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Volume I

Remedial Investigation Report
Terminal 4, Slip 3 Sediments
Port of Portland
Portland, Oregon

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Prepared for
Port of Portland

Port Project No. 23640
Port Task No. 310

April 18, 2000
J-5624-10

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REMEDIAL INVESTIGATION REPORT
TERMINAL 4, SLIP 3 SEDIMENTS
PORT OF PORTLAND
PORTLAND, OREGON

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Environmental Cleanup Office

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REMEDIAL INVESTIGATION REPORT
TERMINAL 4, SLIP 3 SEDIMENTS
PORT OF PORTLAND
PORTLAND, OREGON

EXECUTIVE SUMMARY

Hart Crowser, under contract with the Port of Portland (Port), conducted a Remedial Investigation (RI) of the sediments surrounding Terminal 4, Slip 3 (Slip 3). Terminal 4 (T-4) is a ship loading and unloading facility located at approximately River Mile 5 on the Willamette River. The RI study area consists of the sediments located upriver at Pier 5 Willamette River Dock (Pier 5), Slip 3, and Wheeler Bay, which is immediately downriver and adjacent to Slip 3.

The RI was conducted with Oregon Department of Environmental Quality (DEQ) oversight under the DEQ Voluntary Cleanup Program. RI activities included surface and subsurface sediment sampling, chemical and bioassay testing of sediments, and surface water sampling and chemical testing. The purpose of the sediments RI was to collect data to delineate the extent of contamination in the project area and to evaluate potential risks to human health and environment posed by the presence of chemicals of potential concern (COPCs) in riverine sediments at the site. Potential sources of contamination include: current and past diesel/oil seeps into the river; potential spills from bulk handling practices; discharges from storm water outfalls in the project area; and sediment transport from outside the study area.

Surface sediment samples (0 to 10 centimeters) were collected at 44 locations, including nine surface samples collocated with subsurface sediment sampling locations. As set forth in the DEQ-approved project work plans, sediment samples were analyzed for the following:

- Pencil pitch;
- Diesel;
- Total metals;
- Total organic carbon;
- Semivolatile organics;
- Volatile organics;
- Pesticides (for a limited subset of samples); and
- Grain size.

Detectable concentrations of pencil pitch were present throughout the study area. This is likely the result of storm water runoff events from upland handling activities at the berthing areas, discharge from storm water outfalls, and transport by propwash during ship movements.

Detectable concentrations of diesel in sediment were not found to be distributed throughout the study area, but were generally found in areas associated with known diesel pipeline leaks and seeps near the head of Slip 3 and along Berth 412.

The detected concentrations of chemical constituents in sediment were also compared against the Dredged Material Evaluation Framework - Lower Columbia River Management Area (LCRMA) Screening Levels (SLs) and Maximum Levels (MLs) (Corps. *et al.*, 1998). These screening levels were developed for characterizing dredged material for open-water disposal and were used to screen sediment chemical concentrations against available risk-based sediment quality criteria. The LCRMA screening criteria do not represent regulatory decision criteria for purposes of this RI; however, the LCRMA was utilized to assess the relative magnitude of sediment COPCs.

Concentrations of total high molecular weight polycylic aromatic hydrocarbons (HPAHs) and low molecular weight polycylic hydrocarbons (LPAHs) were detected throughout the study area and exceeded the corresponding LCRMA SLs and MLs. These elevated concentrations of HPAHs and LPAHs are likely a result of pencil pitch and/or diesel.

Metals in T-4 sediments that exceeded the LCRMA SLs were zinc, lead, and cadmium. The exceedence of SLs were collocated for these three metals detected at sample locations HC-S-19 and HC-S-25. The exceedence of LCRMA SLs for zinc and lead were also collocated in subsurface sediment samples HC-VC-7-S2 and HC-VC-11-S2.

An evaluation of the impacts of sediment contamination to ecological receptors in Slip 3 was conducted using sediment toxicity testing. A suite of three sediment bioassay tests (two acute tests and one chronic test) were conducted on 16 test sediments and on two reference sediments collected during this RI. The sediment samples failing biological interpretative criteria were distributed in the eastern half of Slip 3. The samples that failed biological criteria were generally associated with higher detected concentrations of organic (diesel and pencil pitch) and some inorganic (metals) COPCs. Additionally, the sediment samples that passed biological criteria were located in areas of the Slip that exhibit low to moderate concentrations of COPCs. These results suggest sediment toxicity in Slip 3 is associated with elevated concentrations of COPCs

rather than non-contaminant-related factors (e.g., grain size, total organic carbon).

The results of the sediment bioassays were evaluated with regard to the detected concentrations of pencil pitch and diesel – the primary sources of petroleum-related constituents to the Slip. For diesel, five out of six samples containing diesel concentrations greater than 100 mg/kg failed bioassay analysis, while, for all of the samples passing bioassay testing, diesel concentrations were less than 100 mg/kg or not detected at the sample quantitation limit. For pencil pitch, the relationship between detected concentrations and bioassay results were much more inconsistent. Some of the samples failing bioassay analyses contained elevated levels of pencil pitch (HC-S-01 at 7,730 mg/kg and HC-S-04 at 1,350 mg/kg), but others contained much lower pencil pitch concentrations (HC-S-22 at 449 mg/kg). Conversely, some of the samples passing sediment bioassays contained very high concentrations of pencil pitch (HC-S-19 at 8,650 mg/kg and HC-S-24 at 4,320 mg/kg). This inconsistency could be due to the presence (or absence) of other COPCs.

Surface water samples were collected from three locations to assess the contributions of various sources (both aquatic and upland) to the water quality in Slip 3. Metals, HPAHs, and phthalates were detected at these sampling locations; however, no exceedences of Oregon DEQ acute or chronic ambient water quality criteria (AWQC) were identified for the three water samples analyzed.

The next phase of this project is to conduct a feasibility study (FS) for sediments in the project area. This FS will be coordinated with the T-4 upland operable units' FS.

1.0 INTRODUCTION

This report presents the results of Remedial Investigation (RI) activities conducted at the Port of Portland (Port) Marine Terminal 4, Slip 3 (Slip 3) Sediments Operable Unit in Portland, Oregon. Terminal 4 (T-4) is a ship loading and unloading facility located at approximately River Mile 5 on the Willamette River (Figure 1). The RI study area consists of the sediments located upriver at Pier 5 Willamette River Dock (Pier 5), Slip 3, and Wheeler Bay, which is immediately downriver and adjacent to Slip 3 (Figure 2). These areas define the site for the sediments operable unit. The RI activities were conducted for the Port with Oregon Department of Environmental Quality (DEQ) oversight under the DEQ Voluntary Cleanup Program. This sediments RI is being conducted concurrently with the T-4, Slip 3 Upland Operable Unit RI (Hart Crowser, 1999).

1.1 *Remedial Investigation Objectives*

The purpose of the sediments RI was to collect data to delineate the extent of contamination in the project area and to evaluate potential risks to the Willamette River environment and to human health posed by the presence of chemicals of potential concern (COPCs) in riverine sediments at the site. The RI was completed in accordance with the scope of work presented in our August 17, 1998, "Remedial Investigation/Feasibility Study Work Plan, Marine Terminal 4, Slip 3 Sediments" (Hart Crowser, 1998a) and with the October 1, 1998, letter "Response to DEQ comments on the RI Work Plan" (Hart Crowser, 1998b).

The primary objectives of the RI were to:

- Conduct chemical testing of sediments present in the study area to delineate the horizontal and vertical extent of sediment contamination;
- Collect analytical chemistry data of sufficient quality to evaluate potential risks to human health and the environment; and
- Perform freshwater acute and chronic bioassays on surface sediment samples from the site to provide a definitive assessment of risks to benthic organisms.

Other tasks conducted as part of the RI included:

- Duplicate the previous (post-dredge) pencil pitch sediment sampling and analysis program performed under the Environmental Protection Agency (EPA) 1993 Consent Decree. This will enable the Port to determine the present pencil pitch concentrations and spatial (horizontal and vertical) extent of pencil pitch in harbor sediments at Slip 3. A formal report on the pencil pitch duplication study is briefly discussed in this RI and is presented in greater detail in a separate report.
- Perform limited human health and ecological risk assessments.

Following the completion of this RI, a Feasibility Study (FS) will be prepared to determine potential remedial alternatives for sediments at this site. The FS will be coordinated with upland FS activities.

1.2 Report Organization

The main text of the RI report: discusses the site location and physical setting; summarizes previous site investigations, remedial activities, and dredging history; reviews the 1998 RI field activities; discusses the chemical and bioassay testing programs and results; presents the results of a limited human health and ecological risk assessments based on an exposure pathway evaluation; and delineates the area of the site requiring an evaluation of remedial alternatives. The text portion of the report is followed by tables and figures. Tables and figures are presented in the order referenced in the text.

The RI report includes three volumes that contain the report and nine appendices, which provide supporting information and documentation:

- Volume I includes the main body of the report, tables, figures, and Appendices A through F. Appendix A describes the field investigation program. Appendix B includes copies of the sediment core logs. Appendix C presents the analytical chemistry results from the surface and subsurface sediment samples collected during this RI. Appendix D presents the sediment grain size data reports. Appendices E and F present the data quality reports for the chemical analyses and bioassay analyses, respectively.

- Volume II contains Appendices G and H. Appendix G contains copies of the analytical laboratory report and certifications. Appendix H presents the bioassay laboratory report and raw data.

- Volume III includes Appendix I, which presents the hydrocarbon differentiation study prepared by Columbia Analytical Services.

1.3 Limitations

The work Hart Crowser performed for this project was completed in accordance with generally accepted professional practices related to the nature of the work accomplished, in the same or similar localities, at the time the services were performed. This report is for the specific application to the referenced project and for the exclusive use of the Port. No other warranty, express or implied, is made.

2.0 PROJECT DESCRIPTION AND SITE HISTORY

2.1 *Project Description*

In May 1998, the DEQ conducted a Preliminary Assessment (PA) of T-4, which identified it as a "high priority" site for further investigation and cleanup (DEQ, 1998). The PA was based upon a review of historical environmental investigations encompassing soil, groundwater, and sediments at T-4. In response to this notification by DEQ, the Port agreed to perform a RI/FS at T-4 under the DEQ Voluntary Cleanup Program. The site was divided into two operable units, the upland operable unit and the sediments operable unit. This RI addresses only the sediments portion of the RI/FS.

Local potential sources of sediment contamination include current and past diesel/oil seeps into the river, potential spills from bulk handling practices, and runoff from storm water outfalls in the project area (Figure 3). In addition, sediment contamination may be present as a result of sediment transport to the site from other areas of the river.

2.2 *Site History*

T-4 consists of 16 berthing areas (Berths 401 through 416) located in two slips along the eastern edge of the Willamette River. T-4 lies within the St. Johns area of North Portland on land that has been zoned for industrial use. The areas north and south of T-4 are occupied by marine, industrial, and commercial operations. The berthing areas on the river are maintained to a mudline elevation of -40 feet Columbia River Datum (CRD).

Union Pacific Railroad owned and operated a fuel loading facility at this location as early as 1906. The City of Portland's Commission of Public Docks (Commission) purchased property (117 acres) from Union Pacific Railroad in 1917 and began the initial development of T-4. In 1920, the Commission acquired a 5-acre parcel adjoining Pier 5 from the railroad. The pipeline and fuel oil dock contained within the parcel were not included in the purchase. An easement was granted by the Commission to Union Pacific Railroad for the continued use of the pipeline and fuel oil dock.

In 1920, the quay and bulk handling facility at Pier 5 and Berth 412 were constructed. Berths 410 and 411 (Pier 4) were constructed in 1955 and were outfitted with Whirley cranes. The Whirley cranes were removed in 1984. The bulk outloader Dravo was commissioned at Berths 410 and 411 in 1961. The use of the Dravo ended in 1998. In 1962, the wharf at Pier 5 was removed, and

the bulk outloader was decommissioned in 1990. The wharf at Berth 412 was removed in 1997. Presently, only Berths 410 and 411 are in use in Slip 3.

The berthing areas at Slip 3 have historically been used for bulk cargo loading and unloading operations handling pencil pitch; diesel oil; soda ash; talc; iron, lead, zinc, and copper ores; bentonite clay; coke; and briquettes. Bulk off-loading (inbound bulks) no longer occurs at Berth 410 and 411. Handling of pencil pitch was discontinued in June, 1998. T-4 presently has facilities for the handling of autos, containers, logs, lumber, grain, dry and liquid bulks, steel products, and breakbulk cargo (Century West, 1994; Donovan, 1998).

Pier 5 Willamette River Dock. Pier 5 was historically used as a bulk loading facility that handled: diesel oil; coal; and iron, zinc, and copper ores. Diesel oil was handled by an underground pipeline that extended from the face of Pier 5 under Berth 412 and into above-ground storage tanks east of T-4. The bulk ore shipments were moved by conveyor to ship loaders at Pier 5 and Berth 412.

Wheeler Bay. Wheeler Bay has not been used as a ship loading or unloading facility; however, it is connected to Slip 3 via Berth 410 and to T-4 uplands by storm drains. Therefore, this area was included in the RI to determine whether runoff from bulk handling operations at Berths 410 and 411 or storm drains may have impacted the sediments within Wheeler Bay. DEQ has also expressed concern that sediments from Slip 3 could have been transported under Berth 410/411 and into Wheeler Bay.

2.3 Physical Characteristics of the Site

2.3.1 Bathymetry

Based on 1998 bathymetry data, the mudline elevation in Slip 3 ranges from -30 feet CRD at the head of the Slip to -50 feet CRD at the mouth. The bottom of Slip 3 is relatively uniform in elevation (-40 feet CRD), with a -49 feet CRD depression in front of Berth 411. The elevation -49 feet CRD hole is a remnant of pencil pitch removal efforts and scour holes due to prop wash.

2.3.2 Climate

The T-4 area has a temperate marine climate characterized by wet winters and dry summers. Precipitation, temperature, and wind data are summarized below.

Precipitation (Western Regional Climate Center, 1998)

Average Annual	37 inches (mostly rain)
Wettest Months	November through February (greater than 4 inches per month)
Driest Months	July and August (less than 1 inch per month)

Temperature (Geological Survey, 1965; Oregon State University, 1996)

Average Annual	54°F
Coldest Month	January (Average 40°F)
Warmest Month	August (Average 69°F)
Lowest Recorded	-2°F (January 1888)
Highest Recorded	107°F (July 1942)

Wind (Geological Survey, 1965)

Minimum Monthly Mean (October): 6 mph
Maximum Monthly Mean (Dec./Jan.): 10 mph
Maximum Recorded: 88 mph (1962)
Direction: Generally from west, but east winds are common

2.3.3 Regional Geology and Hydrogeology

This section is based on information from U.S. Geological Survey (1965) and U.S. Geological Survey (1993) reports.

Geology. The T-4 area is located at the mouth of the Willamette Valley near the confluence of the Willamette and Columbia Rivers. The Willamette Valley is a broad structural basin bounded on the east by the Cascade Range and on the west by the Coast Range. The most recent geologic evaluation of the area has identified eight regional geologic units, four of which are present beneath the T-4 area. From the ground surface downward, these units are:

- *Unconsolidated Sedimentary Rocks.* Pleistocene catastrophic flood deposits ranging in size from gravel to silt; including fill placed on the site, this unit is about 80 feet thick.
- *Troutdale Gravel.* Composed of poorly to moderately cemented sandy conglomerate; estimated 100 feet thick beneath the site.
- *Undifferentiated Fine-grained Sediments.* Clay and silt with sand lenses that has not been specifically identified as one of the other units, usually because of lack of information.
- *Older Rocks.* Miocene and older volcanic (Columbia River Basalt) and marine sedimentary rocks (Sandy River Mudstone).

Hydrogeology. Aquifers in the unconsolidated sedimentary rocks are generally unconfined and localized because of heterogeneity of the deposits. Water quality and hydraulic conductivity are highly variable. The Troutdale Gravel is used regionally for water supply. Aquifers in the Troutdale Gravel are generally confined with interbedded claystones acting as aquitards.

