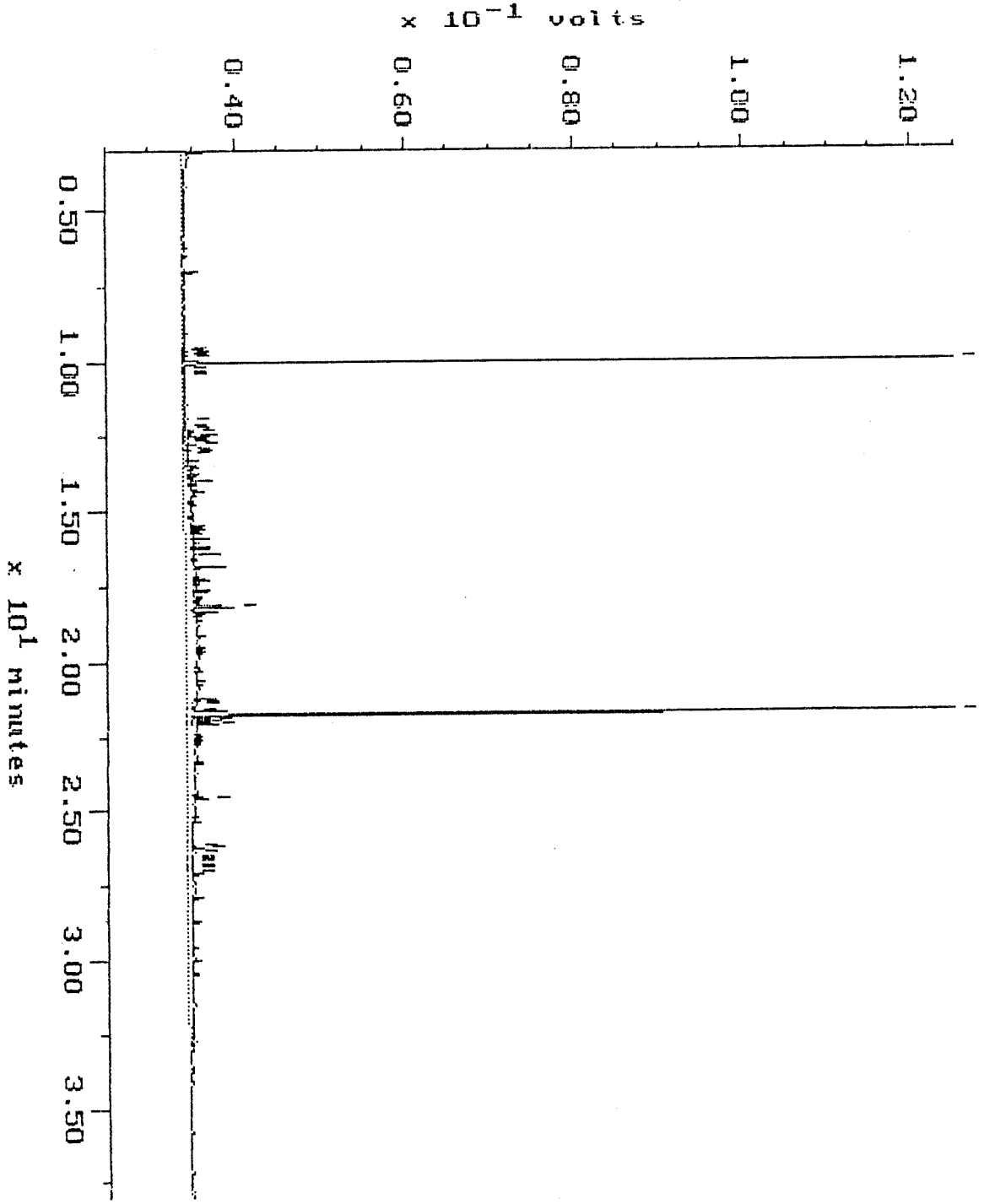
$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Sample Result} - \text{Duplicate Result})|}{\text{Average Result}} \times 100$$

WA[illegible]WTPH-D

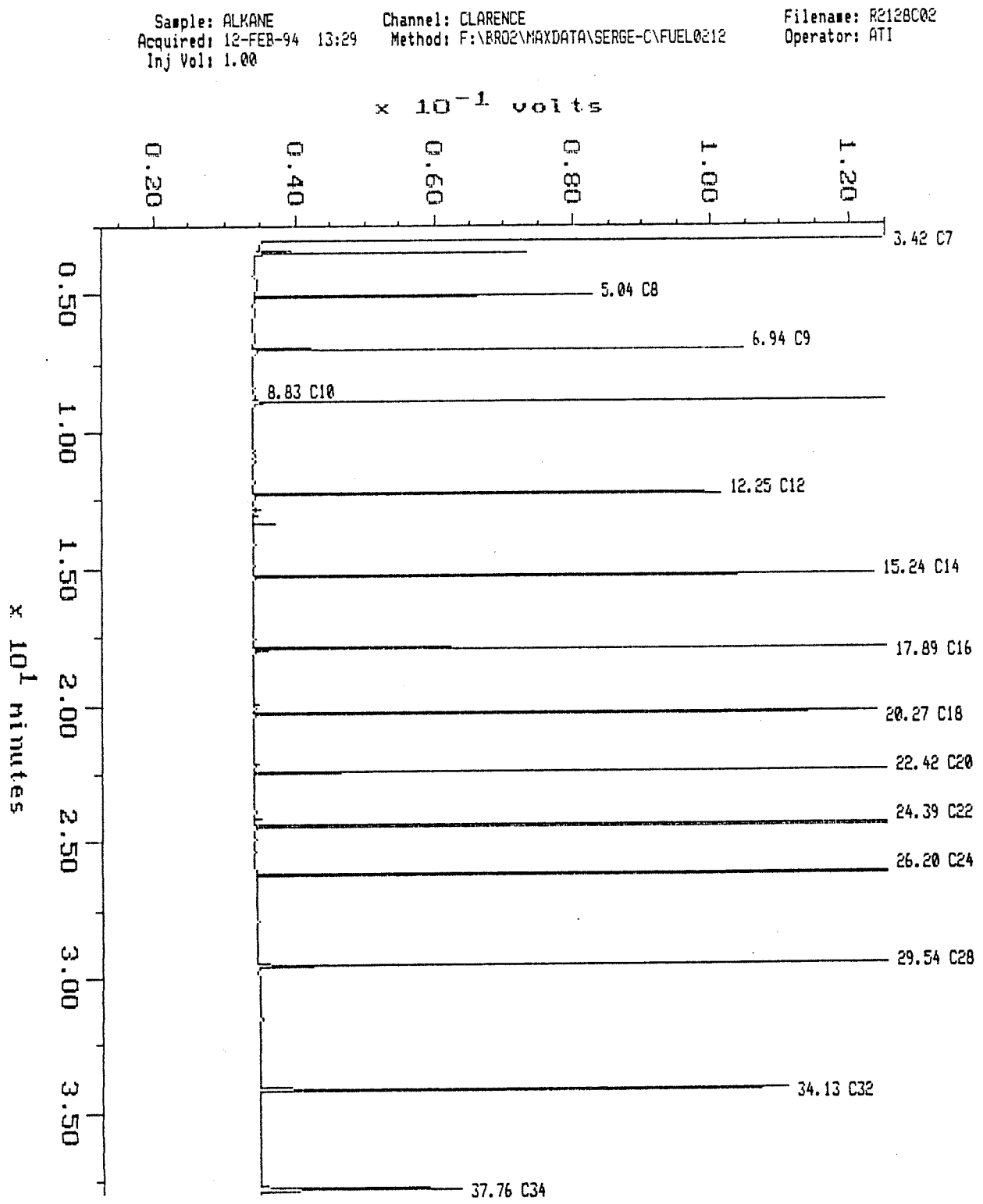
Sample: 9402-123-2 Channel: CLARENCE Filename: R217D07
Acquired: 17-FEB-94 16:03 Method: F:\BRD2\MAXDATA\SERGE-C\FUEL0217 Operator: ATI
Comments: ATI RUSH FUELS: DEDICATED TO QUALITY CLIENT SERVICE



Sample: 9402-125-3 Channel: CLARENCE Filename: R2178C08
Acquired: 17-FEB-94 16:50 Method: F:\BRO2\MAXDATA\SERGE-C\FUEL0217 Operator: ATI
Comments: ATI RUSH FUELS: DEDICATED TO QUALITY CLIENT SERVICE

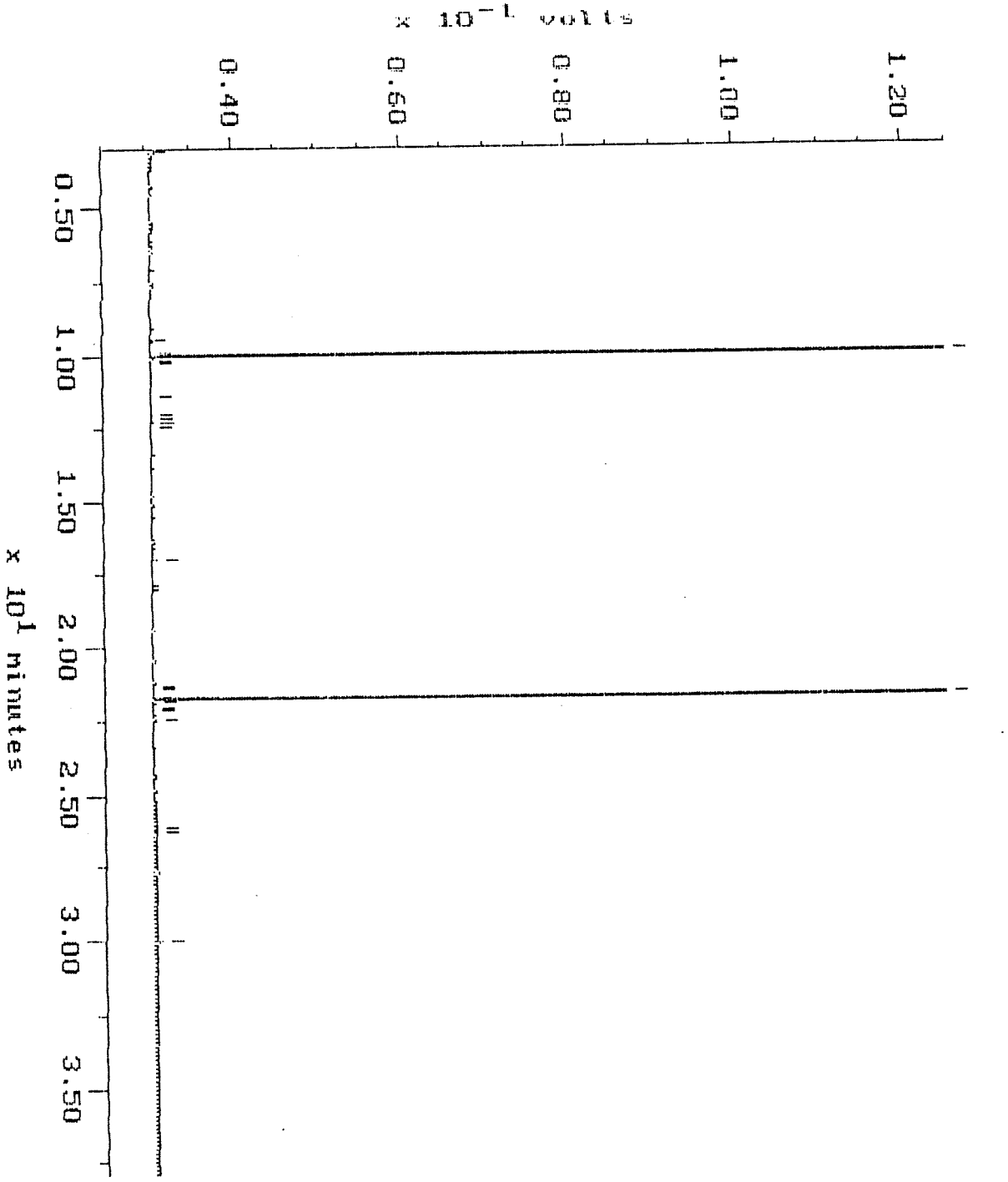


Alkane


Sample: ALKANE
Acquired: 12-FEB-94 13:29
Inj Vol: 1.00
Channel: CLARENCE
Method: F:\BRO2\MAXDATA\SERGE-C\FUEL0212
Filename: R2128C02
Operator: ATI
x 10⁻¹ volts
0.20
0.40
0.60
0.80
1.00
1.20
x 10¹ minutes
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3.42 C7
5.04 C8
6.94 C9
8.83 C10
12.25 C12
15.24 C14
17.89 C16
20.27 C18
22.42 C20
24.39 C22
26.20 C24
29.54 C28
34.13 C32
37.76 C34

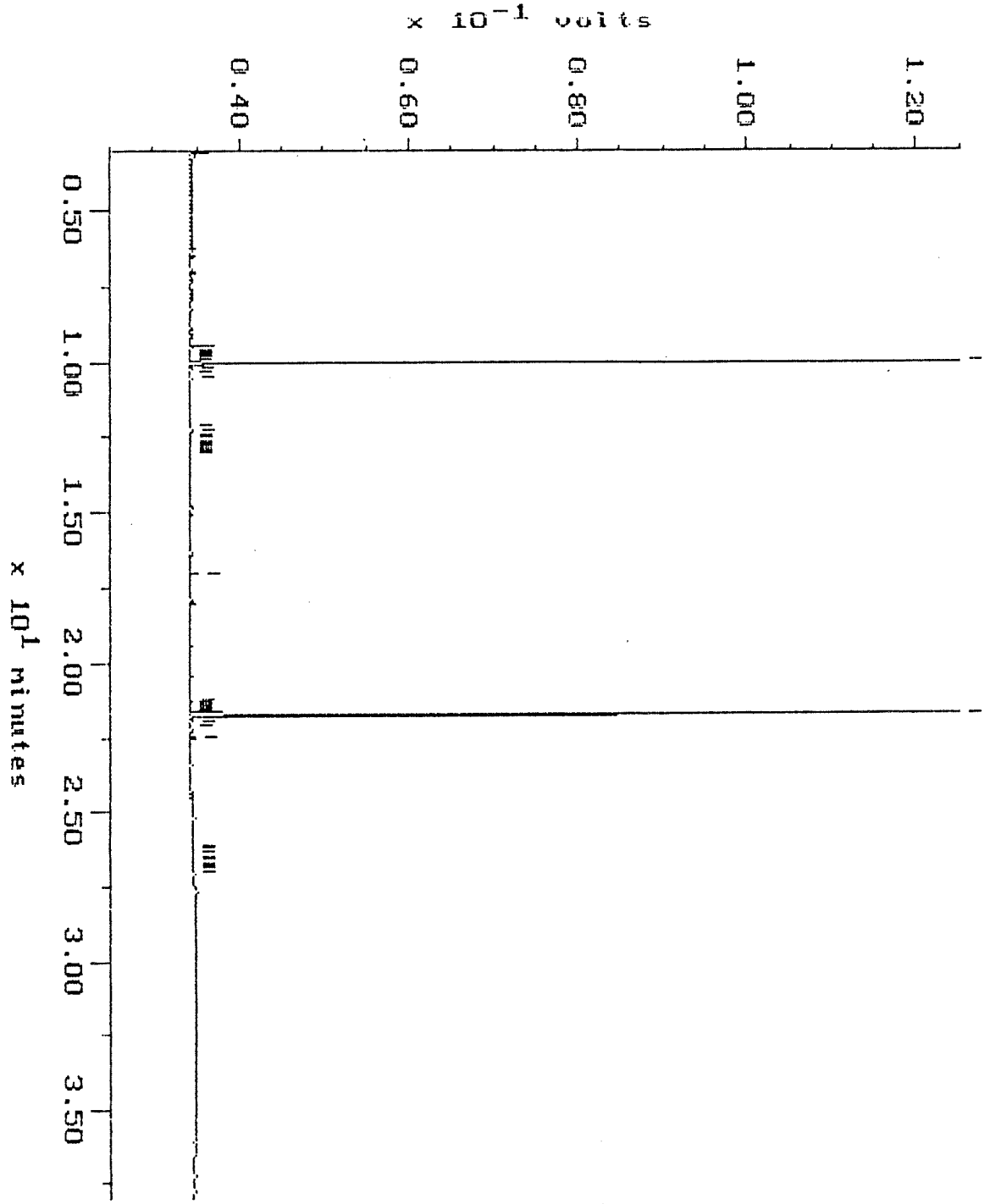
Blank

Sample: WRB 02-16 Channel: NANCY Filename: R2160N05
Acquired: 16-FEB-94 18:36 Method: F:\BR02\MAXDATA\NANCY\FUEL0216 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



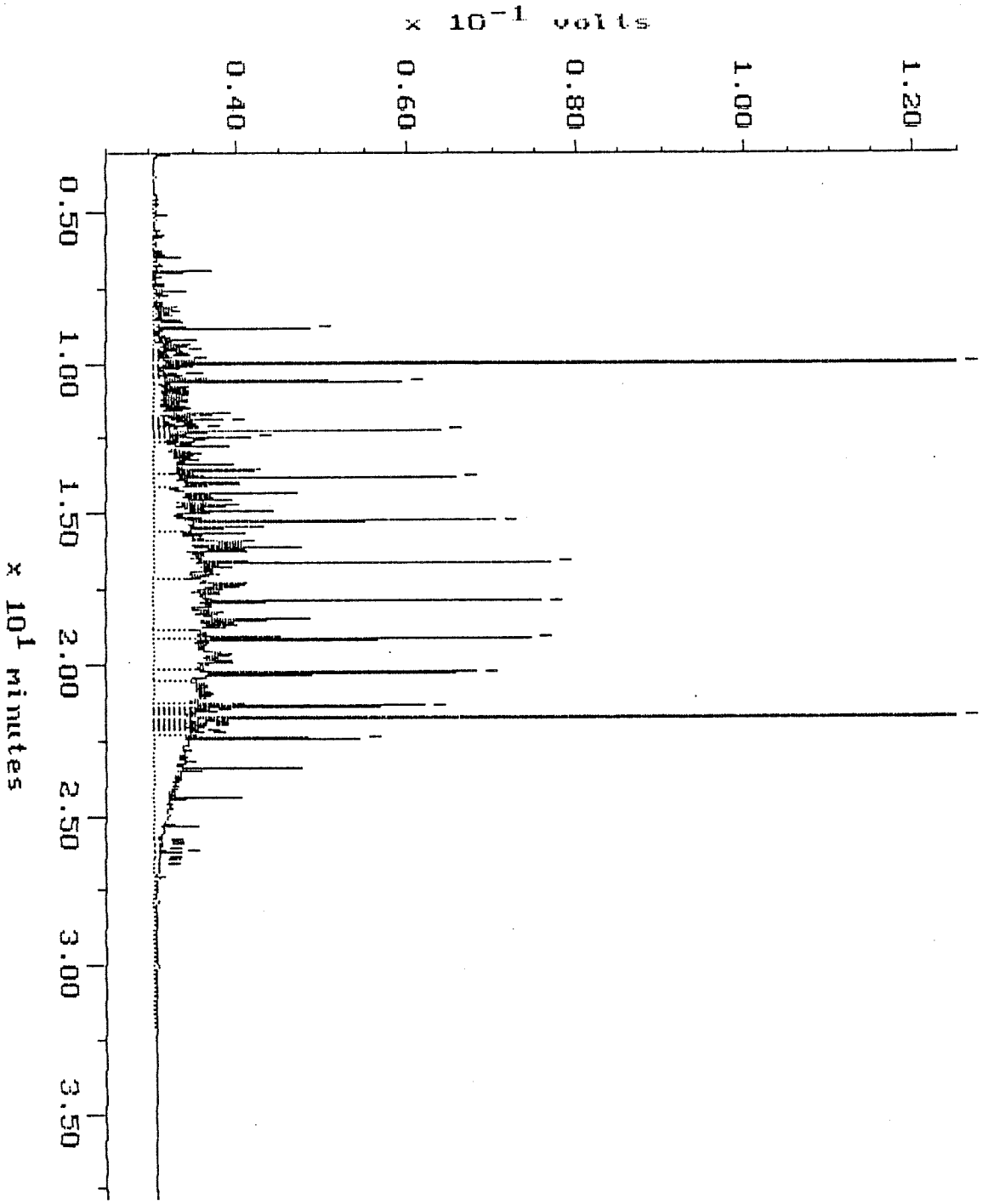
Blank

Sample: WRB 02-16 Channel: CLARENCE Filename: R2170003
Acquired: 17-FEB-94 14:31 Method: F:\BRU2\MAXDATA\SERGE-C\FUEL0217 Operator: AFI
Comments: AFI RUSH FUELS: DEDICATED TO QUALITY CLIENT SERVICE



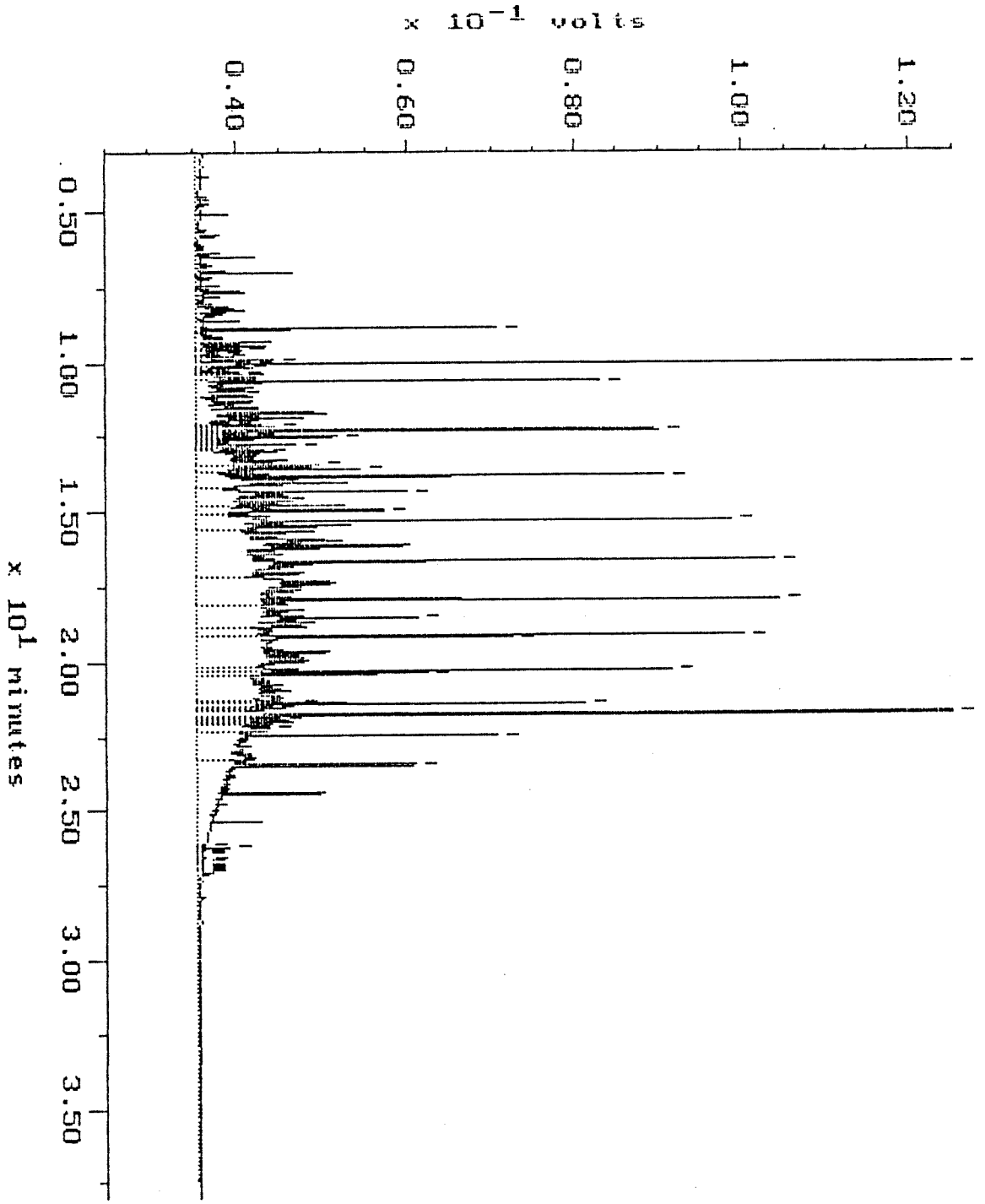
Continuing Calibration

Sample: D 500 Channel: NANCY Filename: R2168N02
Acquired: 16-FEB-94 16:03 Method: F:\BRO2\MAXDATA\NANCY\FUEL0216 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



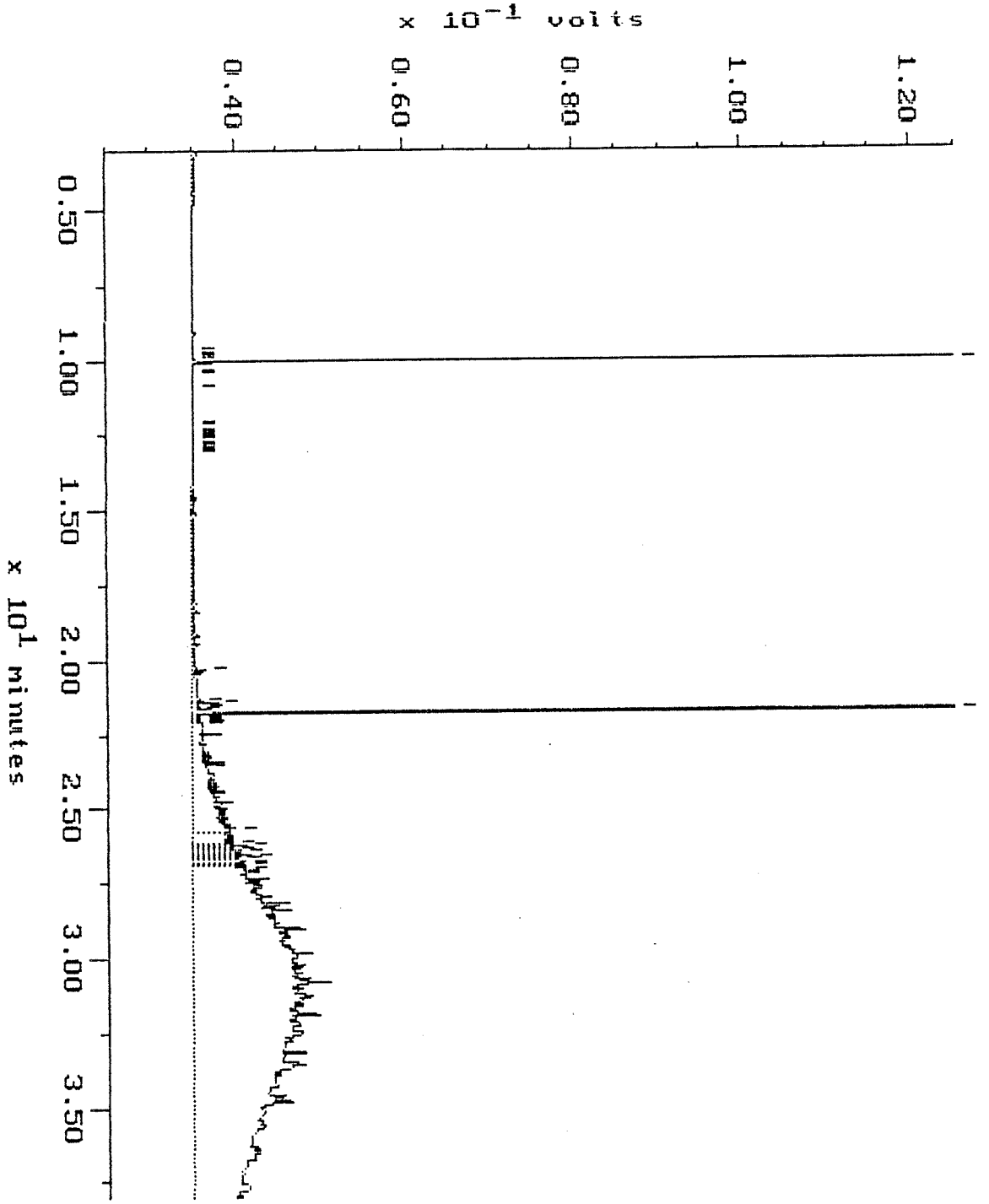
Continuing Calibration

Sample: D 500 Channel: CLARENCE Filename: R2178C02
Acquired: 17-FEB-94 12:12 Method: F:\BRU2\MAXDATA\SERGE-C\FUEL0217 Operator: ATI
Comments: ATI RUSH FUELS: DEDICATED TO QUALITY CLIENT SERVICE



Continuing Calibration

Sample: MO 500 Channel: CLARENCE Filename: R2178C03
Acquired: 17-FEB-94 12:58 Method: F:\BRU2\MAXDATA\SERGE-C\FUEL021/ Operator: ATI
Comments: ATI RUSH FUELS: DEDICATED TO QUALITY CLIENT SERVICE



AnalyticalTechnologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335

DATE: 2/15/94 Page 1 of 1 ATI ACCESSION # 9402-155

COMPANY: HART CROWSER
REPORT TO: VICTOR MEZZARDIS
ADDRESS: 1910 FAIRVIEW AVE E
SEATTLE, WA 98102
PHONE: (206) 324-9530 FAX: (206) 328-5581
PROJECT MANAGER: VICTOR V. MEZZARDIS
PROJECT NUMBER: 3763-04
PROJECT NAME: ALASKA MARINE LINES
ATI will DISPOSE / RETURN samples (circle one)

Sample ID	Date	Time	Matrix	LabID	FUELS: TPH-HCID WA/OR	BETX/TPH-G combo WA/OR	BETX (by 8020) WA/OR	TPH-G WA/OR	TPH-D extended WA/OR	8015 modified WA/OR	418.1	413.2	AK-GRO	AK-DRO	ORGANIC COMPOUNDS: 8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 Pesticides/PCBs	PCB only (by 8080) STD/lo level	8010 Halogenated VOCs	8020 Aromatic VOCs	8310 HPLC PAHs	8040 Phenols	8140 OP Pesticides	8150 OC Herbicides	METALS: Metals (Indicate below *)	Total Lead	Priority Pollutant Metals (13)	TAL Metals (23)	TCLP: TCLP-Volatiles (ZHE-8240)	TCLP-Semivolatiles (8270)	TCLP-Pesticides (8080)	TCLP-Herbicides (8150)	TCLP-Metals (8 metals)	OTHER: % Moisture (please indicate)	TOC, % moisture on solids				Total # of Containers/sample
MW-1	2/14/94	16:30	WATER	-1			X		X											X														X					5
MW-2	"	17:30		-2			X		X											X														X					5
MW-4	"	13:45		-3			X		X											X														X					5
MW-5	"	15:30		-4			X		X											X														X					5
TRIP BLANK	"			-5			X																																2

Turnaround Time		Sample Receipt	
STANDARD TAT	X	TOTAL # CONTAINERS RECVD	
1 WEEK TAT		COC SEALS PRESENT?	
4 WORK DAY TAT		COC SEALS INTACT?	
3 WORK DAY TAT		RECEIVED COLD?	
2 WORK DAY TAT		RECEIVED INTACT?	
24 HOUR TAT		RECEIVED VIA:	

Special Instructions:

* Metals needed:

Relinquished By:	Relinquished By:	Relinquished By:
Date: 2/15/94	Date:	Date:
Time: 13:00	Time:	Time:
VICTOR V. MEZZARDIS		
Received By:	**Received By:**	**Received By:**
Date: 2/15/94	Date:	Date:
Time: 1300	Time:	Time:
M. POSTILA		

Corporate Offices: 5550 Morehouse Drive, San Diego, CA 92121 (619)458-9141

(3)

QC'd 3/23/94 KL

Analytical Technologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335
Karen L. Mixon, Laboratory Manager

ATI I.D. # 9402-077

February 25, 1994

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle WA 98102-3699

Attention : Victor Melbardis

Project Number : 3763-04

Project Name : Alaska Marine Lines

ear Mr. Melbardis:

On February 9, 1994, Analytical Technologies, Inc. (ATI), received five samples for analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Sincerely,

Tamara B. Jerome
Project Manager

TBJ/hal/ff

Enclosure

Analytical Technologies, Inc.