2.3.4 Willamette River Hydrology

The study area is located within the Portland Harbor section of the Willamette River, which represents the river's final reach prior to its confluence with the Columbia River. The Portland Harbor has been heavily developed with many docks and marine facilities designed to accommodate large, deep draft commercial ships in this section of the river. Deepening and widening of the main river channel have significantly altered the morphology of the lower Willamette River (Port of Portland, 1998).

Streamflow throughout the Willamette River basin is dominated by the seasonal rainfall patterns. The low-flow period runs from July through September, and the high-flow period runs from November to April (Anderson *et al.*, 1996).

Water surface elevations in Portland Harbor fluctuate on a daily basis, mainly due to daily tidal fluctuations in the Columbia River. Tidal fluctuations also result in the movement of Columbia River water into the Willamette River. These tidal fluctuations can also result in a reversal of water movement in the lower portion of Portland Harbor and in stagnation points where the water velocities in Portland Harbor are zero.

As water moves downstream through Portland Harbor, it slows as the river widens and as the hydraulic gradient flattens near the mouth of the Willamette River. Water velocities in Portland Harbor are low compared to those measured upstream and in major tributaries of the Willamette River.

2.4 Previous Investigations

Previous sediment chemistry investigations at T-4 have focused on Slip 3 because of its historical and continued use as a bulk handling facility. Information about the sediment investigations based on the year the studies were performed are described below. In addition, Figure 4 identifies known sample locations from each sediment study since 1994.

1988. The Port conducted vertical and horizontal sediment sampling and analysis to delineate the areal extent of chemical concentrations at Slip 3

(Port of Portland, 1994). The study included obtaining 28 surface grabs that penetrated to a depth of 10 centimeters (cm) and six subsurface cores. The sediments were analyzed for concentrations of pencil pitch, PAHs, metals, pesticides, oil and grease, grain size, and polychlorinated biphenyls (PCBs).

Sediment chemistry results from this study indicated that pencil pitch ranged from <1 to 22.8 percent in Slip 3 near Berths 410/411 and was confined to the upper 10 to 15 cm of the sediment column. Trace metals were present in the samples analyzed with zinc and lead detected at the highest concentrations. PAHs were elevated in both surface and deeper sediments.

1993 and 1994. Historical bulk handling and dock cleanup activities at Berths 410 and 411 resulted in non-permitted discharges (spills) of pencil pitch to the sediments. The spills resulted in a Federal Consent Decree issued by the EPA, dated May 7, 1993, requiring that the Port cease all non-permitted discharges of pencil pitch and remediate the sediment concentration of pencil pitch to below 0.5 percent dry weight. In response to the Federal Consent Decree, the Port conducted a sediment investigation to better delineate the depth distribution of contaminants in Slip 3. Ten sediment cores (to a depth of 305 cm) were collected, and the sediment samples were tested for total metals, Toxicity Characteristic Leaching Procedure (TCLP) metals, and PAHs. In addition, SCUBA divers collected surface sediment samples for pencil pitch analysis (Port of Portland, 1994).

Results indicated that petroleum constituents were generally restricted to the top 30 cm; however, some contamination is present deeper in the sediment column. TCLP tests indicated that the sediment metal concentrations are not high enough for the sediments to be considered hazardous wastes. The Port used results of this study to design the dredging and disposal plan for remediation of the pencil pitch-contaminated sediments that was completed in 1995.

Sediments in Slip 3 containing greater than 0.5 percent pencil pitch were dredged in 1995. Dredging activities removed approximately 35,000 cubic yards of material.

1997. Four separate sampling events occurred in Slip 3 in 1997. Summaries for these studies are presented below.

- *Event 1.* A sediment characterization study was conducted as part of the Port's maintenance dredging requirements at Berth 410 (Hart Crowser, 1997a). Results of this study indicated that the PAHs and metals concentrations in sediments exceeded Puget Sound Dredge Disposal

Analysis (PSDDA) SLs and were not suitable for open water disposal. Sediment chemical concentrations were compared to PSDDA because the State of Oregon did not have sediment quality criteria at that time. Subsequently, the Port received an Army Corps of Engineers (Corps) permit for confined in-water disposal at Ross Island.

- *Event 2.* One Dravo bucketful of pencil pitch containing an estimated 50 to 1,000 pounds of pencil pitch was spilled in the vicinity of Berth 411 during a Hall Buck Marine unloading operation. A preliminary removal action was undertaken in July 1997, using a hydraulic dredge to remove pencil pitch from the area most likely contaminated by the spill (Hart Crowser, 1997b). However, surface sediment samples collected after the removal action revealed that pencil pitch concentrations in excess of 0.5 percent remained. A subsequent study was conducted to further delineate the horizontal extent of pencil pitch and to assess the need for future remedial activities at the site (Hart Crowser, 1997b). The study delineated the extent of pencil pitch contamination above 0.5 percent. The pencil pitch-contaminated sediments were dredged in August 1998 by Hall Buck Marine with DEQ oversight.

- *Event 3.* As part of the Portland Harbor Study, the DEQ and EPA conducted a port-wide sediment characterization study that included the T-4 study area (Roy F. Weston Inc., 1998). The Portland Harbor Study was designed to assess the overall chemical contamination of sediments in the lower Willamette River from River Mile 3.5 to 9.5. Seven surface sediment samples (25, 27, 29, 31, 32, 33, and 34) and one subsurface sample (31) were collected from the T-4 study area primarily within Slip 3 (Figure 4). Analytical results for these samples showed elevated concentrations of PAHs and zinc when compared to Washington State Freshwater Sediment Quality Criteria (FSQ). The Weston study compared samples to FSQ criteria because the State of Oregon did not have specific sediment quality criteria at that time.

- *Event 4.* In conjunction with the Portland Harbor Study, the Port took split samples from three locations (31, 32, and 33) in the T-4 study area. Results from the split samples also indicated that PAHs and zinc concentrations were elevated in Slip 3 when compared to Washington State FSQ Criteria.

2.5 Previous Remediation Activities

In response to the 1993 EPA Federal Consent Decree, remediation of pencil pitch-contaminated sediments along Berth 411 was accomplished by dredging and confined aquatic disposal of the dredged material at Ross Island.

Confirmatory sampling was conducted in each dredging unit after initial dredging and re-dredging was conducted if either sediment quality goals or project design depths were not met. Dredging and disposal began in December 1994 and completed in January 1995 (Hartman Associates, 1995).

Following a pencil pitch spill by Hall-Buck Marine in 1997, a hydraulic dredge and clamshell dredge were used to remove the pencil pitch. Confirmatory surface sediment tests revealed that pencil pitch was still present in the sediments at concentrations greater than 0.5 percent. In August 1998, pencil pitch-contaminated sediments in Slip 3 were removed to the satisfaction of the DEQ spill coordinator (DEQ, 1998).

2.6 *Dredging History of Slip 3*

The berthing areas at 410 and 411 must maintain a working draft of -40 feet CRD to safely berth vessels during loading/unloading operations. Maintenance dredging has been conducted three times since 1973. Dredging has also been conducted twice to remove contaminated sediments from pencil pitch spills, as described in Section 2.5. An area in front of Berth 411 was overdredged to elevation -49 feet CRD during the 1994 cleanup operations associated with the remediation of the pencil pitch spill. Based on projected future berthing requirements and sedimentation rates, the Port does not plan to conduct maintenance dredging at Slip 3 in the near future (Ogden Beeman and Hartman Associates, 1996).

2.7 *Potential Contaminant Sources*

Identified local potential contaminants include the following:

- Pencil pitch;
- Diesel; and
- Metals.

These potential contaminants may have entered the study area by one or more of several modes (sources), including:

- Pencil pitch handling procedures and spills that have occurred at Berth 411.
- Historical petroleum leaks and seeps from the former Union Pacific pipeline which passes near Berth 412 (Hart Crowser, 1999). An oil seep into the river at the head of Slip 3 (near Berth 412) originates from the

pipeline (the seep is currently being addressed by an interim remedial action).

- Metals that may have entered the sediments due to bulk handling practices while ships were being loaded or unloaded.
- Storm water runoff from bulk handling areas.
- Storm drains that discharge into the project area.
- Sediment/contaminants originating from upstream sources that deposit in Slip 3.

Once the contaminants reach the sediments, the contaminants can be dispersed throughout the study area primarily by propwash from ship movements and river currents.

3.0 REMEDIAL INVESTIGATION

Surface sediment, subsurface sediment, and surface water sampling were conducted as part of this RI and are described in detail in the following sections of this report. An overall objective of this RI was to collect data of a quality consistent with DEQ guidance for evaluating risk and appropriate remedial alternatives for this site. Surface sediment sampling and analyses (0 to 10 cm) were conducted to delineate the horizontal extent of chemical concentrations in the biologically active zone. Subsurface sediment sampling and analysis were conducted to assess the vertical extent of sediments that exceed sediment quality criteria. Sediment bioassays were conducted on a subset of the total collected samples to assess site-specific bioavailability and toxicity of surface sediments with varying degrees of contamination in the project areas. Surface water sampling and analysis were conducted to assess whether COPCs were present in surface waters of Slip 3 at concentrations exceeding DEQ AWQC risk-based SLs.

The chemical analyses conducted for this RI were limited to the COPCs identified in the RI/FS Work Plan for T-4 Slip 3 Sediments (Hart Crowser, 1998a). Limited analysis for pesticides was also conducted on a subset of surface sediment samples as detailed below.

3.1 Surface Sediment Sampling

Surface sediment samples (0 to 10 centimeters) were collected at 44 locations, including nine surface samples collocated with subsurface sediment sampling locations (Figure 5). Table 1 presents the sediment sample identification,

chemical analysis conducted, and location of sediment samples. The surface sediment samples were analyzed for PAHs, VOCs, pencil pitch, diesel, and standard physical parameters, including grain size and total organic carbon. Additionally, 23 of the surface samples were submitted for metals analyses (Table 1 and Figure 6), and five of the surface samples (HC-S-16, HC-S-28, HC-S-36, HC-S-39, and HC-S-43) were submitted for pesticide analysis. Fifteen of these samples, plus two reference site samples, were also submitted for bioassay analyses, as described in Section 3.5. Surface sediment sampling was conducted in general accordance with the approved project Sampling and Analysis Plan (SAP). Refer to Appendix A and the RI/FS Work Plan (Hart Crowser, 1998a) for detailed descriptions of sampling methods, sample handling, decontamination, and custody protocols. Any modifications in the SAP are presented in Appendix A of this report.

A summary of surface sediment sample locations, sampling dates, and mudline elevations is presented in Table 2. The results of the surface sediment chemical analyses are presented in Appendix C and are summarized in Table 3. Section 4.0 discusses the results of the chemical analyses of surface sediments.

The overall data quality objectives for collection and chemical testing of surface sediment samples were met, as set forth in the Quality Assurance Project Plan (QAPP) of the Slip 3 RI/FS Work Plan, and the data for this project are acceptable for use as qualified. The Data Quality Review is presented in Appendix E, and the laboratory certificates of analysis from Columbia Analytical Services Laboratory are provided in Appendix G of Volume II.

3.2 *Subsurface Sediment Core Sampling*

Subsurface sediment samples were collected at nine locations as shown on Figure 5. Table 1 presents the sediment sample identification, chemical analysis conducted, and location of sediment samples. The subsurface sediment samples were analyzed for PAHs, VOCs, priority pollutant metals, and total organic carbon. Subsurface sediment sampling was conducted in general accordance with the approved project SAP. Refer to Appendix A and the RI/FS Work Plan (Hart Crowser, 1998a) for detailed descriptions of sampling methods, sample handling, decontamination, and custody protocols. Any modifications in the SAP are presented in Appendix A.

To obtain subsurface samples, sediment cores were collected using a vibracore with a 4-inch-diameter aluminum core tube deployed from the research vessel *R/V Nancy Anne*. Core positioning coordinates and mudline elevations are summarized in Table 2. Figure 7 displays the locations of the cross sections. A key to sediment log descriptions is presented on Figure B-1. Percent recoveries,

core logs, and geologic descriptions are compiled in Appendix B and are summarized in generalized cross sections presented on Figures 8 and 9. As shown on the subsurface cross sections, in Slip 3, the sediment stratigraphy indicates there are two distinct horizons present. The upper horizon, consisting of clayey to sandy silt (Table 4) represents recently deposited fine-grained sediments. Based on the core logging, the upper horizon appears to vary depending on the location within the Slip. The depth of this horizon has been affected by historical removal, dredging activities and physical disturbances within the Slip (e.g., propwash). In general, the lower sediment horizon (4 feet below mudline) consists of medium to fine sand and represents the native sediments that have not been impacted by dredging activities.

In accordance with the SAP, core samples were divided into three sections; top and bottom: top sediments represented sediments from 0 to -2 feet (labeled VC-XX-S1); bottom samples consisted of sediments from -2 to -4 feet in depth (labeled VC-XX-S2). A deeper layer, representing the -4 to -6 feet sediment column, was also sampled. These deeper sediment sections were archived for potential future chemical analyses. The results of the subsurface sediment chemical analyses are presented in Appendix C and summarized in Table 5. Section 4.0 discusses the results of the chemical analyses of the subsurface sediments.

The overall data quality objectives for collection and chemical testing of subsurface sediment samples were met, as set forth in the QAPP. Therefore, the data for this project are acceptable for use as qualified. The Data Quality Review are presented in Appendix E, and the laboratory certificates of analysis from Columbia Analytical Laboratories are provided in Appendix G of Volume II.

3.3 *Surface Water Sampling*

Water samples were collected from three locations to assess the contributions of various sources (both aquatic and upland) to the water quality in the Slip (Figure 5). Water samples were collected using a 2-liter Van Dorn Bottle deployed from the research vessel *R/V Nancy Anne* on October 15, 1998. Samples were collected in accordance with the procedures outlined in the Response to DEQ's Comments on the RI Work Plan (Hart Crowser, 1998b).

Water samples were collected midway between the water surface and sediment surface [middle water column (M)] and 1 meter above the sediment surface [bottom water column (B)] at each of the three water sampling locations; HC-WS-01, HC-WS-02, and HC-WS-03. Water samples were analyzed for: total suspended solids (TSS); benzene, toluene, ethylbenzene, and total xylenes

(BTEX); PAHs; and total and dissolved priority pollutant metals (Table 6). Surface water chemical analyses are presented in Table 7.

The overall data quality objectives for collection and chemical testing of surface water samples were met, as set forth in the QAPP, and the data for this project are acceptable for use as qualified. The Data Quality Review is presented in Appendix E, and the laboratory certificates of analysis from Columbia Analytical Laboratories are provided in Appendix G in Volume II.

3.4 Summary of Sediment Chemistry Methods

As set forth in the approved RI Work Plan, sediment samples were analyzed for the following:

- Pencil Pitch (NWTPH-Dx, EPA Method 3550B);
- Diesel (NWTPH-Dx, EPA Method 3550B);
- Total Metals (6000/7000 Series);
- Total Organic Carbon (EPA Method 9060);
- Semivolatile Organics (EPA Method 8270/GC-SIM);
- Volatile Organics (EPA Method 8260);
- Pesticides (EPA Method 8081); and
- Grain Size (PSEP).

During a review of the pencil pitch, diesel, and PAH results, it was deemed necessary to perform PAH differentiation analysis that expanded on the NWTPH-Dx and EPA 8270 methods. The differentiation study was conducted because NWTPH-Dx is a hydrocarbon screening method that measures total PAH concentrations in sediments for carbon ranges C10 to C40. This method provides a general understanding of the types of hydrocarbons present in the sediment, but also tends to overestimate the concentration of each compound (e.g., gasoline, lube oil, pencil pitch, and diesel) because the individual carbon ranges tend to overlap. Conversely, GC/MS SIM provides detailed analysis and concentrations of the individual HPAH and LPAH analytes present in each hydrocarbon product. Therefore, a differentiation study was necessary to further distinguish sediment pencil pitch and diesel concentrations and determine relative percentages of each compound.

Differentiation of pencil pitch versus diesel was performed using a series of analyses that included initial screening by GC/FID and subsequent confirmation

analyses on a selected subset of samples. Differentiation analyses included aliphatic and aromatic separation using silica gel, GC/FID analysis for alkane hydrocarbons, GC/FID analysis for pencil pitch, and GC/MS SIM analysis for PAHs. The data were evaluated against site specific pencil pitch and diesel standards to fingerprint the hydrocarbon content of each constituent in the sediment. Relative percentages of each constituent were calculated from the results of the differentiation study (Table 8). The study was successful in differentiating between diesel and pencil pitch contamination at the site. These results are discussed in Sections 4.4. For further discussion of the study and complete differentiation study report, see Appendix I presented in Volume III.

The PAH differentiation study indicated that the HPAH and LPAH concentrations detected in sediments are a combination of pencil pitch and diesel constituents. Total PAHs constitute approximately 10% of pencil pitch by weight. By comparison, total PAHs constitute only about 0.05% of T-4 diesel. Of the PAHs, LPAHs constitute less than 1% of pencil pitch, and HPAHs constitute almost 9% of pencil pitch. Conversely, for T-4 diesel, LPAHs are the dominant class of total PAHs, yet represent only 0.04% of the product by weight. The study indicated that small amounts of pencil pitch will contribute a PAH signature that will become the dominant fingerprinting characteristic of the PAH chromatogram. The study determined diesel contributions by the aromatic and aliphatic concentrations of the hydrocarbon extract (Appendix I).

As a result of the high percentage of pencil pitch in the sediments, a very small amount of pencil pitch in a sediment sample will create a fingerprint dominated by PAHs. The methylene chloride extraction of pencil pitch from sediment is an effective analytical tool for measuring total PAHs in the sample, but it vastly overstates the potential bioavailability of these PAHs because they are bound up in the insoluble, solid pencil pitch in the environment.

3.5 *Bioassay Testing Program*

To assess site-specific bioavailability and toxicity of sediments in the project areas, confirmatory sediment toxicity testing was conducted on 16 surface sediment samples collected at the site (Figure 10). Confirmatory bioassay testing was conducted to fulfill two objectives:

- Define the areas of the site that exhibit significant adverse ecological effects and require an evaluation of remedial options; and
- Determine the applicability of using the LCRMA SLs and MLs by testing a suite of sediment samples containing low to moderate concentrations of COPCs.

Bioassay testing of surface sediments was conducted in two phases to meet these two objectives.

Phase 1. Eight samples [HC-S-26, HC-S-28, HC-S-35, HC-S-36, HC-S-39, HC-S-42, Reference B (Ref-B), and Reference C (Ref-C)] were selected for Phase 1 bioassay testing based on historical analytical results (Hart Crowser, 1998b). These sample locations represented areas that have been minimally or moderately impacted by site-related activities or areas for which historical sediment quality data do not exist. The rationale for selection of these samples is that these data can be used to correlate bioassay responses associated with low to moderate concentrations of petroleum and inorganic constituents. These samples were also selected to be spatially distributed to maximize their use in identifying areas to be included or excluded from any evaluation of remedial alternatives. A secondary objective for selecting samples with low to moderate concentrations of chemical constituents was to assess the applicability of using the LCRMA SLs and MLs.

Phase 2. Twelve samples were selected for Phase 2 bioassay testing based on the sediment chemistry results from the project area. Phase 2 bioassay testing was conducted to further define the areas that exhibit significant adverse ecological effects and require evaluation of remedial options. These samples (HC-S-01, HC-S-04, HC-S-05, HC-S-07, HC-S-11, HC-S-16, HC-S-19, HC-S-22, HC-S-24, HC-S-30) were selected to represent areas of the site that exhibited elevated COPCs and were also spatially distributed within the project area. The results were compared against samples Ref-B and Ref-C. Distributing the sediment bioassay testing locations sought to maximize their use in defining areas, which may require the evaluation of remedial alternatives.

The following three sediment toxicity tests were used in this study:

- Acute 10-Day Amphipod Survival Test *(Hyalella azteca)*;
- Acute 10-Day Midge Survival Test *(Chironomus tentans)*; and
- Chronic 10-Day Midge Growth Test *(Chironomus tentans)*.

These freshwater sediment toxicity tests were conducted in accordance with available standard protocols (EPA, 1994; ASTM, 1995). Sediment toxicity test results are interpreted against the decision criteria provided in the LCRMA (Corps *et al.,* 1998). Decision criteria are discussed in detail in the RI/FS Work Plan (Hart Crowser, 1998a).

The three sediment toxicity tests used in this study incorporated standard quality assurance/quality check (QA/QC) procedures to ensure the test results are valid. Standard QA/QC procedures include the use of a negative control, a positive control, reference sediment samples, and measurements of water quality during testing. A data quality review was conducted to ensure the results of the sediment bioassays were of sufficient quality for use in dredged material disposal evaluations; the review is included in Appendix F of this report. The sediment bioassay report (including raw data) is presented in Appendix H of Volume II.

4.0 SEDIMENT CHEMICAL DETERMINATIONS

This section discusses chemical testing results for surface and subsurface sediment samples and for surface water samples collected as part of the RI. Fifty-three sediment samples and six surface water samples were collected during the RI effort at locations depicted on Figure 5. Samples were obtained using standard field procedures outlined in Appendix A. Validated chemical analytical results for these samples are presented in Appendix C. A brief review of laboratory data quality, a comparison of sample results to the LCRMA screening levels, and descriptions of the spatial distributions of key site contaminants are discussed below.

4.1 Sediment Sampling Objectives

As stated in Section 1.1, the primary objective of the RI sediment sampling and chemical analysis was to characterize the vertical and horizontal extent of sediment contamination.

Together with the results of confirmatory biological testing discussed in Section 5.0 and the limited human health and ecological risk assessments presented in Section 6.0, these chemical data help define the extent of COPCs in site sediments. In addition, these data will enable an assessment of potential remedial alternatives.

4.2 Summary of Sediment Data Quality

The overall data quality objectives for collection and chemical testing of sediment samples were met, as set forth in the QAPP, and the data for this project are acceptable for use as qualified. Summaries of validated chemical analytical results, organized by sample type for surface and subsurface sediment samples, are presented in Tables 3 and 5, respectively.

4.3 Identification of Key Constituents of Potential Concern

This section presents comparisons of chemical concentrations detected in T-4 site sediments with the LCRMA chemical criteria (SLs and MLs). These screening levels were developed to characterize dredged material for the suitability for open-water disposal. The more conservative SL values provide a regulatory benchmark by identifying surface sediments that are not predicted to result in unacceptable adverse effects on biological resources. The higher ML values identify sediments which are likely to cause adverse effects on biological resources.

Site sediments were compared to the LCRMA chemical criteria to assess the relative magnitude of chemical concentrations and to screen the sediment concentrations against available risk based sediment quality criteria. It is important to note that the LCRMA screening criteria have no regulatory authority for the purposes of this RI. The assessment of sediment quality at the site was based on chemical analysis of 44 surface sediment samples and nine subsurface sediment samples collected from the study area. Sampling locations are shown on Figure 5.

4.3.1 Surface Sediment Exceedences of LCRMA Criteria

As set forth in LCRMA and in the approved project plans, the surface sediment sampling interval was selected to represent the biologically active zone defined for this RI as the 0 to 10 cm depth interval. Tables listing the complete chemical data collected within this surface sediment layer are provided in Appendix C. Individual exceedences of SL and ML values are highlighted in the tables with dashed or solid outlines, respectively.

To aid data interpretation, a summary of the surface sediment chemical data, including detection frequencies, concentration ranges, maximum concentration location, and exceedence statistics relative to both the SL and ML values (frequency of exceedence and maximum enrichment ratio) for each constituent is presented in Table 3. The enrichment ratio (E-ratio) was defined as the ratio of a sample concentration to either the SL or ML value. Table 9 presents the individual chemical constituents from each sample location with an enrichment ratio greater than 1.0. No duplicate samples were included in the summary table.

Of the more than 80 chemicals analyzed, 20 were detected in surface sediments at concentrations exceeding SL values. In order of descending frequency of exceedence relative to SL values, the following analytes were enriched in surface sediments within the study area:

- Indeno(1,2,3-cd)pyrene (93% exceeding SL);
- Fluoranthene (83% exceeding SL);
- Benzo(g,h,i)perylene (79% exceeding SL);
- Chrysene and Pyrene (76% exceeding SL);
- Benzo(a)pyrene (74% exceeding SL);
- Benzo(a)anthracene (71% exceeding SL);
- Phenanthrene (64% exceeding SL);
- Dibenz(a,h)anthracene (57% exceeding SL);
- Total Benzofluoranthenes (52% exceeding SL);
- Acenapthene and Anthracene (36% exceeding SL);
- Zinc (25% exceeding SL);
- Fluorene (24% exceeding SL);
- Lead (13% exceeding SL);
- Cadmium (6% exceeding SL);
- Dibenzofuran (5% exceeding SL); and
- Acenapthylene, 2,4-Dimethylphenol, and Naphthalene (2% exceeding SL)

Based on the ML exceedence statistics in Table 3, the following chemicals, in order of descending frequency, were selected as key COPCs in surface sediments at the site:

- Benzo(a)pyrene and Indeno(1,2,3-cd)pyrene (64% exceeding ML);
- Benzo(g,h,i)perylene (57% exceeding ML);
- Benzo(a)anthracene (50% exceeding ML);
- Pyrene and total benzofluoranthenes (36% exceeding ML);
- Dibenz(a,h)anthracene (17% exceeding ML);
- Chrysene and fluoranthene (14% exceeding ML);
- Phenanthrene (10% exceeding ML);

- Acenapthene (7% exceeding ML); and
- Acenapthylene and fluorene (2% exceeding ML).

4.3.2 Subsurface Sediment Exceedences of LCRMA Criteria

Summaries of subsurface sediment chemical results are presented in Table 5. Listings of complete subsurface sample results that exceeded the SL and ML values are presented in Appendix C. Table 10 presents the individual chemical concentrations from each subsurface sample location with an enrichment ratio greater than 1.0.

The following analytes, in order of descending frequency, were enriched in subsurface sediments at concentrations above the LCRMA chemical criteria for SL values:

- Indeno(1,2,3-cd)pyrene (67% exceeding SL);
- Benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, total benzofluoranthenes, and fluoranthene (56% exceeding SL);
- Pyrene and phenanthrene (44% exceeding SL); and
- Zinc and lead (29% exceeding SL).

Based on the ML exceedence statistics (Table 5) and the LCRMA chemical criteria, the following chemicals, in order of descending frequency, were selected as key COPCS in subsurface sediments of the study area:

- Indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, and benzo(a)pyrene (44% exceeding ML);
- Benzo(a)anthracene and total benzofluoranthenes (33% exceeding ML); and
- Pyrene (22% exceeding ML).

4.3.3 Identification of Key Constituents of Potential Concern

Based on the above discussion and historical information regarding sources of contamination in this site, the following compounds were selected as key COPCs for further evaluation in this RI:

- Pencil pitch;
- Diesel;

- LPAH (Sum of acenapthene, acenaphthylene, anthracene, flourene, napthalene, and phenanthrene);
- HPAH (Sum of benzo(a)anthracene, benzo(a)pyrene, benzo(b)flouranthene, benzo(g,h,l)perylene, benzo(k)flouranthene, chrysene, dibenz(a,h)anthrecene, flouranthene, indeno(1,2,3-cd)pyrene, and pyrene);
- Zinc;
- Lead; and
- Cadmium.

4.4 Spatial Distribution of Constituents of Potential Concern

The areal distributions of the surface sediment COPCs are presented on Figures 11 through 16. The surface sediment concentration contours presented in these figures were created using a surface mapping software (Surfer, Version 6.02) by Golden Software, Inc. This program uses a statistical technique called Kriging to generate concentration contours. Kriging provides a mean of interpolating values for points not physically sampled using knowledge about the underlying spatial relationships in the data set. Only the data collected from the surface sediment sampling program (0 to 10 cm in depth) were used to generate the concentration contours presented in these figures. The following presents a summary of these distributions by chemical groups.

Sediment subsurface concentrations were determined at nine sampling locations. Subsurface samples were divided into two sections, surface and bottom: surface sediments represented sediments from 0 to -2 feet (labeled VC-XX-S1); bottom samples consisted of sediments from -2 to -4 feet in depth (labeled VC-XX-S2). Subsurface analytical results are summarized in Table 5. Table 10 provides the locations and chemical analytes exceeding the LCRMA screening criterion. Table 11 presents analytical results as they are vertically distributed throughout collocated surface and subsurface core locations. Figures 17 through 25 represent the vertical distribution of selected analytes at collocated surface and subsurface locations.

4.4.1 Pencil Pitch

Surface Results. To assess the overall distribution of pencil pitch in the study area, sediment pencil pitch concentrations were determined for the 44 surface sampling locations (Table 12). These data indicate pencil pitch is dispersed throughout the study area, as pencil pitch was detected in all 44 surface sediment samples. No risk-based criteria are available for pencil pitch pertaining

to SLs and MLs. As shown on Figure 11, concentrations of pencil pitch were highest along Berth 411 at HC-S-01 and HC-S-19. Pencil pitch was also detected near Berth 412 (HC-S-24), in Wheeler Bay, and in the three samples collected along Pier 5. The highest pencil pitch concentration (8,650 mg/kg) was recorded at HC-S-19.

Subsurface Results. Pencil pitch is dispersed throughout subsurface sediments in the study area, as it was detected in 16 of 18 subsurface sediment samples. Sample locations HC-VC-13, HC-VC-18, HC-VC-22, HC-VC-32, and HC-VC-39 showed pencil pitch concentrations decreasing with core depth (Figures 19, 20, 21, 23, and 24). Bottom (-2 to -4 ft section) pencil pitch concentrations were higher at HC-VC-11-S2 and HC-VC-42-S2 than at their corresponding top samples (Figures 18 and 25). The elevated subsurface pencil pitch concentrations at HC-VC-11-S2 may be explained by the residual pencil pitch concentrations remaining after the 1995 remedial dredging. The explanation of elevated subsurface pencil pitch concentrations at HC-VC-42-S2 is uncertain due to lack of bathymetric information in Wheeler Bay; however, it could be due to historic discharge from the storm drain located near the location.

4.4.2 Diesel

Surface Results. Diesel was detected in 10 of the 44 surface sediment samples. No criteria are available for diesel pertaining to SLs and MLs. As shown on Figure 12, concentrations of diesel were highest at samples HC-S-01, HC-S-25, and HC-S-34. Diesel was detected at lower concentrations in the head of the Slip near HC-S-04, HC-S-05, HC-S-06, and HC-S-07 and in the middle of the Slip HC-S-16, HC-S-33, and HC-S-36. The elevated diesel concentrations correlate with known diesel pipelines and seeps (Figure 3). Based on historical bathymetry data, HC-S-01 also appears to be a depositional area of the Slip. Diesel was not detected in surface sediments in Wheeler Bay, the areas along Berth 410 and 411, or Pier 5.

Subsurface Results. Diesel was not analyzed at the majority of subsurface locations. Where diesel was analyzed, it was below analytical detection limits (Table 12).

4.4.3 LPAHs

Surface Results. Total LPAHs exceeded the SL of 5,200 µg/kg in 19 of 42 surface sediment samples; six of these samples also exceeded the ML of 29,000 µg/kg. As shown on Figure 13, concentrations of total LPAHs were highest near the head of the Slip. Total LPAHs exceeded the ML at HC-S-38 along Pier 5, and

SLs were exceeded at HC-S-41 and HC-S-42 in Wheeler Bay. SL exceedence was present throughout the inner portions of Slip 3.

Subsurface Results. Bottom (-2 to -4 ft section) LPAH concentrations were higher at HC-VC-7-S2, HC-VC-11-S2, and HC-VC-42-S2 than at their corresponding top samples (Figures 17, 18, and 25). Top (0 to -2 ft sections) LPAH concentrations were higher at HC-VC-13-S1, HC-VC-18-S1, HC-VC-22-S1, HC-VC-32-S1, and HC-VC-39-S1 than at their corresponding bottom samples (Figures 23 and 24). As explained in Section 3.4 and Section 4.4.2, the LPAH concentrations are likely a result of pencil pitch.