ATI I.D. # 9402-077

SAMPLE CROSS REFERENCE SHEET

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9402-077-1	MW-1	02/08/94	WATER
9402-077-2	MW-2	02/08/94	WATER
9402-077-3	MW-4	02/08/94	WATER
9402-077-4	MW-5	02/08/94	WATER
9402-077-5	TRIP BLANK	N/A	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	5

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077

ANALYTICAL SCHEDULE

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

ANALYSIS	TECHNIQUE	REFERENCE	LAB
POLYNUCLEAR AROMATIC HYDROCARBONS	HPLC/UV/FLUOR	EPA 8310	R
BETX	GC/PID	EPA 8020	R
TOTAL PETROLEUM HYDROCARBONS	GC/FID	WA DOE WTPH-D	R
TOTAL DISSOLVED SOLIDS	GRAVIMETRIC	EPA 160.1	R

R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PNR = ATI - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

CASE NARRATIVE: POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS

Four (4) water samples were received by ATI on February 19, 1994, for the following analysis: EPA method 8310.

All corresponding quality assurance and quality control results defined as blank spike/blank spike duplicate (BS/BSD), method blank and surrogate recoveries were within the established control limits.

Analytical**Technologies**, Inc.

ATI I.D. # 9402-077

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/10/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 02/14/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.50
ACENAPHTHYLENE	<1.0
1-METHYLNAPHTHALENE	<0.50
2-METHYLNAPHTHALENE	<0.50
ACENAPHTHENE	<0.50
FLUORENE	<0.10
PHENANTHRENE	<0.050
ANTHRACENE	<0.050
FLUORANTHENE	<0.10
PYRENE	<0.10
BENZO(A)ANTHRACENE	<0.10
CHRYSENE	<0.10
ENZO(B)FLUORANTHENE	<0.10
BENZO(K)FLUORANTHENE	<0.10
BENZO(A)PYRENE	<0.10
DIBENZO(A,H)ANTHRACENE	<0.20
BENZO(G,H,I)PERYLENE	<0.10
INDENO(1,2,3-CD)PYRENE	<0.10

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	77 ✓	33 - 123

Analytical Technologies, Inc.

ATI I.D. # 9402-077-1

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/08/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/09/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/10/94
CLIENT I.D.	: MW-1	DATE ANALYZED	: 02/14/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.49
ACENAPHTHYLENE	<0.98
1-METHYLNAPHTHALENE	<0.49
2-METHYLNAPHTHALENE	<0.49
ACENAPHTHENE	0.90
FLUORENE	<0.098
PHENANTHRENE	<0.049
ANTHRACENE	<0.049
FLUORANTHENE	<0.098
PYRENE	<0.098
BENZO(A)ANTHRACENE	<0.098
CHRYSENE	<0.098
BENZO(B)FLUORANTHENE	<0.098
BENZO(K)FLUORANTHENE	<0.098
BENZO(A)PYRENE	<0.098
DIBENZO(A,H)ANTHRACENE	<0.20
BENZO(G,H,I)PERYLENE	<0.098
INDENO(1,2,3-CD)PYRENE	<0.098

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	77	33 - 123

Analytical Technologies, Inc.

ATI I.D. # 9402-077-2

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/08/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/09/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/10/94
CLIENT I.D.	: MW-2	DATE ANALYZED	: 02/14/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.49
ACENAPHTHYLENE	<0.97
1-METHYLNAPHTHALENE	<0.49
2-METHYLNAPHTHALENE	<0.49
ACENAPHTHENE	<0.49
FLUORENE	<0.097
PHENANTHRENE	<0.049
ANTHRACENE	<0.049
FLUORANTHENE	<0.097
PYRENE	<0.097
BENZO(A)ANTHRACENE	<0.097
CHRYSENE	<0.097
BENZO(B)FLUORANTHENE	<0.097
BENZO(K)FLUORANTHENE	<0.097
BENZO(A)PYRENE	<0.097
DIBENZO(A,H)ANTHRACENE	<0.19
BENZO(G,H,I)PERYLENE	<0.097
INDENO(1,2,3-CD)PYRENE	<0.097

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	69	33 - 123

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077-3

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/08/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/09/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/10/94
CLIENT I.D.	: MW-4	DATE ANALYZED	: 02/14/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	8.9
ACENAPHTHYLENE	3.4
1-METHYLNAPHTHALENE	1.8
2-METHYLNAPHTHALENE	4.8
ACENAPHTHENE	4.2
FLUORENE	4.8
PHENANTHRENE	1.7
ANTHRACENE	0.20
FLUORANTHENE	<0.097
PYRENE	<0.097
BENZO(A)ANTHRACENE	<0.097
CHRYSENE	<0.097
BENZO(B)FLUORANTHENE	<0.097
BENZO(K)FLUORANTHENE	<0.097
BENZO(A)PYRENE	<0.097
DIBENZO(A,H)ANTHRACENE	<0.19
BENZO(G,H,I)PERYLENE	<0.097
INDENO(1,2,3-CD)PYRENE	<0.097

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	81	33 - 123

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077-4

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/08/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/09/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/10/94
CLIENT I.D.	: MW-5	DATE ANALYZED	: 02/14/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.49
ACENAPHTHYLENE	<0.97
1-METHYLNAPHTHALENE	<0.49
2-METHYLNAPHTHALENE	<0.49
ACENAPHTHENE	<0.49
FLUORENE	<0.097
PHENANTHRENE	<0.049
ANTHRACENE	<0.049
FLUORANTHENE	<0.097
PYRENE	<0.097
BENZO(A)ANTHRACENE	<0.097
CHRYSENE	<0.097
BENZO(B)FLUORANTHENE	<0.097
BENZO(K)FLUORANTHENE	<0.097
BENZO(A)PYRENE	<0.097
DIBENZO(A,H)ANTHRACENE	<0.19
BENZO(G,H,I)PERYLENE	<0.097
INDENO(1,2,3-CD)PYRENE	<0.097

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	72 √	33 - 123

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
EPA METHOD : 8310

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 02/10/94
DATE ANALYZED : 02/14/94
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<1.00	20.0	16.1	81	15.6	78	3
PHENANTHRENE	<0.0500	2.00	1.68	84	1.60	80	5
PYRENE	<0.100	2.00	1.88	94	1.76	88	7
BENZO(K)FLUORANTHENE	<0.100	2.00	1.93	97	1.82	91	6
DIBENZO(A,H)ANTHRACENE	<0.200	2.00	2.08 ✓	104	1.96	98 ✓	6 ✓

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	32 - 131	32
PHENANTHRENE	58 - 120	30
PYRENE	50 - 120	30
BENZO(K)FLUORANTHENE	50 - 120	29
DIBENZO(A,H)ANTHRACENE	56 - 129	26

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	85 /	81 /	33 - 123

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 02/09/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	103 ✓	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9402-077-1

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/08/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/09/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-1	DATE ANALYZED	: 02/10/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	105 ✓	76 - 120

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/10/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 02/10/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	94 ✓	50 - 150

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077-1

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/08/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/09/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/10/94
CLIENT I.D.	: MW-1	DATE ANALYZED	: 02/11/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	87	50 - 150

√

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077-2

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/08/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/09/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/10/94
CLIENT I.D.	: MW-2	DATE ANALYZED	: 02/11/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	0.32
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	91	50 - 150

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Analytical**Technologies,**Inc.

ATI I.D. # 9402-077-3

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/08/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/09/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/10/94
CLIENT I.D.	: MW-4	DATE ANALYZED	: 02/11/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	0.66
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	91	50 - 150

Analytical**Technologies,** Inc.

ATI I.D. # 9402-077-4

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 02/08/94
PROJECT #	: 3763-04	DATE RECEIVED	: 02/09/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 02/10/94
CLIENT I.D.	: MW-5	DATE ANALYZED	: 02/11/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	58	50 - 150

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 02/10/94
DATE ANALYZED : 02/10/94
UNITS : mg/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	<0.250	2.50	2.18	87	2.11	84	3
CONTROL LIMITS				% REC.			RPD
DIESEL				70 - 114			20
SURROGATE RECOVERIES		SPIKE		DUP. SPIKE		LIMITS	
O-TERPHENYL		90		91		50 - 150	

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : 9402-083-1
DATE EXTRACTED : 02/10/94
DATE ANALYZED : 02/10/94
UNITS : mg/L

COMPOUNDS	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	<0.250	<0.250	NC	N/A	N/A	N/A	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
DIESEL	N/A	20

SURROGATE RECOVERIES	SAMPLE	SAMPLE DUP.	LIMITS
O-TERPHENYL	92	90	50 - 150

NC = Not Calculable.

Analytical Technologies, Inc.

ATI I.D. # 9402-077

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : 9402-085-2
DATE EXTRACTED : 02/10/94
DATE ANALYZED : 02/10/94
UNITS : mg/L

COMPOUNDS	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	0.530	0.466	13	2.38	2.42	79	2.66	90	9

CONTROL LIMITS	% REC.	RPD
DIESEL	56 - 135	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	89	96	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 9402-077

GENERAL CHEMISTRY ANALYSIS

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

PARAMETER	DATE PREPARED	DATE ANALYZED
TOTAL DISSOLVED SOLIDS	02/10/94	02/10/94

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES UNITS : mg/L

ATI I.D. #	CLIENT I.D.	TOTAL DISSOLVED SOLIDS
9402-077-1	MW-1	4000
9402-077-2	MW-2	380
9402-077-3	MW-4	110
9402-077-4	MW-5	1100
METHOD BLANK	-	<10

Analytical**Technologies,**Inc.

ATI I.D. # 9402-077

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

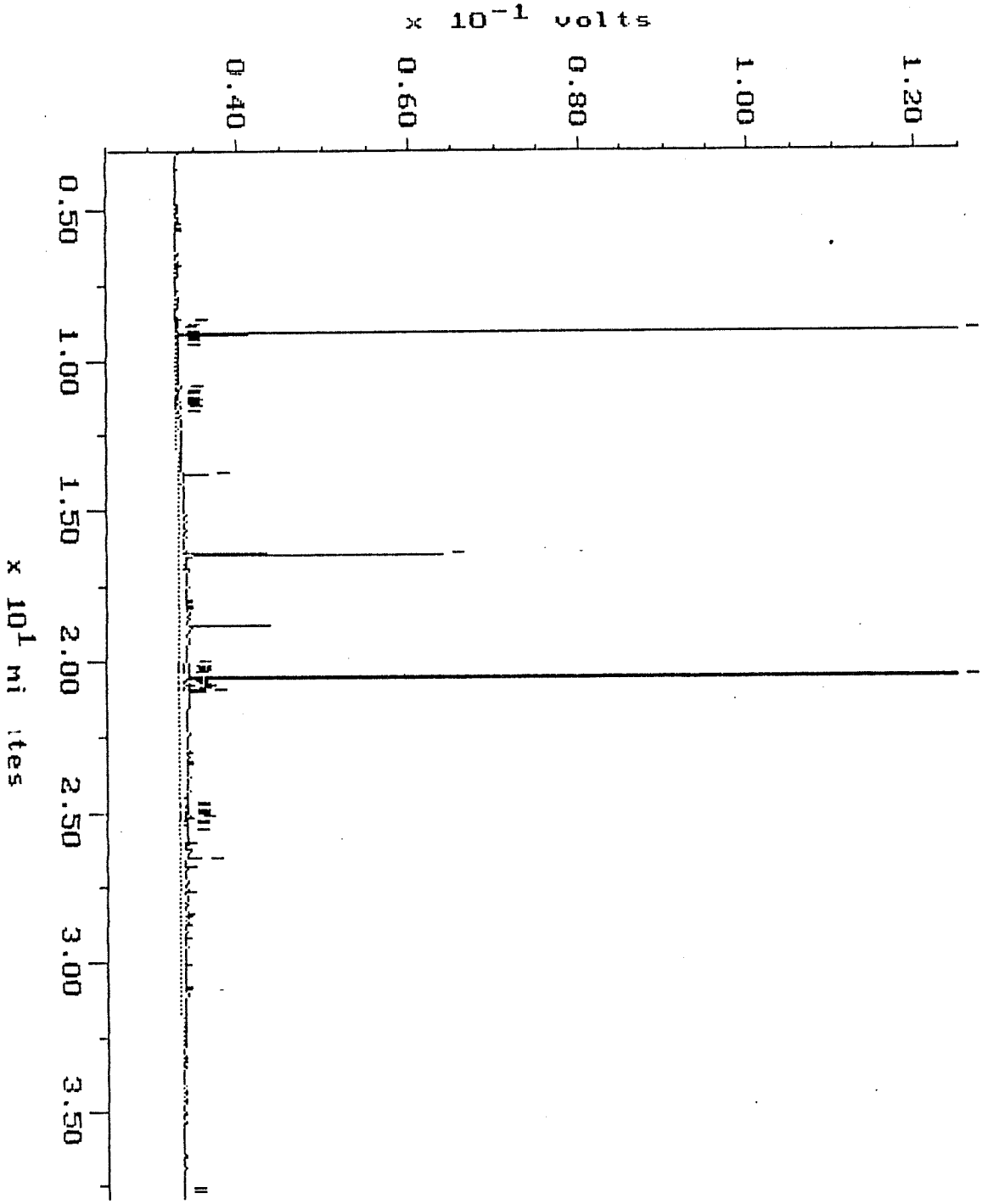
CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES UNITS : mg/L

PARAMETER	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
TOTAL DISSOLVED SOLIDS	BLANK	<10	N/A	N/A	464	463	100 ✓
TOTAL DISSOLVED SOLIDS	9402-079-4	160	150	6 ✓	N/A	N/A	N/A

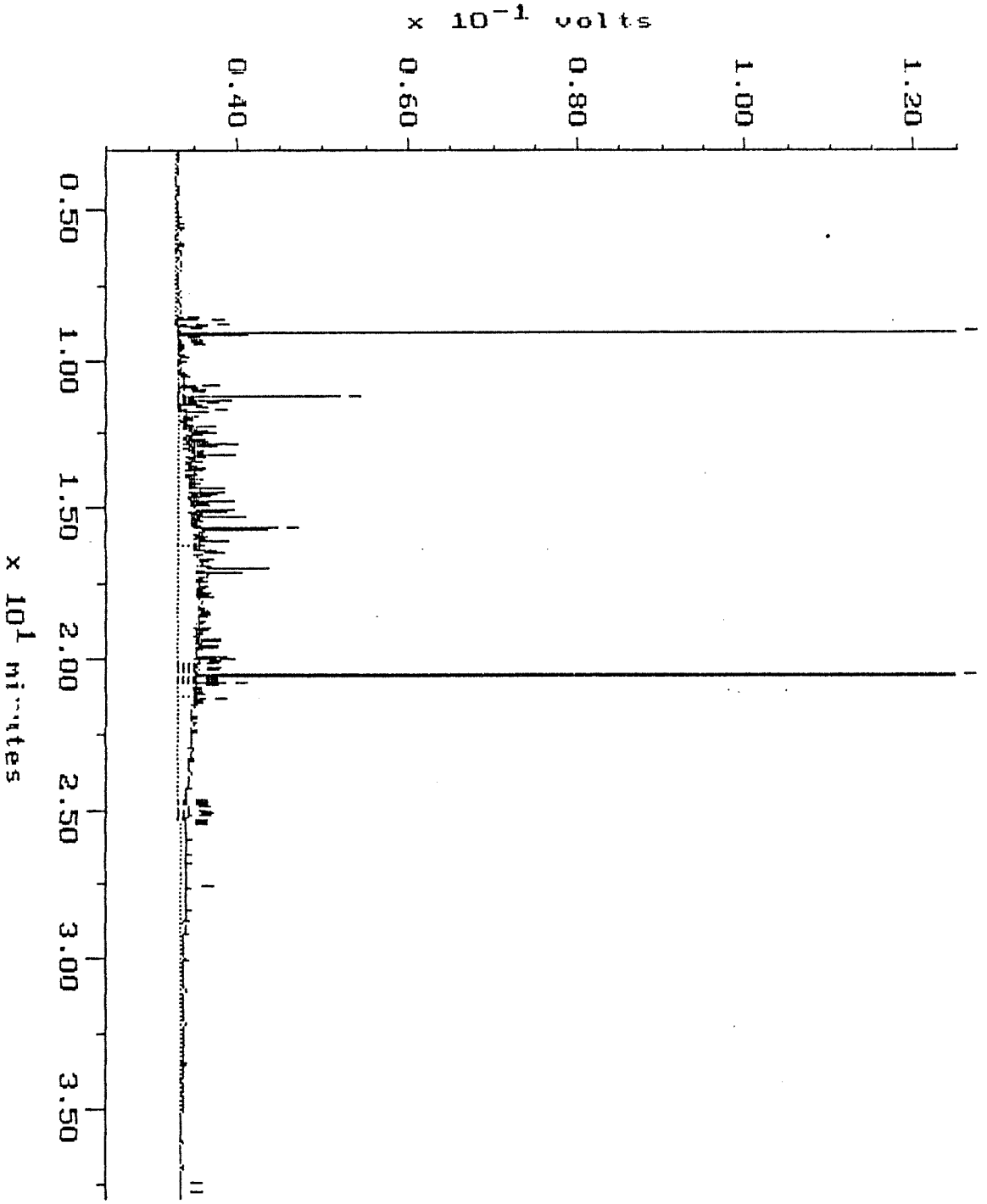
$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Sample Result} - \text{Duplicate Result})|}{\text{Average Result}} \times 100$$

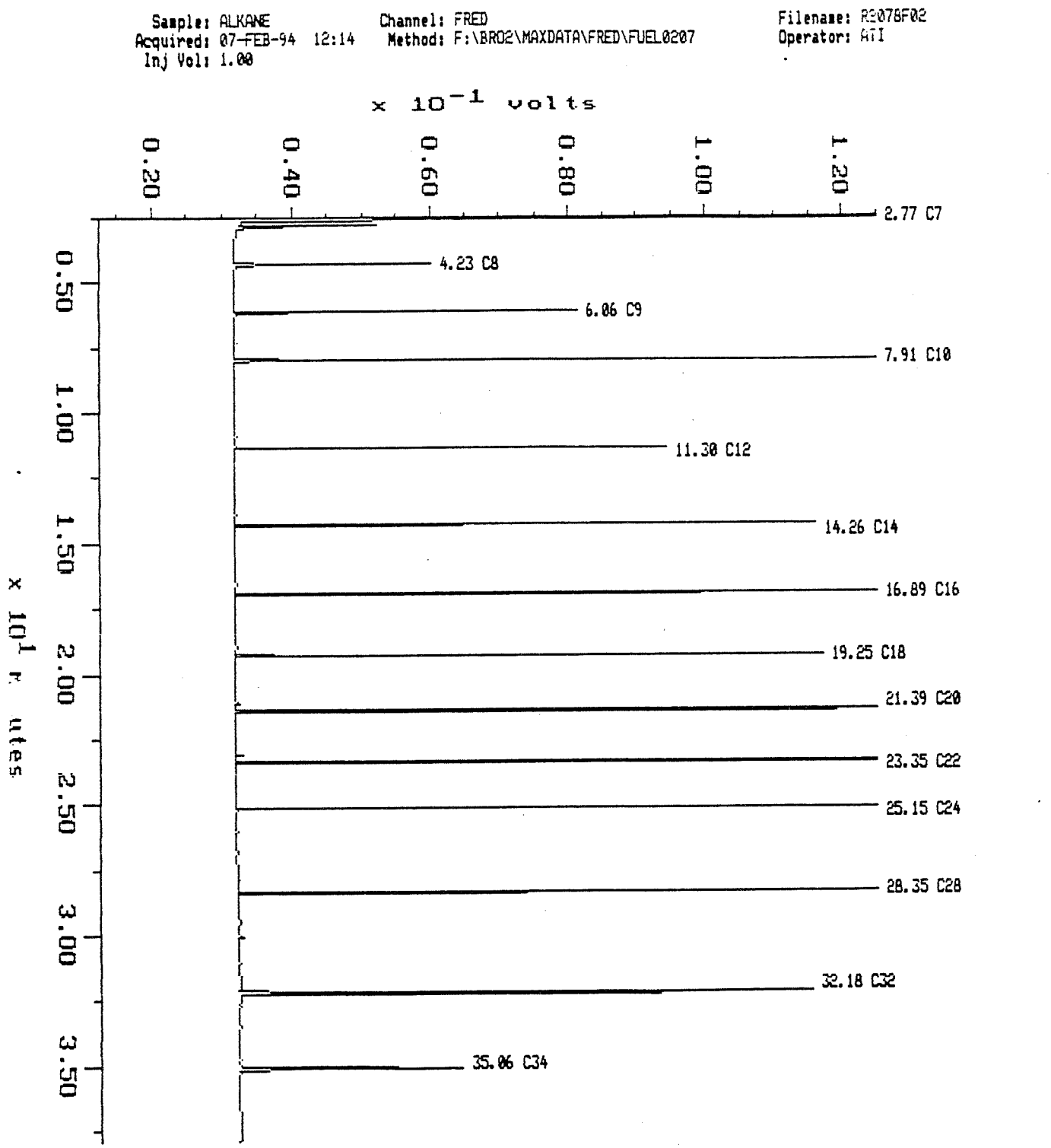
Sample: 9402-077-2 Channel: FRED Filename: R2108F18
Acquired: 11-FEB-94 3:38 Method: F:\BRO2\MAXDATA\FRED\FUEL0210 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



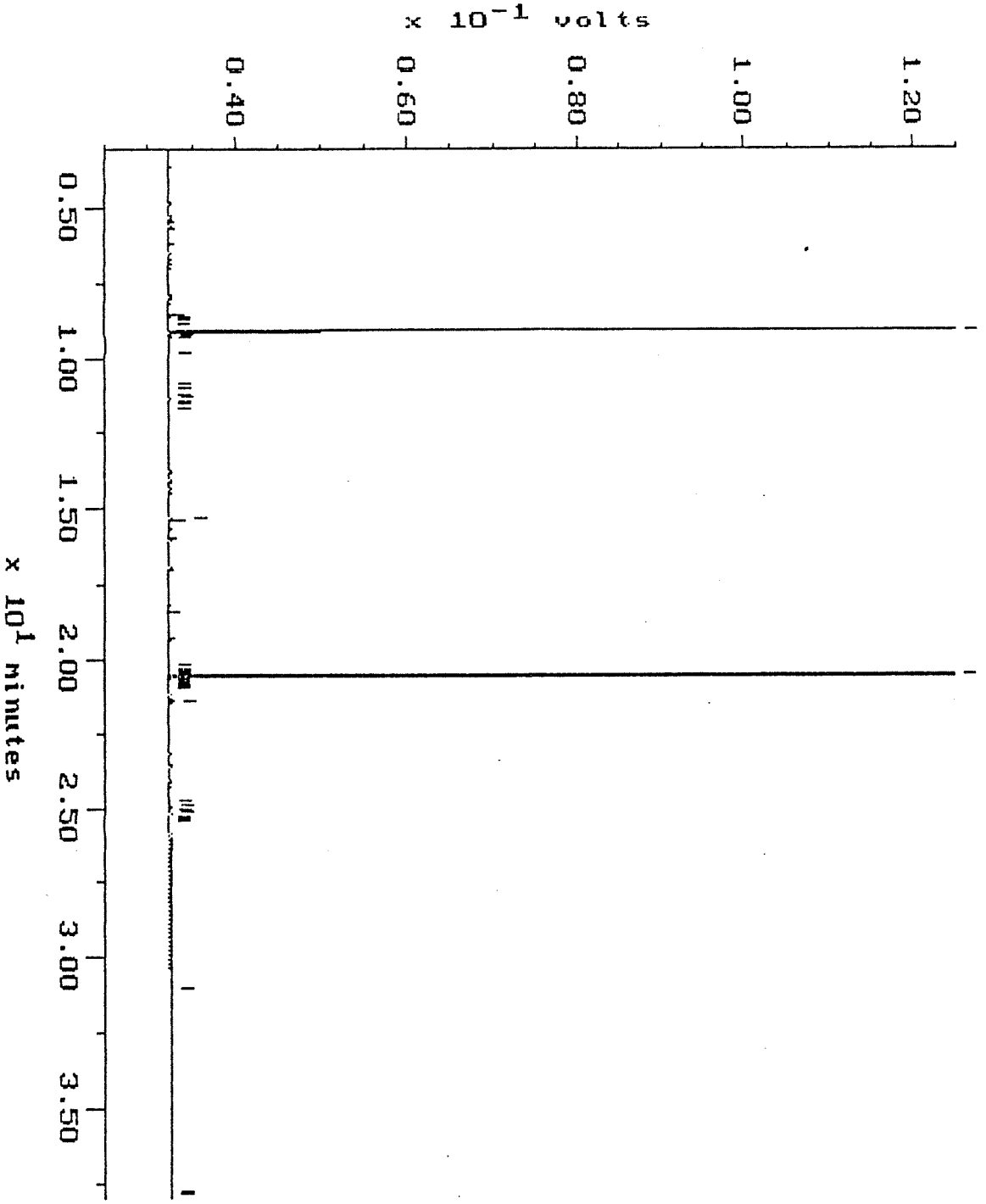
Sample: 9402-077-3 Channel: FRED Filename: R2106F19
Acquired: 11-FEB-94 4:24 Method: F:\BK02\MAXDATA\FRED\FUEL0210 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



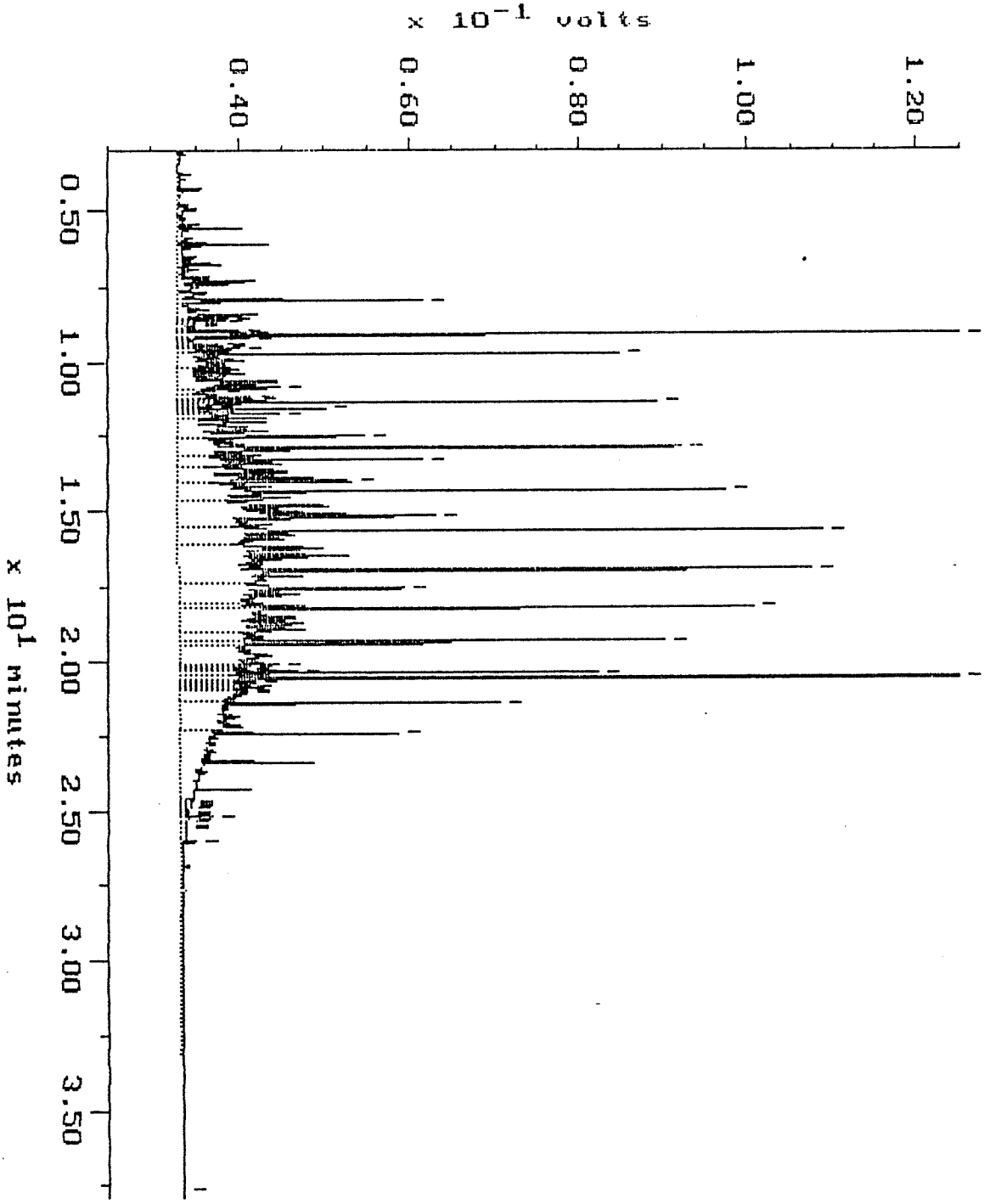
Alkane


Sample: ALKANE
Acquired: 07-FEB-94 12:14
Inj Vol: 1.00
Channel: FRED
Method: F:\BRO2\MAXDATA\FRED\FUEL0207
Filename: R2076F02
Operator: ATI
x 10⁻¹ volts
0.20
0.40
0.60
0.80
1.00
1.20
0.50
1.00
1.50
2.00
2.50
3.00
3.50
x 10¹ minutes
2.77 C7
4.23 C8
6.06 C9
7.91 C10
11.30 C12
14.26 C14
16.89 C16
19.25 C18
21.39 C20
23.35 C22
25.15 C24
28.35 C28
32.18 C32
35.06 C34