4.4.4 HPAHs

Surface Results. Total HPAHs were elevated throughout the study area and exceeded the SL of 12,000 µg/kg in 33 of 42 surface sediment samples; 21 of these samples also exceeded ML of 69,000 µg/kg. As shown on Figure 14, concentrations of total HPAHs exceeded the SL throughout most of Slip 3, Wheeler Bay, and Pier 5. The highest HPAH concentrations were located along Berth 411. Total HPAHs exceeded the ML near the head of the Slip, at Pier 5, and in Wheeler Bay. Surface samples HC-S-13, HC-S-22, and HC-S-32 exceeded the SL for HPAHs as well as recording much higher concentrations than their corresponding subsurface samples (Table 11).

Subsurface Results. Bottom (-2 to -4 ft section) HPAH concentrations were higher at HC-VC-11-S2 and HC-VC-42-S2 than at their corresponding top samples (Figures 18 and 25). Top (0 to -2 ft sections) HPAH concentrations were higher at HC-VC-7-S1, HC-VC-13-S1, HC-VC-22-S1, HC-VC-32-S1, and HC-VC-39-S1 than at their corresponding bottom samples (Figures 17, 19, 21, 23, and 24). As explained in Section 3.4, the HPAH concentrations are likely a result of pencil pitch.

4.4.5 Metals

Zinc. Zinc exceeded the SL of 410 mg/kg in 8 of 32 surface samples (0 to 10 cm). As shown on Figure 15, concentrations of zinc were highest along Berth 412 at HC-S-25 and HC-S-13. Concentrations of zinc above the SL were also located along Berth 411 at HC-S-19.

Bottom (-2 to -4 ft section) zinc concentrations were higher at HC-VC-7-S2, HC-VC-11-S2, HC-VC-39-S2, and HC-VC-42-S2 than at their corresponding top samples (Figures 17, 18, 24, and 25). Top (0 to -2 ft sections) zinc concentrations were higher at HC-VC-13-S1, HC-VC-22-S1, and HC-VC-27-S1 than at their corresponding bottom samples (Figures 19, 21, and 22).

Lead. Lead exceeded the SL of 450 mg/kg in 4 of 32 surface samples. As shown on Figure 16, concentrations of lead were highest along Berth 411. Concentrations of lead above the SL were also located along Berth 412 at HC-S-25. The ML for lead was not exceeded in any surface or subsurface sediment samples.

Bottom (-2 to -4 ft section) lead concentrations were higher at HC-VC-7-S2, HC-VC-11-S2, HC-VC-27-S2, and HC-VC-42-S2 than at their corresponding top samples (Figures 17, 18, 22, and 25). The lead concentration at sample location HC-VC-39-S2 was higher than its corresponding top (0 to -2 ft section) sample, but not at its corresponding surface (0 to 10 cm) sample (Figure 24). Top (0 to -2 ft sections) lead concentrations were higher at HC-VC-13-S1 and HC-VC-22-S1 than at their corresponding bottom samples (Figures 19 and 21).

Cadmium. Cadmium exceeded the SL of 5.1 mg/kg in 2 of 32 surface samples. The ML for cadmium was not exceeded in any surface sediment samples. Concentrations exceeded SL values at HC-S-19 and HC-S-25. HC-S-19 is located by Berth 411 (see Figure 5), which has been historically used as an inloading area of ores, clay, talc, and coal tar pitch. HC-S-25 is located by Berth 412, historically used for bulk loading and unloading of briquettes, coke, and sulfur.

Bottom (-2 to -4 ft section) cadmium concentrations were higher at HC-VC-7-S2, HC-VC-11-S2, and HC-VC-42-S2 than at their corresponding surface or top samples (Figures 17, 18, and 25). The SL or ML for cadmium was not exceeded in any subsurface sediment sample.

4.4.6 DDT

The Portland Harbor Study indicated that elevated concentrations of DDT were found in sediments throughout the Portland Harbor area (Roy F. Weston Inc., 1998). In addition, the Port found elevated concentrations of DDT in the surface sediments of the Willamette River Navigation Channel and at other Port facilities that have historically never handled DDT (Port of Portland, 1999). In response to the results of these studies, five surface sediment samples (HC-S-16, HC-S-28, HC-S-36, HC-S-39, and HC-S-43) were analyzed for total DDT (summation of 4,4-DDD, 4,4-DDE, and 4,4-DDT). Sample locations were chosen from the middle of Slip 3 out to the mouth and near Pier 5 and Wheeler

Bay (Figure 5). Surface sediment DDT concentrations exceeded the LCRMA SL, but were below the ML at each of the five locations tested (Tables 3 and 9). Because the Port never handled DDT at the T-4 study area, DDT found in the surface sediments must be attributable to other upriver sources. Subsurface samples were not tested for DDT.

4.4.7 Summary of Chemical Results

Pencil Pitch. Chemical results show that pencil pitch is present throughout the study area. The highest pencil pitch concentrations were located near Berth 411 where pencil pitch was handled and where spills occurred. This area, along Berth 411, is also suspected of having a high sediment depositional rate, especially in the northeast corner of the Slip represented by HC-S-01. The elevated concentrations of pencil pitch detected in Wheeler Bay appear to be correlated with storm drain discharge as evidenced by pencil pitch concentrations at HC-S-41 and HC-S-42, which were located near the terminus of the storm drain (Figures 3 and 11).

Diesel. The detected concentrations of diesel in sediments correlate with known diesel handling areas at Berth 412 and with diesel pipeline leaks and seeps in Slip 3 (Figures 3 and 12). Diesel concentrations were elevated near the previously mentioned depositional area in the northeast corner of Slip 3 represented by sample HC-S-01.

HPAHs and LPAHs. Concentrations of total HPAHs and LPAHs were detected throughout the study area. For general comparison, the LCRMA SLs for HPAHs and LPAHs were exceeded at 32 and 19 of the sample locations, respectively.

Metals. Metals exceeding the LCRMA SLs were zinc, lead, and cadmium. The exceedence of SLs were collocated for these three metals detected at sample locations HC-S-19 and HC-S-25. Elevated subsurface concentrations of zinc and lead are generally collocated with elevated concentrations of pencil pitch.

DDT. Sediment total DDT concentrations exceeded the LCRMA SL at each of the five locations at which it was tested. Because the Port has never handled DDT at the T-4 study area, detected concentrations of DDT in the surface sediments must be attributable to other upriver sources.

4.5 Chemical Analysis of Water

Water samples collected within Slip 3 (Figure 5) were compared to DEQ AWQC. Metals, HPAHs, and phthalates were detected at the three sampling

locations; however, no exceedences of AWQC were identified for any water sample analyzed (Table 7).

Metals detected below the AWQC were identified as having higher concentrations at HC-WS-01 and tended to decrease towards the mouth of Slip 3. HPAHs were detected in HC-WS-01 samples only. Of the HPAHs detected at HC-WS-01, samples collected in the middle of the water column were greater than the bottom samples. Low-level phthalate detections were comparable at the three sampling locations.

5.0 BIOASSAY RESULTS

This section summarizes the investigation of biological effects using confirmatory bioassay testing of sediments collected at the site and tested in accordance with the SAP and QAPP (Hart Crowser, 1998a). The following three bioassays were conducted on 16 test sediments and on two reference sediments collected during this RI (Figure 10):

- Acute 10-Day Amphipod Survival Test *(Hyalella azteca)*;
- Acute 10-Day Midge Survival Test *(Chironomus tentans)*; and
- Chronic 10-Day Midge Growth Test *(Chironomus tentans)*.

The sediment bioassay tests were conducted in two phases, as discussed in Section 3.5. The test sediment samples were collected by Hart Crowser on October 13 through 15, 1998, and were submitted for toxicity testing to Northwestern Aquatic Sciences (NAS) Laboratory in Newport, Oregon, on October 17, 1998. Reference sediments B (Ref-B) and C (Ref-C) were collected by Hart Crowser on October 15, 1998, and were submitted for toxicity testing to NAS Laboratory on October 17, 1998. Phase 1 of sediment bioassay testing was initiated on October 20, 1998, and Phase 2 was initiated on December 8, 1998.

The reference sediment selected for comparison with each test sediment was based on grain size characteristics of the sediment. The reference sediments are uncontaminated material collected from the vicinity of the site and are used as a point of comparison to identify potential contaminant effects of in the test sediments. The reference sediments were collected from two areas located on the Columbia River (Figure 26). These sediments were tested in both Phase 1 and Phase 2 rounds of bioassay testing. Reference sediments were submitted for chemical analyses, the results of which are provided in Appendix C of this

report. No compounds were detected in reference sediments at concentrations exceeding their corresponding LCRMA SLs.

The Phase 1 and Phase 2 negative control sediments were collected on October 19, 1998, and December 3, 1998, respectively, from an area adjacent to the Highway 101 bridge at Beaver Creek, approximately 8 miles south of Newport, Oregon. Negative control sediments are used to check laboratory performance. Negative control sediments are clean sediments in which the test organisms normally live. Separate negative control sediments were collected prior to the initiation of each phase of bioassay testing.

5.1 *Interpretative Criteria*

The sediment bioassay results were interpreted in accordance with the LCRMA guidance as presented in the DEQ-approved RI/FS Work Plan (Hart Crowser, 1998a). The response of bioassay organisms exposed to a test sediment is compared to the response of these organisms in both control and reference sediments. This comparison determines if the test sediment sample has passed or failed the sediment bioassays.

Biological test interpretation relies on two levels of observed response in the test organism. These are known as "one-hit" and "two-hit" criteria failures. The bioassay-specific guidelines for each of these response categories are listed below. In general, a one-hit failure is a marked response in any one biological test. A marked response in comparison to the reference sediment in any one of the three sediment bioassays will result in the test sediment failing bioassay analyses. A two-hit failure exhibits a lower intensity response which must be present in two or more biological tests for the test sediment to fail bioassay analyses.

One-Hit Criteria

When any one of the three biological tests shows a test sediment response relative to the reference sediment that exceeds the bioassay-specific response guidelines (presented below), and if that response is "statistically different" from the reference, the test sediment is judged to have failed the bioassay. The method for determining statistical significance is presented below.

In accordance with the LCRMA, the bioassay-specific response guidelines for evaluating the "one hit criteria" are as follows:

Amphipod Bioassay. Mean test mortality is greater than 15 percent over the mean reference response and is statistically different from the reference (alpha = 0.05); and

Midge Bioassay. Mean mortality in the test sediment is 20 percent over reference and statistically different from reference (alpha = 0.05). For the growth test, a mean biomass is achieved that is less than 60 percent of the reference sediment response and statistically different from the reference (alpha = 0.05).

Two-Hit Criteria

When any two of the three biological tests show test sediment responses that are less than the bioassay specific guidelines noted above for a one-hit failure, but are significantly different statistically from the reference sediment, the test sediment is judged to have failed the bioassay.

5.2 Data Quality Review

A data quality review of the confirmatory sediment bioassays was conducted to ensure the results of the sediment bioassays were of sufficient quality for use in this RI. The bioassay data quality review is included as Appendix F of this report. The sediment bioassay report from NAS is included as Appendix H in Volume II of this report.

The following criteria were evaluated as part of this data quality review:

- Holding times;
- Bioassay performance in negative control and reference sediments;
- Bioassay performance in positive control tests; and
- Bioassay test conditions.

The grain size of the reference sediments collected for bioassay testing were representative of very fine grained (<63um) and coarse grained (>63um) material. Ref-B was characterized as 99.1% fines and Ref-C was characterized as 19.8% fines (Table 13). The test sediment grain size characteristics ranged from 23.1% to 92.9% fines. While it would have been preferable to include an additional reference sediment with grain size characteristics between those of Ref-B and Ref-C, the lack of established reference sediment collection areas in the Lower Willamette River has limited the availability of appropriate reference sediment. The reference sediments tested in both Phase 1 and Phase 2 of the

sediment bioassay testing program all met required performance criteria and were suitable for use in this RI.

The conclusion of the bioassay data quality review was that all bioassay data were of acceptable quality and fully usable for the purposes of the RI (Appendix F).

5.3 *Interpretation of Bioassay Results*

The results of the acute amphipod and acute and chronic midge bioassays are presented in Tables 14 through 16. These tables list the sediment samples tested in Phase 1 and Phase 2, the corresponding reference sediment samples (based on similar grain size), the test endpoint, comparison with the one-hit and two-hit interpretative criteria, and the overall results of whether the test sediment passed or failed the biological effects interpretive criteria. The comparative grain size data and the reference sediments that were compared against test sediments are provided in Table 13.

Selection of appropriate reference sediments for comparison with test sediments was based on the percent fines fraction. Percent fines are defined as the percentage of silts and clays in the sediment. The percent fines for Ref-B and Ref-C were 99.1 and 19.8 percent, respectively. The median value of the percent fines between reference sediments was used to determine the appropriate location for statistical comparison.

- Test sediments with % fines < 59.5% were compared to Ref-C; and
- Test sediments with % fines > 59.5% were compared to Ref-B.

The percent fines for test sediments ranged from 23.1 to 92.9 percent. Five test sediments contained percent fines less than 59.5 percent and were compared to Ref-C. Eleven test sediments contained percent fines greater than 59.5 percent and were compared to Ref-B.

The analytical chemistry results for the sediment samples included in both the Phase 1 and Phase 2 rounds of bioassay testing are presented in Table 17.

5.3.1 Amphipod Bioassay Results

The mean percent mortality in the test sediments for the 10-day amphipod bioassay (*H. azteca*) ranged from 3.8 to 16.3 percent in the Phase 1 bioassays (Table 14). In Phase 1, sediments passed the one-hit criteria, but two of six

samples (HC-S-26 and HC-S-28) were found to have statistically greater mortality than the corresponding reference sediment (two-hit criteria).

In the Phase 2 bioassays, the mean percent mortality in test sediments ranged from 12.5 to 37.5 percent (Table 14). Three of the ten samples (HC-S-01, HC-S-04, and HC-S-22) failed the one-hit criteria, and five of the ten samples (HC-S-01, HC-S-04, HC-S-05, HC-S-16, and HC-S-22) were determined to have statistically greater mortality than the corresponding reference sediment (two-hit criteria).

5.3.2 Midge Survival Bioassay Results

The mean percent mortality in the test sediments for the 10-day acute midge bioassay *(C. tentans)* ranged from 26.3 to 41.3 percent in the Phase 1 bioassays (Table 15). In Phase 1, sediments passed the one-hit criteria, but one of the six samples (HC-S-39) was determined to have statistically greater mortality than the corresponding reference sediment (two-hit criteria).

In the Phase 2 bioassays, the mean percent mortality in test sediments ranged from 8.6 to 47.5 percent (Table 15). Two of the ten samples (HC-S-01 and HC-S-22) failed the one-hit criteria, and four of the ten samples (HC-S-01, HC-S-04, HC-S-05, and HC-S-22) were determined to have statistically greater mortality than the corresponding reference sediment (two-hit criteria).

5.3.3 Midge Growth Bioassay Results

The mean test individual biomass for the 10-day chronic midge bioassay *(C. tentans)* ranged from 1.32 to 2.01 mg in the Phase 1 bioassays. In Phase 1, sediments passed both the one-hit criteria and two-hit criteria (Table 16). The mean test individual biomass ranged from 0.19 to 1.09 mg in the Phase 2 bioassays (Table 16).

In Phase 2, four of the ten samples (HC-S-01, HC-S-04, HC-S-05, and HC-S-07) failed the one-hit criteria, and eight of the ten samples (HC-S-01, HC-S-04, HC-S-05, HC-S-07, HC-S-11, HC-S-16, HC-S-24, and HC-S-30) were determined to have statistically less biomass than the corresponding reference sediment (two-hit criteria).

5.3.4 Summary of Bioassay Results

The biological effects interpretive criteria used in this RI are based on an analysis of bioassay results. This analysis segregates responses that are markedly different from reference responses (one-hit criteria) and responses that are less

than the one-hit criteria but nonetheless statistically different from reference sediment response (two-hit criteria). As described previously, any one-hit failure in any of the bioassays will result in the interpretation that the test sediment has failed the biological effects criteria. In the absence of a one-hit failure, two of the three bioassays tests must fail the two-hit criteria before a test sediment will be determined to have failed the biological effects criteria. The results of both phases of bioassay testing are presented on Figure 27 of this report.

In the Phase 1 bioassay testing, all of the test sediments were determined to have passed the biological effects criteria. An analysis of the concentrations of constituents detected in these samples revealed that low to moderate concentrations, in many cases above the LCRMA SLs, did not result in unacceptable ecological impacts (i.e., did not fail biological interpretive criteria) to benthic organisms at this site.

In the Phase 2 bioassay testing, six of the ten samples (HC-S-01, HC-S-04, HC-S-05, HC-S-07, HC-S-16, and HC-S-22) were determined to have failed the biological effects criteria. Of the six test sediments determined to have failed biological criteria, five samples (HC-S-01, HC-S-04, HC-S-05, HC-S-07, and HC-S-22) exhibited a marked response in one or more bioassay tests (one-hit failure), and one sample (HC-S-16) was determined to have failed biological criteria based on two tests exhibiting statistically different responses from the corresponding reference sediment (two-hit failure).

The spatial distribution of the sediment samples passing or failing biological interpretative criteria are presented on Figure 27. Additionally, the sediment bioassay results are presented along with the concentration contours of the key COPCs on Figures 11 through 16. Figure 11 presents the concentration contours for pencil pitch, Figure 12 presents the concentration contours for diesel, Figure 13 presents the concentration contours for LPAHs, Figure 14 presents the concentration contours for HPAHs, Figure 15 presents the concentration contours for zinc, and Figure 16 presents the contours for lead concentrations. For those constituents with corresponding LCRMA SLs and MLs, contours representing these concentrations are also presented in these figures.

In general, the samples that failed biological criteria are clustered in the eastern half of Slip 3, which is associated with higher concentrations of COPCs. However, some samples containing elevated concentrations of COPCs (i.e., HC-S-19 and HC-S-24) passed biological criteria. The sediment samples passing biological criteria are generally clustered in western areas of the Slip that exhibit low to moderate concentrations of COPCs. These results suggest that sediment

toxicity at this Slip is associated with elevated concentrations of COPCs rather than non-contaminant-related factors (e.g., grain size, total organic carbon).

5.3.5 Evaluation of Sediment Diesel and Pencil Pitch Concentrations

An evaluation of the relationship of concentrations of diesel and pencil pitch (the two main sources of petroleum related constituents to the Slip) to sediment bioassay results was conducted. The analytical results for sediment diesel concentrations in the bioassay samples (Table 17) reveals that five out of six samples that contained diesel concentrations greater than 100 mg/kg failed bioassay analysis. In contrast, all of the samples that passed bioassay testing had diesel concentrations less than 100 mg/kg or were not detected at the sample quantitation limit.

The relationship between sediment pencil pitch concentrations and bioassay results were much more inconsistent (Figure 11). Some of the samples that failed bioassay analyses contained elevated levels of pencil pitch (HC-S-01 at 7,730 mg/kg and HC-S-04 at 1,350 mg/kg), but others contained much lower pencil pitch concentrations (HC-S-22 at 449 mg/kg). Conversely, some of the samples that passed sediment bioassays contained very high concentrations of pencil pitch (HC-S-19 at 8,650 mg/kg and HC-S-24 at 4,320 mg/kg).

This discrepancy in relating detected concentrations of diesel and pencil pitch to bioassay results can be explained by the nature of these two petroleum mixtures. Diesel is a liquid mixture of as many as 500 individual compounds within the general carbon range of C10 to C20 and is primarily composed of aliphatics. The petroleum hydrocarbons that make up diesel are, in general, more mobile, water soluble, and bioavailable than the longer chained petroleum hydrocarbons that make up pencil pitch (API, 1996). Pencil pitch is a complex mixture of petroleum constituents within the carbon range of C12 and C36 that exists either as small or large solid particles scattered in the sediment. It has been reported in the literature that petroleum constituents present in sediment as pitch or coal particles can result in elevated detected concentrations of petroleum constituents (such as PAHs), but that bioavailability of this material is very limited (Paine et al., 1996). Bioavailability of pencil pitch is limited due to low water solubility (Appendix I). Therefore, while high pencil pitch and PAH concentrations may be present in sediment, these concentrations may not be associated with adverse effects to the environment.

This fact was particularly evident in the results from sample HC-S-19. This sample contained very elevated concentrations of pencil pitch (8,650 mg/kg pencil pitch), HPAHs (471 mg/kg), and LPAHs (41.9 mg/kg), but had low concentrations of diesel (not detected at a sample quantitation limit of 50

mg/kg). This sample passed the biological interpretation criteria for all three bioassays conducted on this sample. The petroleum constituents in diesel are much more mobile, water soluble, and bioavailable than those in pencil pitch and, as indicated in this study, are more correlated to the expression of sediment toxicity in the sediments of Slip 3 than are detected concentrations of pencil pitch. As previously discussed, the petroleum hydrocarbon mixture that comprises diesel is characterized by compounds with lower molecular weights and carbon molecules than the hydrocarbon mixture that characterizes pencil pitch.

6.0 LIMITED HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS

A limited evaluation of human health and ecological risks was conducted for this RI because there are only a limited number of complete exposure pathways to Slip 3 sediment-associated constituents of concerns for the identified ecological and human receptors. The primary complete exposure pathways are quantitatively evaluated in Sections 6.5 and 6.6. The exposure pathway related to the bioaccumulation of constituents of concerns from sediments is discussed in Section 6.4. The limited human health and ecological risk assessments are sufficient to address the complete exposure pathways and delineate areas of the Slip requiring an evaluation of remedial alternatives based on the quantified risks to human health and the environment.

This section presents a discussion of current and future land use and a summary of the environmental setting at T-4, Slip 3. Additionally, a brief description of the ecological characteristics of the lower Willamette River is presented with a discussion of potential ecological receptors, including sensitive and/or protected species. An exposure pathway evaluation is provided, based on the exposure pathways originating from contaminated sediment in Slip 3. The section concludes with a quantitative evaluation of the identified complete exposure pathways. For this RI, the evaluation was limited to assessing risks associated with direct contact and incidental ingestion of sediment and surface water by aquatic organisms in the Slip. A delineation of areas within Slip 3 requiring an evaluation of remedial alternatives based on the results of the sediment bioassays and limited Risk Assessment is presented in Section 6.7.

T-4, Slip 3 is located within the Portland Harbor area of concern, which EPA has recommended for listing on the National Priorities List. The current DEQ work plan recommends that risk assessment issues be evaluated on a harbor-wide basis rather than at the individual site level. These include addressing risks due to exposure to bioaccumulative compounds. Because of the regulatory uncertainty of the Portland Harbor, the nature and scope of this assessment are

unknown. However, as the exposure pathway related to the food chain transfer of bioaccumulative compounds has not been identified as a primary pathway of concern at this site (see discussion in Section 6.4), the evaluation of risks associated with exposure to bioaccumulative compounds should not significantly impact the results of this assessment.

6.1 *Current and Future Land Use*

Hart Crowser performed a land use survey of T-4 by contacting the City of Portland Planning Bureau and nearby landowners and by reviewing the Port's Master Plan for this Marine Terminal to understand past, current, and potential future land uses within the locality of the facility. The locality of the facility is any point where a human or an ecological receptor contacts or is reasonably likely to come into contact with facility-related chemical contamination. The locality of the facility takes into account the likelihood of contamination migrating over time. Based on our current understanding of the site, the locality of the facility is limited to the study area presented in Figure 2.

This survey was conducted as part of the T-4 Upland RI (Hart Crowser, 1999), and relevant portions of that survey are reproduced in this section.

Current Use. The site and surrounding properties are zoned heavy industrial and are being used mostly for these purposes. The west side of the terminal has several berths that are parallel and perpendicular to the Willamette River. The area east of the terminal is used for industrial and commercial activities. The areas north and south of the terminal are occupied by marine, industrial, and commercial operations. The southern half of T-4 is leased to Toyota Logistics Services for vehicle offloading from ships and temporary storage at T-4.

As an active industrial facility, access to the T-4 property is regulated. The only access to the uplands area is via an occasionally manned gate. Public access from the river is limited to personal watercraft from the river. As Slip 3 is almost continuously used by vessels loading soda ash at Berth 410, recreational use of the Slip (e.g., swimming, boating, and fishing) is not permitted or expected. Access by trespassers or recreational uses of the piers, riverbanks, and near-shore areas is also prohibited and not expected. The industrial activities occurring at Slip 3, currently only involving the loading of soda ash, do not result in worker exposure to either the sediments or surface waters of the Slip. Additionally, there are some limited remedial activities associated with the T-4 upland investigation. These do not result in worker exposure to either the sediments or surface water of the Slip. The RI study area consists of the sediments located upriver at Pier 5, Slip 3, and Wheeler Bay, which is

immediately downriver and adjacent to Slip 3. Additional information on the uses of these areas is presented in Section 2.2.

Future Use. There are no planned changes to the present or future operational uses at the facilities in the study area. Berth 410 will continue to be used as a bulk handling facility. Because the pier has been removed at Berth 412, it is not currently being used as a berthing facility; however, the future use is planned for a bulk handling facility. Berth 411 is currently inactive but could be used for bulk handling in the future. There are no current plans for any future changes to the uses at Wheeler Bay and Pier 5. In addition, there are not any plans to handle petroleum-related bulk at any of these facilities in the future.

The water side use for Pier 5 is and will be nonexistent since there are no longer dock facilities. The upland area, including warehouses, is and will continue to be used. Two potential uses are: urea (unloaded at Berth 414 and storage/transfer to trucks in Warehouse 5), and steel slab (unloaded at Berth 414/415 and use of Warehouse 7).

Summary of Land Use. Land use in the locality of the facility has been heavy industrial. Reasonably likely future land use in this area is expected to be industrial due to current zoning, the City's comprehensive plan, the marine terminal master plan and recent updates, and existing/planned business developments.

6.2 *Environmental Setting and Ecological Receptor Characterization*

T-4 is located on the lower Willamette River in Portland, Oregon. The Willamette River is the tenth largest river in the conterminous United States (in total discharge). The lower Willamette consists of a freshwater tidal section with typical mid-channel depths of approximately 12 m from River Mile (RM) 0 to Willamette Falls. The Willamette River drains a 29,800-km^2 basin in which 70 percent of the human population and the three largest cities of Oregon are located (USGS, 1997).

The occurrence, abundance, and condition of aquatic organisms in an area is dependent on many factors, including habitat characteristics, water quality, and availability of food resources. As the Willamette River flows to Portland, the river becomes slower, warmer, more channeled, and incidences of water quality impacts increase due to the proximity of the urban center of Portland. The following sections summarize available information on the fish and macroinvertebrate communities present in the lower Willamette River.

Fish. The Willamette basin supports a diverse and extensive fish community. The Oregon Department of Fish and Wildlife (ODFW, 1988) listed 54 species of fish as being present within the Willamette basin, and an additional 7 species have been reported from other sources (USGS, 1997). Fish species richness tends to increase from the smaller, high elevation, steep gradient, cold water, headwater areas to the larger, low elevation, low gradient, warm water, main stem channel. The fish of the mid-to-high elevation tributaries in the basin tend to be dominated by a few cold water salmonid species, such as coho salmon and cutthroat trout as well as a few species of suckers, minnows, and sculpins, and the mountain whitefish *(Prosopium williamsoni)*.

Species composition in the low elevation reaches of the major rivers of the Willamette Valley and foothills include numerous warm water fish such as bass *(Micropterus spp.)*, catfish *(Ictalurus spp.)*, and several species in the sunfish group. The fish fauna of the lower Willamette River is dominated by non-native, warm water, pollution-tolerant species (USGS, 1997). The United States Geological Survey (USGS, 1997) reports that fish assemblages in the Portland Harbor, from the confluence of the Willamette River with the Columbia River to RM 15, were dominated by the northern squawfish, followed by black crappie, white crappie, largemouth bass, smallmouth bass, and walleye.

The lower Willamette River is primarily used by anadromous salmonids, particularly chinook salmon and steelhead trout, as a passageway to tributaries where spawning grounds are located (USGS, 1997). Most salmonid spawning in the Willamette basin occurs in tributaries of the Willamette River, except for the reestablished runs of fall chinook salmon, which spawns from RM 50 (Newburg) through RM 187 (Springfield). ODFW (1992) conducted a study to determine when juvenile salmonids are in the Willamette River and how long they are in the Portland Harbor stretch of the river. The results indicate that the abundance of yearling chinook salmon peaks in mid-to-late March. Subyearling chinook salmon first appear in late April, peak in mid-May, and remain in decreasing numbers through June. Juvenile coho salmon and steelhead also begin to appear during late April; coho salmon are present in the harbor through May, and steelhead are present through June. It was reported that juvenile steelhead generally migrate through the Portland Harbor within 1 to 2 days, whereas yearling chinook generally migrate through the harbor within 2 to 3 days. A few yearling chinook salmon took as long as eight days to migrate through the harbor. Migration rates of these fish were not significantly correlated with river flow (ODFW, 1992).

Macroinvertebrates. There are numerous studies reported in the literature that describe the macroinvertebrate communities present in the Willamette basin. These studies have been conducted for a variety of objectives, and it is difficult

to synthesize the results to develop a comprehensive description of the distribution and abundance of macroinvertebrate populations because of the different sampling methodologies and varying taxonomic levels of identification used by these different studies (USGS, 1997).

In general, the upper reaches of the Willamette basin are characterized by streams and rivers with a high diversity of taxa and a high richness of pollution-intolerant species. Within the slow-current reaches of the lower Willamette River, the typical invertebrates are those that tolerate low dissolved oxygen concentrations, such as oligochaetes (segmented worms), cladocerans (water fleas), amphipods (scuds), odonates (dragonflies and damselflies), and chironomid midges (USGS, 1997).

Freshwater clams, mussels, crayfish, and snails have been identified as important components of the aquatic macroinvertebrate fauna of the basin. These species serve as prey items for fish, birds, and sometimes, recreational harvest for human consumption. No studies were found investigating the community characteristics of these species in the lower Willamette, though the habitat characteristics of this reach of river are not especially conducive to many of these species.

A recent benthic community survey conducted (Striplin Environmental Associates, 1999) at the Portland Shipyard (PSY) and adjacent lower Willamette River concluded that sediments in the Portland Harbor are dominated by two major taxonomic groups: oligochaetes and chironomids. The abundance and number of species found in Portland Harbor appear to be low in comparison to other similar river and lake systems. This report was not able to provide definitive reasons for the low abundance and diversity observed but suggested that contributing factors include: physical characteristics of the sediment (predominance of fine-grained soft sediment), industrial activity, and disturbance and channelization of the river.

Species of Concern. Species that have been selected by regulatory agencies for special protection and/or consideration were identified by contacting the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the Oregon Natural Heritage Program (ONHP). The following species are Federally listed as threatened pursuant to the Endangered Species Act:

- Steelhead trout (*Oncorhyncus mykiss*), Lower Columbia River Evolutionary Significant Unit (ESU); and

- Chinook salmon (*Oncorhyncus tshawytscha*), Lower Columbia River ESU.

In addition, coastal cutthroat trout (*Oncorhyncus clarki clarki*) are proposed as threatened for the Southwest Washington/Columbia River ESU. USFWS lists the following aquatic species as "Species of Concern" for this region: pacific lamprey *(Lampetra tridentata)*, river lamprey *(Lampetra ayresi)*, and the California floater *(Anodonta californiensis)*. The California floater (mussel) was not found on the macroinvertebrate species list provided by the USGS (1997); therefore, it is unknown whether this species is present in the lower Willamette River. The USFWS identifies species of concern as "those taxa whose conservation status is of concern to the Service but for which further information is still needed."