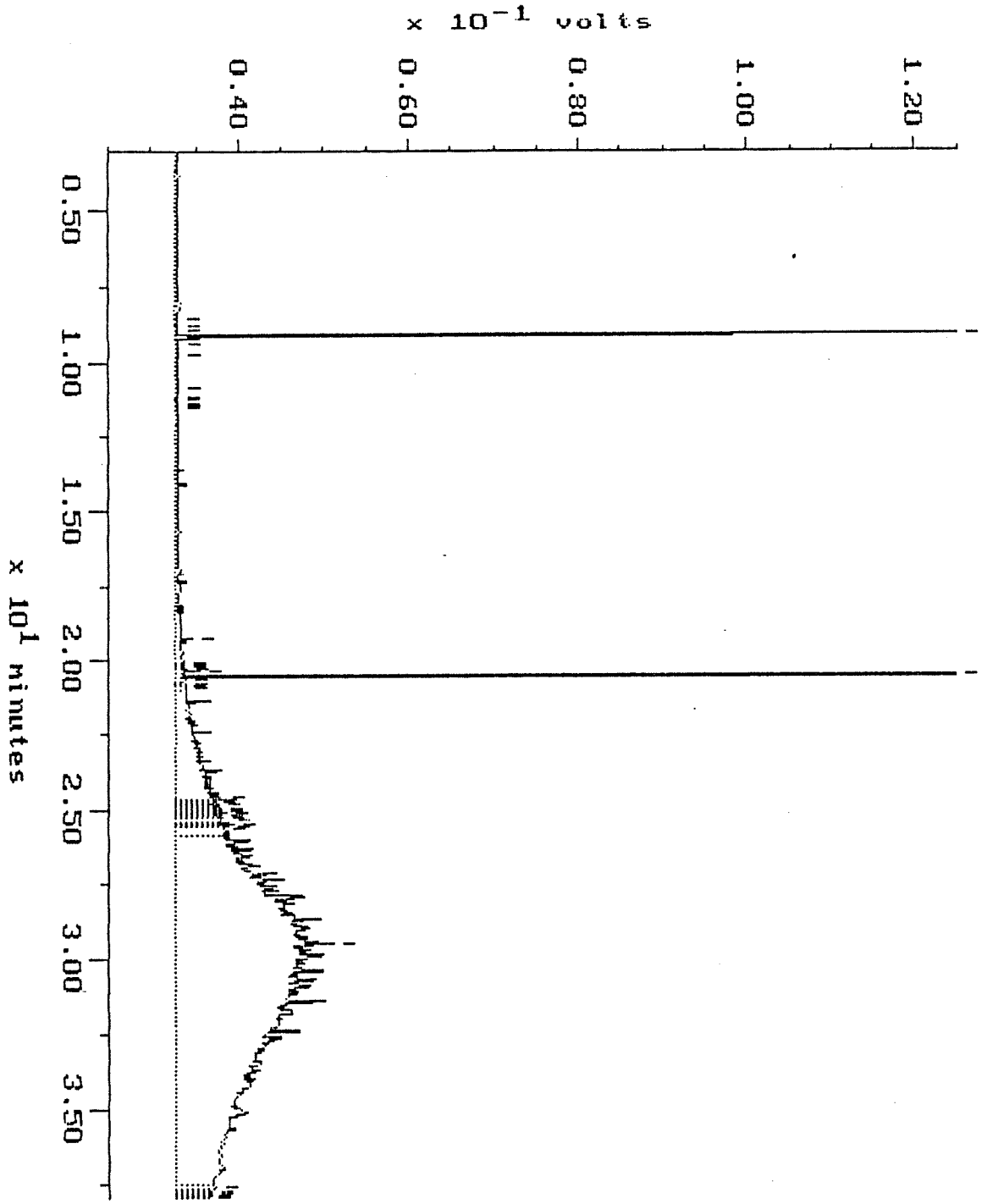
Sample: WRB 2-10 Channel: FRED Filename: R2108F05
Acquired: 10-FEB-94 17:29 Method: F:\BK02\MAXDATA\FRED\FUEL0210 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



Sample: D 500 Channel: FRED Filename: R2108F02
Acquired: 10-FEB-94 12:05 Method: F:\BRO2\MAXDATA\FRED\FUEL0210 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



Sample: MO 500 Channel: FRED Filename: R2108F03
Acquired: 10-FEB-94 12:52 Method: F:\BRO2\MAXDATA\FRED\FUEL0210 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



AnalyticalTechnologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335

DATE: Feb 9, 94 Page 1 of 1 ATI ACCESSION # 1402-27

COMPANY: Hart Crowser
REPORT TO: Victor V. Medardis
ADDRESS: 1910 Fairview Ave E
Seattle, WA 98102
PHONE: (206) 324-9530 FAX: (206) 328-5581
PROJECT MANAGER: Victor Medardis
PROJECT NUMBER: 3763-04
PROJECT NAME: Alaska Marine Lines

ATI will DISPOSE / RETURN samples (circle one)

Sample ID	Date	Time	Matrix	LabID
MW-1	2/8	13:00	Water	1
MW-2	"	14:00	"	2
MW-4	"	16:30	"	3
MW-5	"	16:00	"	4
Trip Blank				5

	FUELS											ORGANIC COMPOUNDS										METALS			TCLP					OTHER			Total # of Containers/sample
	TPH-HCID	WA/OR	BETX/TPH-G combo	WA/OR	BETX (by 8020)	WA/OR	TPH-G	WA/OR	TPH-D	8015 modified	418.1	WA/OR	413.2	AK-GRO	AK-DRO	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 Pesticides/PCBs	PCB only (by 8080) STD/lo level	8010 Halogenated VOCs	8020 Aromatic VOCs	8310 HPLC PAHs	8040 Phenols	8140 OP Pesticides	8150 OC Herbicides	Metals (Indicate below *)	Total Lead	Priority Pollutant Metals (13)	TAL Metals (23)	TCLP-Volatiles (ZHE-8240)	TCLP-Semivolatiles (8270)	TCLP-Pesticides (8080)	TCLP-Herbicides (8150)	TCLP-Metals (8 metals)	% Moisture (please indicate)	Total # of Containers/sample		
MW-1					X				X													X											X	6	
MW-2					X				X													X											X	6	
MW-4					X				X													X											X	6	
MW-5					X				X													X											X	6	
Trip Blank					X																												2	

Turnaround Time	
STANDARD TAT	X
1 WEEK TAT	
4 WORK DAY TAT	
3 WORK DAY TAT	
2 WORK DAY TAT	
24 HOUR TAT	

Sample Receipt	
TOTAL # CONTAINERS RECVD	26
COC SEALS PRESENT?	NA
COC SEALS INTACT?	NA
RECEIVED COLD?	
RECEIVED INTACT?	✓
RECEIVED VIA:	Hand

Special Instructions:

* Metals needed:

Relinquished By:	Relinquished By:	Relinquished By:
Date: 2/9/94	Date:	Date:
Time: 1725	Time:	Time:
Victor V. Medardis		
Received By:	**Received By:**	**Received By:**
Date: 2/10/94	Date:	Date:
Time: 1715	Time:	Time:
M. Postma		

Corporate Offices: 5550 Morehouse Drive, San Diego, CA 92121 (619)458-9141

(2)

QC'd 3/23/94 KR

Analytical Technologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335
Karen L. Mixon, Laboratory Manager

ATI I.D. # 9401-089

February 4, 1994

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle WA 98102-3699

Attention : Victor Melbardis

Project Number : 3763-04

Project Name : Alaska Marine Lines

ear Mr. Melbardis:

On January 12, 1994, Analytical Technologies, Inc. (ATI), received eight samples for analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

The analysis for total organic carbon and the associated moisture was performed at ATI - San Diego, CA. This report is included as an appendix.

Sincerely,

Tamara B. Jerome

Tamara B. Jerome
Project Manager

TBJ/hal/mrj

Enclosure

Analytical Technologies, Inc.

ATI I.D. # 9401-089

SAMPLE CROSS REFERENCE SHEET

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9401-089-1	MW5-S1	01/11/94	SOIL
9401-089-2	WW5-S5*	01/11/94	SOIL
9401-089-3	B1-S2	01/11/94	SOIL
9401-089-4	B1-S4	01/11/94	SOIL
9401-089-5	B1-S5	01/11/94	SOIL
9401-089-6	B2-S1	01/11/94	SOIL
9401-089-7	B2-S3	01/11/94	SOIL
9401-089-8	B2-S5	01/11/94	SOIL

* Sample identification was incorrectly listed on C.O.C. Correct identification should be MW5-S5. Error was noticed after analyses were completed.

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	8

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled isposal date.

Analytical Technologies, Inc.

ATI I.D. # 9401-089

ANALYTICAL SCHEDULE

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

ANALYSIS	TECHNIQUE	REFERENCE	LAB
SYNTHETIC PRECIPITATION LEACHING PROCEDURE (SPLP)	-	EPA 1312	R
POLYNUCLEAR AROMATIC HYDROCARBONS	HPLC/UV/FLUOR	EPA 8310	R
TOTAL PETROLEUM HYDROCARBONS	GC/FID	WA DOE WTPH-D	R
TOTAL ORGANIC CARBON	WALKLEY-BLACK	ASA 90-3.2	SD
MOISTURE	GRAVIMETRIC	CLP SOW ILM01.0	R
MOISTURE	GRAVIMETRIC	METHOD 7-2.2	SD

R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PNR = ATI - Pensacola
FC = ATI - Fort Collins
UB = Subcontract

Analytical Technologies, Inc.

ATI I.D. # 9401-089

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

CASE NARRATIVE: POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS - SPLP

Eight (8) soil samples were received by ATI on January 12, 1994, for the following analysis: EPA method 8310.

Samples 9401-089-3 (B1-S2) and 9401-089-6 (B2-S1) were analyzed according to EPA method 8310 following SPLP 1312, as per client request. The sample leachates, leachate blank, blank spike (BS), matrix spike/matrix spike duplicate (MS/MSD) and method blank were then extracted using EPA method 3520.

All corresponding quality assurance and quality control results defined as MS/MSD, BS, method blank, leachate blank and surrogate recoveries were within the ATI established control limits.

Analytical Technologies, Inc.

ATI I.D. # 9401-089

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/14/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 01/18/94
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<1.7
ACENAPHTHYLENE	<3.3
1-METHYLNAPHTHALENE	<1.7
2-METHYLNAPHTHALENE	<1.7
ACENAPHTHENE	<1.7
FLUORENE	<0.33
PHENANTHRENE	<0.17
ANTHRACENE	<0.17
FLUORANTHENE	<0.33
PYRENE	<0.33
BENZO(A)ANTHRACENE	<0.33
CHRYSENE	<0.33
BENZO(B)FLUORANTHENE	<0.33
BENZO(K)FLUORANTHENE	<0.33
BENZO(A)PYRENE	<0.33
DIBENZO(A,H)ANTHRACENE	<0.67
BENZO(G,H,I)PERYLENE	<0.33
INDENO(1,2,3-CD)PYRENE	<0.33

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	83 ✓	33 - 123

AnalyticalTechnologies,Inc.

ATI I.D. # 9401-089

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE LEACHED	: 01/13/94
CLIENT I.D.	: TCLP BLANK	DATE EXTRACTED	: 01/14/94
SAMPLE MATRIX	: LEACHATE	DATE ANALYZED	: 01/18/94
EPA METHOD	: 8310	UNITS	: ug/L
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<1.7
ACENAPHTHYLENE	<3.3
1-METHYLNAPHTHALENE	<1.7
2-METHYLNAPHTHALENE	<1.7
ACENAPHTHENE	<1.7
FLUORENE	<0.33
PHENANTHRENE	<0.17
ANTHRACENE	<0.17
FLUORANTHENE	<0.33
PYRENE	<0.33
BENZO(A)ANTHRACENE	<0.33
CHRYSENE	<0.33
BENZO(B)FLUORANTHENE	<0.33
BENZO(K)FLUORANTHENE	<0.33
BENZO(A)PYRENE	<0.33
DIBENZO(A,H)ANTHRACENE	<0.67
BENZO(G,H,I)PERYLENE	<0.33
INDENO(1,2,3-CD)PYRENE	<0.33

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	83 ✓	33 - 123

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-3

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE LEACHED	: 01/13/94
CLIENT I.D.	: B1-S2	DATE EXTRACTED	: 01/14/94
SAMPLE MATRIX	: LEACHATE	DATE ANALYZED	: 01/18/94
EPA METHOD	: 8310	UNITS	: ug/L
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<1.7
ACENAPHTHYLENE	<3.3
1-METHYLNAPHTHALENE	37
2-METHYLNAPHTHALENE	3.2
ACENAPHTHENE	3.3
FLUORENE	6.9
PHENANTHRENE	9.0
ANTHRACENE	2.8
FLUORANTHENE	<0.33
PYRENE	1.4
BENZO(A)ANTHRACENE	<0.33
CHRYSENE	<0.33
BENZO(B)FLUORANTHENE	<0.33
BENZO(K)FLUORANTHENE	<0.33
BENZO(A)PYRENE	<0.33
DIBENZO(A,H)ANTHRACENE	<0.67
BENZO(G,H,I)PERYLENE	<0.33
INDENO(1,2,3-CD)PYRENE	<0.33

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	91 ✓	33 - 123

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-6

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE LEACHED	: 01/13/94
CLIENT I.D.	: B2-S1	DATE EXTRACTED	: 01/14/94
SAMPLE MATRIX	: LEACHATE	DATE ANALYZED	: 01/18/94
EPA METHOD	: 8310	UNITS	: ug/L
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<1.7
ACENAPHTHYLENE	<3.3
1-METHYLNAPHTHALENE	<1.7
2-METHYLNAPHTHALENE	<1.7
ACENAPHTHENE	<1.7
FLUORENE	<0.33
PHENANTHRENE	<0.17
ANTHRACENE	<0.17
FLUORANTHENE	<0.33
PYRENE	<0.33
BENZO(A)ANTHRACENE	<0.33
CHRYSENE	<0.33
BENZO(B)FLUORANTHENE	<0.33
BENZO(K)FLUORANTHENE	<0.33
BENZO(A)PYRENE	<0.33
DIBENZO(A,H)ANTHRACENE	<0.67
BENZO(G,H,I)PERYLENE	<0.33
INDENO(1,2,3-CD)PYRENE	<0.33

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	87 √	33 - 123

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
EPA METHOD : 8310

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 01/14/94
DATE ANALYZED : 01/18/94
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<3.33	66.7	55.8	84	N/A	N/A	N/A
PHENANTHRENE	<0.167	6.67	5.69	85	N/A	N/A	N/A
PYRENE	<0.333	6.67	6.18	93	N/A	N/A	N/A
BENZO(K)FLUORANTHENE	<0.333	6.67	6.25	94	N/A	N/A	N/A
DIBENZO(A,H)ANTHRACENE	<0.667	6.67	6.49	97 ✓	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	32 - 131	32
PHENANTHRENE	58 - 120	30
PYRENE	50 - 120	30
BENZO(K)FLUORANTHENE	50 - 120	29
DIBENZO(A,H)ANTHRACENE	56 - 129	26

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	89 ✓	N/A	33 - 123

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : LEACHATE
EPA METHOD : 8310

SAMPLE I.D. # : 9401-089-3 ✓
DATE LEACHED : 01/13/94
DATE EXTRACTED : 01/14/94
DATE ANALYZED : 01/18/94
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<3.33	66.7	49.7	75	52.5	79	5
PHENANTHRENE	8.97	6.67	13.1	62	14.1	77	7
PYRENE	1.37	6.67	6.67	79	7.24	88	8
BENZO(K)FLUORANTHENE	<0.333	6.67	5.30	79	5.77	87	8
DIBENZO(A,H)ANTHRACENE	<0.667	6.67	5.41	81 ✓	5.84	88 ✓	8 ✓

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	31 - 127	32
PHENANTHRENE	31 - 143	30
PYRENE	37 - 140	30
BENZO(K)FLUORANTHENE	39 - 131	29
DIBENZO(A,H)ANTHRACENE	31 - 142	26

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	81 ✓	87 ✓	33 - 123

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/13/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 01/14/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8310	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
NAPHTHALENE	<0.083
ACENAPHTHYLENE	<0.17
1-METHYLNAPHTHALENE	<0.17
2-METHYLNAPHTHALENE	<0.17
ACENAPHTHENE	<0.17
FLUORENE	<0.017
PHENANTHRENE	<0.0083
ANTHRACENE	<0.0083
FLUORANTHENE	<0.017
PYRENE	<0.017
BENZO(A)ANTHRACENE	<0.017
CHRYSENE	<0.017
BENZO(B)FLUORANTHENE	<0.017
BENZO(K)FLUORANTHENE	<0.017
BENZO(A)PYRENE	<0.017
DIBENZO(A,H)ANTHRACENE	<0.034
BENZO(G,H,I)PERYLENE	<0.017
INDENO(1,2,3-CD)PYRENE	<0.017

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	94 ✓	25 - 134

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-1

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/13/94
CLIENT I.D.	: MW5-S1	DATE ANALYZED	: 01/14/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8310	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
NAPHTHALENE	<0.10
ACENAPHTHYLENE	<0.21
1-METHYLNAPHTHALENE	<0.21
2-METHYLNAPHTHALENE	0.26
ACENAPHTHENE	<0.21
FLUORENE	0.14
PHENANTHRENE	0.87
ANTHRACENE	0.16
FLUORANTHENE	1.3
PYRENE	0.61
BENZO(A)ANTHRACENE	0.36
CHRYSENE	0.34
BENZO(B)FLUORANTHENE	0.26
BENZO(K)FLUORANTHENE	0.16
BENZO(A)PYRENE	0.31
DIBENZO(A,H)ANTHRACENE	<0.042
BENZO(G,H,I)PERYLENE	0.19
INDENO(1,2,3-CD)PYRENE	0.20

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	100 ✓	25 - 134

Analytical Technologies, Inc.

ATI I.D. # 9401-089-2

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/13/94
CLIENT I.D.	: WW5-S5	DATE ANALYZED	: 01/14/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8310	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
NAPHTHALENE	<0.10
ACENAPHTHYLENE	<0.21
1-METHYLNAPHTHALENE	<0.21
2-METHYLNAPHTHALENE	<0.21
ACENAPHTHENE	<0.21
FLUORENE	<0.021
PHENANTHRENE	0.012
ANTHRACENE	<0.010
FLUORANTHENE	<0.021
PYRENE	<0.021
BENZO(A)ANTHRACENE	<0.021
CHRYSENE	<0.021
BENZO(B)FLUORANTHENE	<0.021
BENZO(K)FLUORANTHENE	<0.021
BENZO(A)PYRENE	<0.021
DIBENZO(A,H)ANTHRACENE	<0.043
BENZO(G,H,I)PERYLENE	<0.021
INDENO(1,2,3-CD)PYRENE	<0.021

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	93 ✓	25 - 134

AnalyticalTechnologies,Inc.

ATI I.D. # 9401-089-3

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/13/94
CLIENT I.D.	: B1-S2	DATE ANALYZED	: 01/15/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8310	DILUTION FACTOR	: 20

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
NAPHTHALENE	<2.1
ACENAPHTHYLENE	<4.4
1-METHYLNAPHTHALENE	31
2-METHYLNAPHTHALENE	<4.4
ACENAPHTHENE	<4.4
FLUORENE	7.1
PHENANTHRENE	22
ANTHRACENE	6.1
FLUORANTHENE	<0.44
PYRENE	5.4
BENZO(A)ANTHRACENE	2.7
CHRYSENE	5.0
BENZO(B)FLUORANTHENE	<0.44
BENZO(K)FLUORANTHENE	<0.44
BENZO(A)PYRENE	0.73
DIBENZO(A,H)ANTHRACENE	<0.87
BENZO(G,H,I)PERYLENE	1.6
INDENO(1,2,3-CD)PYRENE	<0.44

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	I	25 - 134

I = Surrogate out of limits due to sample dilution.

Analytical**Technologies**, Inc.

ATI I.D. # 9401-089-4

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/13/94
CLIENT I.D.	: B1-S4	DATE ANALYZED	: 01/14/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8310	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
NAPHTHALENE	<0.12
ACENAPHTHYLENE	<0.24
1-METHYLNAPHTHALENE	0.69
2-METHYLNAPHTHALENE	<0.24
ACENAPHTHENE	<0.24
FLUORENE	0.20
PHENANTHRENE	0.46
ANTHRACENE	0.16
FLUORANTHENE	<0.024
PYRENE	<0.024
BENZO(A)ANTHRACENE	<0.024
CHRYSENE	<0.024
BENZO(B)FLUORANTHENE	<0.024
BENZO(K)FLUORANTHENE	<0.024
BENZO(A)PYRENE	0.031
DIBENZO(A,H)ANTHRACENE	<0.047
BENZO(G,H,I)PERYLENE	<0.024
INDENO(1,2,3-CD)PYRENE	<0.024

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	104 ✓	25 - 134

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-5

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/13/94
CLIENT I.D.	: B1-S5	DATE ANALYZED	: 01/14/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8310	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
NAPHTHALENE	<0.12
ACENAPHTHYLENE	<0.24
1-METHYLNAPHTHALENE	<0.24
2-METHYLNAPHTHALENE	<0.24
ACENAPHTHENE	<0.24
FLUORENE	<0.024
PHENANTHRENE	0.067
ANTHRACENE	<0.012
FLUORANTHENE	<0.024
PYRENE	<0.024
BENZO(A)ANTHRACENE	<0.024
CHRYSENE	<0.024
BENZO(B)FLUORANTHENE	<0.024
BENZO(K)FLUORANTHENE	<0.024
BENZO(A)PYRENE	<0.024
DIBENZO(A,H)ANTHRACENE	<0.049
BENZO(G,H,I)PERYLENE	<0.024
INDENO(1,2,3-CD)PYRENE	<0.024

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	75 ✓	25 - 134

AnalyticalTechnologies,Inc.

ATI I.D. # 9401-089-6

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/13/94
CLIENT I.D.	: B1-S1	DATE ANALYZED	: 01/14/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8310	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
NAPHTHALENE	<0.11
ACENAPHTHYLENE	<0.22
1-METHYLNAPHTHALENE	<0.22
2-METHYLNAPHTHALENE	<0.22
ACENAPHTHENE	<0.22
FLUORENE	<0.022
PHENANTHRENE	0.029
ANTHRACENE	<0.011
FLUORANTHENE	0.079
PYRENE	0.057
BENZO(A)ANTHRACENE	0.027
CHRYSENE	0.030
BENZO(B)FLUORANTHENE	<0.022
BENZO(K)FLUORANTHENE	<0.022
BENZO(A)PYRENE	0.026
DIBENZO(A,H)ANTHRACENE	<0.044
BENZO(G,H,I)PERYLENE	<0.022
INDENO(1,2,3-CD)PYRENE	<0.022

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	92 ✓	25 - 134

AnalyticalTechnologies,Inc.

ATI I.D. # 9401-089-7

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/13/94
CLIENT I.D.	: B2-S3	DATE ANALYZED	: 01/14/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8310	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
NAPHTHALENE	0.54
ACENAPHTHYLENE	<0.24
1-METHYLNAPHTHALENE	<0.24
2-METHYLNAPHTHALENE	0.28
ACENAPHTHENE	<0.24
FLUORENE	0.083
PHENANTHRENE	0.032
ANTHRACENE	<0.012
FLUORANTHENE	0.025
PYRENE	<0.024
BENZO(A)ANTHRACENE	<0.024
CHRYSENE	<0.024
BENZO(B)FLUORANTHENE	<0.024
BENZO(K)FLUORANTHENE	<0.024
BENZO(A)PYRENE	<0.024
DIBENZO(A,H)ANTHRACENE	<0.047
BENZO(G,H,I)PERYLENE	<0.024
INDENO(1,2,3-CD)PYRENE	<0.024

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	89 ✓	25 - 134

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-8

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/13/94
CLIENT I.D.	: B2-S5	DATE ANALYZED	: 01/14/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8310	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
NAPHTHALENE	<0.13
ACENAPHTHYLENE	<0.27
1-METHYLNAPHTHALENE	<0.27
2-METHYLNAPHTHALENE	<0.27
ACENAPHTHENE	<0.27
FLUORENE	<0.027
PHENANTHRENE	<0.013
ANTHRACENE	<0.013
FLUORANTHENE	<0.027
PYRENE	<0.027
BENZO(A)ANTHRACENE	<0.027
CHRYSENE	<0.027
BENZO(B)FLUORANTHENE	<0.027
BENZO(K)FLUORANTHENE	<0.027
BENZO(A)PYRENE	<0.027
DIBENZO(A,H)ANTHRACENE	<0.053
BENZO(G,H,I)PERYLENE	<0.027
INDENO(1,2,3-CD)PYRENE	<0.027

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	82 ✓	25 - 134

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : SOIL
EPA METHOD : 8310

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 01/13/94
DATE ANALYZED : 01/14/94
UNITS : mg/Kg

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<0.170	3.33	3.00	90	N/A	N/A	N/A
PHENANTHRENE	<0.00833	0.333	0.301	90	N/A	N/A	N/A
PYRENE	<0.0170	0.333	0.321	96	N/A	N/A	N/A
BENZO(K)FLUORANTHENE	<0.0170	0.333	0.325	98	N/A	N/A	N/A
DIBENZO(A,H)ANTHRACENE	<0.0340	0.333	0.343	103 ✓	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	48 - 145	20
PHENANTHRENE	47 - 137	35
PYRENE	59 - 122	34
BENZO(K)FLUORANTHENE	50 - 126	34
DIBENZO(A,H)ANTHRACENE	54 - 138	33

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	93 ✓	N/A	25 - 134

AnalyticalTechnologies,Inc.

ATI I.D. # 9401-089

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : SOIL
EPA METHOD : 8310

SAMPLE I.D. # : 9401-089-7
DATE EXTRACTED : 01/13/94
DATE ANALYZED : 01/14/94
UNITS : mg/Kg

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<0.170	3.33	2.80	84	2.77	83	1
PHENANTHRENE	0.0232	0.333	0.319	89	0.301	83	6
PYRENE	<0.0170	0.333	0.338	102	0.316	95	7
BENZO(K)FLUORANTHENE	<0.0170	0.333	0.317	95	0.307	92	3
DIBENZO(A,H)ANTHRACENE	<0.0340	0.333	0.332	100	0.349	105	5

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	50 - 136	20
PHENANTHRENE	14 - 162	35
PYRENE	25 - 143	34
BENZO(K)FLUORANTHENE	36 - 143	34
DIBENZO(A,H)ANTHRACENE	34 - 152	33

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	89	90	25 - 134

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/14/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 01/14/94
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	102 ✓	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 9401-089

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE LEACHED	: 01/13/94
CLIENT I.D.	: SPLP BLANK	DATE EXTRACTED	: 01/14/94
SAMPLE MATRIX	: LEACHATE	DATE ANALYZED	: 01/14/94
METHOD	: WA DOE WTPH-D	UNITS	: mg/L
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	100 ✓	50 - 150

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-3

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE LEACHDED	: 01/13/94
CLIENT I.D.	: B1-S2	DATE EXTRACTED	: 01/14/94
SAMPLE MATRIX	: LEACHATE	DATE ANALYZED	: 01/14/94
METHOD	: WA DOE WTPH-D	UNITS	: mg/L
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	2.2
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	104 ✓	50 - 150

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-6

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE LEACHED	: 01/13/94
CLIENT I.D.	: B2-S1	DATE EXTRACTED	: 01/14/94
SAMPLE MATRIX	: LEACHATE	DATE ANALYZED	: 01/14/94
METHOD	: WA DOE WTPH-D	UNITS	: mg/L
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
^-TERPHENYL	112 √	50 - 150

AnalyticalTechnologies,Inc.

ATI I.D. # 9401-089

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 01/14/94
DATE ANALYZED : 01/14/94
UNITS : mg/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	<0.250	2.50	2.55	102 ✓	2.61	104 ✓	2 ✓
CONTROL LIMITS				% REC.			RPD
DIESEL				70 - 115			20
SURROGATE RECOVERIES		SPIKE		DUP. SPIKE		LIMITS	
O-TERPHENYL		102 /		102 /		50 - 150	

Analytical Technologies, Inc.

ATI I.D. # 9401-089

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/12/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 01/13/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<10
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<40
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	98	50 - 150

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-1

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/12/94
CLIENT I.D.	: MW5-S1	DATE ANALYZED	: 01/13/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<12
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<49
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	94 ✓	50 - 150

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-2

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/12/94
CLIENT I.D.	: WW5-S5	DATE ANALYZED	: 01/13/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<13
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<50
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	94 ✓	50 - 150

AnalyticalTechnologies,Inc.

ATI I.D. # 9401-089-3

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/12/94
CLIENT I.D.	: B1-S2	DATE ANALYZED	: 01/13/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 10

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	3400
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<510
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY			LIMITS
O-TERPHENYL	162	F	50 - 150

F = Out of limits due to matrix interference.

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-4

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/12/94
CLIENT I.D.	: B1-S4	DATE ANALYZED	: 01/13/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	430
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	100
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	94 ✓	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 9401-089-5

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/12/94
CLIENT I.D.	: B1-S5	DATE ANALYZED	: 01/13/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<14
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<57
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	96 ✓	50 - 150

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-6

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/12/94
CLIENT I.D.	: B2-S1	DATE ANALYZED	: 01/13/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	33
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	79
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
⁀-TERPHENYL	92 ✓	50 - 150

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089-7

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 01/11/94
PROJECT #	: 3763-04	DATE RECEIVED	: 01/12/94
PROJECT NAME	: ALASKA MARINE LINES	DATE EXTRACTED	: 01/12/94
CLIENT I.D.	: B2-S3	DATE ANALYZED	: 01/13/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<14
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<56
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
o-TERPHENYL	95	50 - 150

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : 9401-089-2
DATE EXTRACTED : 01/12/94
DATE ANALYZED : 01/13/94
UNITS : mg/Kg

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	<10.0	<10.0	NC	200	210	105	209	105	0

CONTROL LIMITS	% REC.	RPD
DIESEL	63 - 131	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	100	95	50 - 150

NC = Not Calculable.

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089

GENERAL CHEMISTRY ANALYSIS

CLIENT : HART CROWSER, INC. MATRIX : SOIL
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES

PARAMETER	DATE ANALYZED
MOISTURE	01/13/94

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC. MATRIX : SOIL
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES UNITS : %

ATI I.D. #	CLIENT I.D.	MOISTURE
9401-089-1	MW5-S1	19
9401-089-2	WW5-S5	20
9401-089-3	B1-S2	22
9401-089-4	B1-S4	28
9401-089-5	B1-S5	30
9401-089-6	B2-S1	23
9401-089-7	B2-S3	28
9401-089-8	B2-S5	36

Analytical**Technologies,**Inc.