The ONHP conducted a data search of threatened and endangered species within a two-mile radius of the site. The ONHP identified the historical presence of the following:

- Tricolored blackbird *(Agelaius tricolor)* - reported south of Tomahawk Island on the NE Bridgeton Road, off of Marine Drive.
- Painted turtle *(Chrysemys picta)* - reported at the peninsular drainage canal; off of the Columbia Slough near the Portland International Airport.
- Columbia pebblesnail or spire snail *(Flumincola columbiana)* - reported in the Columbia River.
- Giant Columbia river limpet *(Fisherola nuttalli)* - reported in the Columbia River.

Based on the information gathered regarding the presence of species of concern in and around T-4, it is concluded that the species of concern that may be exposed to sediment-associated contaminants at this site would be limited to pacific lamprey, river lamprey, steelhead trout, coastal cutthroat trout, and chinook salmon. The other species mentioned above were observed at locations sufficiently distant (e.g., Columbia River, Columbia Slough) from T-4 to preclude exposure.

6.3 Exposure Pathway Evaluation

Based on the information on human use and ecological receptors present in and around T-4, an exposure pathway evaluation was conducted to identify potentially complete exposure pathways to the human and ecological receptors present at the site. The exposure pathway evaluation is based on an evaluation

of existing data and the presumed current and reasonably likely future conditions at the site.

To be considered complete, an exposure pathway must have: 1) an identified source of chemicals of potential concern; 2) a release/transport mechanism from the source; and 3) a receptor with which contact can occur.

Potentially Exposed Populations. Potential human receptors include industrial workers and construction/utility workers. As this site is an active industrial facility with controlled access, recreational use and trespassers are not expected at this site. The potential human exposure pathway involving exposure via off-site recreational or subsistence harvesting of fish that have been exposed to and have accumulated T-4 sediment-associated contaminants is discussed in Section 6.4.

Potential populations of ecological receptors include resident and anadromous fish species (including the species of concern presented above) and resident populations of benthic macroinvertebrates present in Slip 3. The potential ecological exposure pathway involving exposure to higher trophic level aquatic and terrestrial receptors via the ingestion of fish that have been exposed to and have accumulated T-4 sediment-associated contaminants is discussed in Section 6.4.

Figure 28 presents the preliminary exposure model for this site based on the above discussion. Check marks on the figure indicate potentially complete pathways to the indicated receptor. Question marks on the figure indicate uncertain exposure pathways related to ingestion by human and ecological receptors of aquatic organisms that may have taken up bioaccumulative contaminants from T-4 sediments.

Complete Exposure Routes. Exposure pathways for quantitative analysis were selected based on the exposure pathway evaluation developed for this site. As presented on Figure 28, the primary original sources of sediment contamination at this site were spills and leaks associated with the unloading of pencil pitch and ore, petroleum pipeline leaks and related seeps, and storm drain discharge. The secondary release mechanism for sediment-associated contaminants was the solubilization of contaminants to surface water. Additionally, uptake of bioaccumulative compounds from sediment and/or surface water by fish and subsequent ingestion by human and ecological receptors were considered. This evaluation is presented in the next section of this report.

Based on currently available information, complete exposure pathways for ecological receptors were limited to sediment and surface water as the exposure

medium. Exposure pathways identified as complete for ecological receptors were: 1) direct contact and incidental ingestion of sediment by aquatic organisms (fish and benthic invertebrates); and 2) direct contact and incidental ingestion of surface water by aquatic organisms (fish and benthic invertebrates). Additionally, the ingestion of fish that have taken up bioaccumulative compounds was identified as a potentially complete pathway.

Based on currently available information, the exposure pathways that were identified as complete for human receptors were limited to potential exposures related to off-site recreational and/or subsistence fishing and consumption of fish that have taken up bioaccumulative compounds from T-4 sediments or surface water. As previously discussed, industrial and construction worker exposure to T-4 sediments and surface water is not expected, and recreational use of the area, including fishing, is prohibited.

6.4 *Evaluation of Risks Associated with Exposure to Bioaccumulative Contaminants*

The exposure to bioaccumulative compounds from consumption of aquatic organisms that have taken up contaminants from sediments has been identified as a potentially complete exposure pathway for the human and ecological receptors at this site. A list of bioaccumulative contaminants of interest for the Portland Harbor (RM 3.5 to RM 6.5, including T-4, Slip 3) has been identified based on their presence in Portland Harbor sediments and fish tissues, and on their potential for bioaccumulation (DEQ, 1999a). The bioaccumulative contaminants of interest identified by the DEQ for the Portland Harbor are:

- Arsenic;
- Mercury;
- Butyltins;
- Pentachlorophenol;
- Bis(2-ethylhexyl)phthalate;
- Butylbenzyl pthalate;
- Di-n-butyl phthalate;
- Di-n-octyl phthalate;
- DDT and derivatives;
- Aldrin and dieldrin;

- PCBs; and
- Dioxins/furans.

The surface sediment chemistry results from this RI (Table 3) were evaluated with regard to the detection frequency and the detected concentrations of bioaccumulative contaminants of interest. The detected concentrations of bioaccumulative compounds of interest were compared against SLs and Bioaccumulation Trigger values (BT) provided in the LCRMA. BTs are screening values used to identify sediments that require bioaccumulation testing for determining appropriate disposal options for dredged material; they are based on identifying sediments that contain elevated concentrations of bioaccumulative compounds. All BT concentrations are higher than the corresponding SLs. The results are provided below:

- Arsenic; detected in 32 of 32 samples but no concentrations exceeded LCRMA SL or BT.
- Mercury; detected in 31 of 32 samples but no concentrations exceeded LCRMA SL or BT.
- Pentachlorophenol; not detected in 42 sediment samples.
- Bis(2-ethylhexyl)phthalate; detected in 29 of 42 samples but no concentrations exceeded LCRMA SL or BT.
- Butylbenzyl pthalate; detected in 7 of 42 samples but no concentrations exceeded LCRMA SL and no BT is available for this compound.
- Di-n-butyl phthalate; detected in only 1 of 42 samples which did not exceed the LCRMA SL or BT.
- Di-n-octyl phthalate; detected in 2 of 42 samples but no concentrations exceeded the LCRMA SL or BT.
- DDT and derivatives, detected in five of five samples, detected concentration exceeded LCRMA SL but not the BT.
- Aldrin and dieldrin, not detected in any of the five samples.

Two of the bioaccumulative contaminants of interest identified for the Portland Harbor (PCBs and butyltins) were not COPCs at this site and were not included in the analyte list for this RI. However, the concentrations of these compounds in sediment were evaluated in Slip 3 (by Berth 410) as part of a dredge material characterization study conducted at the Slip by Hart Crowser in 1997 (Hart Crowser, 1997a). Three sediment samples (composited from six sediment core samples) were submitted for chemical analysis. TBT was detected in only one of

the three sediment pore water samples, and the detected concentration was below the LCRMA SL and BT for TBT. Total PCBs were detected in two of the three samples; however, the detected concentrations were below the LCRMA SL and BT.

Therefore, while the bioaccumulative exposure pathway has been identified as potentially complete for higher trophic order aquatic and terrestrial ecological receptors and for off-site recreational and subsistence fishermen, the concentration of bioaccumulative contaminants of interest identified for the Portland Harbor are present at low or undetected concentrations in the sediments of this slip. Thus, the bioaccumulation exposure pathway is not considered to be a significant pathway of concern at this site.

The Portland Harbor Management Plan (DEQ, 1999a and 1999b) has identified the evaluation of risks associated with the bioaccumulation exposure pathways as an issue that should be addressed on a harbor-wide basis rather than at a site-specific level. While the regulatory status of the Portland Harbor is still uncertain, if and/or when a comprehensive assessment for bioaccumulative risk is conducted for the Portland Harbor, this remedial investigation may have to be revisited based on that risk assessment's results.

6.5 *Summary of Surface Water Screening*

The risk associated with direct contact and incidental ingestion of surface water by aquatic ecological receptors was assessed by comparing the surface water chemistry data to established risk-based water quality criteria. For this comparison, the analytical data for surface waters were compared against Oregon's AWQC established to protect the beneficial uses of the state's waterways. This comparison was conducted to provide a definitive assessment of risk to aquatic organisms from direct contact and ingestion of surface waters at the site. If the detected concentrations of constituents were below corresponding acute and chronic AWQC, no unacceptable risks to aquatic ecological receptors (including sensitive species) were predicted at this site.

Sampling locations were spatially distributed in the Slip to provide a comprehensive evaluation of potential exposure point concentrations to constituents of concern present in surface water (Figure 5). Samples were collected from just above the sediment-water interface to represent the potential worst-case conditions of contaminants solubilizing from sediment and also from the midpoint in the water column to represent the more likely exposure point for resident fish. As presented in Section 3.3, surface water samples were analyzed for TSS, BTEX, PAHs, and total and dissolved priority pollutant metals.

The analytical results and screening of the surface water data are presented in Table 7.

No concentrations of constituents were detected above corresponding acute or chronic AWQC in any of the surface water samples collected from the site. Therefore, no unacceptable risks to ecological receptors (including sensitive species) related to surface water exposure are expected in this slip.

6.6 *Summary of Sediment Bioassay Results*

The risk from direct contact and incidental ingestion of sediment by aquatic ecological receptors was assessed by sediment bioassay testing as described in Section 5.0. The results of the sediment bioassays are reported in Tables 14 through 16. These tables list the sediment samples, the corresponding reference sediment sample, the test endpoint, comparison with the "one-hit" and "two-hit" interpretative criteria, and the overall results of whether the test sediment passed or failed the biological effects interpretive criteria. As discussed in Section 5.0, bioassay testing was conducted in two phases during this RI.

In the Phase 1 bioassay testing, the test sediments were determined to have passed the biological effects criteria. In the Phase 2 bioassay testing, six of ten samples (HC-S-01, HC-S-04, HC-S-05, HC-S-07, HC-S-16, and HC-S-22) failed the biological effects criteria. Of the six test sediments that failed biological criteria, five samples (HC-S-01, HC-S-04, HC-S-05, HC-S-07, and HC-S-22) exhibited a marked response in one or more bioassay tests (one-hit failure), and one sample (HC-S-16) failed biological criteria based on two tests exhibiting statistically different responses from the corresponding reference sediment (two-hit failure).

The spatial distribution of the sediment samples failing biological interpretative criteria is presented on Figure 27 and, additionally, is shown along with the contours of constituents of concern on Figures 11 through 16.

As direct contact and incidental ingestion of sediment by aquatic organisms were the primary exposure pathways of concern at this site, the results of the sediment bioassays are considered definitive for delineating areas causing unacceptable ecological risks in the Slip. Bioaccumulation and food chain exposure were not identified as a concerns at this site because of the limited detection and the low concentrations of bioaccumulative compounds in sediments at this site. These sediment bioassays utilize pollution-sensitive organisms that reside within the biologically active zone in surface sediments and receive maximum exposure to sediment contaminants based on their life history characteristics. Additionally, bioassays are the best tool for evaluating the potential toxic effects of multiple contaminants present in sediments.

6.7 *Delineation of Areas Requiring Evaluation of Remedial Alternatives*

Areas of the site requiring an evaluation of remedial alternatives, as shown on Figure 29, were delineated using a combination of analytical chemistry results and the results of the confirmatory bioassays conducted for this RI. This delineation was conducted in accordance with the Washington State Sediment Management Standards established for Puget Sound and included in the DEQ-approved work plans for this investigation (Hart Crowser, 1998a). The Washington State Sediment Management Standard was used because the DEQ does not currently have promulgated sediment cleanup criteria. As presented in the Washington State Sediment Management Standard WAC Chapter 173-204 and PSDDA Program, sediments with concentrations of COPCs that exceed sediment quality standards or criteria (in the case of this RI, the LCRMA SLs and MLs) are designated as having ecological adverse effects, pending confirmation via biological testing. For the purpose of this RI, the LCRMA SLs and MLs are used only for comparison purposes and are not regulatory standards or criteria.

A suite of three bioassays are used as biological effects criteria to confirm or overturn initial designations based on chemical criteria. The results of the sediment bioassays are considered more definitive than chemical criteria for assessing risks to benthic organisms from direct contact and ingestion of surface sediments.

The sediment samples selected for bioassay testing for this RI were spatially distributed within the site to capture both a range of concentrations of constituents of concern and also to ensure sufficient spatial coverage within Slip 3 for delineating areas of the site requiring an evaluation of remedial alternatives.

Based on the exposure pathway analysis and the assessment of ecological risks associated with exposure to surface water, the ecological risks associated with direct contact and ingestion of surface sediments was the only complete exposure pathway present at this site on which to base decisions regarding areas of the site requiring an evaluation of remedial alternatives. The concentration of bioaccumulative contaminants of interest identified for the Portland Harbor are present at low or undetected concentrations in the sediments of this slip. Thus, the bioaccumulation exposure pathway is not considered to be a significant pathway of concern at this site. The area of the Slip requiring further evaluation is delineated by identifying areas that exhibit unacceptable ecological risks based on sediment bioassay failures. This area is presented on Figure 29.

The area delineated in Figure 29 serves as the starting point for the evaluation of remedial alternatives to be conducted as part of the Feasibility Study for this site.

7.0 REFERENCES

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FIGURES

Table 1 - Sediment Sample Identification and Analysis Summary
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	PAHs	Volatile Organic Compounds	Grain Size	Metals	Pesticides	Bioassays	Pencil Pitch	Diesel
HC-S-01	X	X	X			X	X	X
HC-S-02	X	X	X	X			X	X
HC-S-03	X	X					X	X
HC-S-04	X	X	X	X		X	X	X
HC-S-05	X	X	X	X		X	X	X
HC-S-06							X	X
HC-S-07	X	X	X	X		X	X	X
HC-VC-07-S1	X	X		X			X	
HC-VC-07-S2	X	X	X	X			X	
HC-S-08	X	X	X				X	X
HC-S-09	X	X		X			X	X
HC-S-10							X	X
HC-S-11	X	X	X	X		X	X	X
HC-VC-11-S1	X	X		X			X	X
HC-VC-11-S2	X	X	X	X			X	X
HC-S-12							X	X
HC-S-13	X	X	X	X			X	X
HC-VC-13-S1	X	X		X			X	X
HC-VC-13-S2	X	X	X	X			X	
HC-S-14	X	X		X			X	X
HC-S-15							X	X
HC-S-16	X	X	X	X	X	X	X	X
HC-S-17							X	X
HC-S-18							X	X
HC-VC-18-S1	X	X					X	
HC-VC-18-S2	X	X	X				X	
HC-S-19	X	X	X	X		X	X	X
HC-S-20	X	X					X	X
HC-S-21							X	X
HC-S-22	X	X	X	X		X	X	X
HC-VC-22-S1	X	X		X			X	
HC-VC-22-S2	X	X		X			X	
HC-S-23							X	X
HC-S-24	X	X	X	X		X	X	X
HC-S-25	X	X		X			X	X
HC-S-26	X	X	X	X		X	X	X

Table 1 - Sediment Sample Identification and Analysis Summary
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	PAHs	Volatile Organic Compounds	Grain Size	Metals	Pesticides	Bioassays	Pencil Pitch	Diesel
HC-S-27							X	X
HC-VC-27-S1	X	X		X			X	
HC-VC-27-S2	X	X		X			X	
HC-S-28	X	X	X	X	X	X	X	X
HC-S-29							X	X
HC-S-30	X	X	X	X		X	X	X
HC-S-31							X	X
HC-S-32	X	X	X				X	X
HC-VC-32-S1	X	X					X	
HC-VC-32-S2	X	X	X				X	
HC-S-33							X	X
HC-S-34	X	X	X	X			X	X
HC-S-35	X	X	X	X		X	X	X
HC-S-36	X	X	X	X	X	X	X	X
HC-S-37	X	X					X	X
HC-S-38	X	X					X	X
HC-S-39	X	X	X	X	X	X	X	X
HC-VC-39-S1	X	X		X			X	
HC-VC-39-S2	X	X		X			X	
HC-S-40	X	X					X	X
HC-S-41	X	X		X			X	X
HC-S-42	X	X	X	X		X	X	X
HC-VC-42-S1	X	X		X			X	
HC-VC-42-S2	X	X		X			X	
HC-S-43	X	X			X		X	X
HC-S-44	X	X	X				X	X
Reference B	X	X	X	X		X		
Reference C	X	X	X	X		X		