ATI I.D. # 9401-089

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

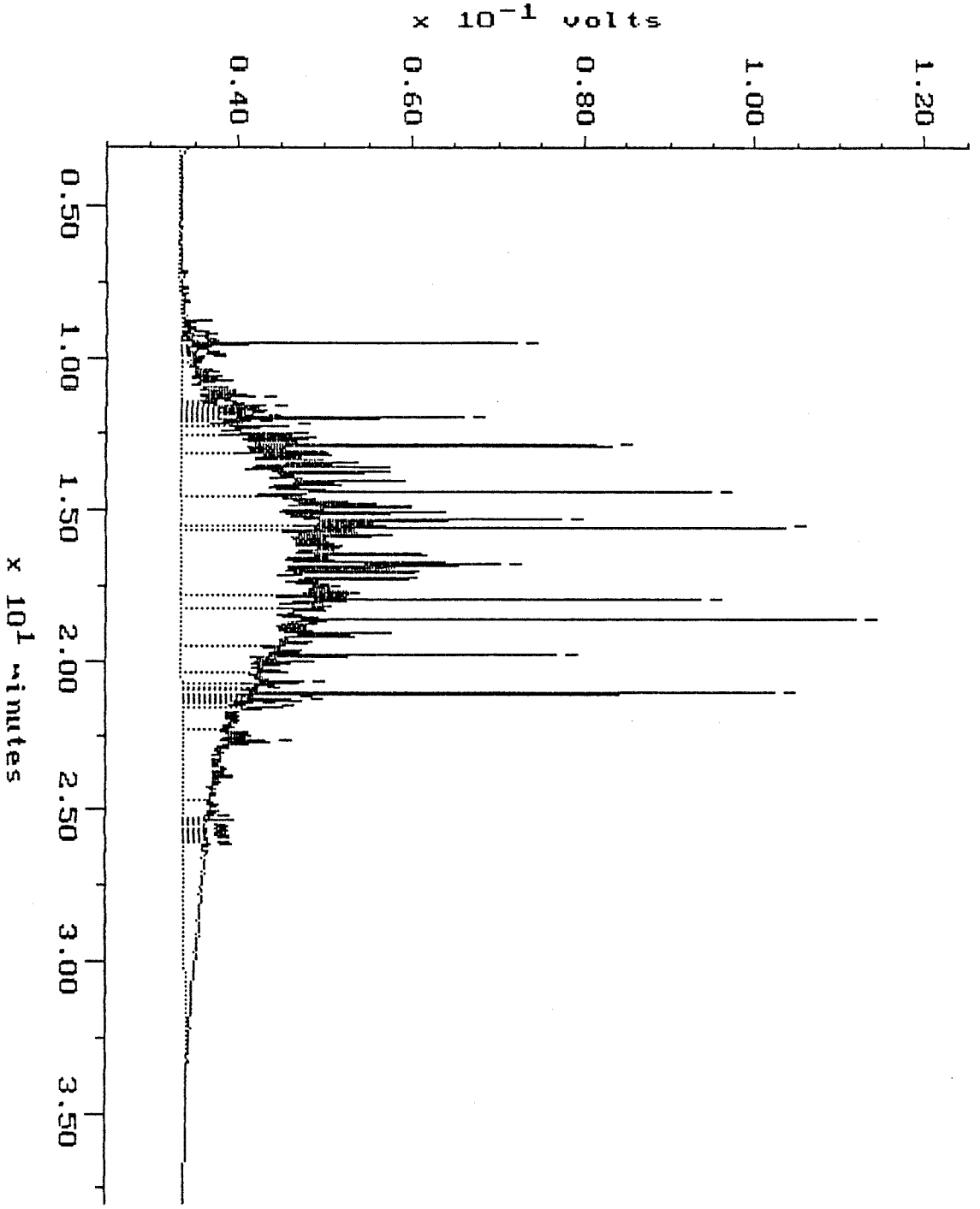
CLIENT : HART CROWSER, INC. MATRIX : SOIL
PROJECT # : 3763-04
PROJECT NAME : ALASKA MARINE LINES UNITS : %

PARAMETER	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
MOISTURE	9401-085-2	17	18	6	N/A	N/A	N/A
MOISTURE	9401-095-9	24	24	0	N/A	N/A	N/A

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

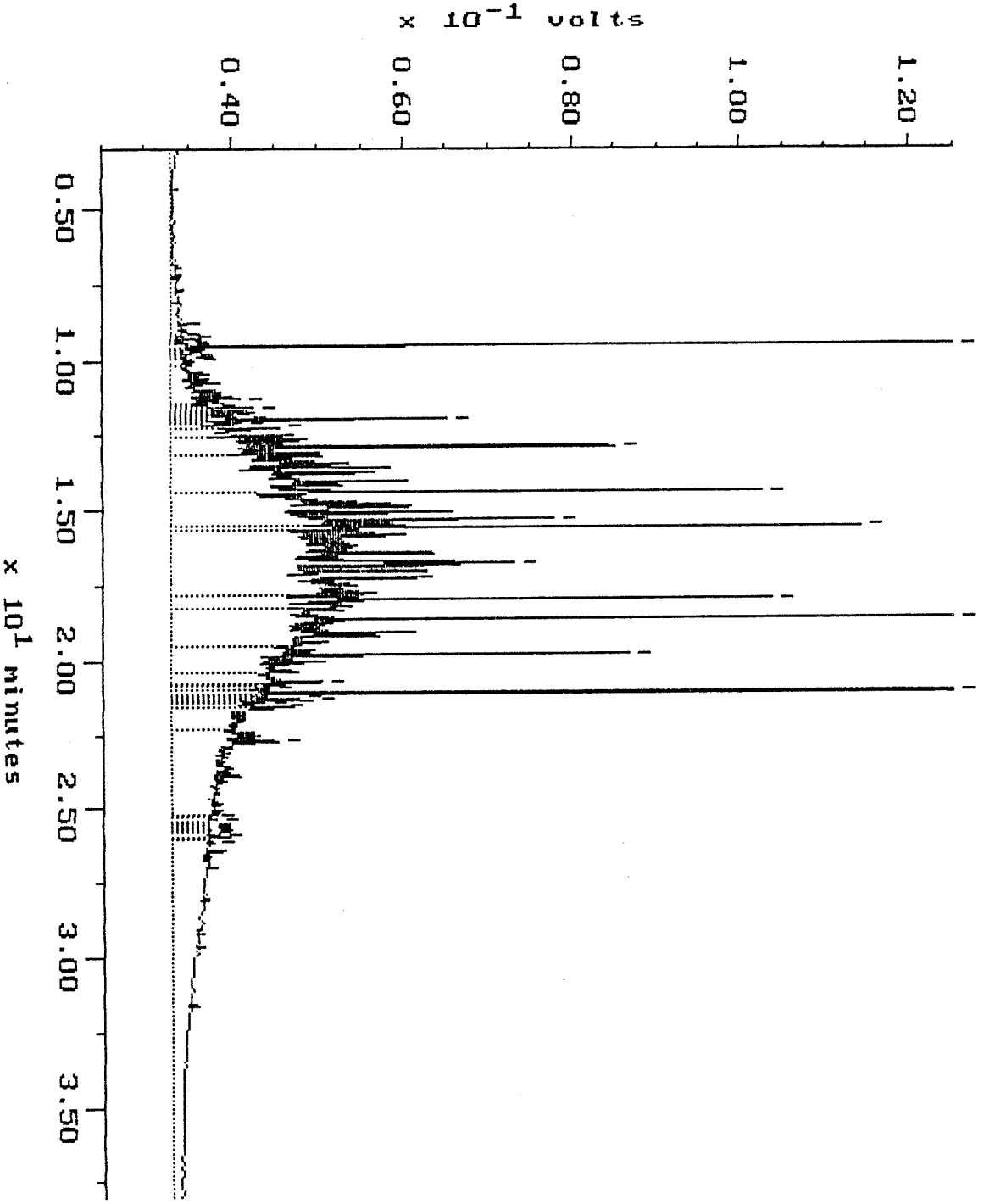
$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Sample Result} - \text{Duplicate Result})|}{\text{Average Result}} \times 100$$

Sample: 9401-089-3 DIL Channel: WILMA Filename: R1128W23
Acquired: 13-JAN-94 6:33 Method: F:\BKG2\MAXDATA\WILMA\FUEL0112 Operator: BKG
Dilution: 1 : 10.000

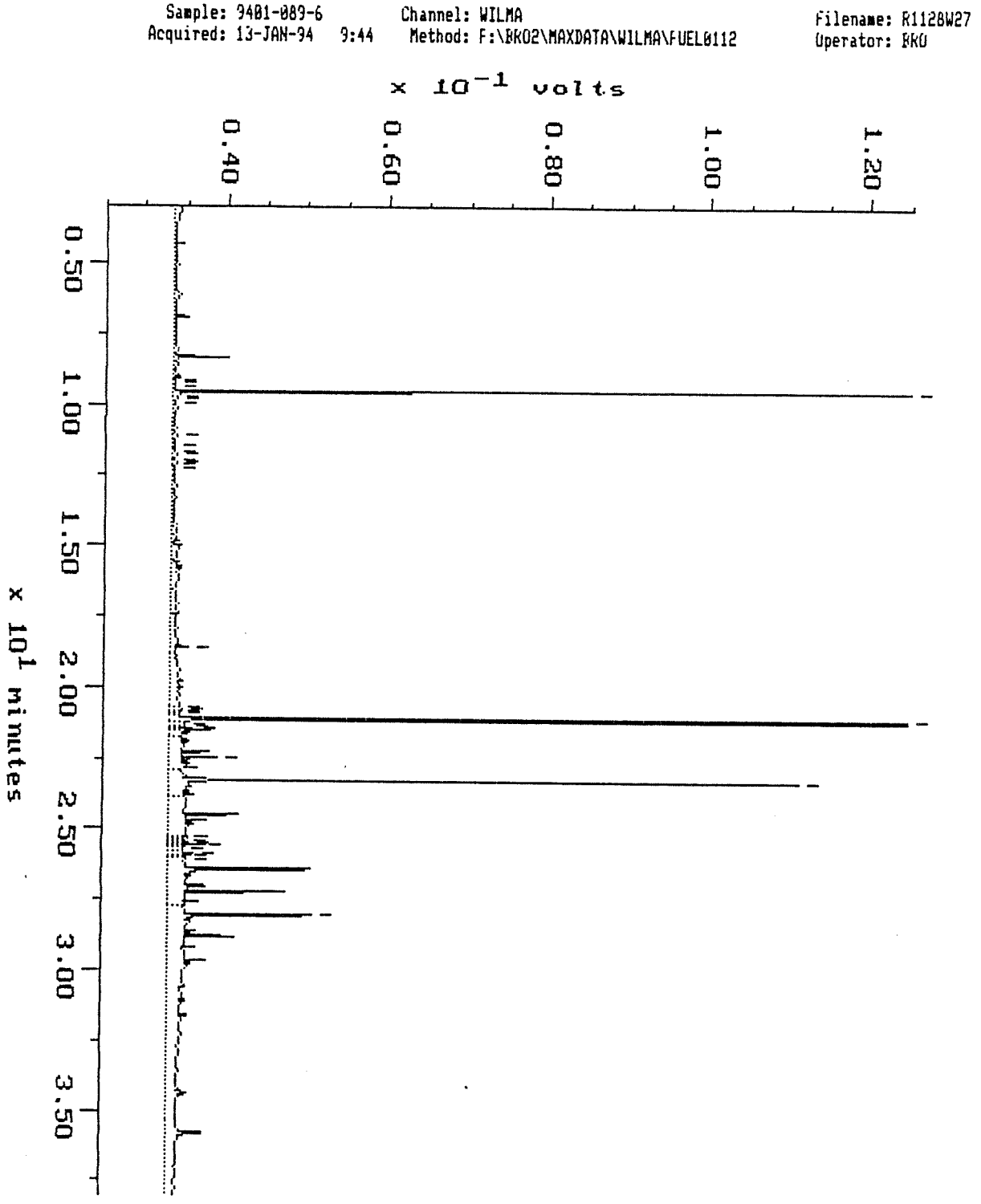


WA DOE WTPH-D

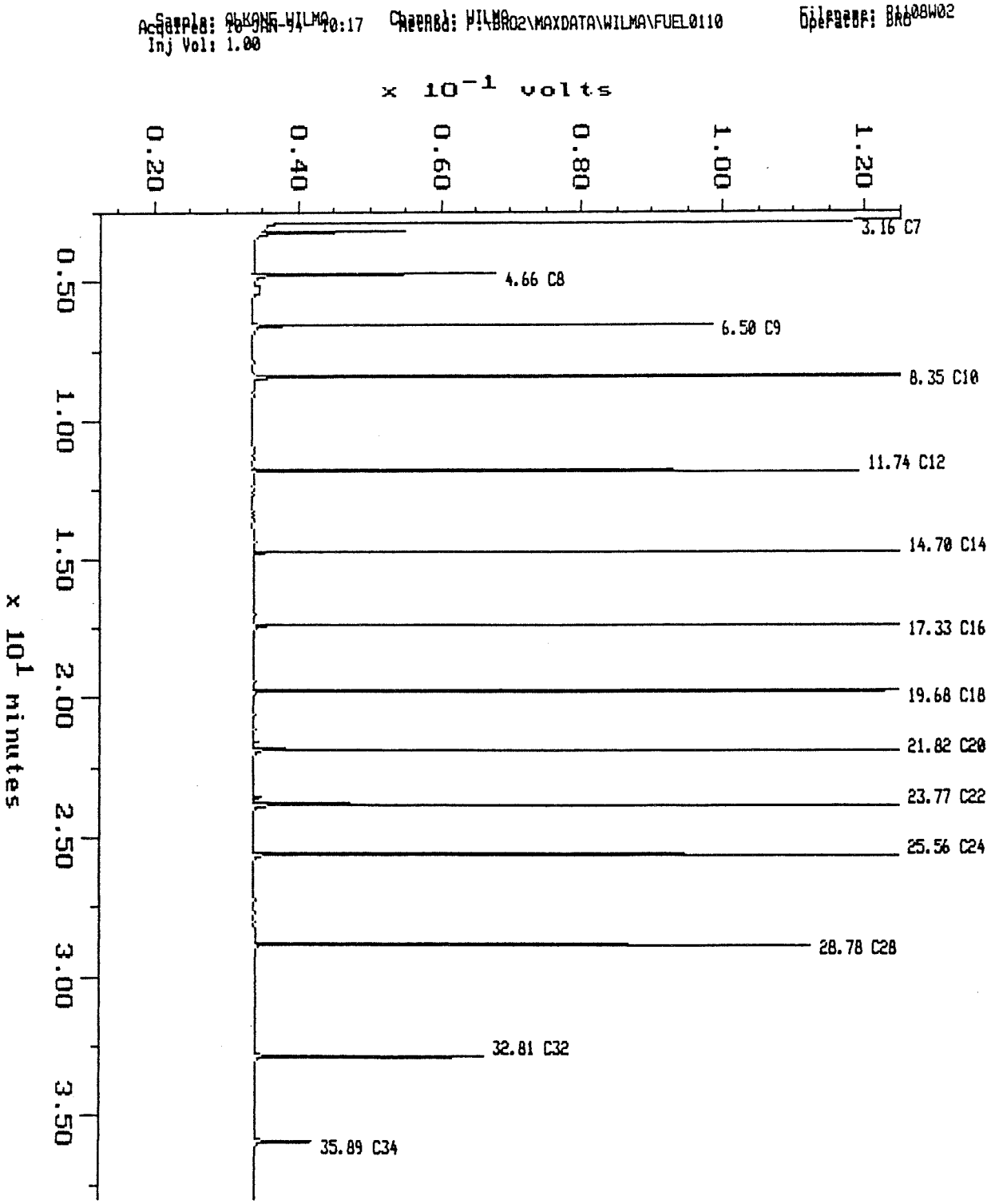
Sample: 9401-089-4 Channel: WILMA Filename: R1128W39
Acquired: 13-JAN-94 19:22 Method: F:\BRO2\MAXDATA\WILMA\FUEL0112 Operator: BRO



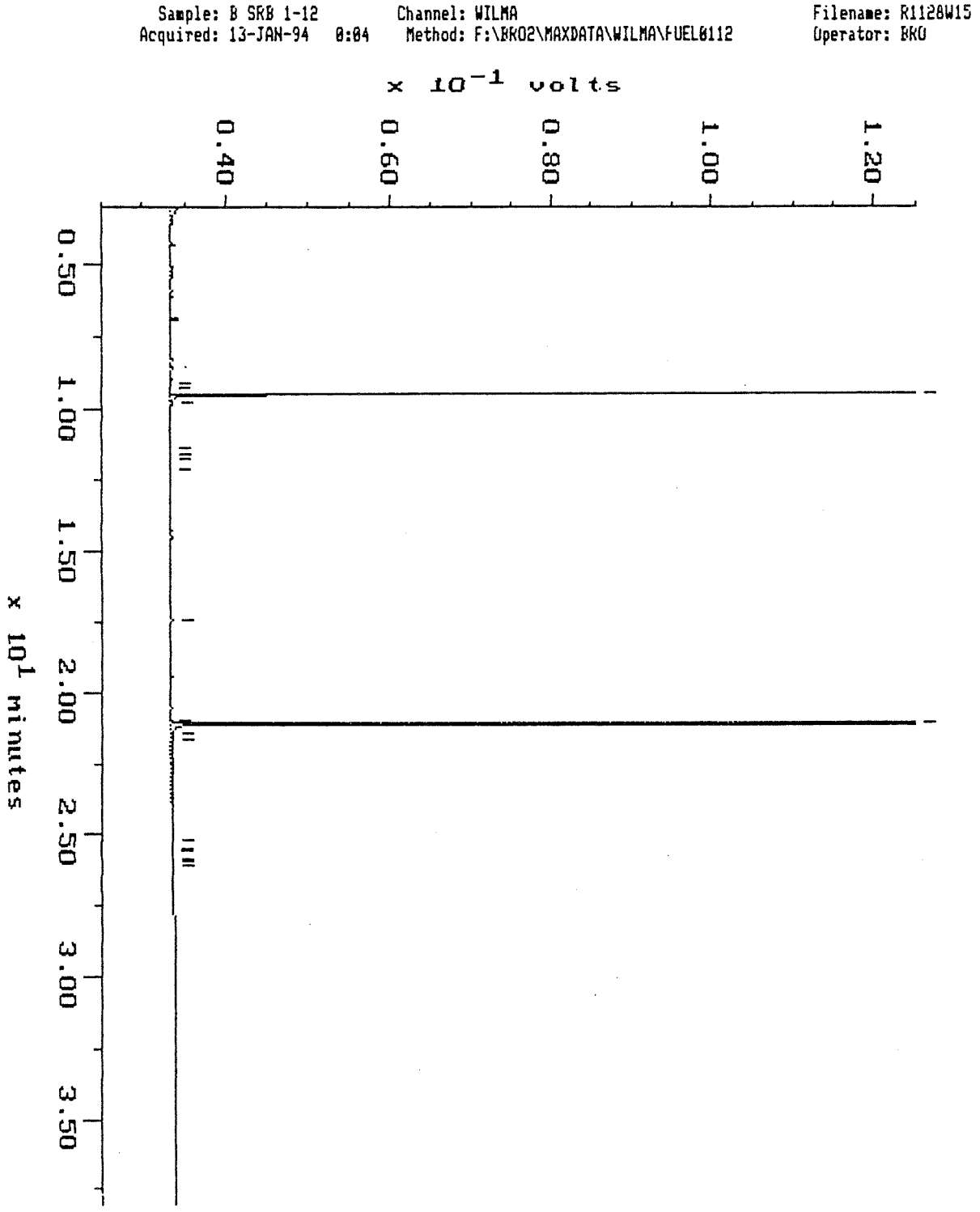
WA DOE WTPH-D


Sample: 9401-089-6
Acquired: 13-JAN-94 9:44
Channel: WILMA
Method: F:\BK02\MAXDATA\WILMA\FUEL0112
Filename: R1128W27
Operator: BKU
x 10⁻¹ volts
0.40
0.60
0.80
1.00
1.20
0.50
1.00
1.50
2.00
2.50
3.00
3.50
x 10¹ minutes

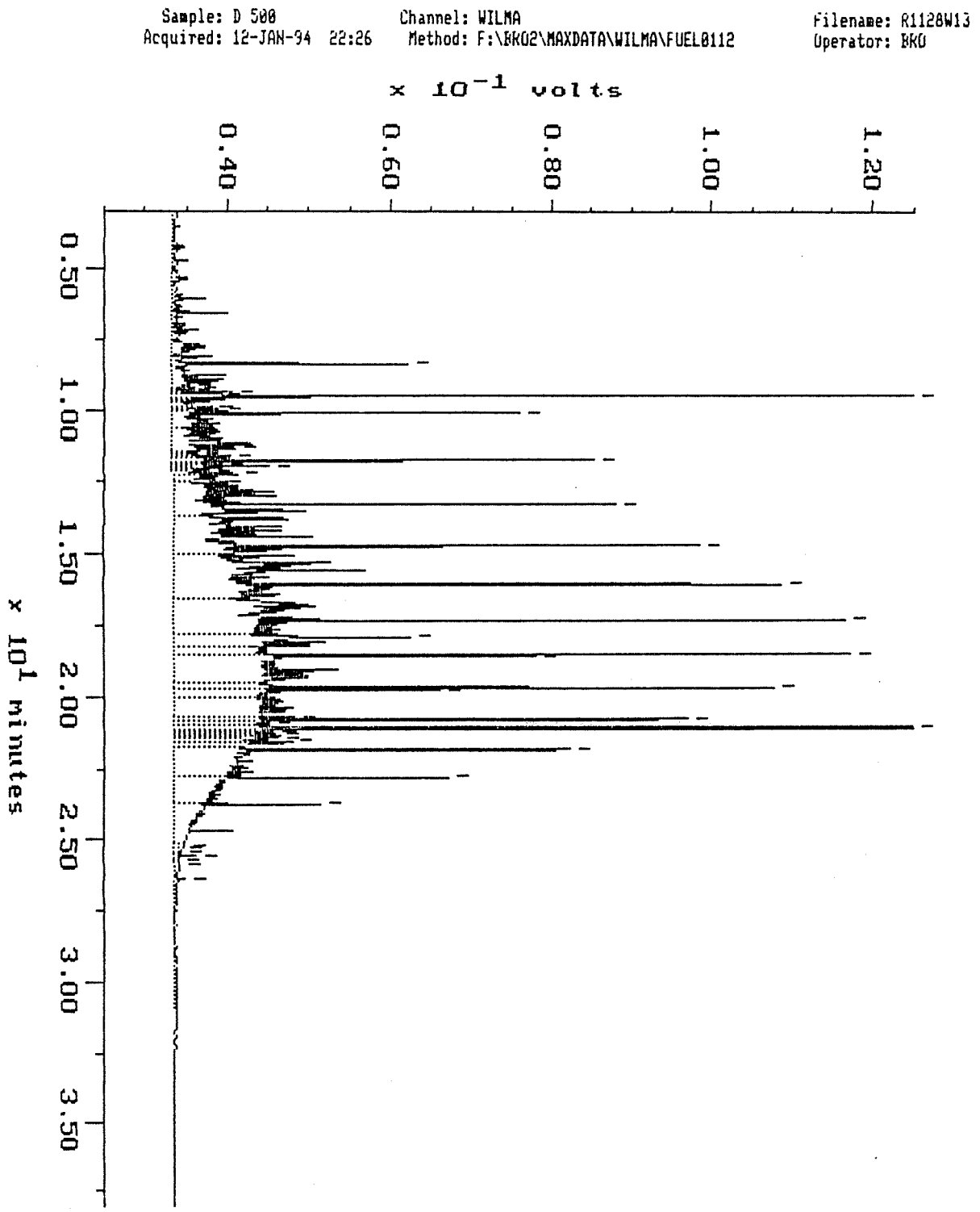
Alkane


Sample: ALKANE WILMA
Acquired: 10-JAN-94 10:17
Inj Vol: 1.00
Channel: WILMA
Method: P:\BR02\MAXDATA\WILMA\FUEL0110
Filename: B1108W02
Operator: BRB
x 10⁻¹ volts
0.20
0.40
0.60
0.80
1.00
1.20
x 10¹ minutes
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3.16 C7
4.66 C8
6.50 C9
8.35 C10
11.74 C12
14.70 C14
17.33 C16
19.68 C18
21.82 C20
23.77 C22
25.56 C24
28.78 C28
32.81 C32
35.89 C34

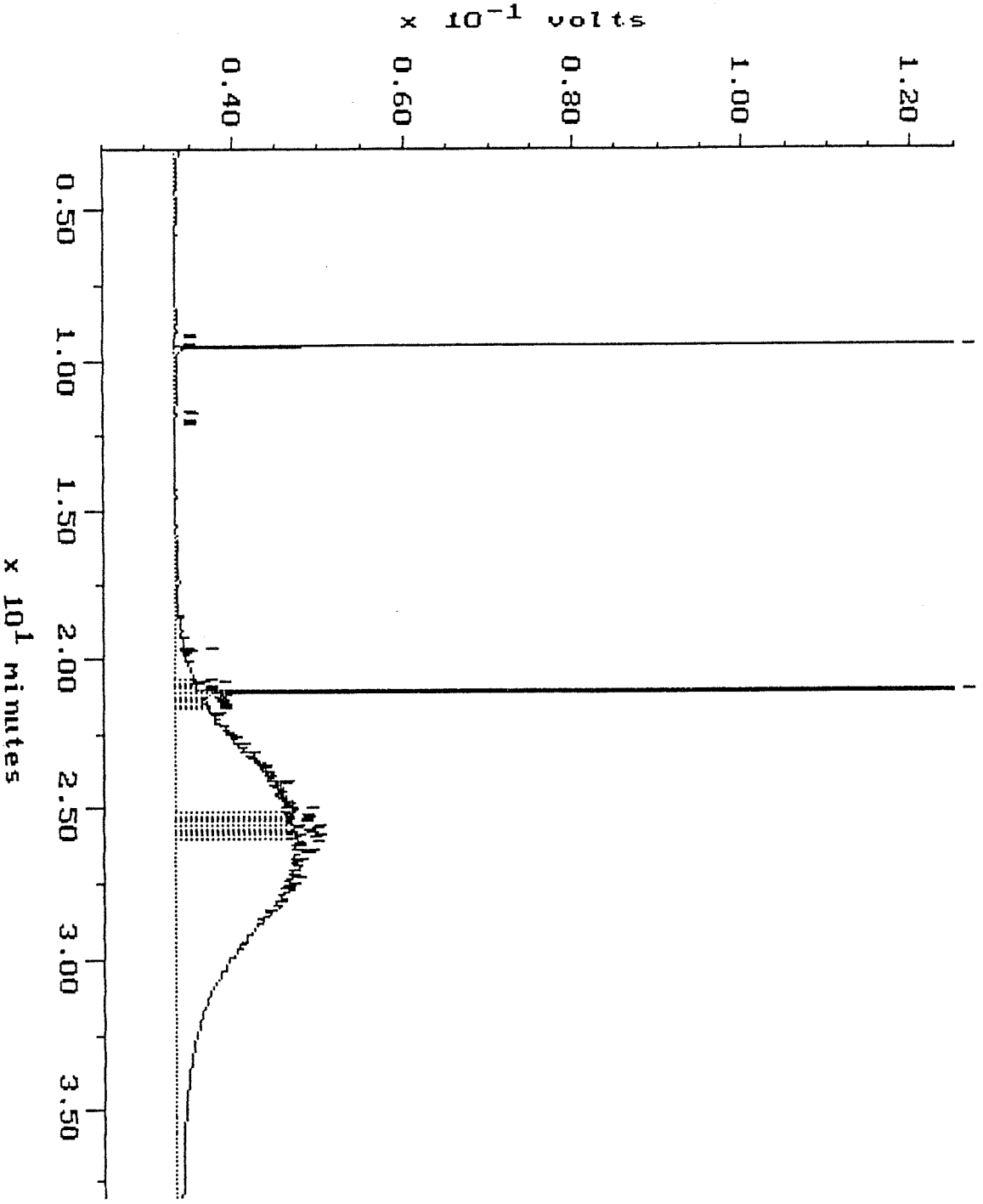
Blank


Sample: B SRB 1-12
Acquired: 13-JAN-94 0:04
Channel: WILMA
Method: F:\BRO2\MAXDATA\WILMA\FUEL0112
Filename: R1128W15
Operator: BRO
x 10⁻¹ volts
0.40
0.60
0.80
1.00
1.20
0.50
1.00
1.50
2.00
2.50
3.00
3.50
x 10¹ minutes

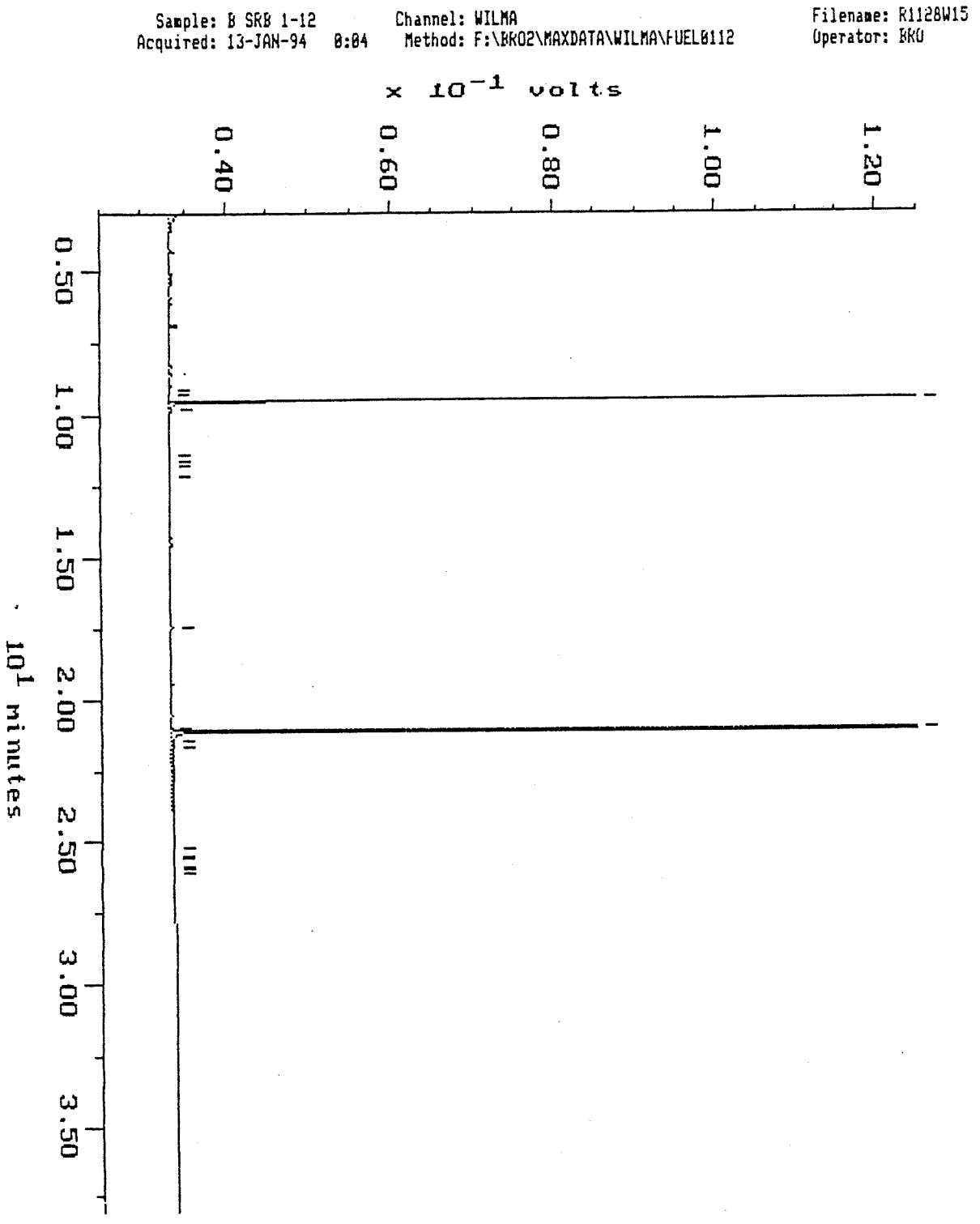
Continuing Calibration



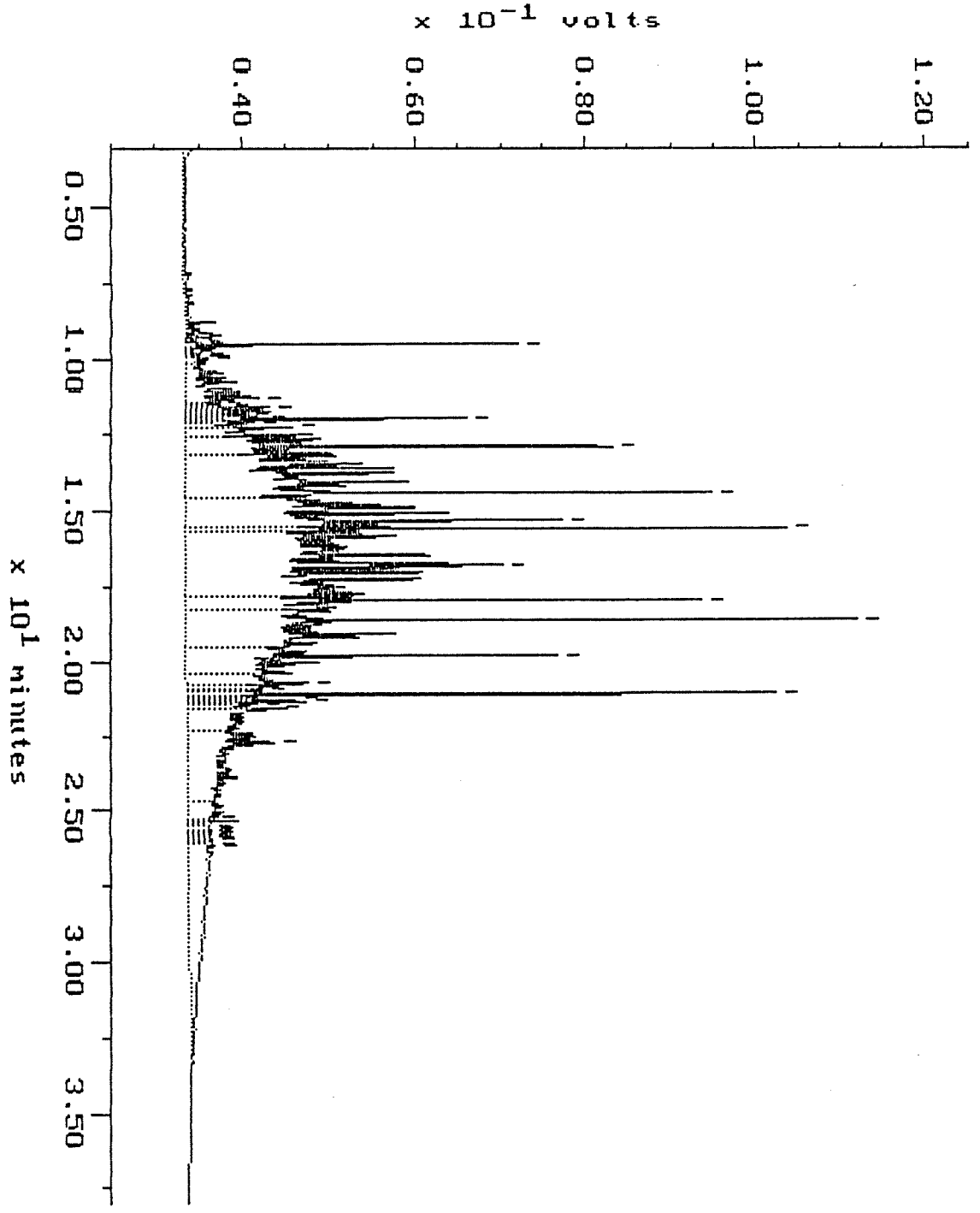
Continuing Calibration



Blank

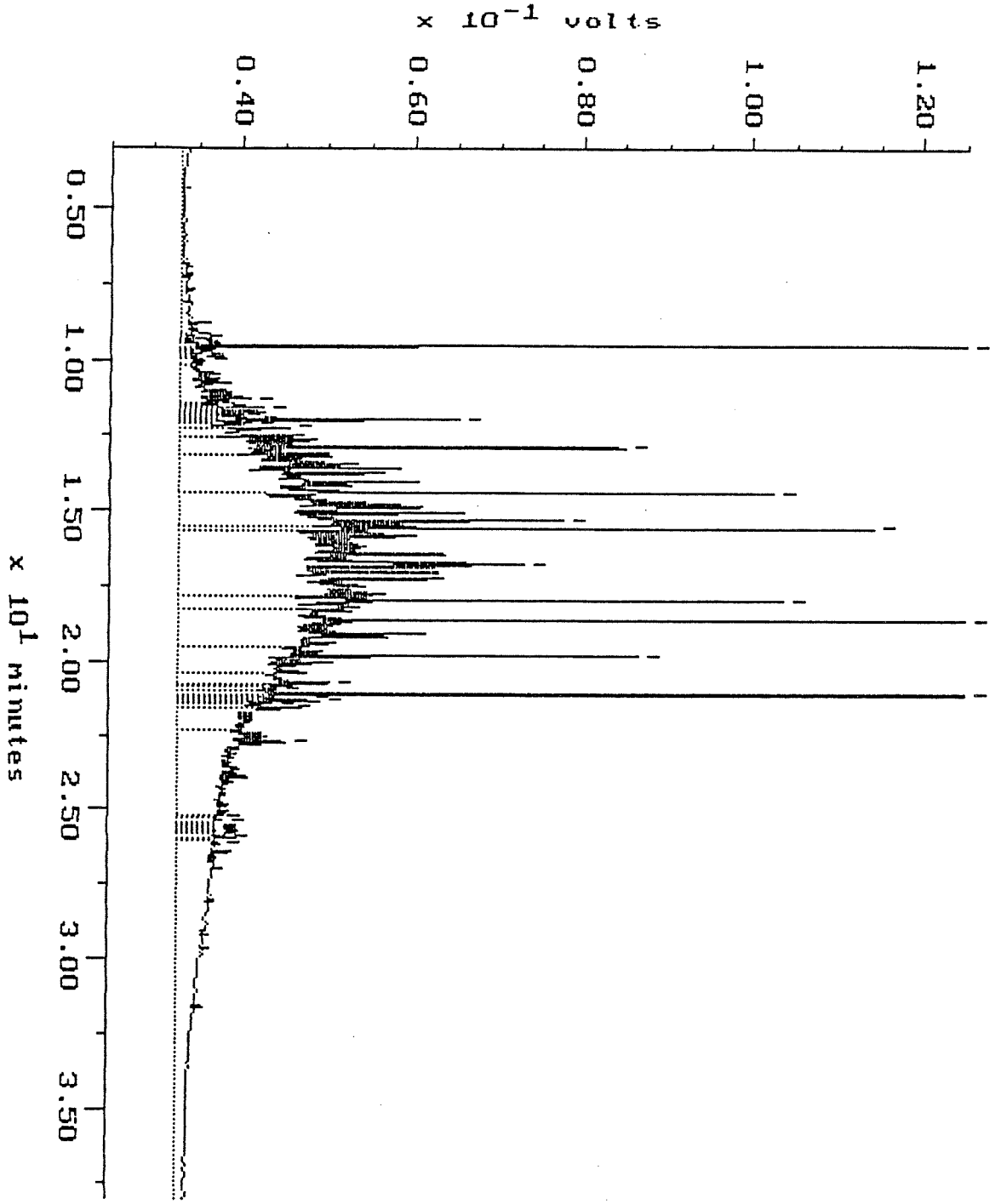

Sample: B SRB 1-12
Acquired: 13-JAN-94 0:04
Channel: WILMA
Method: F:\BK02\MAXDATA\WILMA\FUEL0112
Filename: R1128W15
Operator: BKU
x 10⁻¹ volts
0.40
0.60
0.80
1.00
1.20
0.50
1.00
1.50
2.00
2.50
3.00
3.50
10¹ minutes

Sample: 9401-089-3 DIL Channel: WILMA Filename: R1128W23
Acquired: 13-JAN-94 6:33 Method: F:\BRO2\MAXDATA\WILMA\FUEL0112 Operator: BRO
Dilution: 1 : 10.000



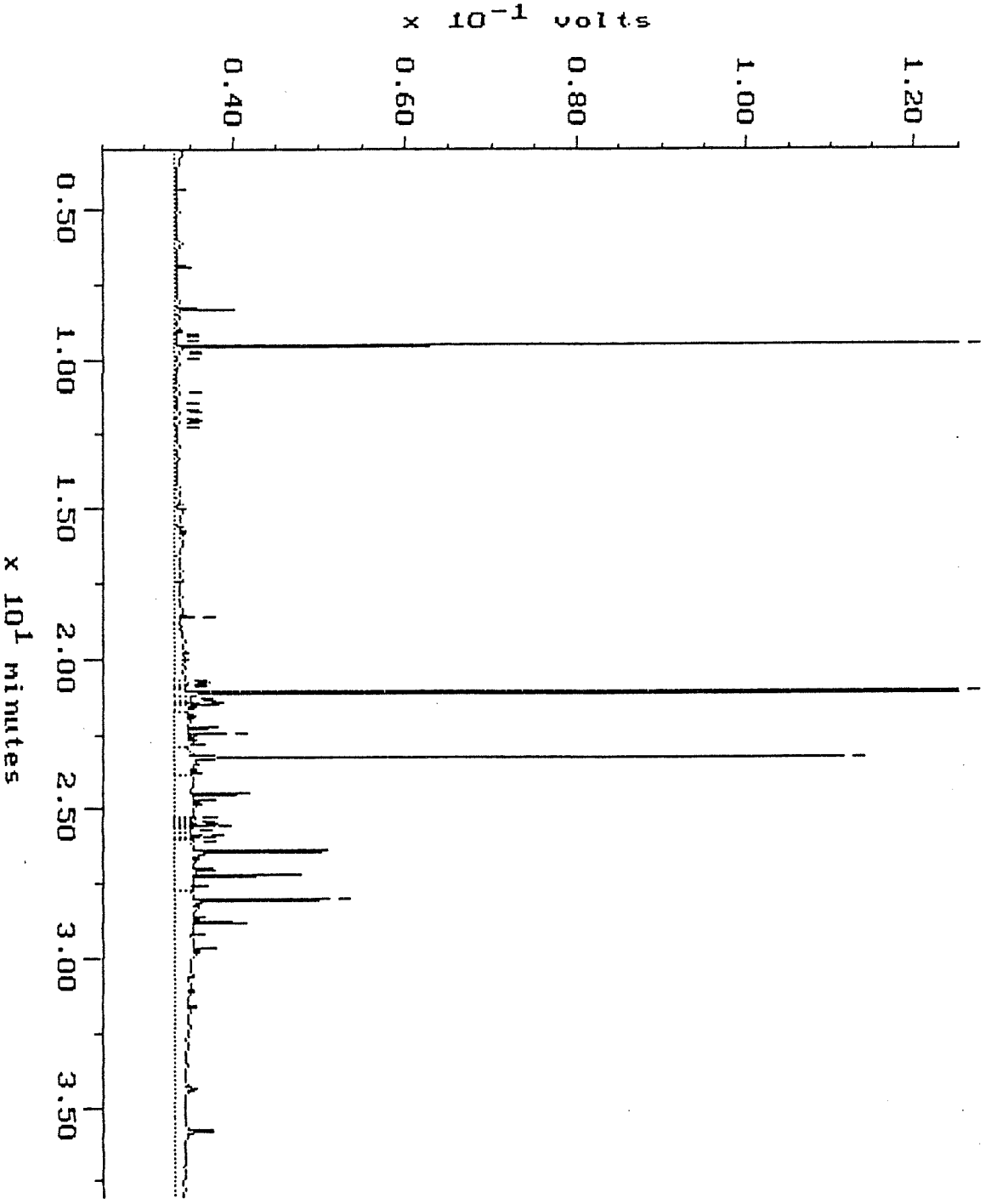
WA DOE WTPH-D

Sample: 9401-089-4 Channel: WILMA Filename: R1128W39
Acquired: 13-JAN-94 19:22 Method: F:\BRO2\MAXDATA\WILMA\FUEL0112 Operator: BRO

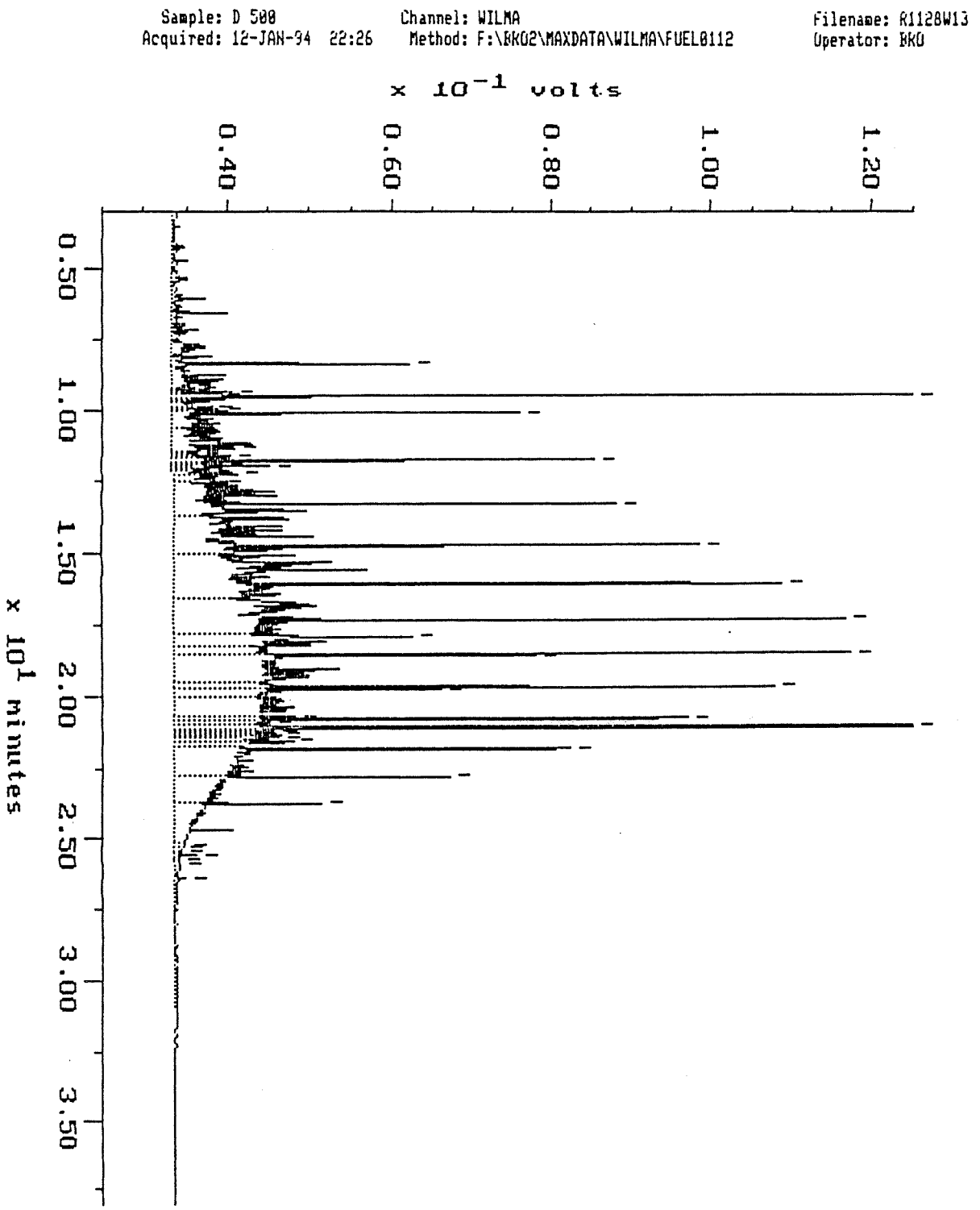


WA DOE WTPH-D

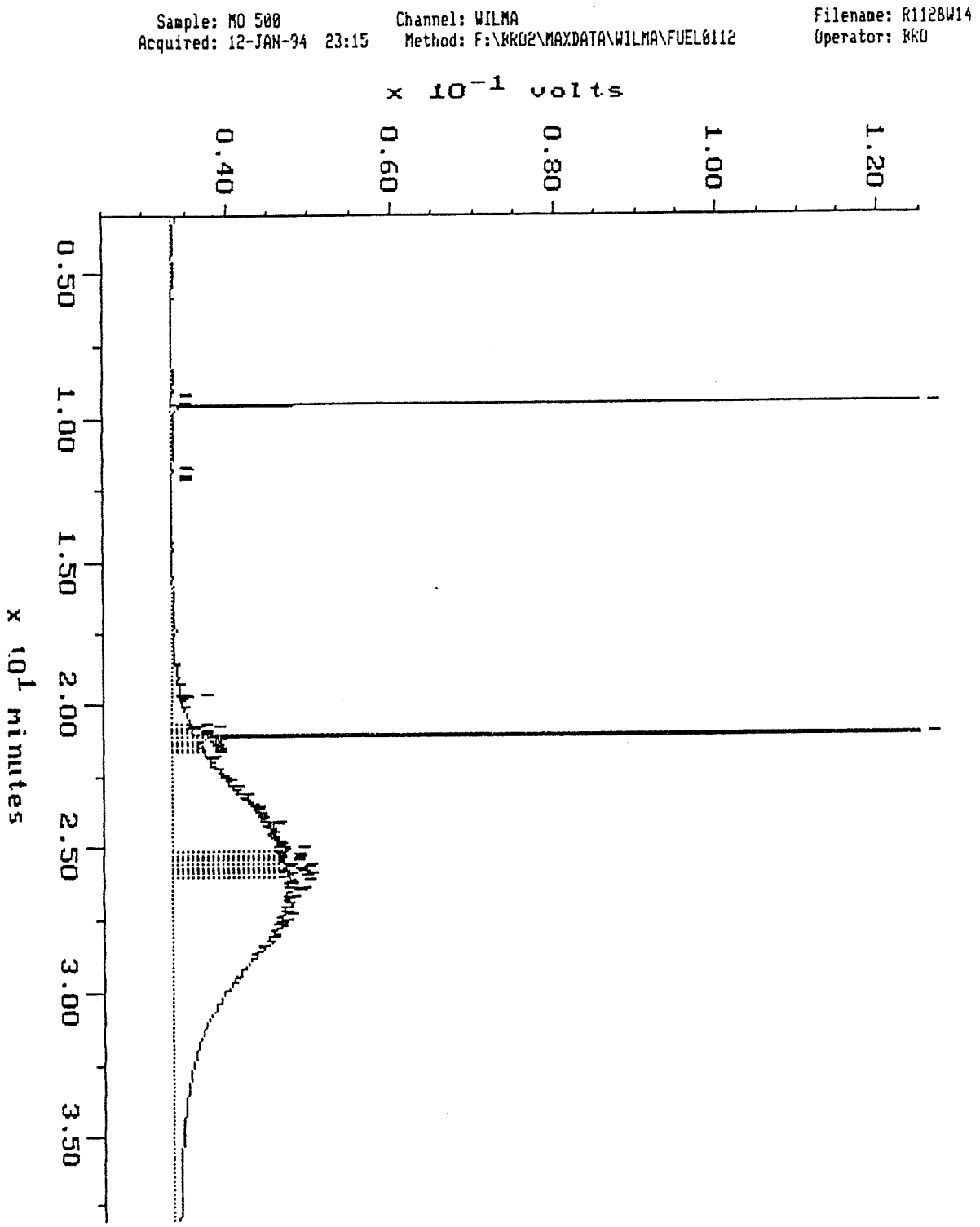
Sample: 9401-089-6 Channel: WILMA Filename: R1128W27
Acquired: 13-JAN-94 9:44 Method: F:\BK02\MAXDATA\WILMA\FUEL0112 Operator: BK0



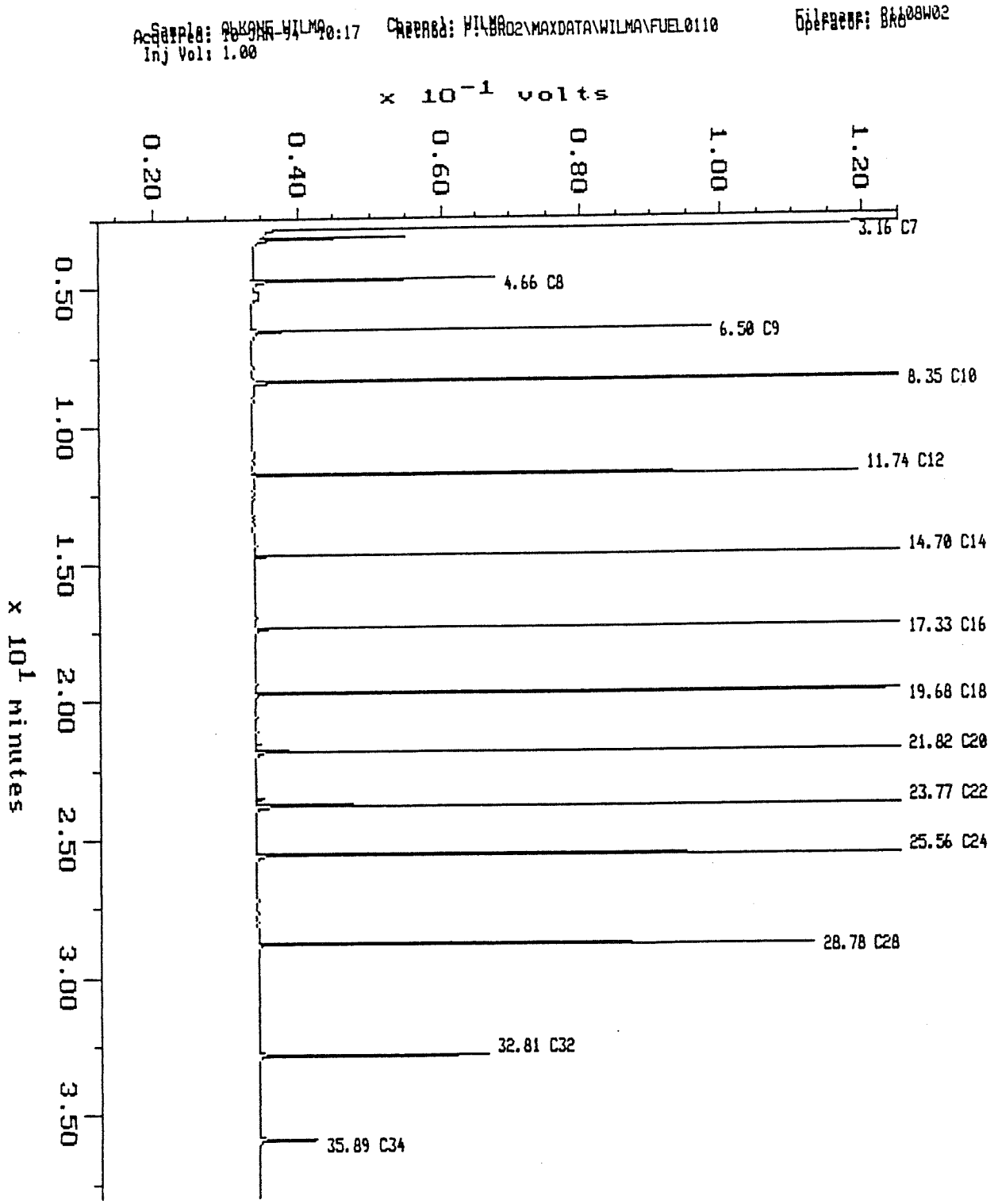
Continuing Calibration



Continuing Calibration

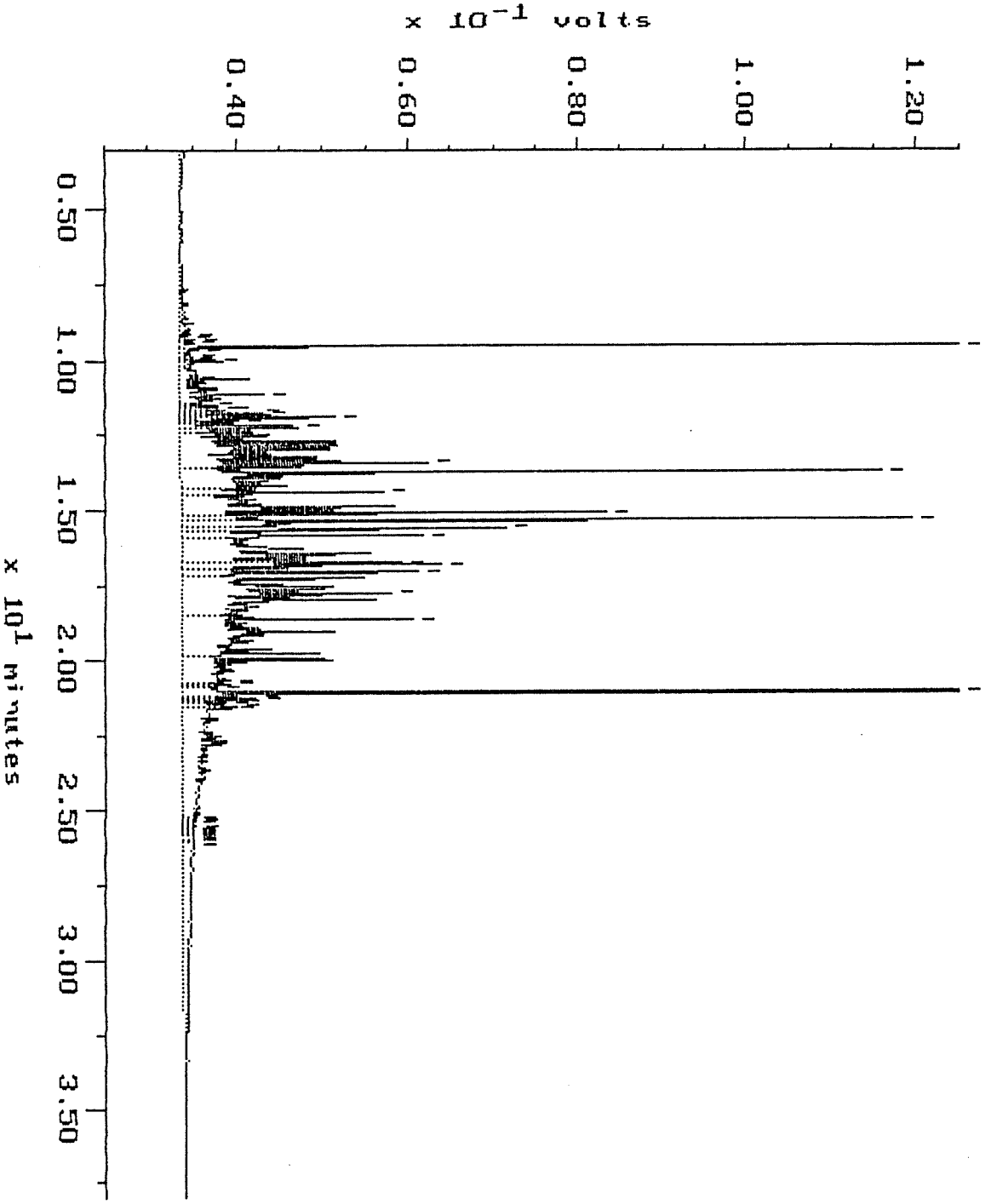


Alkane

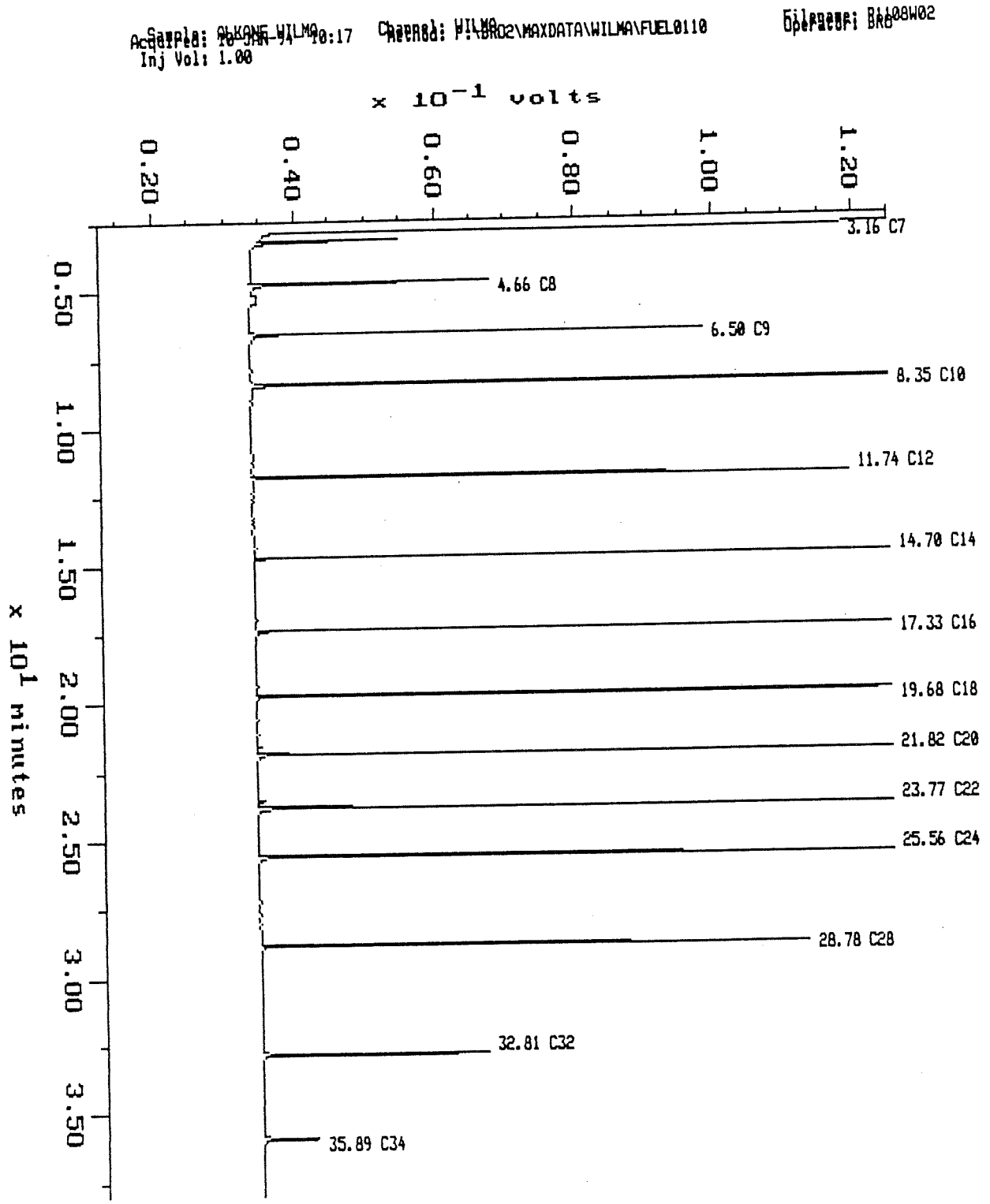

Sample: ALKANE WILMA
Acquired: 10-JAN-94 10:17
Inj Vol: 1.00
Channel: WILMA
Method: F:\BRO2\MAXDATA\WILMA\FUEL0110
Filename: B1108W02
Operator: BRO
x 10⁻¹ volts
0.20
0.40
0.60
0.80
1.00
1.20
x 10¹ minutes
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3.16 C7
4.66 C8
6.50 C9
8.35 C10
11.74 C12
14.70 C14
17.33 C16
19.68 C18
21.82 C20
23.77 C22
25.56 C24
28.78 C28
32.81 C32
35.89 C34

WA DOE WTPH-D

Sample: 9401-089-3 Channel: WILMA Filename: R1148W10
Acquired: 14-JAN-94 23:12 Method: F:\BKO2\MAXDATA\WILMA\FUEL0114 Operator: BKO