Table 2 - Sample Collection Dates, Locations, and Mudline Elevations
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Sampling Date	Latitude	Longitude	Sediment Elevation in CRD
HC-S-01	10/13/98	45° 36.06'	122° 46.38'	-46
HC-S-02	10/13/98	45° 36.05'	122° 46.37'	-37.8
HC-S-03	10/13/98	45° 36.03'	122° 46.37'	-25.6
HC-S-04	10/13/98	45° 36.02'	122° 46.37'	-31.6
HC-S-05	10/13/98	45° 36.01'	122° 46.40'	-34.9
HC-S-06	10/13/98	45° 36.02'	122° 46.39'	-40.7
HC-S-07	10/13/98	45° 36.03'	122° 46.39'	-39.2
HC-VC-07	10/12/98	45° 36.03'	122° 46.39'	-40.2
HC-S-08	10/13/98	45° 36.04'	122° 46.39'	-43.6
HC-S-09	10/13/98	45° 36.06'	122° 46.38'	-46.1
HC-S-10	10/14/98	45° 36.06'	122° 46.41'	-48.1
HC-S-11	10/12/98	45° 36.05'	122° 46.41'	-44
HC-VC-11	10/12/98	45° 36.05'	122° 46.41'	-44
HC-S-12	10/14/98	45° 36.03'	122° 46.41'	-37.9
HC-S-13	10/12/98	45° 36.02'	122° 46.42'	-40.2
HC-VC-13	10/12/98	45° 36.02'	122° 46.42'	-40.2
HC-S-14	10/14/98	45° 36.01'	122° 46.45'	-35.4
HC-S-15	10/14/98	45° 36.02'	122° 46.44'	-39.9
HC-S-16	10/14/98	45° 36.04'	122° 46.44'	-37.4
HC-S-17	10/14/98	45° 36.05'	122° 46.44'	-43.5
HC-S-18	10/12/98	45° 36.06'	122° 46.43'	-47.8
HC-VC-18	10/12/98	45° 36.06'	122° 46.43'	-48.0
HC-S-19	10/15/98	45° 36.06'	122° 46.42'	-40
HC-S-20	10/15/98	45° 36.06'	122° 46.45'	-45.6
HC-S-21	10/15/98	45° 36.07'	122° 46.47'	-45.8
HC-S-22	10/14/98	45° 36.05'	122° 46.47'	-45.9
HC-VC-22	10/12/98	45° 36.05'	122° 46.47'	-46.7
HC-S-23	10/14/98	45° 36.04'	122° 46.47'	-41
HC-S-24	10/14/98	45° 36.02'	122° 46.48'	-42.7
HC-S-25	10/14/98	45° 36.01'	122° 46.50'	-36.5
HC-S-26	10/14/98	45° 36.02'	122° 46.51'	-36.4
HC-S-27	10/14/98	45° 36.03'	122° 46.52'	-42.3
HC-VC-27	10/12/98	45° 36.03'	122° 46.52'	-43.0
HC-S-28	10/12/98	45° 36.04'	122° 46.52'	-47.1
HC-S-29	10/14/98	45° 36.05'	122° 46.52'	-41.4
HC-S-30	10/15/98	45° 36.07'	122° 46.52'	-45.1
HC-S-31	10/15/98	45° 36.07'	122° 46.54'	-41.8
HC-S-32	10/14/98	45° 36.06'	122° 46.54'	-45.9

Refer to notes at the end of this table.

Table 2 - Sample Collection Dates, Locations, and Mudline Elevations
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Sampling Date	Latitude	Longitude	Sediment Elevation in CRD
HC-VC-32	10/12/98	45° 36.06'	122° 46.54'	-46.3
HC-S-33	10/14/98	45° 36.04'	122° 46.55'	-43.2
HC-S-34	10/15/98	45° 36.01'	122° 46.55'	-38
HC-S-35	10/14/98	45° 36.07'	122° 46.57'	-40.9
HC-S-36	10/15/98	45° 36.05'	122° 46.60'	-42.6
HC-S-37	10/14/98	45° 36.08'	122° 46.61'	-41.5
HC-S-38	10/15/98	45° 35.97'	122° 46.56'	-25.3
HC-S-39	10/15/98	45° 35.94'	122° 46.54'	-26.7
HC-VC-39	10/12/98	45° 35.94'	122° 46.54'	-27.1
HC-S-40	10/15/98	45° 35.92'	122° 46.53'	-32.9
HC-S-41	10/15/98	45° 36.09'	122° 46.54'	-10.8
HC-S-42	10/15/98	45° 36.10'	122° 46.56'	-11.2
HC-VC-42	10/12/98	45° 36.10'	122° 46.56'	-46.3
HC-S-43	10/15/98	45° 36.12'	122° 46.62'	-12.9
HC-S-44	10/15/98	45° 36.10'	122° 46.62'	-17.3
Reference Site B	10/15/98	45° 44.93'	122° 46.25'	- -
Reference Site C	10/15/98	45° 41.69'	122° 45.75'	- -
HC-WS-01-B	10/15/98	45° 36.03'	122° 46.38'	- -
HC-WS-01-M	10/15/98	45° 36.03'	122° 46.38'	- -
HC-WS-02-B	10/15/98	45° 36.04'	122° 46.50'	- -
HC-WS-02-M	10/15/98	45° 36.04'	122° 46.50'	- -
HC-WS-03-B	10/15/98	45° 36.05'	122° 46.62'	- -
HC-WS-03-M	10/15/98	45° 36.05'	122° 46.62'	- -

Notes:
Coordinates on NAD 83 Geographic Coordinates
- - = Not Applicable

Table 3 - Summary of Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

	Detection Frequency	Range	Maximum Detection	Location of Max. Detect.	SL	Exceedence Frequency	E-Ratio	ML	Exceedence Frequency
Conventionals in mg/kg									
Ammonia as Nitrogen	32/32	12.2 to 224	224	HC-S-01					
Sulfide, Total	32/32	1.6 to 1830 J	1830 J	HC-S-25					
Conventionals in %									
Carbon, Total Organic	32/32	.42 to 3.69	3.69	HC-S-01					
Solids, Total	44/44	30.1 to 78	78	HC-S-19					
Solids, Total Volatile	34/34	1.76 to 12.9	12.9	HC-S-02					
Metals in mg/kg									
Antimony, Total	17/25	.1 J to 4.4 J	4.4 J	HC-S-19	150	0/25		200	0/25
Arsenic, Total	25/25	3 to 14	14	HC-S-02	57	0/25		700	0/25
Cadmium, Total	25/25	.2 to 6.6 J	6.6 J	HC-S-25	5.1	2/25	1.29	14	0/25
Chromium, Total	25/25	14.3 to 35.3	35.3	HC-S-14					
Copper, Total	25/25	15.3 to 90.1	90.1	HC-S-02	390	0/25		1300	0/25
Lead, Total	25/25	15.2 to 1160	1160	HC-S-19	450	4/25	2.58	1200	0/25
Mercury, Total	24/25	.02 U to .34	0.34	HC-S-25	0.41	0/25		2.3	0/25
Nickel, Total	25/25	12 to 56	56	HC-S-25	140	0/25		370	0/25
Silver, Total	25/25	.1 to 2	2	HC-S-02	6.1	0/25		8.4	0/25
Zinc, Total	25/25	82 J to 1330 J	1330 J	HC-S-25	410	7/25	3.24	3800	0/25
Volatiles in µg/kg									
1,2-Dichlorobenzene	0/32	5 U to 25 U	N/A		35	0/32		110	0/32
1,3-Dichlorobenzene	0/32	5 U to 25 U	N/A		170	0/32			
1,4-Dichlorobenzene	0/32	5 U to 25 U	N/A		110	0/32		120	0/32
Benzene	0/32	5 U to 25 U	N/A						
Ethylbenzene	0/32	5 U to 25 U	N/A		10	0/32		50	0/32
Tetrachloroethene (PCE)	0/32	5 U to 25 U	N/A		57	0/32		210	0/32
Toluene	0/32	5 U to 25 U	N/A						
Total Xylenes	0/32	5 U to 25 U	N/A		40	0/32		160	0/32
Trichloroethene (TCE)	0/32	5 U to 25 U	N/A		160	0/32		1600	0/32

Refer to notes at the end of this table.

Table 3 - Summary of Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

	Detection Frequency	Range	Maximum Detection	Location of Max. Detect.	SL	Exceedence Frequency	E-Ratio	ML	Exceedence Frequency	E-Ratio
Volatiles in µg/kg										
m- & p-Xylenes	0/32	5 U to 25 U	N/A							
o-Xylene	0/32	5 U to 25 U	N/A							
TPH in mg/kg										
Diesel	14/44	25 UJ to 962	962	HC-S-25						
Fluoranthene	44/44	.5 J to 180 J	180 J	HC-S-19	2100	0/44		2400	0/44	
Lube Oil	7/44	100 U to 1100 J	1100 J	HC-S-25						
Pencil Pitch	44/44	20.9 to 8430	8430	HC-S-19						
Phytane	11/44	.5 to 6.1	6.1	HC-S-25						
Pristane	15/44	.5 to 7	7	HC-S-25						
LPAHs in µg/kg										
Acenaphthene	31/33	23 to 20000 U	14000	HC-S-02	500	14/33	28.00	2000	3/33	7
Acenaphthylene	18/33	20 to 20000 U	3600	HC-S-24	560	1/33	6.43	1300	1/33	2.77
Anthracene	31/33	27 to 20000 U	12000	HC-S-02	960	14/33	12.50	13000	0/33	
Fluorene	28/33	20 U to 20000 U	14000	HC-S-02	540	10/33	25.93	3600	1/33	3.89
Naphthalene	26/33	20 U to 20000 U	2200	HC-S-24	2100	1/33	1.05	2400	0/33	
Phenanthrene	33/33	150 to 74000	74000	HC-S-02	1500	23/33	49.33	21000	4/33	3.52
Total LPAHs (1/2 U)	33/33	253 to 124000	124000	HC-S-02	5200	17/33	23.85	29000	6/33	4.28
HPAHs in µg/kg										
Benz(a)anthracene	33/33	170 to 81000	81000	HC-S-02	1300	25/33	62.31	5100	18/33	15.88
Benzo(a)pyrene	33/33	180 to 86000	86000	HC-S-01	1600	26/33	53.75	3600	22/33	23.89
Benzo(b)fluoranthene	33/33	150 to 83000	83000	HC-S-01						
Benzo(g,h,i)perylene	33/33	220 to 55000	55000	HC-S-01	670	28/33	82.09	3200	21/33	17.19
Benzo(k)fluoranthene	33/33	98 to 63000	63000	HC-S-02						
Chrysene	33/33	170 to 78000	78000	HC-S-02	1400	27/33	55.71	21000	6/33	3.71
Dibenz(a,h)anthracene	30/33	50 to 20000 U	11000	HC-S-19	230	24/33	47.83	1900	7/33	5.79
Fluoranthene	33/33	310 to 130000	130000	HC-S-02	1700	30/33	76.47	30000	6/33	4.33
Indeno(1,2,3-cd)pyrene	33/33	340 to 110000	110000	HC-S-01	600	32/33	183.33	4400	23/33	25.00

Refer to notes at the end of this table.

Table 3 - Summary of Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

	Detection Frequency	Range	Maximum Detection	Location of Max. Detect.	SL	Exceedence Frequency	E-Ratio	ML	Exceedence Frequency	E-Ratio
HPAHs in µg/kg										
Pyrene	33/33	380 to 110000	110000	HC-S-24	2600	27/33	42.31	16000	14/33	6.88
Total Benzofluoranthenes	33/33	248 to 144000	144000	HC-S-01	3200	24/33	45.00	9900	18/33	14.55
Total HPAHs (1/2 U)	33/33	2068 to 775000	775000	HC-S-01	12000	28/33	64.58	69000	18/33	11.23
Phenols in µg/kg										
2,4-Dimethylphenol	3/33	6 U to 6000 U	31	HC-S-19	29	1/33	1.07	210	0/33	
2-Methylphenol	2/33	6 U to 6000 U	51	HC-S-19	63	0/33		77	0/33	
4-Methylphenol	4/33	20 U to 20000 U	130	HC-S-19	670	0/33		3600	0/33	
Pentachlorophenol (PCP)	0/33	60 U to 60000 U	N/A		400	0/33		690	0/33	
Phenol	2/33	20 U to 20000 U	110	HC-S-19	420	0/33		1200	0/33	
Phthalates in µg/kg										
Bis(2-ethylhexyl) Phthalate	28/33	50 to 20000 U	550	HC-S-43	8300	0/33				
Butyl Benzyl Phthalate	7/33	20 to 20000 U	110	HC-S-41	970	0/33				
Di-n-butyl Phthalate	1/33	20 U to 20000 U	43	HC-S-20	5100	0/33				
Di-n-octyl Phthalate	2/33	20 U to 20000 U	100	HC-S-42	6200	0/33				
Diethyl Phthalate	1/33	20 U to 20000 U	25	HC-S-25	1200	0/33				
Dimethyl Phthalate	0/33	20 U to 20000 U	N/A		1400	0/33				
Semivolatiles in µg/kg										
Benzoic Acid	1/33	100 U to 100000 U	110	HC-S-19	650	0/33		760	0/33	
Benzyl Alcohol	0/33	6 U to 6000 U	N/A		57	0/33		870	0/33	
Dibenzofuran	21/33	20 U to 20000 U	860	HC-S-38	540	2/33	1.59	1700	0/33	
Hexachlorobenzene	0/33	20 U to 20000 U	N/A		22	0/33		230	0/33	
Hexachlorobutadiene	0/33	20 U to 20000 U	N/A		29	0/33		290	0/33	
N-Nitrosodiphenylamine	0/33	12 U to 12000 U	N/A		28	0/33		130	0/33	
Pesticide µg/kg										
4,4'-DDD	5/5	1 J to 8 J	8 J	HC-S-16; S-28; S-43						
4,4'-DDE	4/5	2 J to 20 U	5 J	HC-S-16; S-28						
4,4'-DDT	4/5	3 J to 26	26	HC-S-16						

Refer to notes at the end of this table.