Alkane

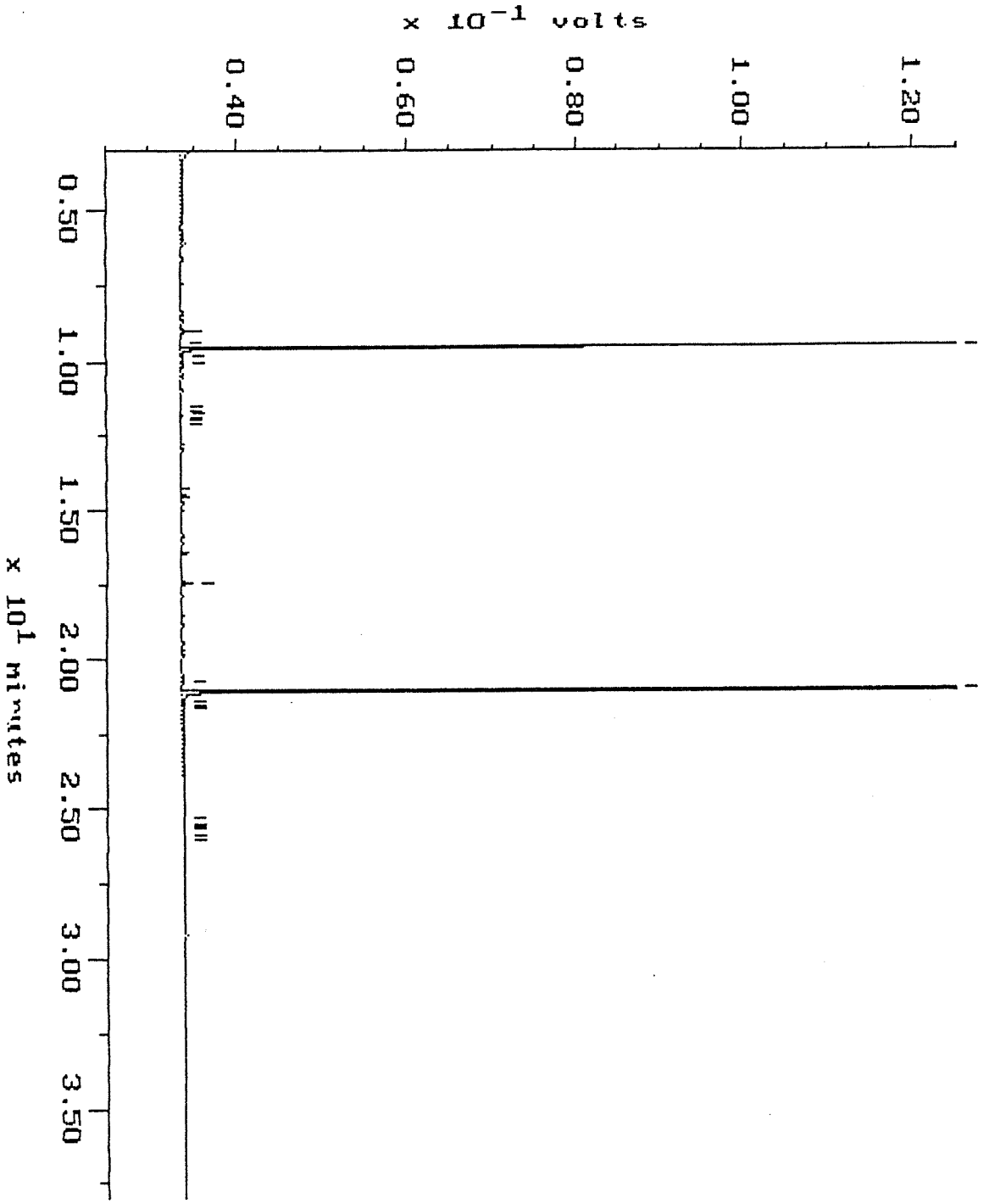

Sample: ALKANE WILMA
Acquired: 10 JAN 94 10:17
Inj Vol: 1.00
Channel: WILMA
Method: F:\BRO2\MAXDATA\WILMA\FUEL0110
Operator: BRO
Filename: B1108W02
x 10⁻¹ volts
0.20
0.40
0.60
0.80
1.00
1.20
x 10¹ minutes
0.50
1.00
1.50
2.00
2.50
3.00
3.50
3.16 C7
4.66 C8
6.50 C9
8.35 C10
11.74 C12
14.70 C14
17.33 C16
19.68 C18
21.82 C20
23.77 C22
25.56 C24
28.78 C28
32.81 C32
35.89 C34

Blank

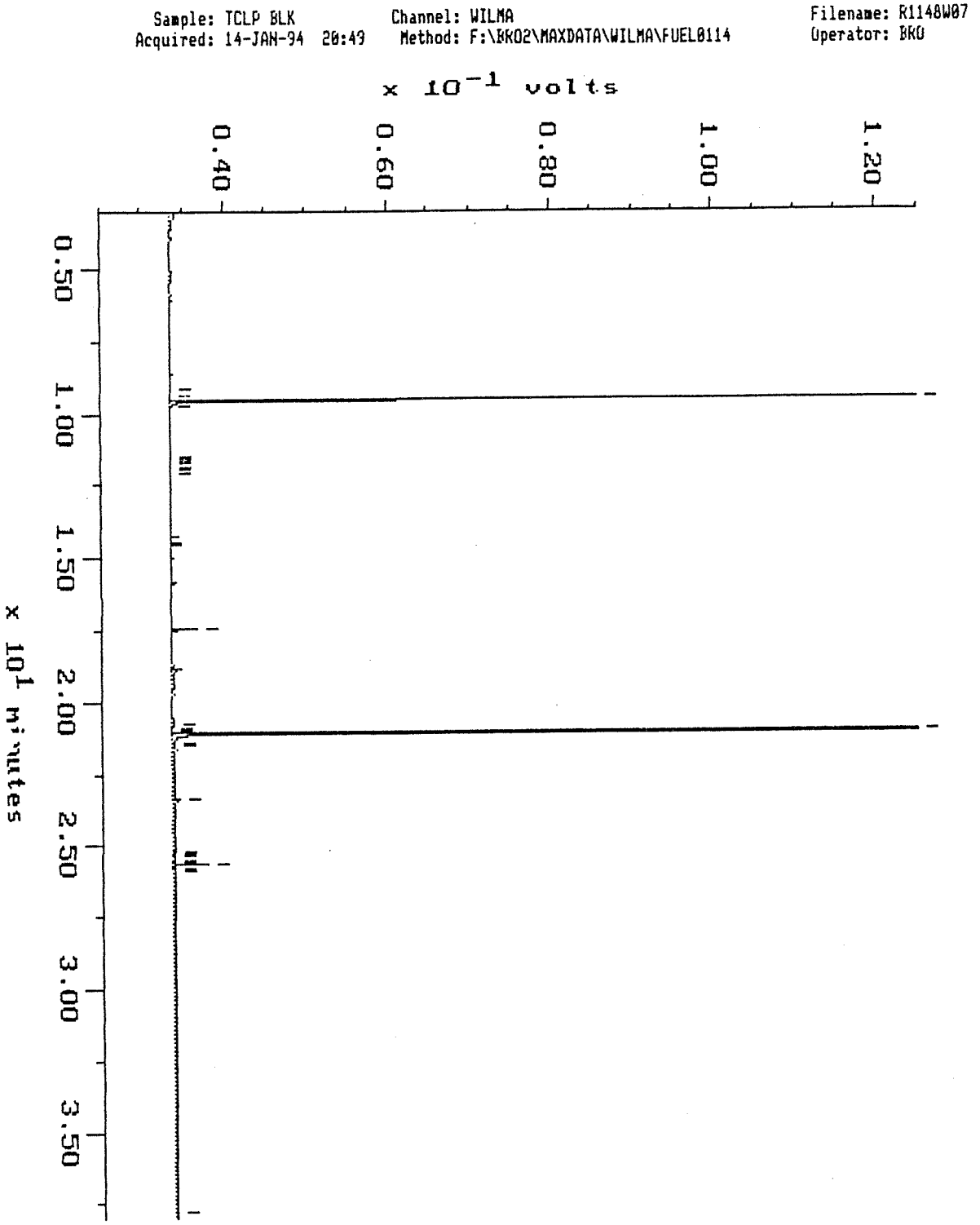
Sample: WRB 1-14
Acquired: 14-JAN-94 18:27

Channel: WILMA
Method: F:\BRO2\MAXDATA\WILMA\FUEL0114

Filename: R1148W04
Operator: BRO



Blank

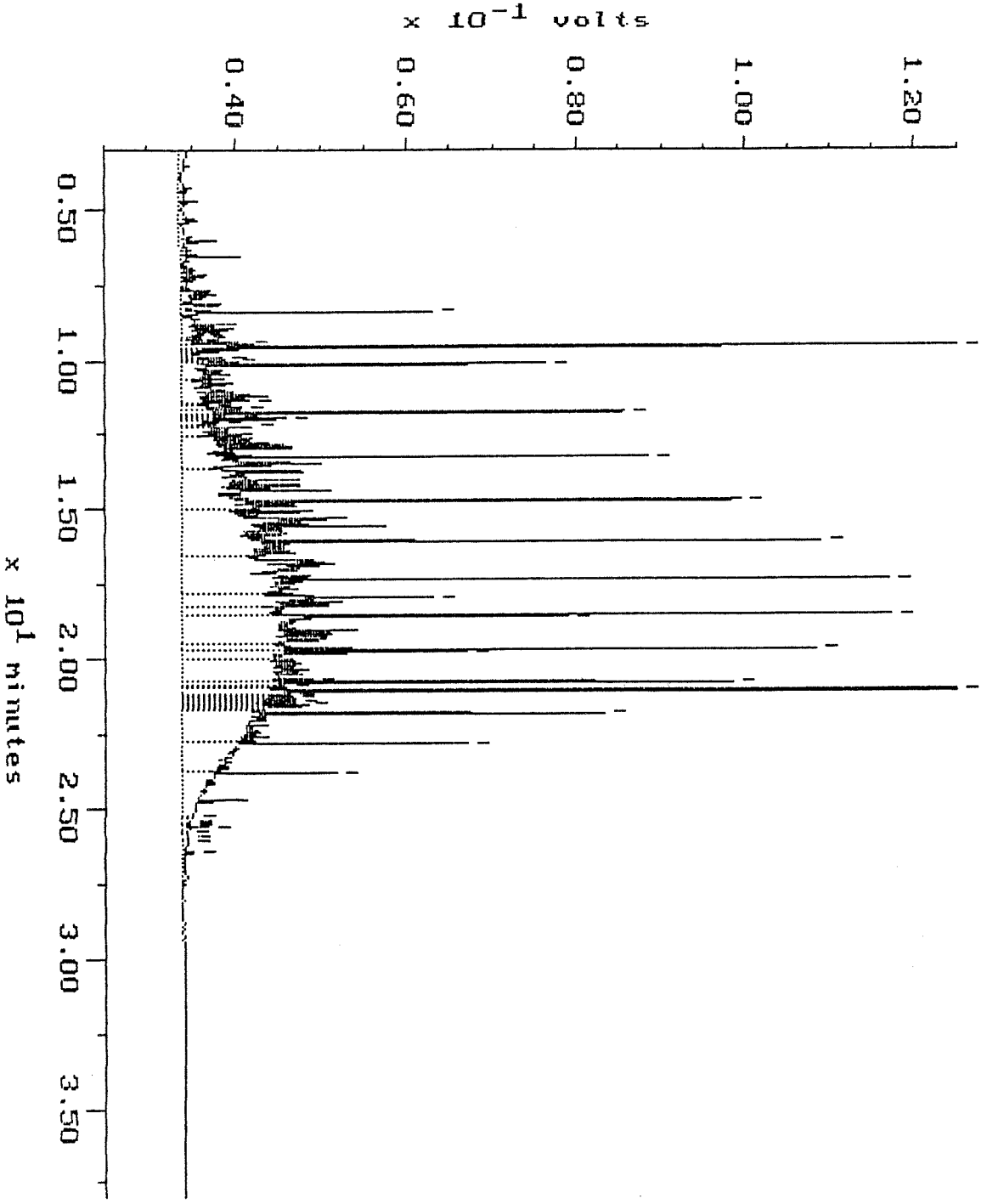

Sample: TCLP BLK
Acquired: 14-JAN-94 20:43
Channel: WILMA
Method: F:\BK02\MAXDATA\WILMA\FUEL0114
Filename: R1148W07
Operator: BK0
x 10⁻¹ volts
0.40
0.60
0.80
1.00
1.20
0.50
1.00
1.50
2.00
2.50
3.00
3.50
x 10¹ minutes

Continuing Calibration

Sample: D 500
Acquired: 14-JAN-94 16:51

Channel: WILMA
Method: F:\BRO2\MAXDATA\WILMA\FUEL0114

Filename: R1148W02
Operator: BRO

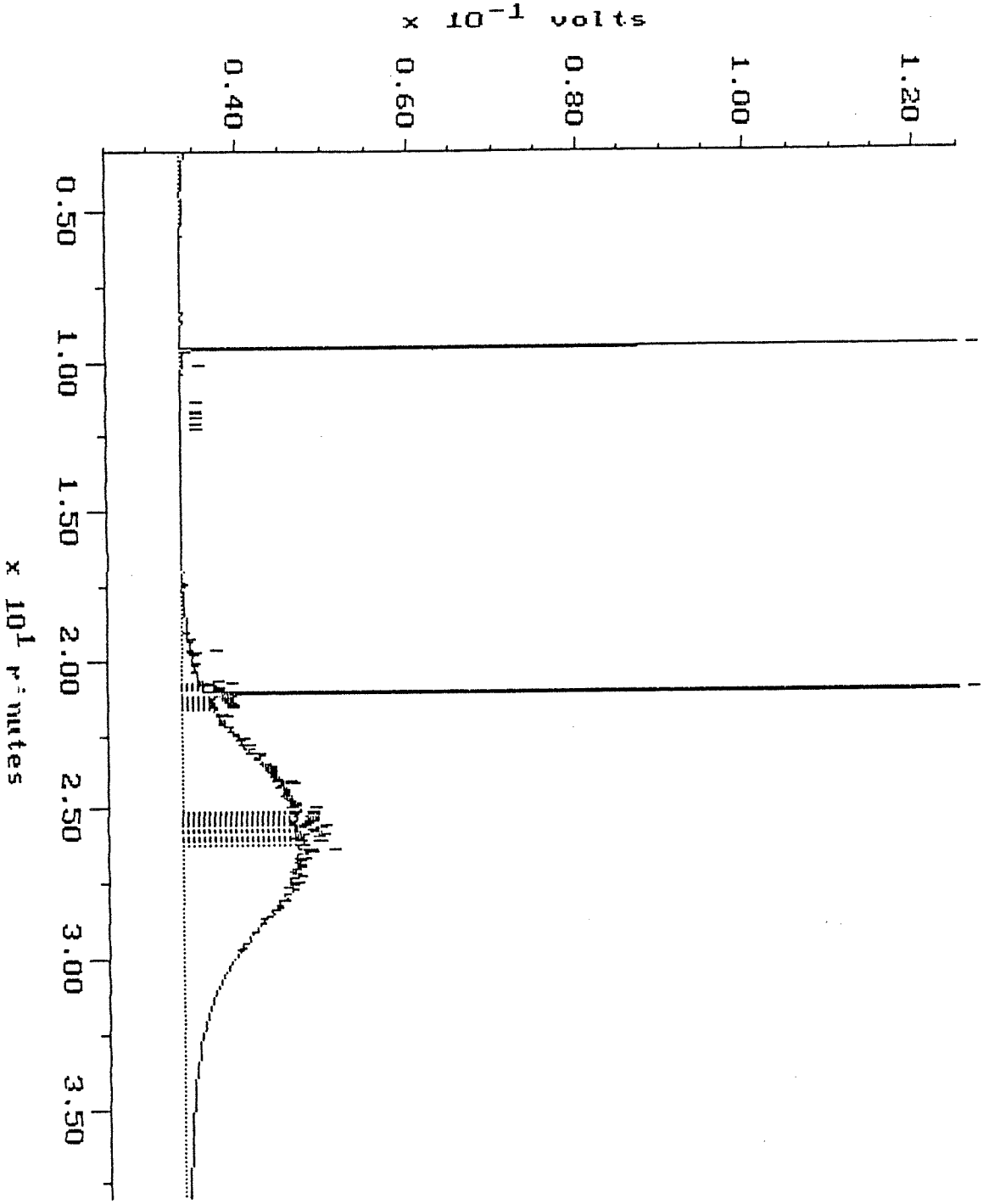


Continuing Calibration

Sample: MO 500
Acquired: 14-JAN-94 17:39

Channel: WILMA
Method: F:\BKO2\MAXDATA\WILMA\FUEL0114

Filename: R1148W03
Operator: BKO



Analytical Technologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 2[illegible]35

DATE: 1/11/94 Page 1 of 1 ATI ACCESSION # 2461 089

COMPANY: HART CROWSER
REPORT TO: VICTOR V. MELCHARDS
ADDRESS: 1910 FAIRVIEW AVE E
SEATTLE, WA 98102
PHONE: (206) 324-9530 FAX: (206) 328-5581
PROJECT MANAGER: VICTOR V. MELCHARDS
PROJECT NUMBER: 3736-04
PROJECT NAME: AMC

ATI will DISPOSE / RETURN samples (circle one)

Sample ID	Date	Time	Matrix	LabID
MW5-S1	1/11/94		SOIL	1
MW5-S5				2
B1-S2				3
B1-S4				4
B1-S5				5
B2-S1				6
B2-S3				7
B2-S5				8

FUELS											ORGANIC COMPOUNDS											METALS				TCLP					OTHER					Total # of Containers/sample
TPH-HCID	WA/OR										8240 GCMS Volatiles											Metals (Indicate below *)				TCLP-Volatiles (ZHE-8240)					% Moisture (please indicate)					
BETX/TPH-G combo	WA/OR										8270 GCMS Semivolatiles											Total Lead				TCLP-Semivolatiles (8270)						SPLP (1312)				
BETX (by 8020)	WA/OR										8080 Pesticides/PCBs											Priority Pollutant Metals (13)				TCLP-Pesticides (8080)							TOC			
TPH-G	WA/OR										PCB only (by 8080) STD/lo level											TAL Metals (23)				TCLP-Herbicides (8150)										
TPH-D EXTENDED	WA/OR										8010 Halogenated VOCs															TCLP-Metals (8 metals)										
8015 modified	WA/OR										8020 Aromatic VOCs																								
418.1											8310 HPLC PAHs																								
413.2											8040 Phenols																								
AK-GRO											8140 OP Pesticides																								
AK-DRO											8150 OC Herbicides																								
MW5-S1					✓											✓														✓	✓				2
MW5-S5					✓											✓														✓	✓				2
B1-S2					✓											✓														✓	✓				3
B1-S4					✓											✓														✓	✓				2
B1-S5					✓											✓														✓	✓				2
B2-S1					✓											✓														✓	✓				2
B2-S3					✓											✓														✓	✓				2
B2-S5					✓											✓														✓	✓				2

Turnaround Time		Sample Receipt	
STANDARD TAT	X	TOTAL # CONTAINERS RECVD	18
1 WEEK TAT		COC SEALS PRESENT?	Y
4 WORK DAY TAT		COC SEALS INTACT?	Y
3 WORK DAY TAT		RECEIVED COLD?	Y
2 WORK DAY TAT		RECEIVED INTACT?	Y
24 HOUR TAT		RECEIVED VIA:	COURIER

Special Instructions:
ANALYZE SPLP EXTRACTS FOR TPH (8310) AND WTPH-Dx EXTENDED

* Metals needed:

Relinquished By:	Relinquished By:	Relinquished By:
Date: 1/11/94	Date:	Date:
Time: 1800	Time:	Time:
Received By:	Received By:	Received By:
Date: 1/12/94	Date:	Date:
Time: 10:30	Time:	Time:

APPENDIX

Analytical**Technologies,** Inc. Corporate Offices: 5550 Morehouse Drive San Diego, CA 92121 (619) 458-9141

ATI I.D.: 401138

January 19, 1994

ANALYTICAL TECHNOLOGIES, INC.
560 NACHES AVENUE SW., SUITE 101
RENTON, WA 98055

Project Name: HART CROWSER/ALASKA
Project # : 9401-089

Attention: TAMARA JEROME

Analytical Technologies, Inc. has received the following sample(s):

Date Received	Quantity	Matrix
January 13, 1994	8	SOIL

The sample(s) were analyzed with EPA methodology or equivalent methods as specified in the enclosed analytical schedule. The symbol for "less than" indicates a value below the reportable detection limit. Please note that the Sample Condition Upon Receipt Checklist is included at the end of this report.

The results of these analyses and the quality control data are enclosed.

JON M. BREWSTER
PROJECT MANAGER

M. E. SHIGLEY
LABORATORY MANAGER

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE

Client : ANALYTICAL TECHNOLOGIES, INC.
Project # : 9401-089
Project Name: HART CROWSER/ALASKA

Report Date: January 19, 1994
ATI I.D. : 401138

ATI #	Client Description	Matrix	Date Collected
1	9401-089-1	SOIL	11-JAN-94
2	9401-089-2	SOIL	11-JAN-94
3	9401-089-3	SOIL	11-JAN-94
4	9401-089-4	SOIL	11-JAN-94
5	9401-089-5	SOIL	11-JAN-94
6	9401-089-6	SOIL	11-JAN-94
7	9401-089-7	SOIL	11-JAN-94
8	9401-089-8	SOIL	11-JAN-94

---TOTALS---

Matrix	# Samples
SOIL	8

ATI STANDARD DISPOSAL PRACTICE

The sample(s) from this project will be disposed of in twenty-one (21) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

ANALYTICAL SCHEDULE

Client : ANALYTICAL TECHNOLOGIES, INC.
Project # : 9401-089
Project Name: HART CROWSER/ALASKA

ATI I.D.: 401138

Analysis	Technique/Description
ASA 90-3.2 (TOTAL ORGANIC CARBON)	WALKLEY-BLACK
METHOD 7-2.2,METHODS OF SOIL ANALYSIS(% MOISTURE)	GRAVIMETRIC

NOTE: ALL SAMPLE RESULTS WERE REPORTED IN DRY WEIGHT.

GENERAL CHEMISTRY RESULTS

Client : ANALYTICAL TECHNOLOGIES, INC.
Project # : 9401-089
Project Name: HART CROWSER/ALASKA

ATI I.D.: 401138

Sample #	Client ID	Matrix	Date Sampled	Date Received
1	9401-089-1	SOIL	11-JAN-94	13-JAN-94
2	9401-089-2	SOIL	11-JAN-94	13-JAN-94
3	9401-089-3	SOIL	11-JAN-94	13-JAN-94
4	9401-089-4	SOIL	11-JAN-94	13-JAN-94
5	9401-089-5	SOIL	11-JAN-94	13-JAN-94

Parameter	Units	1	2	3	4	5
% MOISTURE	%	20.6	18.7	23.6	19.9	29.8
TOTAL ORGANIC CARBON (WB)	%	0.14	0.18	0.13	0.51	1.9

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

Client : ANALYTICAL TECHNOLOGIES, INC.
Project # : 9401-089 ATI I.D.: 401138
Project Name: HART CROWSER/ALASKA

Sample #	Client ID	Matrix	Date Sampled	Date Received
6	9401-089-6	SOIL	11-JAN-94	13-JAN-94
7	9401-089-7	SOIL	11-JAN-94	13-JAN-94
8	9401-089-8	SOIL	11-JAN-94	13-JAN-94

Parameter	Units	6	7	8
% MOISTURE	%	26.8	27.3	31.1
TOTAL ORGANIC CARBON (WB)	%	2.5	0.39	2.0

Analytical Technologies, Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

DUP/MS

Client : ANALYTICAL TECHNOLOGIES, INC.
Project # : 9401-089
Project Name: HART CROWSER/ALASKA

ATI I.D. : 401138

Parameters	REF I.D.	Units	Sample Result	Dup Result	RPD	Spiked Sample	Spike Conc	% Rec
% MOISTURE	401138-03	%	23.6	21.9	7	N/A	N/A	N/A
TOTAL ORGANIC CARBON (WB)	401138-02	%	0.18	0.22	20	0.58	0.35	114

% Recovery = (Spike Sample Result - Sample Result)*100/Spike Concentration
RPD (Relative % Difference) = (Sample Result - Duplicate Result)*100/Average Result

Analytical Technologies, Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

BLANK SPIKE

Client : ANALYTICAL TECHNOLOGIES, INC.
Project # : 9401-089 ATI I.D. : 401138
Project Name: HART CROWSER/ALASKA

Parameters	Blank Spike ID#	Units	Blank Result	Spiked Sample	Spike Conc.	% Rec
TOTAL ORGANIC CARBON (WB)	43327	%	<0.010	0.049	0.053	92

% Recovery = (Spike Sample Result - Sample Result)*100/Spike Concentration
RPD (Relative % Difference) = (Sample Result - Duplicate Result)*100/Average Result

Project Id: 9108-120 Proj Name : HART CROWSER/ALASKA
Proj Num : 9401-089 Accession : 401138

Test: ASA 90-3.2 (TOTAL ORGANIC CARBON)

ATI #	Matrix	Client ID	Sampled	Received	Analyzed	Prep Date
1	SOIL	9401-089-1	11-JAN-94	13-JAN-94	18-JAN-94	N/A
2	SOIL	9401-089-2	11-JAN-94	13-JAN-94	18-JAN-94	N/A
3	SOIL	9401-089-3	11-JAN-94	13-JAN-94	18-JAN-94	N/A
4	SOIL	9401-089-4	11-JAN-94	13-JAN-94	18-JAN-94	N/A
5	SOIL	9401-089-5	11-JAN-94	13-JAN-94	18-JAN-94	N/A
6	SOIL	9401-089-6	11-JAN-94	13-JAN-94	18-JAN-94	N/A
7	SOIL	9401-089-7	11-JAN-94	13-JAN-94	18-JAN-94	N/A
8	SOIL	9401-089-8	11-JAN-94	13-JAN-94	18-JAN-94	N/A

Test: METHOD 7-2.2,METHODS OF SOIL ANALYSIS(% MOISTURE)

ATI #	Matrix	Client ID	Sampled	Received	Analyzed	Prep Date
1	SOIL	9401-089-1	11-JAN-94	13-JAN-94	14-JAN-94	N/A
2	SOIL	9401-089-2	11-JAN-94	13-JAN-94	14-JAN-94	N/A
3	SOIL	9401-089-3	11-JAN-94	13-JAN-94	14-JAN-94	N/A
4	SOIL	9401-089-4	11-JAN-94	13-JAN-94	14-JAN-94	N/A
5	SOIL	9401-089-5	11-JAN-94	13-JAN-94	14-JAN-94	N/A
6	SOIL	9401-089-6	11-JAN-94	13-JAN-94	14-JAN-94	N/A
7	SOIL	9401-089-7	11-JAN-94	13-JAN-94	14-JAN-94	N/A
8	SOIL	9401-089-8	11-JAN-94	13-JAN-94	14-JAN-94	N/A

ACCESSION #: 40158 INITIALS: G. J.

SAMPLE CONDITION UPON RECEIPT CHECKLIST
(FOR RE-ACCESSIONS, COMPLETE #7 THRU #9)

1	Does this project require special handling according to NEESA Levels C, D, AFOEHL or CLP protocols? If yes, complete a) thru c) a) Cooler temperature _____ b) pH sample aliquoted: yes / no / n/a c) LOT #'s: _____	YES	(NO)
2	Are custody seals present on cooler?	YES	(NO)
	If yes, are seals intact? (N/A)	YES	NO
3	Are custody seals present on sample containers?	YES	(NO)
	If yes, are seals intact? (N/A)	YES	NO
4	Is there a Chain-Of-Custody (COC)*?	(YES)	NO
5	Is the COC* complete? Relinquished: (yes)/no Requested analysis: (yes)/no	(YES)	NO
6	Is the COC* in agreement with the samples received? # Samples: (yes)/no Sample ID's: (yes)/no Date sampled: (yes)/no Matrix: (yes)/no # containers: (yes)/no	(YES)	NO
7	Are the samples preserved correctly?	(YES)	NO
8	Is there enough sample for all the requested analyses?	(YES)	NO
9	Are all samples within holding times for the requested analyses?	(YES)	NO
10	Cooler temperature: 5°C		
11	Were all sample containers received intact (ie. not broken, leaking, etc.)?	(YES)	NO
12	Are samples requiring no headspace, headspace free? (N/A)	YES	NO
13	Are VOA 1st stickers required?	YES	(NO)
14	Are there special comments on the Chain of Custody which require client contact?	YES	(N/A)
15	If yes, was ATI Project Manager notified?	YES	NO

Describe "no" items: _____

Was client contacted? yes / no

If yes, Date: _____ Name of Person contacted: _____

Describe actions taken or client instructions: _____

*Or other representative documents, letters, and/or shipping memos

PLEASE FAX A SIGNED COPY OF THIS COC TO THE PROJECT MANAGER ASAP

TO [redacted] San Diego, CA

Analytical**Technologies,**Inc.

560 Naches Avenue SW, Suite 101 Renton,WA 98055 (206)228-8335

Chain of Custody

DATE 1/12/94 PAGE 1 OF 1

LABORATORY NUMBER: 401138

PROJECT MANAGER: TAMARA TERRELL

ANALYTICAL TECHNOLOGIES, INC.
560 NACHES AVE SW, SUITE 101
RENTON, WA 98055
(206) 228-8335

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal ☑ Return

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
401-CEG-1	1/11/94		SOIL	
-2				
-3				
-4				
-5				
-6				
-7				
-8				
-9	1/12/94			

ANALYSIS REQUEST

8240 GC/MS Volatiles	8270 GC/MS BNA's	8310 HPLC PNA's	8080 Pest/PCB's	PCB's only	8150 Herbicides	TOC	TOX 9020	BOD	COD	CYANIDE	MBAS	NITRATE/NITRITE	PP METALS	EPTOX METALS	TCLP METALS	TCLP 8240 (ZHE)	TCLP 8270	TCLP 8150	TCLP 8080	PHENOLS, total	% MOISTURE						NUMBER OF CONTAINERS
						X															X						
						↓															↓						
						↓															↓						

PROJECT INFORMATION

ATI PROJ #:
ATI PROJ NAME:
CLIENT PROJ: Alaska Mass...

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS
COC SEALS/INTACT? Y/N/NA
RECEIVED GOOD COND./COLD
RECEIVED VIA:

SPECIAL INSTRUCTIONS: See interlab TM93101 5°C

VERBALS DUE: 1/14/94

HARDCOPY DUE: 1/28/94

PRICE: _____ DISC: ____%

DIGESTION NEEDED?

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Time:	Signature: Time:	Signature: Time:
Printed Name: Date: TAMARA TERRELL 1-12-94	Printed Name: Date:	Printed Name: Date:
Company: ATI	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature: Time:	Signature: Time: 950
Printed Name: Date:	Printed Name: Date:	Printed Name: Date: David Schmidt 1/13/94
Company:	Company:	Analytical Technologies, Inc.

ATI Labs: San Diego (619)458-9141 • Phoenix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

(1)

QC'd 3/23/94 KR

HARTCROWSER

Earth and Environmental Technologies

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle, Washington 98102
FAX 206.328.5581
206.324.9530

CHEMISTRY LABORATORY ANALYTICAL REPORT

November 19, 1993

David Templeton, Hart Crowser Sr. Project Environmental Chemist

RE: Duwamish Shipyard, J-3763-04

Attached are the compiled results from analyses conducted on samples received October 26, 1993. We performed extractions and analyses as indicated:

	Matrix	Quantity	Date Extracted	Date Analyzed
► TPH-HCID	Soil	2	10/27/93	10/27/93
► TPH-HCID	Soil	1	11/02/93	11/02/93
► TPH-D	Soil	2	10/29/93	10/29/93
► TPH-G	Soil	5	10/27/93	11/02/93
► Aromatic Volatiles (8020/602)	Soil	5	10/27/93	11/02/93

This report contains the following:

- Analytical results for soil samples presented on a dry weight basis.
- Data qualifiers.
- Results for method blanks.
- Differences for duplicate analyses.
- Recoveries for laboratory control sample.
- Copies of chain of custody forms.

Analytical Limitations

The compound(s) detected in the volatiles analysis are tentatively identified by single column analysis.

HART CROWSER, INC.

JAMES HERNDON
Laboratory Manager
Washington State Department of Ecology
Laboratory Accreditation Number C134

Analytical Results

Results in ppm (mg/kg or mg/L)

Compound	SP-D1 10/27/93	Duplicate SP-D1 10/27/93	SP-D2 10/27/93
Matrix	Soil	Soil	Soil
% Moisture	16%	16%	17%
Gasoline	10 U	10 U	10 U
Kensol	10 U	10 U	10 U
Kerosene/Jet A	10 U	10 U	10 U
Stoddard Solvent	10 U	10 U	10 U
Diesel/Fuel Oil #2	1,500	1,400	400
Bunker C	50 U	50 U	50 U
Oil	750	830	450
Unknown	10 U	10 U	10 U
Total TPH Concentration	2,250	2,230	850
2-Fluorobiphenyl (surr #1)	M	M	116%
o-Terphenyl (surr #2)	106%	103%	102%
Hexacosane - nC26 (surr #3)	116%	115%	113%

RPD
$\frac{2,250-2230}{(2250+2230)/2} = 0.89$

Analytical Results, continued

Results in ppm (mg/kg or mg/L)

Compound	SP-C1 11/02/93
Matrix	Soil
% Moisture	4%
Gasoline	10 U
Kensol	10 U
Kerosene/Jet A	10 U
Stoddard Solvent	10 U
Diesel/Fuel Oil #2	90
Bunker C	50 U
Oil	670
Unknown	10 U
Total TPH Concentration	760
2-Fluorobiphenyl (surr #1)	104%
o-Terphenyl (surr #2)	102%
Hexacosane - nC26 (surr #3)	101%

Analytical Results, continued

Results in ppm (mg/kg or mg/L)

Compound	C-B7 10/29/93	N-W4 10/29/93	Duplicate N-W4 10/29/93
Matrix	Soil	Soil	Soil
% Moisture	21%	22%	22%
TPH-D, C12 > C24 (Diesel)	68	20 U	20 U
TPH-D, C24 > C37 (Oil)	68	50 U	50 U
2-Fluorobiphenyl (surr #1)	93%	87%	95%
o-Terphenyl (surr #2)	95%	98%	102%
Hexacosane - nC26 (surr #3)	107%	105%	109%

Analytical Results, continued

Results in ppm (mg/kg or mg/L)

Compound	NE-W4-0 11/2/93	Duplicate NE-W4-0 11/2/93	SE-B7-0 11/2/93
Matrix	Soil	Soil	Soil
% Moisture	9%	9%	21%
TPH-G (gasoline) toluene > C12	570	760	10 U

Results in ppb (µg/kg or µg/L)

Benzene	50 U	50 U	50 U
Toluene	50 U	50 U	50 U
Ethylbenzene	350	330	50 U
Xylenes	1,200 B	1,200 B	50 U
a,a,a-Trifluorotoluene (surr)	95%	91%	72%
1,2-Bromofluorobenzene (surr)	117%	113%	77%

570
760
-190 28%

Analytical Results, continued

Results in ppm (mg/kg or mg/L)

Compound	S-W4 SE-20 11/2/93	W-W4 SW-30 11/2/93	NW-W4-0 11/2/93
Matrix	Soil	Soil	Soil
% Moisture	16%	32%	4%
TPH-G (gasoline) toluene > C12	10 U	10 U	10 U

Results in ppb (µg/kg or µg/L)

Benzene	50 U	50 U	50 U
Toluene	50 U	50 U	50 U
Ethylbenzene	50 U	50 U	50 U
Xylenes	50 U	50 U	50 U
a,a,a-Trifluorotoluene (surr)	95%	94%	95%
1,2-Bromofluorobenzene (surr)	98%	98%	99%

✓ ✓ ✓

Data Qualifiers

U Not detected at indicated detection limit.
\- Below detection limit.
J Estimated value below detection limit.
B Also detected in associated method blank.
M Unable to calculate recovery due to matrix interference.
n/t Test not performed.
n/a Not applicable.
Surr Surrogate compound.

Method Blanks

Results in ppm (mg/kg or mg/L)

Compound	10/27/93	11/02/93
Matrix	Soil	Soil
Gasoline	10 U	10 U
Kensol	10 U	10 U
Kerosene/Jet A	10 U	10 U
Stoddard Solvent	10 U	10 U
Diesel/Fuel Oil #2	20 U	20 U
Bunker C	50 U	50 U
Oil	50 U	50 U
Unknown	10 U	10 U
Total TPH Concentration	-	-
2-Fluorobiphenyl (surr #1)	100%	100%
o-Terphenyl (surr #2)	100%	100%
Hexacosane - nC26 (surr #3)	100%	100%

Method Blanks, continued

Results in ppm (mg/kg or mg/L)

Compound	10/29/93
Matrix	Soil
TPH-D, C12 > C24 (Diesel)	20 U
TPH-D, C24 > C37 (Oil)	50 U
2-Fluorobiphenyl (surr #1)	93%
o-Terphenyl (surr #2)	99%
Hexacosane - nC26 (surr #3)	106%

Compound	11/2/93
Matrix	Soil
TPH-G (gasoline) toluene > C12	10 U

Results in ppb (µg/kg or µg/L)

Benzene	50 U
Toluene	50 U
Ethylbenzene	50 U
Xylenes	75
a,a,a-Trifluorotoluene (surr)	98%
1,2-Bromofluorobenzene (surr)	97%

Duplicates

Relative % Difference

Compound	SP-D1 10/27/93
Matrix	Soil
Total TPH Concentration	1%

Compound	NE-W4-0 11/2/93
Matrix	Soil
TPH-G (gasoline) toluene > C12	-29%
Ethylbenzene	6%
Xylenes	0%

Laboratory Control Sample

% Recovery

Compound	10/27/93	11/02/93
Matrix	Soil	Soil
Kerosene/Jet A	98%	108%
2-Fluorobiphenyl (surr #1)	M	M
o-Terphenyl (surr #2)	101%	100%
Hexacosane - nC26 (surr #3)	98%	98%

Compound	10/29/93
Matrix	Soil
TPH-D, C12 > C24 (Diesel)	98%
2-Fluorobiphenyl (surr #1)	122%
o-Terphenyl (surr #2)	M
Hexacosane - nC26 (surr #3)	119%

Laboratory Control Sample, continued

% Recovery

Compound	11/2/93
Matrix	Soil
TPH-G (gasoline) toluene > C12	92%
a,a,a-Trifluorotoluene (surr)	102%
1,2-Bromofluorobenzene (surr)	M

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 · Bothell, WA 98011-2569
Phone (206) 481-9200 · FAX (206) 485-2992

Hart Crowser, Seattle	Client Project ID:	DSI, #3763-04	
1910 Fairview Ave. E.	Sample Matrix:	Soil	
Seattle, WA 98102			Received: Nov 9, 1993
Attention: Terry Montoya	First Sample #:	311-0678	Reported: Nov 22, 1993

TOTAL SOLIDS & MOISTURE CONTENT REPORT

Sample Number	Sample Description	Total Solids %	Moisture Content %
311-0678	NE-B7-0	78	22
311-0679	NE-W4-0	90	10
311-0680	SE-B7-0	79	21
311-0681	E-W4-NE30	83	17
311-0682	SE-W4	80	20
311-0683	S-W4-SE20	90	10
311-0684	W-W4-SW30	70	30
311-0685	SW-W4-0	84	16
311-0686	WW-W4-0	97	3.0
311-0687	W-B7-SW10	77	23
311-0688	C-B7	79	21

The enclosed analytical results for soils, sediments and sludges have been converted to a DRY WEIGHT reporting basis.
To attain the wet weight "as received" equivalent, multiply the dry weight result by the decimal fraction of percent Total Solids.
The results in this report apply to the samples analyzed in accordance with the chain of custody document.
This analytical report must be reproduced in its entirety.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101· Bothell, WA 98011-2569
Phone (206) 481-9200 · FAX (206) 485-2992

Hart Crowser, Seattle	Client Project ID:	DSI, #3763-04		
1910 Fairview Ave. E.	Sample Matrix:	Soil		
Seattle, WA 98102			Received:	Nov 9, 1993
Attention: Terry Montoya	First Sample #:	311-0689	Reported:	Nov 22, 1993

TOTAL SOLIDS & MOISTURE CONTENT REPORT

Sample Number	Sample Description	Total Solids %	Moisture Content %
311-0689	N-W4	82	18

The enclosed analytical results for soils, sediments and sludges have been converted to a DRY WEIGHT reporting basis.
To attain the wet weight "as received" equivalent, multiply the dry weight result by the decimal fraction of percent Total Solids.
The results in this report apply to the samples analyzed in accordance with the chain of custody document.
This analytical report must be reproduced in its entirety.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 · Bothell, WA 98011-2569
Phone (206) 481-9200 · FAX (206) 485-2992

Hart Crowser, Seattle	Client Project ID:	DSI, #3763-04	Sampled:	Oct 26, 1993
1910 Fairview Ave. E.	Sample Matrix:	Soil	Received:	Nov 9, 1993
Seattle, WA 98102	Analysis Method:	WTPH-D	Extracted:	Nov 9, 1993
Attention: Terry Montoya	First Sample #:	311-0678	Analyzed:	Nov 15, 1993
			Reported:	Nov 22, 1993

TOTAL PETROLEUM HYDROCARBONS-DIESEL RANGE

Sample Number	Sample Description	Sample Result mg/kg (ppm)	Surrogate Recovery %
311-0678	NE-B7-0	140	99 √
311-0679	NE-W4-0	12,000	S-2
311-0680	SE-B7-0	18	108 √
311-0681	E-W4-NE30	17,000	S-2
311-0682	SE-W4	94	81
311-0683	S-W4-SE20	N.D.	86
311-0684	W-W4-SW30	N.D.	78
311-0685	SW-W4-0	N.D.	89
311-0686	NW-W4-0	N.D.	94
311-0687	W-B7-SW10	N.D.	91

Reporting Limit:	**10**

2-Fluorobiphenyl surrogate recovery control limits are 50 - 150 %.
Extractable Total Petroleum Hydrocarbons are quantitated as Diesel Range Organics (C12 - C24).
Analytes reported as N.D. were not detected above the stated Reporting Limit. The results reported above are on a dry weight basis.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

Please Note:
S-2 = The Surrogate Recovery for this sample is not available due to coelution with other organic compounds present in the sample.

NORTH CREEK ANALYTICAL

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Phone (206) 481-9200 · FAX (206) 485-2992

Hart Crowser, Seattle	Client Project ID:	DSI, #3763-04		
1910 Fairview Ave. E.	Sample Matrix:	Method Blank		
Seattle, WA 98102	Analysis Method:	WTPH-D	Extracted:	Nov 9, 1993
Attention: Terry Montoya	First Sample #:	BLK110993	Analyzed:	Nov 15, 1993
			Reported:	Nov 22, 1993

TOTAL PETROLEUM HYDROCARBONS-DIESEL RANGE

Sample Number	Sample Description	Sample Result mg/kg (ppm)	Surrogate Recovery %
BLK110993	Method Blank	N.D.	135 ✓

Reporting Limit:	10

2-Fluorobiphenyl surrogate recovery control limits are 50 - 150 %.
Extractable Total Petroleum Hydrocarbons are quantitated as Diesel Range Organics (C12 - C24).
Analytes reported as N.D. were not detected above the stated Reporting Limit. The results reported above are on a dry weight basis.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101· Bothell, WA 98011-2569
Phone (206) 481-9200 · FAX (206) 485-2992

Hart Crowser, Seattle	Client Project ID: DSI, #3763-04	Analyst: D. Anderson
1910 Fairview Ave. E.	Sample Matrix: Soil	
Seattle, WA 98102	Analysis Method: WTPH-D	Extracted: Nov 9, 1993
Attention: Terry Montoya	Units: mg/kg (ppm)	Analyzed: Nov 11, 1993
		Reported: Nov 22, 1993

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT
Laboratory Control Sample

Diesel

Spike Conc. Added:	67
Spike Result:	61
% Recovery:	91 ✓
Upper Control Limit %:	122
Lower Control Limit %:	84

PRECISION ASSESSMENT
Sample Duplicate

Diesel Range Hydrocarbons

Sample Number:	311-0687
Original Result:	N.D.
Duplicate Result:	N.D.
Relative % Difference	Relative Percent Difference values are not reported at sample concentration levels less than 10 times the Detection Limit. ✓
Maximum RPD:	49

NORTH CREEK ANALYTICAL Inc

Matthew T. Essig
Project Manager

$$\text{\% Recovery:} \quad \frac{\text{Spike Result}}{\text{Spike Concentration Added}} \times 100$$

$$\text{Relative \% Difference:} \quad \frac{\text{Original Result - Duplicate Result}}{(\text{Original Result + Duplicate Result}) / 2} \times 100$$

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Phone (206) 481-9200 · FAX (206) 485-2992

Hart Crowser, Seattle	Client Project ID:	DSI, #3763-04	Sampled:	Oct 26, 1993
1910 Fairview Ave. E.	Sample Matrix:	Soil	Received:	Nov 9, 1993
Seattle, WA 98102	Analysis Method:	WTPH-418.1 Modified	Extracted:	Nov 10, 1993
Attention: Terry Montoya	First Sample #:	311-0678	Analyzed:	Nov 11, 1993
			Reported:	Nov 22, 1993

TOTAL PETROLEUM HYDROCARBONS-OIL RANGE

Sample Number	Sample Description	Sample Result mg/kg (ppm)
311-0678	NE-B7-0	110
311-0679	NE-W4-0	13,000
311-0680	SE-B7-0	N.D.
311-0681	E-W4-NE30	11,000
311-0682	SE-W4	120
311-0683	S-W4-SE20	N.D.
311-0684	W-W4-SW30	N.D.
311-0685	SW-W4-0	N.D.
311-0686	NW-W4-0 WW-W4-0	N.D.
311-0687	W-B7-SW10	N.D.

Reporting Limit:	**100**

Analytes reported as N.D. were not detected above the stated Reporting Limit.
The results reported above are on a dry weight basis.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101· Bothell, WA 98011-2569
Phone (206) 481-9200 · FAX (206) 485-2992

Hart Crowser, Seattle	Client Project ID:	DSI, #3763-04	Sampled:	Oct 26, 1993
1910 Fairview Ave. E.	Sample Matrix:	Soil	Received:	Nov 9, 1993
Seattle, WA 98102	Analysis Method:	WTPH-418.1 Modified	Extracted:	Nov 10, 1993
Attention: Terry Montoya	First Sample #:	311-0688	Analyzed:	Nov 11, 1993
			Reported:	Nov 22, 1993

TOTAL PETROLEUM HYDROCARBONS-OIL RANGE

Sample Number	Sample Description	Sample Result mg/kg (ppm)
311-0688	C-B7	1,100
311-0689	N-W4	480
BLK111093	Method Blank	N.D.

Reporting Limit:	100

Analytes reported as N.D. were not detected above the stated Reporting Limit.
The results reported above are on a dry weight basis.

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 · Bothell, WA 98011-2569
Phone (206) 481-9200 · FAX (206) 485-2992

Hart Crowser, Seattle	Client Project ID: DSI, #3763-04	Analyst:	E. Perley
1910 Fairview Ave. E.	Sample Matrix: Soil		
Seattle, WA 98102	Analysis Method: WTPH-418.1 Modified	Extracted:	Nov 10, 1993
Attention: Terry Montoya	Units: mg/kg (ppm)	Analyzed:	Nov 11, 1993
		Reported:	Nov 22, 1993

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT
Laboratory Control Sample

	Petroleum Oil
Spike Conc. Added:	140
Spike Result:	140
% Recovery:	100 ✓
Upper Control Limit %:	140
Lower Control Limit %:	59

PRECISION ASSESSMENT
Sample Duplicate

	Petroleum Oil
Sample Number:	311-0689
Original Result:	480
Duplicate Result:	440
Relative % Difference	8.7 ✓
Maximum RPD:	50

NORTH CREEK ANALYTICAL Inc.

Matthew T. Essig
Project Manager

$$\text{\% Recovery:} = \frac{\text{Spike Result}}{\text{Spike Concentration Added}} \times 100$$

$$\text{Relative \% Difference:} = \frac{\text{Original Result - Duplicate Result}}{(\text{Original Result + Duplicate Result}) / 2} \times 100$$

Sample Custody Record

DATE 11/9/93 PAGE 1 OF 1

HARTCROWSER

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle, Washington 98102-3699

JOB NUMBER 3163 04 LAB NUMBER

PROJECT MANAGER D. Templeton

PROJECT NAME DSI

SAMPLED BY: TERRY MONTOYA

LAB NO.	SAMPLE	TIME	STATION	MATRIX	TESTING: WTPH-D	TESTING: 418.1	NO. OF CONTAINERS
3 11067[illegible]	NE-B7-0	10/2[illegible]		Soil	X	X	
3 11 0679	NE-W4-0				X	X	
3 11 0680	SE-B7-0				X	X	
3 11 0681	E-W4-NE30				X	X	
3 11 0682	SE-W4				X	X	
3 11 0683	S-W4-SE20				X	X	
3 11 0684	W-W4-SW30				X	X	
3 11 0685	SW-W4-0				X	X	
3 11 0686	NW-W4-0				X	X	
3 11 0687	W-B7-SW10				X	X	
3 11 0688	C-B7				[illegible]	X	
3 11 0689	W-W4				[illegible]	X	

OBSERVATIONS/COMMENTS/
COMPOSITING INSTRUCTIONS

MUST EXTRACT
TODAY 11-9-93
See Scott C.

ONLY 418.1
ONLY 418.1

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	11/9	SIGNATURE	11/9
PRINTED NAME: TERRY MONTOYA	TIME	PRINTED NAME: KEITH ARUON	TIME
COMPANY: HART CROWSER		COMPANY: NCA	1139
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE		SIGNATURE	
PRINTED NAME	TIME	PRINTED NAME	TIME
COMPANY		COMPANY	

TOTAL NUMBER OF CONTAINERS

METHOD OF SHIPMENT

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS: MUST EXTRACT TODAY @ END OF Holding Time.

DISTRIBUTION:

1. PROVIDE WHITE AND YELLOW COPIES TO LABORATORY
2. RETURN PINK COPY TO PROJECT MANAGER
3. LABORATORY TO FILL IN SAMPLE NUMBER AND SIGN FOR RECEIPT
4. LABORATORY TO RETURN WHITE COPY TO HART CROWSER

Analytical Technologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335
Karen L. Mixon, Laboratory Manager

ATI I.D. # 9310-236

November 11, 1993

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle WA 98102-3699

Attention: D. Templeton

Project Number : 3763-04

Project Name : DSI

ear Mr. Templeton:

On October 26, 1993, Analytical Technologies, Inc. (ATI), received seven samples for analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Sincerely,

Tamara B. Jerome
Project Manager

TBJ/hal/ff

Enclosure

Analytical**Technologies,**Inc.

ATI I.D. # 9310-236

SAMPLE CROSS REFERENCE SHEET

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : DSI

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9310-236-1	SE-B7-0	10/25/93	SOIL
9310-236-2	NE-W4-0	10/25/93	SOIL
9310-236-3	E-W4-NE30	10/25/93	SOIL
9310-236-4	SP-D1	10/26/93	SOIL
9310-236-5	W-W4-SW30	10/26/93	SOIL
9310-236-6	NW-W4-0	10/26/93	SOIL
9310-236-7	S-W4-SE20	10/26/93	SOIL

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	7

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled isposal date.

Analytical Technologies, Inc.

ATI I.D. # 9310-236

ANALYTICAL SCHEDULE

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : DSI

ANALYSIS	TECHNIQUE	REFERENCE	LAB
SEMI-VOLATILE COMPOUNDS	GCMS	EPA 8270	R
MOISTURE	GRAVIMETRIC	CLP SOW ILM01.0	R

R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PNR = ATI - Pensacola
FC = ATI - Fort Collins
JB = Subcontract

Analytical Technologies, Inc.

ATI I.D. # 9310-236

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : DSI

CASE NARRATIVE: SEMI-VOLATILE ORGANICS ANALYSIS

The samples associated with this accession were analyzed using EPA method 8270. The extraction procedure used for this accession was EPA method 3550.

The method blank was free of all analytes of interest. All surrogate percent recoveries were within ATI control limits. The matrix spike/matrix spike duplicate (MS/MSD) recoveries and relative percent differences (RPDs) were within ATI control limits. All blank spike (BS) recoveries were within ATI control limits. All sample analytical hold times were met.

In the initial calibration standards, the relative standard deviations were below 30% for all calibration check compounds. In the continuing calibration, the percent differences were below 30% for all continuing calibration check compounds. The relative response factors were above the minimum for all system performance check compounds in the initial and continuing calibration standards.

The daily tuning and mass calibration met all EPA criteria for this method. All sample internal standard areas were within 50% and 200% of the daily continuing calibration internal standard areas.

AnalyticalTechnologies, inc.

ATI I.D. # 9310-236

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<0.17
PHENOL	<0.17
ANILINE	<0.17
BIS(2-CHLOROETHYL)ETHER	<0.17
2-CHLOROPHENOL	<0.17
1,3-DICHLOROBENZENE	<0.17
1,4-DICHLOROBENZENE	<0.17
BENZYL ALCOHOL	<0.17
1,2-DICHLOROBENZENE	<0.17
2-METHYLPHENOL	<0.17
BIS(2-CHLOROISOPROPYL)ETHER	<0.17
^-METHYLPHENOL	<0.17
-NITROSO-DI-N-PROPYLAMINE	<0.17
HEXACHLOROETHANE	<0.17
NITROBENZENE	<0.17
ISOPHORONE	<0.17
2-NITROPHENOL	<0.17
2,4-DIMETHYLPHENOL	<0.17
BENZOIC ACID	<0.85
BIS(2-CHLOROETHOXY)METHANE	<0.17
2,4-DICHLOROPHENOL	<0.17
1,2,4-TRICHLOROBENZENE	<0.17
NAPHTHALENE	<0.17
4-CHLOROANILINE	<0.17
HEXACHLOROBUTADIENE	<0.17
4-CHLORO-3-METHYLPHENOL	<0.17
2-METHYLNAPHTHALENE	<0.17
HEXACHLOROCYCLOPENTADIENE	<0.17
2,4,6-TRICHLOROPHENOL	<0.17
2,4,5-TRICHLOROPHENOL	<0.85
2-CHLORONAPHTHALENE	<0.17
2-NITROANILINE	<0.85
DIMETHYLPHTHALATE	<0.17
ACENAPHTHYLENE	<0.17
3-NITROANILINE	<0.85
ACENAPHTHENE	<0.17
2,4-DINITROPHENOL	<0.85
-NITROPHENOL	<0.85

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Analytical Technologies, Inc.

ATI I.D. # 9310-236

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
DIBENZOFURAN	<0.17
2,4-DINITROTOLUENE	<0.17
2,6-DINITROTOLUENE	<0.17
DIETHYLPHTHALATE	<0.17
4-CHLOROPHENYL-PHENYLETHER	<0.17
FLUORENE	<0.17
4-NITROANILINE	<0.85
4,6-DINITRO-2-METHYLPHENOL	<0.85
N-NITROSODIPHENYLAMINE	<0.17
4-BROMOPHENYL-PHENYLETHER	<0.17
HEXACHLOROBENZENE	<0.17
PENTACHLOROPHENOL	<0.17
PHENANTHRENE	<0.17
ANTHRACENE	<0.17
DI-N-BUTYLPHTHALATE	<0.17
FLUORANTHENE	<0.17
BENZIDINE	<1.7
PYRENE	<0.17
BUTYLBENZYLPHTHALATE	<0.17
3,3'-DICHLOROBENZIDINE	<0.34
BENZO(A)ANTHRACENE	<0.17
BIS(2-ETHYLHEXYL)PHTHALATE	<0.17
CHRYSENE	<0.17
DI-N-OCTYLPHTHALATE	<0.17
BENZO(B)FLUORANTHENE	<0.17
BENZO(K)FLUORANTHENE	<0.17
BENZO(A)PYRENE	<0.17
INDENO(1,2,3-CD)PYRENE	<0.17
DIBENZO(A,H)ANTHRACENE	<0.17
BENZO(G,H,I)PERYLENE	<0.17

SURROGATE PERCENT RECOVERY		LIMITS
NITROBENZENE-D5	86	32 - 140
2-FLUOROBIPHENYL	99	57 - 121
TERPHENYL-D14	111	59 - 143
PHENOL-D5	82	46 - 127
2-FLUOROPHENOL	79	47 - 117
2,4,6-TRIBROMOPHENOL	101	40 - 132

Analytical**Technologies,**Inc.

ATI I.D. # 9310-236

TENTATIVELY IDENTIFIED COMPOUNDS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3763-04	DATE RECEIVED	: N/A
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	ESTIMATED CONC.	FLAG	R.T.

NO NON-HSL COMPOUNDS FOUND > 10% OF NEAREST INTERNAL STANDARD

Analytical Technologies, Inc.

ATI I.D. # 9310-236-1

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/25/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: SE-B7-0	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<0.22
PHENOL	<0.22
ANILINE	<0.22
BIS(2-CHLOROETHYL)ETHER	<0.22
2-CHLOROPHENOL	<0.22
1,3-DICHLOROBENZENE	<0.22
1,4-DICHLOROBENZENE	<0.22
BENZYL ALCOHOL	<0.22
1,2-DICHLOROBENZENE	<0.22
2-METHYLPHENOL	<0.22
BIS(2-CHLOROISOPROPYL)ETHER	<0.22
4-METHYLPHENOL	<0.22
·NITROSO-DI-N-PROPYLAMINE	<0.22
нEXACHLOROETHANE	<0.22
NITROBENZENE	<0.22
ISOPHORONE	<0.22
2-NITROPHENOL	<0.22
2,4-DIMETHYLPHENOL	<0.22
BENZOIC ACID	<1.1
BIS(2-CHLOROETHOXY)METHANE	<0.22
2,4-DICHLOROPHENOL	<0.22
1,2,4-TRICHLOROBENZENE	<0.22
NAPHTHALENE	<0.22
4-CHLOROANILINE	<0.22
HEXACHLOROBUTADIENE	<0.22
4-CHLORO-3-METHYLPHENOL	<0.22
2-METHYLNAPHTHALENE	<0.22
HEXACHLOROCYCLOPENTADIENE	<0.22
2,4,6-TRICHLOROPHENOL	<0.22
2,4,5-TRICHLOROPHENOL	<1.1
2-CHLORONAPHTHALENE	<0.22
2-NITROANILINE	<1.1
DIMETHYLPHTHALATE	<0.22
ACENAPHTHYLENE	<0.22
3-NITROANILINE	<1.1
ACENAPHTHENE	<0.22
2,4-DINITROPHENOL	<1.1
ʻ-NITROPHENOL	<1.1

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Analytical Technologies, Inc.

ATI I.D. # 9310-236-1

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/25/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: SE-B7-0	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
DIBENZOFURAN	<0.22
2,4-DINITROTOLUENE	<0.22
2,6-DINITROTOLUENE	<0.22
DIETHYLPHTHALATE	<0.22
4-CHLOROPHENYL-PHENYLETHER	<0.22
FLUORENE	<0.22
4-NITROANILINE	<1.1
4,6-DINITRO-2-METHYLPHENOL	<1.1
N-NITROSODIPHENYLAMINE	<0.22
4-BROMOPHENYL-PHENYLETHER	<0.22
HEXACHLOROBENZENE	<0.22
PENTACHLOROPHENOL	<0.22
PHENANTHRENE	<0.22
ANTHRACENE	<0.22
DI-N-BUTYLPHTHALATE	<0.22
FLUORANTHENE	<0.22
BENZIDINE	<2.2
PYRENE	<0.22
BUTYLBENZYLPHTHALATE	<0.22
3,3'-DICHLOROBENZIDINE	<0.45
BENZO(A)ANTHRACENE	<0.22
BIS(2-ETHYLHEXYL)PHTHALATE	<0.22
CHRYSENE	<0.22
DI-N-OCTYLPHTHALATE	<0.22
BENZO(B)FLUORANTHENE	<0.22
BENZO(K)FLUORANTHENE	<0.22
BENZO(A)PYRENE	<0.22
INDENO(1,2,3-CD)PYRENE	<0.22
DIBENZO(A,H)ANTHRACENE	<0.22
BENZO(G,H,I)PERYLENE	<0.22

SURROGATE PERCENT RECOVERY		LIMITS
NITROBENZENE-D5	83	32 - 140
2-FLUOROBIPHENYL	89	57 - 121
TERPHENYL-D14	107	59 - 143
PHENOL-D5	84	46 - 127
-FLUOROPHENOL	80	47 - 117
,4,6-TRIBROMOPHENOL	99	40 - 132

Analytical**Technologies,**Inc.

ATI I.D. # 9310-236-1

TENTATIVELY IDENTIFIED COMPOUNDS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/25/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: SE-B7-0	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	ESTIMATED CONC.	FLAG	R.T.
UNKNOWN HYDROCARBON	0.36	JN	7.03
SULFUR, MOL. (S8)	1.1	↓	27.59

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AnalyticalTechnologies,Inc.

ATI I.D. # 9310-236-2

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/25/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: NE-W4-0	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 5

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<0.90
PHENOL	<0.90
ANILINE	<0.90
BIS(2-CHLOROETHYL)ETHER	<0.90
2-CHLOROPHENOL	<0.90
1,3-DICHLOROBENZENE	<0.90
1,4-DICHLOROBENZENE	<0.90
BENZYL ALCOHOL	<0.90
1,2-DICHLOROBENZENE	<0.90
2-METHYLPHENOL	<0.90
BIS(2-CHLOROISOPROPYL)ETHER	<0.90
4-METHYLPHENOL	<0.90
-NITROSO-DI-N-PROPYLAMINE	<0.90
HEXACHLOROETHANE	<0.90
NITROBENZENE	<0.90
ISOPHORONE	<0.90
2-NITROPHENOL	<0.90
2,4-DIMETHYLPHENOL	<0.90
BENZOIC ACID	<4.6
BIS(2-CHLOROETHOXY)METHANE	<0.90
2,4-DICHLOROPHENOL	<0.90
1,2,4-TRICHLOROBENZENE	<0.90
NAPHTHALENE	1.4
4-CHLOROANILINE	<0.90
HEXACHLOROBUTADIENE	<0.90
4-CHLORO-3-METHYLPHENOL	<0.90
2-METHYLNAPHTHALENE	10
HEXACHLOROCYCLOPENTADIENE	<0.90
2,4,6-TRICHLOROPHENOL	<0.90
2,4,5-TRICHLOROPHENOL	<4.6
2-CHLORONAPHTHALENE	<0.90
2-NITROANILINE	<4.6
DIMETHYLPHTHALATE	<0.90
ACENAPHTHYLENE	<0.90
3-NITROANILINE	<4.6
ACENAPHTHENE	3.2
2,4-DINITROPHENOL	<4.6
-NITROPHENOL	<4.6

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Analytical Technologies, Inc.

ATI I.D. # 9310-236-2

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/25/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: NE-W4-0	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 5

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
DIBENZOFURAN	2.1
2,4-DINITROTOLUENE	<0.90
2,6-DINITROTOLUENE	<0.90
DIETHYLPHTHALATE	<0.90
4-CHLOROPHENYL-PHENYLETHER	<0.90
FLUORENE	6.8
4-NITROANILINE	<4.6
4,6-DINITRO-2-METHYLPHENOL	<4.6
N-NITROSODIPHENYLAMINE	<0.90
4-BROMOPHENYL-PHENYLETHER	<0.90
HEXACHLOROBENZENE	<0.90
PENTACHLOROPHENOL	<0.90
PHENANTHRENE	17
ANTHRACENE	5.2
DI-N-BUTYLPHTHALATE	<0.90
FLUORANTHENE	1.4
BENZIDINE	<9.0
PYRENE	4.5
BUTYLBENZYLPHTHALATE	<0.90
3,3'-DICHLOROBENZIDINE	<1.8
BENZO(A)ANTHRACENE	1.6
BIS(2-ETHYLHEXYL)PHTHALATE	<0.90
CHRYSENE	2.5
DI-N-OCTYLPHTHALATE	<0.90
BENZO(B)FLUORANTHENE	<0.90
BENZO(K)FLUORANTHENE	<0.90
BENZO(A)PYRENE	1.0
INDENO(1,2,3-CD)PYRENE	<0.90
DIBENZO(A,H)ANTHRACENE	<0.90
BENZO(G,H,I)PERYLENE	<0.90

SURROGATE PERCENT RECOVERY		LIMITS
NITROBENZENE-D5	108	32 - 140
2-FLUOROBIPHENYL	101	57 - 121
TERPHENYL-D14	96	59 - 143
PHENOL-D5	87	46 - 127
`-FLUOROPHENOL	78	47 - 117
2,4,6-TRIBROMOPHENOL	74	40 - 132

Analytical Technologies, Inc.

ATI I.D. # 9310-236-2

TENTATIVELY IDENTIFIED COMPOUNDS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/25/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: NE-W4-0	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 5

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	ESTIMATED CONC.	FLAG	R.T.
DODECANE, 6-METHYL-	23	JN	15.50
NAPHTHALENE, 1,2,3,4-TETRA	18		16.49
NAPHTHALENE, 1-METHYL-	20		17.35
NAPHTHALENE, 2,3-DIMETHYL-	25		19.25
UNKNOWN ALKANE	32		23.32

Analytical**Technologies,**Inc.

ATI I.D. # 9310-236-3

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/25/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: E-W4-NE30	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 5

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<1.1
PHENOL	<1.1
ANILINE	<1.1
BIS(2-CHLOROETHYL)ETHER	<1.1
2-CHLOROPHENOL	<1.1
1,3-DICHLOROBENZENE	<1.1
1,4-DICHLOROBENZENE	<1.1
BENZYL ALCOHOL	<1.1
1,2-DICHLOROBENZENE	<1.1
2-METHYLPHENOL	<1.1
BIS(2-CHLOROISOPROPYL)ETHER	<1.1
^-METHYLPHENOL	<1.1
-NITROSO-DI-N-PROPYLAMINE	<1.1
HEXACHLOROETHANE	<1.1
NITROBENZENE	<1.1
ISOPHORONE	<1.1
2-NITROPHENOL	<1.1
2,4-DIMETHYLPHENOL	<1.1
BENZOIC ACID	<5.5
BIS(2-CHLOROETHOXY)METHANE	<1.1
2,4-DICHLOROPHENOL	<1.1
1,2,4-TRICHLOROBENZENE	<1.1
NAPHTHALENE	19
4-CHLOROANILINE	<1.1
HEXACHLOROBUTADIENE	<1.1
4-CHLORO-3-METHYLPHENOL	<1.1
2-METHYLNAPHTHALENE	30
HEXACHLOROCYCLOPENTADIENE	<1.1
2,4,6-TRICHLOROPHENOL	<1.1
2,4,5-TRICHLOROPHENOL	<5.5
2-CHLORONAPHTHALENE	<1.1
2-NITROANILINE	<5.5
DIMETHYLPHTHALATE	<1.1
ACENAPHTHYLENE	<1.1
3-NITROANILINE	<5.5
ACENAPHTHENE	4.1
2,4-DINITROPHENOL	<5.5
-NITROPHENOL	<5.5

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Analytical Technologies, Inc.

ATI I.D. # 9310-236-3

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/25/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: E-W4-NE30	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 5

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS	
DIBENZOFURAN	2.9	
2,4-DINITROTOLUENE	<1.1	
2,6-DINITROTOLUENE	<1.1	
DIETHYLPHTHALATE	<1.1	
4-CHLOROPHENYL-PHENYLETHER	<1.1	
FLUORENE	8.9	
4-NITROANILINE	<5.5	
4,6-DINITRO-2-METHYLPHENOL	<5.5	
N-NITROSODIPHENYLAMINE	<1.1	
4-BROMOPHENYL-PHENYLETHER	<1.1	
HEXACHLOROBENZENE	<1.1	
PENTACHLOROPHENOL	<1.1	
PHENANTHRENE	24	
ANTHRACENE	9.3	
DI-N-BUTYLPHTHALATE	<1.1	
FLUORANTHENE	3.0	
BENZIDINE	<11	
PYRENE	7.7	
BUTYLBENZYLPHTHALATE	<1.1	
3,3'-DICHLOROBENZIDINE	<2.2	
BENZO(A)ANTHRACENE	3.0	
BIS(2-ETHYLHEXYL)PHTHALATE	<1.1	
CHRYSENE	4.3	
DI-N-OCTYLPHTHALATE	<1.1	
BENZO(B)FLUORANTHENE	1.0	J
BENZO(K)FLUORANTHENE	<1.1	
BENZO(A)PYRENE	2.0	
INDENO(1,2,3-CD)PYRENE	<1.1	
DIBENZO(A,H)ANTHRACENE	<1.1	
BENZO(G,H,I)PERYLENE	0.80	J

SURROGATE PERCENT RECOVERY		LIMITS
NITROBENZENE-D5	116	32 - 140
2-FLUOROBIPHENYL	91	57 - 121
TERPHENYL-D14	100	59 - 143
PHENOL-D5	94	46 - 127
2-FLUOROPHENOL	81	47 - 117
2,4,6-TRIBROMOPHENOL	70 ✓	40 - 132

J = Estimated value.

AnalyticalTechnologies,Inc.

ATI I.D. # 9310-236-3

TENTATIVELY IDENTIFIED COMPOUNDS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/25/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: E-W4-NE30	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 5

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	ESTIMATED CONC.	FLAG	R.T.
UNDECANE, 3,6-DIMETHYL-	48	JN	15.51
NAPHTHALENE, 1-METHYL-	19		17.34
NAPHTHALENE, 1,3-DIMETHYL-	19		18.93
NAPHTHALENE, 1,6-DIMETHYL-	35		19.24
UNKNOWN ALKANE	39		23.31

Analytical Technologies, Inc.

ATI I.D. # 9310-236-4

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: SP-D1	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<0.20
PHENOL	<0.20
ANILINE	<0.20
BIS(2-CHLOROETHYL)ETHER	<0.20
2-CHLOROPHENOL	<0.20
1,3-DICHLOROBENZENE	<0.20
1,4-DICHLOROBENZENE	<0.20
BENZYL ALCOHOL	<0.20
1,2-DICHLOROBENZENE	<0.20
2-METHYLPHENOL	<0.20
BIS(2-CHLOROISOPROPYL)ETHER	<0.20
4-METHYLPHENOL	<0.20
N-NITROSO-DI-N-PROPYLAMINE	<0.20
HEXACHLOROETHANE	<0.20
NITROBENZENE	<0.20
ISOPHORONE	<0.20
2-NITROPHENOL	<0.20
2,4-DIMETHYLPHENOL	<0.20
BENZOIC ACID	<1.0
BIS(2-CHLOROETHOXY)METHANE	<0.20
2,4-DICHLOROPHENOL	<0.20
1,2,4-TRICHLOROBENZENE	<0.20
NAPHTHALENE	3.3
4-CHLOROANILINE	<0.20
HEXACHLOROBUTADIENE	<0.20
4-CHLORO-3-METHYLPHENOL	<0.20
2-METHYLNAPHTHALENE	3.2
HEXACHLOROCYCLOPENTADIENE	<0.20
2,4,6-TRICHLOROPHENOL	<0.20
2,4,5-TRICHLOROPHENOL	<1.0
2-CHLORONAPHTHALENE	<0.20
2-NITROANILINE	<1.0
DIMETHYLPHTHALATE	<0.20
ACENAPHTHYLENE	<0.20
3-NITROANILINE	<1.0
ACENAPHTHENE	2.1
2,4-DINITROPHENOL	<1.0
4-NITROPHENOL	<1.0

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Analytical Technologies, Inc.

ATI I.D. # 9310-236-4

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: SP-D1	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
DIBENZOFURAN	1.1
2,4-DINITROTOLUENE	<0.20
2,6-DINITROTOLUENE	<0.20
DIETHYLPHTHALATE	<0.20
4-CHLOROPHENYL-PHENYLETHER	<0.20
FLUORENE	2.0
4-NITROANILINE	<1.0
4,6-DINITRO-2-METHYLPHENOL	<1.0
N-NITROSODIPHENYLAMINE	<0.20
4-BROMOPHENYL-PHENYLETHER	<0.20
HEXACHLOROBENZENE	<0.20
PENTACHLOROPHENOL	<0.20
PHENANTHRENE	4.9
ANTHRACENE	1.2
DI-N-BUTYLPHTHALATE	<0.20
FLUORANTHENE	2.3
BENZIDINE	<2.0
PYRENE	2.2
BUTYLBENZYLPHTHALATE	<0.20
3,3'-DICHLOROBENZIDINE	<0.41
BENZO(A)ANTHRACENE	0.67
BIS(2-ETHYLHEXYL)PHTHALATE	0.35
CHRYSENE	0.76
DI-N-OCTYLPHTHALATE	<0.20
BENZO(B)FLUORANTHENE	0.24
BENZO(K)FLUORANTHENE	0.24
BENZO(A)PYRENE	0.32
INDENO(1,2,3-CD)PYRENE	<0.20
DIBENZO(A,H)ANTHRACENE	<0.20
BENZO(G,H,I)PERYLENE	<0.20

SURROGATE PERCENT RECOVERY		LIMITS
NITROBENZENE-D5	101	32 - 140
2-FLUOROBIPHENYL	91	57 - 121
TERPHENYL-D14	98	59 - 143
PHENOL-D5	99	46 - 127
2-FLUOROPHENOL	86	47 - 117
2,4,6-TRIBROMOPHENOL	88	40 - 132

Analytical**Technologies**, Inc.

ATI I.D. # 9310-236-4

TENTATIVELY IDENTIFIED COMPOUNDS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: SP-D1	DATE ANALYZED	: 11/03/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	ESTIMATED CONC.	FLAG	R.T.
NAPHTHALENE, 1,8-DIMETHYL-	4.5	JN	18.86
NAPHTHALENE, 1,3-DIMETHYL	8.1		19.10
UNKNOWN HYDROCARBON	4.5		19.47
UNKNOWN ALKANE	4.1		19.67
UNKNOWN HYDROCARBON	5.3		21.06

AnalyticalTechnologies,Inc.

ATI I.D. # 9310-236-5

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: W-W4-SW30	DATE ANALYZED	: 11/04/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<0.25
PHENOL	<0.25
ANILINE	<0.25
BIS(2-CHLOROETHYL)ETHER	<0.25
2-CHLOROPHENOL	<0.25
1,3-DICHLOROBENZENE	<0.25
1,4-DICHLOROBENZENE	<0.25
BENZYL ALCOHOL	<0.25
1,2-DICHLOROBENZENE	<0.25
2-METHYLPHENOL	<0.25
BIS(2-CHLOROISOPROPYL)ETHER	<0.25
⁴-METHYLPHENOL	<0.25
.-NITROSO-DI-N-PROPYLAMINE	<0.25
HEXACHLOROETHANE	<0.25
NITROBENZENE	<0.25
ISOPHORONE	<0.25
2-NITROPHENOL	<0.25
2,4-DIMETHYLPHENOL	<0.25
BENZOIC ACID	<1.3
BIS(2-CHLOROETHOXY)METHANE	<0.25
2,4-DICHLOROPHENOL	<0.25
1,2,4-TRICHLOROBENZENE	<0.25
NAPHTHALENE	<0.25
4-CHLOROANILINE	<0.25
HEXACHLOROBUTADIENE	<0.25
4-CHLORO-3-METHYLPHENOL	<0.25
2-METHYLNAPHTHALENE	<0.25
HEXACHLOROCYCLOPENTADIENE	<0.25
2,4,6-TRICHLOROPHENOL	<0.25
2,4,5-TRICHLOROPHENOL	<1.3
2-CHLORONAPHTHALENE	<0.25
2-NITROANILINE	<1.3
DIMETHYLPHTHALATE	<0.25
ACENAPHTHYLENE	<0.25
3-NITROANILINE	<1.3
ACENAPHTHENE	<0.25
2,4-DINITROPHENOL	<1.3
-NITROPHENOL	<1.3

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Analytical**Technologies,**Inc.

ATI I.D. # 9310-236-5

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: W-W4-SW30	DATE ANALYZED	: 11/04/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
DIBENZOFURAN	<0.25
2,4-DINITROTOLUENE	<0.25
2,6-DINITROTOLUENE	<0.25
DIETHYLPHTHALATE	<0.25
4-CHLOROPHENYL-PHENYLETHER	<0.25
FLUORENE	<0.25
4-NITROANILINE	<1.3
4,6-DINITRO-2-METHYLPHENOL	<1.3
N-NITROSODIPHENYLAMINE	<0.25
4-BROMOPHENYL-PHENYLETHER	<0.25
HEXACHLOROBENZENE	<0.25
PENTACHLOROPHENOL	<0.25
PHENANTHRENE	<0.25
ANTHRACENE	<0.25
DI-N-BUTYLPHTHALATE	<0.25
FLUORANTHENE	<0.25
BENZIDINE	<2.5
PYRENE	<0.25
BUTYLBENZYLPHTHALATE	<0.25
3,3'-DICHLOROBENZIDINE	<0.51
BENZO(A)ANTHRACENE	<0.25
BIS(2-ETHYLHEXYL)PHTHALATE	<0.25
CHRYSENE	<0.25
DI-N-OCTYLPHTHALATE	<0.25
BENZO(B)FLUORANTHENE	<0.25
BENZO(K)FLUORANTHENE	<0.25
BENZO(A)PYRENE	<0.25
INDENO(1,2,3-CD)PYRENE	<0.25
DIBENZO(A,H)ANTHRACENE	<0.25
BENZO(G,H,I)PERYLENE	<0.25

SURROGATE PERCENT RECOVERY		LIMITS
NITROBENZENE-D5	86	32 - 140
2-FLUOROBIPHENYL	75	57 - 121
TERPHENYL-D14	89	59 - 143
PHENOL-D5	90	46 - 127
-FLUOROPHENOL	78	47 - 117
2,4,6-TRIBROMOPHENOL	90 ✓	40 - 132

Analytical**Technologies,**Inc.

ATI I.D. # 9310-236-5

TENTATIVELY IDENTIFIED COMPOUNDS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: W-W4-SW30	DATE ANALYZED	: 11/04/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	ESTIMATED CONC.	FLAG	R.T.
PENTATRIACONTANE	0.45	JN	34.09
HEXADECANAL	0.40		35.31
UNKNOWN ALKANE	0.40		35.82
UNKNOWN HYDROCARBON	0.45		40.70
UNKNOWN HYDROCARBON	0.55		41.47

AnalyticalTechnologies,Inc.

ATI I.D. # 9310-236-6

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: NW-W4-0	DATE ANALYZED	: 11/04/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<0.17
PHENOL	<0.17
ANILINE	<0.17
BIS(2-CHLOROETHYL)ETHER	<0.17
2-CHLOROPHENOL	<0.17
1,3-DICHLOROBENZENE	<0.17
1,4-DICHLOROBENZENE	<0.17
BENZYL ALCOHOL	<0.17
1,2-DICHLOROBENZENE	<0.17
2-METHYLPHENOL	<0.17
BIS(2-CHLOROISOPROPYL)ETHER	<0.17
-METHYLPHENOL	<0.17
-NITROSO-DI-N-PROPYLAMINE	<0.17
HEXACHLOROETHANE	<0.17
NITROBENZENE	<0.17
ISOPHORONE	<0.17
2-NITROPHENOL	<0.17
2,4-DIMETHYLPHENOL	<0.17
BENZOIC ACID	<0.88
BIS(2-CHLOROETHOXY)METHANE	<0.17
2,4-DICHLOROPHENOL	<0.17
1,2,4-TRICHLOROBENZENE	<0.17
NAPHTHALENE	<0.17
4-CHLOROANILINE	<0.17
HEXACHLOROBUTADIENE	<0.17
4-CHLORO-3-METHYLPHENOL	<0.17
2-METHYLNAPHTHALENE	<0.17
HEXACHLOROCYCLOPENTADIENE	<0.17
2,4,6-TRICHLOROPHENOL	<0.17
2,4,5-TRICHLOROPHENOL	<0.88
2-CHLORONAPHTHALENE	<0.17
2-NITROANILINE	<0.88
DIMETHYLPHTHALATE	<0.17
ACENAPHTHYLENE	<0.17
3-NITROANILINE	<0.88
ACENAPHTHENE	<0.17
2,4-DINITROPHENOL	<0.88
-NITROPHENOL	<0.88

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Analytical Technologies, Inc.

ATI I.D. # 9310-236-6

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: NW-W4-0	DATE ANALYZED	: 11/04/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
DIBENZOFURAN	<0.17
2,4-DINITROTOLUENE	<0.17
2,6-DINITROTOLUENE	<0.17
DIETHYLPHTHALATE	<0.17
4-CHLOROPHENYL-PHENYLETHER	<0.17
FLUORENE	<0.17
4-NITROANILINE	<0.88
4,6-DINITRO-2-METHYLPHENOL	<0.88
N-NITROSODIPHENYLAMINE	<0.17
4-BROMOPHENYL-PHENYLETHER	<0.17
HEXACHLOROBENZENE	<0.17
PENTACHLOROPHENOL	<0.17
PHENANTHRENE	<0.17
ANTHRACENE	<0.17
DI-N-BUTYLPHTHALATE	<0.17
FLUORANTHENE	<0.17
BENZIDINE	<1.7
PYRENE	<0.17
BUTYLBENZYLPHTHALATE	<0.17
3,3'-DICHLOROBENZIDINE	<0.35
BENZO(A)ANTHRACENE	<0.17
BIS(2-ETHYLHEXYL)PHTHALATE	<0.17
CHRYSENE	<0.17
DI-N-OCTYLPHTHALATE	<0.17
BENZO(B)FLUORANTHENE	<0.17
BENZO(K)FLUORANTHENE	<0.17
BENZO(A)PYRENE	<0.17
INDENO(1,2,3-CD)PYRENE	<0.17
DIBENZO(A,H)ANTHRACENE	<0.17
BENZO(G,H,I)PERYLENE	<0.17

SURROGATE PERCENT RECOVERY		LIMITS
NITROBENZENE-D5	89	32 - 140
2-FLUOROBIPHENYL	95	57 - 121
TERPHENYL-D14	99	59 - 143
PHENOL-D5	91	46 - 127
2-FLUOROPHENOL	87	47 - 117
2,4,6-TRIBROMOPHENOL	93 ✓	40 - 132

Analytical**Technologies,**Inc.

ATI I.D. # 9310-236-6

TENTATIVELY IDENTIFIED COMPOUNDS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: NW-W4-0	DATE ANALYZED	: 11/04/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	ESTIMATED CONC.	FLAG	R.T.
UNKNOWN HYDROCARBON	0.34	JN	7.03

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Analytical**Technologies,**Inc.

ATI I.D. # 9310-236-7

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: S-W4-SE20	DATE ANALYZED	: 11/04/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<0.22
PHENOL	<0.22
ANILINE	<0.22
BIS(2-CHLOROETHYL)ETHER	<0.22
2-CHLOROPHENOL	<0.22
1,3-DICHLOROBENZENE	<0.22
1,4-DICHLOROBENZENE	<0.22
BENZYL ALCOHOL	<0.22
1,2-DICHLOROBENZENE	<0.22
2-METHYLPHENOL	<0.22
BIS(2-CHLOROISOPROPYL)ETHER	<0.22
'-METHYLPHENOL	<0.22
,-NITROSO-DI-N-PROPYLAMINE	<0.22
HEXACHLOROETHANE	<0.22
NITROBENZENE	<0.22
ISOPHORONE	<0.22
2-NITROPHENOL	<0.22
2,4-DIMETHYLPHENOL	<0.22
BENZOIC ACID	<1.1
BIS(2-CHLOROETHOXY)METHANE	<0.22
2,4-DICHLOROPHENOL	<0.22
1,2,4-TRICHLOROBENZENE	<0.22
NAPHTHALENE	<0.22
4-CHLOROANILINE	<0.22
HEXACHLOROBUTADIENE	<0.22
4-CHLORO-3-METHYLPHENOL	<0.22
2-METHYLNAPHTHALENE	<0.22
HEXACHLOROCYCLOPENTADIENE	<0.22
2,4,6-TRICHLOROPHENOL	<0.22
2,4,5-TRICHLOROPHENOL	<1.1
2-CHLORONAPHTHALENE	<0.22
2-NITROANILINE	<1.1
DIMETHYLPHTHALATE	<0.22
ACENAPHTHYLENE	<0.22
3-NITROANILINE	<1.1
ACENAPHTHENE	<0.22
2,4-DINITROPHENOL	<1.1
-NITROPHENOL	<1.1

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AnalyticalTechnologies,Inc.

ATI I.D. # 9310-236-7

SEMI-VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: S-W4-SE20	DATE ANALYZED	: 11/04/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
DIBENZOFURAN	<0.22
2,4-DINITROTOLUENE	<0.22
2,6-DINITROTOLUENE	<0.22
DIETHYLPHTHALATE	<0.22
4-CHLOROPHENYL-PHENYLETHER	<0.22
FLUORENE	<0.22
4-NITROANILINE	<1.1
4,6-DINITRO-2-METHYLPHENOL	<1.1
N-NITROSODIPHENYLAMINE	<0.22
4-BROMOPHENYL-PHENYLETHER	<0.22
HEXACHLOROBENZENE	<0.22
⁻ENTACHLOROPHENOL	<0.22
⁄ENANTHRENE	<0.22
ANTHRACENE	<0.22
DI-N-BUTYLPHTHALATE	<0.22
FLUORANTHENE	<0.22
BENZIDINE	<2.2
PYRENE	<0.22
BUTYLBENZYLPHTHALATE	<0.22
3,3'-DICHLOROBENZIDINE	<0.44
BENZO(A)ANTHRACENE	<0.22
BIS(2-ETHYLHEXYL)PHTHALATE	<0.22
CHRYSENE	<0.22
DI-N-OCTYLPHTHALATE	<0.22
BENZO(B)FLUORANTHENE	<0.22
BENZO(K)FLUORANTHENE	<0.22
BENZO(A)PYRENE	<0.22
INDENO(1,2,3-CD)PYRENE	<0.22
DIBENZO(A,H)ANTHRACENE	<0.22
BENZO(G,H,I)PERYLENE	<0.22

SURROGATE PERCENT RECOVERY		LIMITS
NITROBENZENE-D5	85	32 - 140
2-FLUOROBIPHENYL	87	57 - 121
TERPHENYL-D14	95	59 - 143
PHENOL-D5	92	46 - 127
FLUOROPHENOL	86	47 - 117
⁄,4,6-TRIBROMOPHENOL	97 ✓	40 - 132

AnalyticalTechnologies,Inc.

ATI I.D. # 9310-236-7

TENTATIVELY IDENTIFIED COMPOUNDS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/26/93
PROJECT #	: 3763-04	DATE RECEIVED	: 10/26/93
PROJECT NAME	: DSI	DATE EXTRACTED	: 10/30/93
CLIENT I.D.	: S-W4-SE20	DATE ANALYZED	: 11/04/93
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8270	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	ESTIMATED CONC.	FLAG	R.T.
UNKNOWN HYDROCARBON	0.26	JN	7.04
SULFUR, MOL. (S8)	1.2	↓	27.58
UNKNOWN HYDROCARBON	0.56		39.89
UNKNOWN HYDROCARBON	0.48		40.67
UNKNOWN HYDROCARBON	0.87		41.13

Analytical Technologies, Inc.

ATI I.D. # 9310-236

SEMI-VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : DSI
SAMPLE MATRIX : SOIL
EPA METHOD : 8270

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 10/30/93
DATE ANALYZED : 11/03/93
UNITS : mg/Kg

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
PHENOL	<0.167	6.67	4.13	62	N/A	N/A	N/A
2-CHLOROPHENOL	<0.167	6.67	4.14	62	N/A	N/A	N/A
1,4-DICHLOROBENZENE	<0.167	3.33	2.60	78	N/A	N/A	N/A
N-NITROSO-DI-N-PROPYLAMINE	<0.167	3.33	2.47	74	N/A	N/A	N/A
1,2,4-TRICHLOROBENZENE	<0.167	3.33	2.68	80	N/A	N/A	N/A
4-CHLORO-3-METHYLPHENOL	<0.167	6.67	4.36	65	N/A	N/A	N/A
ACENAPHTHENE	<0.167	3.33	2.72	82	N/A	N/A	N/A
4-NITROPHENOL	<0.850	6.67	5.79	87	N/A	N/A	N/A
2,4-DINITROTOLUENE	<0.167	3.33	2.83	85	N/A	N/A	N/A
PENTACHLOROPHENOL	<0.167	6.67	4.89	73	N/A	N/A	N/A
PYRENE	<0.167	3.33	2.79	84	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
PHENOL	26 - 124	20
2-CHLOROPHENOL	30 - 133	21
1,4-DICHLOROBENZENE	29 - 120	22
N-NITROSO-DI-N-PROPYLAMINE	24 - 126	20
1,2,4-TRICHLOROBENZENE	28 - 129	20
4-CHLORO-3-METHYLPHENOL	28 - 129	20
ACENAPHTHENE	32 - 126	21
4-NITROPHENOL	26 - 141	20
2,4-DINITROTOLUENE	29 - 126	20
PENTACHLOROPHENOL	22 - 156	28
PYRENE	32 - 139	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
NITROBENZENE-D5	87	N/A	32 - 140
2-FLUOROBIPHENYL	97	N/A	57 - 121
TERPHENYL-D14	100	N/A	59 - 143
PHENOL-D5	88	N/A	46 - 127
2-FLUOROPHENOL	84	N/A	47 - 117
2,4,6-TRIBROMOPHENOL	97	N/A	40 - 132

Analytical**Technologies,**Inc.

ATI I.D. # 9310-236

SEMI-VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : DSI
SAMPLE MATRIX : SOIL
EPA METHOD : 8270

SAMPLE I.D. # : 9310-236-6
DATE EXTRACTED : 10/30/93
DATE ANALYZED : 11/04/93
UNITS : mg/Kg

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
PHENOL	<0.172	6.89	4.34	63	4.72	69	8
2-CHLOROPHENOL	<0.172	6.89	4.30	62	4.26	62	1
1,4-DICHLOROBENZENE	<0.172	3.45	2.62	76	2.68	78	2
N-NITROSO-DI-N-PROPYLAMINE	<0.172	3.45	2.57	74	2.45	71	5
1,2,4-TRICHLOROBENZENE	<0.172	3.45	2.76	80	2.83	82	3
4-CHLORO-3-METHYLPHENOL	<0.172	6.89	5.12	74	4.77	69	7
ACENAPHTHENE	<0.172	3.45	2.80	81	2.75	80	2
4-NITROPHENOL	<0.879	6.89	6.60	96	6.65	97	1
2,4-DINITROTOLUENE	<0.172	3.45	2.89	84	3.03	88	5
PENTACHLOROPHENOL	<0.172	6.89	6.09	88	5.79	84	5
PYRENE	<0.172	3.45	3.08	89	2.88	83	7

CONTROL LIMITS	% REC.	RPD
PHENOL	54 - 107	20
2-CHLOROPHENOL	54 - 116	21
1,4-DICHLOROBENZENE	38 - 118	22
N-NITROSO-DI-N-PROPYLAMINE	39 - 134	20
1,2,4-TRICHLOROBENZENE	31 - 143	20
4-CHLORO-3-METHYLPHENOL	55 - 122	20
ACENAPHTHENE	36 - 134	21
4-NITROPHENOL	39 - 129	20
2,4-DINITROTOLUENE	53 - 115	20
PENTACHLOROPHENOL	25 - 156	28
PYRENE	22 - 149	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
NITROBENZENE-D5	88	91	32 - 140
2-FLUOROBIPHENYL	101	104	57 - 121
TERPHENYL-D14	101	100	59 - 143
PHENOL-D5	88	90	46 - 127
2-FLUOROPHENOL	82	87	47 - 117
2,4,6-TRIBROMOPHENOL	101	99	40 - 132

Analytical Technologies, Inc.

ATI I.D. # 9310-236

GENERAL CHEMISTRY ANALYSIS

CLIENT : HART CROWSER, INC.
PROJECT # : 3763-04
PROJECT NAME : DSI

MATRIX : SOIL

PARAMETER	DATE ANALYZED
MOISTURE	10/27/93

Analytical Technologies, Inc.

ATI I.D. # 9310-236

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC. MATRIX : SOIL
PROJECT # : 3763-04
PROJECT NAME : DSI UNITS : %

ATI I.D. #	CLIENT I.D.	MOISTURE
9310-236-1	SE-B7-0	25
9310-236-2	NE-W4-0	7.3
9310-236-3	E-W4-NE30	23
9310-236-4	SP-D1	18
9310-236-5	W-W4-SW30	33
9310-236-6	NW-W4-0	3.3
9310-236-7	S-W4-SE20	23

Analytical**Technologies,**Inc.

ATI I.D. # 9310-236

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC. MATRIX : SOIL
PROJECT # : 3763-04
PROJECT NAME : DSI UNITS : %

PARAMETER	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
MOISTURE	9310-236-6	3.3	3.3	0	N/A	N/A	N/A

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Sample Result} - \text{Duplicate Result})|}{\text{Average Result}} \times 100$$

9310-236

Sample Custody Record

DATE 10/26 PAGE 1 OF

HART CROWSER

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle, Washington 98102-3699

JOB NUMBER 3763-04 LAB NUMBER 9310-236

PROJECT MANAGER D Templeton

PROJECT NAME DSI

SAMPLED BY: Terry Montoya

LAB NO.	SAMPLE	TIME	STATION	MATRIX	TESTING 8270	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
1	E-B7-0	10/25		Soil	X	1	Normal Turn
2	NE-W4-0	10/25			X	1	
3	E-W4-NE30	10/25			X	1	
4	SP-D1	10/26			X	1	
5	W-W4-SW30	10/26			X	1	
6	NW-W4-0	10/26			X	1	
7	S-W4-SE20	10/26			X	1	

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/26	SIGNATURE	10/28
Terry Montoya	TIME	Marcia Postma	TIME
PRINTED NAME	1:09pm	PRINTED NAME	1525
COMPANY		ATI	

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE		SIGNATURE	
	TIME		TIME
PRINTED NAME		PRINTED NAME	
COMPANY		COMPANY	

TOTAL NUMBER OF CONTAINERS 7

METHOD OF SHIPMENT Courier

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS

DISTRIBUTION:

1. PROVIDE WHITE AND YELLOW COPIES TO LABORATORY
2. RETURN PINK COPY TO PROJECT MANAGER
3. LABORATORY TO FILL IN SAMPLE NUMBER AND SIGN FOR RECEIPT
4. LABORATORY TO RETURN WHITE COPY TO HART CROWSER