Table 3 - Summary of Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

	Detection Frequency	Range	Maximum Detection	Location of Max. Detect.	SL	Exceedence Frequency	E-Ratio	ML	Exceedence Frequency	E-Ratio
Pesticide µg/kg										
Total DDT	5/5	5 J to 39 J	39 J	HC-S-16	6.9	5/5	5.65	69	0/5	
Aldrin	0/5	20 U to 20 U	N/A		10	0/5				
Dieldrin	0/5	20 U to 20 U	N/A		10	0/5				
Endosulfan I	0/5	20 U to 20 U	N/A							
Endosulfan II	0/5	20 U to 20 U	N/A							
Endosulfan Sulfate	0/5	20 U to 20 U	N/A							
Endrin	0/5	20 U to 20 U	N/A							
Endrin Aldehyde	0/5	20 U to 20 U	N/A							
Endrin Ketone	0/5	20 U to 20 U	N/A							
Heptachlor	0/5	20 U to 20 U	N/A		10	0/5				
Heptachlor Epoxide	0/5	20 U to 20 U	N/A							
Methoxychlor	0/5	20 U to 20 U	N/A							
Toxaphene	0/5	300 U to 300 U	N/A							
alpha-BHC	0/5	20 U to 20 U	N/A							
alpha-Chlordane	0/5	20 U to 20 U	N/A		10	0/5				
beta-BHC	0/5	20 U to 20 U	N/A							
delta-BHC	0/5	20 U to 20 U	N/A							
gamma-BHC	0/5	20 U to 20 U	N/A		10	0/5				
gamma-Chlordane	0/5	20 U to 20 U	N/A		10	0/5				

Notes:

N/A = Not Applicable

U = Not detected at the detection limit indicated

J = Estimated concentration

Table 4 - Sediment Grain Size Summary
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample Identification	%Gravel	%Sand	%Silt	%Clay	Material Description
HC-S-01	0.1	19.1	65	15.8	Clayey, sandy SILT
HC-S-02	0.3	54.5	33.1	12.1	Clayey, very silty SAND
HC-S-04	0.7	17.7	66.6	15	Clayey, sandy SILT
HC-S-05	0	39.6	45.8	14.6	Clayey, very sandy SILT
HC-S-07	0	12.9	68.3	18.8	Sandy, clayey SILT
HC-VC-7-S2	0.1	47.8	36.3	15.8	Clayey, very silty SAND
HC-S-08	0	5.6	73.7	20.7	Slightly sandy, clayey SILT
HC-S-11	0	13.4	69.8	16.8	Sandy, clayey, SILT
HC-VC-11-S2	0	47.8	39.7	12.5	Clayey, very silty SAND
HC-S-13	0.1	39.1	46.4	14.4	Clayey, very sandy SILT
HC-VC-13-S2	0.1	96.9	2.1	0.9	SAND
HC-S-16	0	29.6	55.3	15.1	Clayey, sandy SILT
HC-VC-18-S2	0	96.8	2.3	0.9	SAND
HC-S-19	3.7	64.4	24.4	7.5	Slightly clayey, silty SAND
HC-S-22	0	39	46.9	14.1	Clayey, very sandy SILT
HC-S-24	0.7	58.5	30.4	10.4	Slightly clayey, silty SAND
HC-S-26	0	76.9	17.4	5.7	Slightly clayey, silty SAND
HC-S-28	0	16	65	19	Sandy, clayey SILT
HC-S-30	0	59.2	30.6	10.2	Slightly clayey, silty SAND
HC-S-32	0	43.8	38.6	17.6	Clayey, very silty SAND
HC-VC-32-S2	0	96.5	2.6	0.9	SAND
HC-S-34	0.1	38.2	47.2	14.5	Clayey, very sandy SILT
HC-S-35	0	35.5	50.2	14.3	Clayey, very sandy SILT
HC-S-36	0.2	76.4	17.1	6.3	Slightly clayey, silty SAND
HC-S-39	0	14.9	69.4	15.7	Sandy, clayey SILT
HC-S-42	0	7.1	78.3	14.6	Slightly sandy, clayey SILT
HC-S-44	0	11.2	72	16.8	Slightly sandy, clayey SILT
HC-Ref-B	0	0.9	73.6	25.5	Clayey SILT
HC-Ref-C	1.1	79.1	16.6	3.2	Silty SAND

Table 5 - Summary of Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

	Detection Frequency	Range	Maximum Detection	Location of Max. Detect.	SL	Exceedence Frequency	E-Ratio	ML	Exceedence Frequency	E-Ratio
Conventionals in mg/kg										
Ammonia as Nitrogen	18/18	1.4 to 327	327	HC-VC-39-S2						
Sulfide, Total	12/12	2 J to 796 J	796 J	HC-VC-7-S2						
Conventionals in %										
Carbon, Total Organic	18/18	.03 to 2.95	2.95	HC-VC-42-S2						
Solids, Total	18/18	49 to 81.4	81.4	HC-VC-32-S2						
Solids, Total Volatile	18/18	1.73 to 10.5	10.5	HC-VC-11-S1						
Metals in mg/kg										
Antimony, Total	7/14	.1 UJ to 1.4 J	1.4 J	HC-VC-7-S2	150	0/14		200	0/14	
Arsenic, Total	14/14	2 to 15	15	HC-VC-7-S2	57	0/14		700	0/14	
Cadmium, Total	13/14	.1 to 3.3	3.3	HC-VC-7-S2	5.1	0/14		14	0/14	
Chromium, Total	14/14	9 to 29.4	29.4	HC-VC-42-S2						
Copper, Total	14/14	13.3 to 83.2	83.2	HC-VC-7-S2	390	0/14		1300	0/14	
Lead, Total	14/14	3 to 576	576	HC-VC-7-S2	450	2/14	1.28	1200	0/14	
Mercury, Total	12/14	.02 to .18	0.18	HC-VC-7-S2	0.41	0/14		2.3	0/14	
Nickel, Total	14/14	15 to 26	26	HC-VC-7-S1	140	0/14		370	0/14	
Silver, Total	10/14	.1 U to 1.4	1.4	HC-VC-7-S2	6.1	0/14		8.4	0/14	
Zinc, Total	14/14	37 to 656	656	HC-VC-11-S2	410	3/14	1.6	3800	0/14	
Volatiles in µg/kg										
1,2-Dichlorobenzene	0/18	5 U to 10 U	N/A		35	0/18		110	0/18	
1,3-Dichlorobenzene	0/18	5 U to 10 U	N/A		170	0/18				
1,4-Dichlorobenzene	0/18	5 U to 10 U	N/A		110	0/18		120	0/18	
Benzene	0/18	5 U to 10 U	N/A							
Ethylbenzene	0/18	5 U to 10 U	N/A		10	0/18		50	0/18	
Tetrachloroethene (PCE)	0/18	5 U to 10 U	N/A		57	0/18		210	0/18	
Toluene	0/18	5 U to 10 U	N/A							
Total Xylenes	0/18	5 U to 10 U	N/A		40	0/18		160	0/18	
Trichloroethene (TCE)	0/18	5 U to 10 U	N/A		160	0/18		1600	0/18	

Refer to notes at the end of this table.

Table 5 - Summary of Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

	Detection Frequency	Range	Maximum Detection	Location of Max. Detect.	SL	Exceedence Frequency	E-Ratio	ML	Exceedence Frequency	E-Ratio
Volatiles in µg/kg										
m- & p-Xylenes	0/18	5 U to 10 U	N/A							
o-Xylene	0/18	5 U to 10 U	N/A							
TPH in mg/kg										
Diesel	0/3	25 U to 100 U	N/A							
Fluoranthene	2/3	.5 U to 24	24	HC-VC-11-S2	2100	0/3		2400	0/3	
Lube Oil	0/3	100 U to 100 U	N/A							
Pencil Pitch	16/18	21 to 2000	2000	HC-VC-42-S2						
Phytane	0/3	.5 U to .5 U	N/A							
Pristane	0/3	.5 U to .5 U	N/A							
LPAHs in µg/kg										
Acenaphthene	2/18	20 U to 4000 U	510	HC-VC-18-S1	500	1/18	1.02	2000	0/18	
Acenaphthylene	0/18	20 U to 4000 U	N/A		560	0/18		1300	0/18	
Anthracene	5/18	20 U to 4000 U	1000	HC-VC-11-S1	960	1/18	1.04	13000	0/18	
Fluorene	0/18	20 U to 4000 U	N/A		540	0/18		3600	0/18	
Naphthalene	0/18	20 U to 4000 U	N/A		2100	0/18		2400	0/18	
Phenanthrene	15/18	20 U to 10000	10000	HC-VC-42-S2	1500	8/18	6.67	21000	0/18	
Total LPAHs (1/2 U)	15/18	60 U to 20000	20000	HC-VC-42-S2	5200	5/18	3.85	29000	0/18	
HPAHs in µg/kg										
Benz(a)anthracene	16/18	20 U to 20000	20000	HC-VC-42-S2 HC-VC-7-S1	1300	10/18	15.38	5100	6/18	3.92
Benzo(a)pyrene	16/18	20 U to 24000	24000	HC-VC-42-S2	1600	10/18	15.00	3600	9/18	6.67
Benzo(b)fluoranthene	16/18	20 U to 21000	21000	HC-VC-42-S2						
Benzo(g,h,i)perylene	16/18	20 U to 16000	16000	HC-VC-42-S2	670	10/18	23.88	3200	7/18	5.00
Benzo(k)fluoranthene	16/18	20 U to 17000	17000	HC-VC-7-S1						
Chrysene	16/18	20 U to 20000	20000	HC-VC-7-S1	1400	10/18	14.29	21000	0/18	
Dibenz(a,h)anthracene	3/18	20 U to 4000 U	43	HC-VC-13-S2	230	0/18		1900	0/18	
Fluoranthene	16/18	20 U to 28000	28000	HC-VC-7-S1	1700	10/18	16.47	30000	0/18	

Refer to notes at the end of this table.

Table 5 - Summary of Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

	Detection Frequency	Range	Maximum Detection	Location of Max. Detect.	SL	Exceedence Frequency	E-Ratio	ML	Exceedence Frequency	E-Ratio
Indeno(1,2,3-cd)pyrene	16/18	20 U to 32000	32000	HC-VC-42-S2	600	13/18	53.33	4400	8/18	7.27
Pyrene	16/18	20 U to 24000	24000	HC-VC-7-S1; HC-VC-42-S2	2600	9/18	9.23	16000	3/18	1.50
Total Benzofluoranthenes	16/18	20 U to 36000	36000	HC-VC-7-S1; HC-VC-42-S2	3200	10/18	11.25	9900	6/18	3.64
Total HPAHs (1/2 U)	16/18	100 U to 200000	200000	HC-VC-42-S2	12000	10/18	16.67	69000	6/18	2.90
Phenols in µg/kg										
2,4-Dimethylphenol	0/17	6 U to 1200 U	N/A		29	0/17		210	0/17	
2-Methylphenol	0/17	6 U to 1200 U	N/A		63	0/17		77	0/17	
4-Methylphenol	0/17	20 U to 4000 U	N/A		670	0/17		3600	0/17	
Pentachlorophenol (PCP)	0/17	60 U to 12000 U	N/A		400	0/17		690	0/17	
Phenol	0/17	20 U to 4000 U	N/A		420	0/17		1200	0/17	
Phthalates in µg/kg										
Bis(2-ethylhexyl) Phthalate	2/18	20 U to 4000 U	180	HC-VC-39-S2	8300	0/18				
Butyl Benzyl Phthalate	0/18	20 U to 4000 U	N/A		970	0/18				
Di-n-butyl Phthalate	0/18	20 U to 4000 U	N/A		5100	0/18				
Di-n-octyl Phthalate	0/18	20 U to 4000 U	N/A		6200	0/18				
Diethyl Phthalate	0/18	20 U to 4000 U	N/A		1200	0/18				
Dimethyl Phthalate	0/18	20 U to 4000 U	N/A		1400	0/18				
Semivolatiles in µg/kg										
Benzoic Acid	0/18	100 U to 20000 U	N/A		650	0/18		760	0/18	
Benzyl Alcohol	0/18	6 U to 1200 U	N/A		57	0/18		870	0/18	
Dibenzofuran	0/18	20 U to 4000 U	N/A		540	0/18		1700	0/18	
Hexachlorobenzene	0/18	20 U to 4000 U	N/A		22	0/18		230	0/18	
Hexachlorobutadiene	0/18	20 U to 4000 U	N/A		29	0/18		290	0/18	
N-Nitrosodiphenylamine	0/18	12 U to 2400 U	N/A		28	0/18		130	0/18	

Notes:

N/A = Not Applicable

U = Not detected at the detection limit indicated

J = Estimated concentration

Table 6 - Surface Water Sample Identification and Analysis Summary
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Priority Pollutant Metals[1]	Volatile Organics	PAHs	Semivolatile Organics
HC-WS-01-B	X	X	X	X
HC-WS-01-M	X	X	X	X
HC-WS-02-B	X	X	X	X
HC-WS-02-M	X	X	X	X
HC-WS-03-B	X	X	X	X
HC-WS-03-M	X	X	X	X

Note:

[1] Priority Pollutants Include: Sb, As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Th, and Zn

Table 7 - Summary of Surface Water Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Hart Crowser
J-5624-10

Lab ID Sample ID	Fresh Acute	Fresh Chronic	K9807169-019 HC-WS-01-B	K9807169-018 HC-WS-01-M	K9807169-021 HC-WS-02-B	K9807169-020 HC-WS-02-M
Metals in µg/L						
Antimony, Total	9000	1600	0.09	0.05	0.04	0.05
Arsenic, Total	360	190	0.6	0.6	0.6	0.6
Cadmium, Total	3.7	1.03	0.02	0.02 U	0.02 U	0.02
Chromium, Total	549	178	0.4	0.5	0.2	0.2 U
Copper, Total	17	11.4	1.7	2	1.4	2.7
Lead, Total	64.6	2.52	2.68	2.85	0.71	0.61
Mercury, Total	2.4	0.012	0.5 U	0.5 U	0.5 U	0.5 U
Nickel, Total	1415	157	0.7	0.7	0.6	0.5
Silver, Total	1.19	0.12	0.02 U	0.02 U	0.02 U	0.04
Thallium, Total	1400	40	0.02	0.03	0.02	0.02 U
Zinc, Total	114.4	104.5	5	5.2	3.2	3.2
Volatiles in µg/L						
1,2-Dichlorobenzene	1120	763	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	1120	763	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	1120	763	0.5 U	0.5 U	0.5 U	0.5 U
Benzene	5300		0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	32000		0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene (PCE)	5280	840	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	17500		0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	45000	21900	0.5 U	0.5 U	0.5 U	0.5 U
m- & p-Xylenes			0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene			0.5 U	0.5 U	0.5 U	0.5 U
Total Xylenes			0.5 U	0.5 U	0.5 U	0.5 U
LPAHs in µg/L						
Acenaphthene	1700	520	0.1 U	0.1 U	0.1 U	0.1 U
Acenaphthylene			0.1 U	0.1 U	0.1 U	0.1 U
Anthracene			0.1 U	0.1 U	0.1 U	0.1 U
Fluorene			0.1 U	0.1 U	0.1 U	0.1 U
Naphthalene	2300	620	0.1 U	0.1 U	0.1 U	0.1 U
Phenanthrene			0.1 U	0.1 U	0.1 U	0.1 U
Total LPAHs			0.1 U	0.1 U	0.1 U	0.1 U
HPAHs in µg/L						
Benz(a)anthracene			0.1 U	0.1	0.1 U	0.1 U
Benzo(a)pyrene			0.1 U	0.2	0.1 U	0.1 U
Benzo(b)fluoranthene			0.1 U	0.2	0.1 U	0.1 U
Benzo(k)fluoranthene			0.1 U	0.1	0.1 U	0.1 U
Total Benzofluoranthenes			0.1 U	0.3	0.1 U	0.1 U
Benzo(g,h,i)perylene			0.1 U	0.1	0.1 U	0.1 U
Chrysene			0.1 U	0.1	0.1 U	0.1 U
Dibenz(a,h)anthracene			0.1 U	0.1 U	0.1 U	0.1 U
Fluoranthene	3980		0.1	0.2	0.1 U	0.1 U
Indeno(1,2,3-cd)pyrene			0.2	0.3	0.1 U	0.1 U
Pyrene			0.1	0.2	0.1 U	0.1 U
Total HPAHs			0.4	1.8	0.1 U	0.1 U

Note:
U = Undetected at or above the MRL

Table 7 - Summary of Surface Water Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Lab ID Sample ID	Fresh Acute	Fresh Chronic	K9807169-019 HC-WS-01-B	K9807169-018 HC-WS-01-M	K9807169-021 HC-WS-02-B	K9807169-020 HC-WS-02-M
Phenols in µg/L						
2,4-Dimethylphenol	2120		0.5 U	0.5 U	0.5 U	0.5 U
2-Methylphenol			0.5 U	0.5 U	0.5 U	0.5 U
4-Methylphenol			0.5 U	0.5 U	0.5 U	0.5 U
Pentachlorophenol (PCP)	20	13	0.5 U	0.5 U	0.5 U	0.5 U
Phenol	10200	2560	0.5 U	0.5 U	0.5 U	0.5 U
Phthalates in µg/L						
Bis(2-ethylhexyl) Phthalate			0.2 U	0.4 U	0.3 U	0.2 U
Butyl Benzyl Phthalate			0.1 U	0.1 U	0.1 U	0.1 U
Di-n-butyl Phthalate			0.2	0.2	0.2	0.2
Di-n-octyl Phthalate			0.1 U	0.1 U	0.1 U	0.1 U
Diethyl Phthalate			0.1 U	0.2	0.1	0.1
Dimethyl Phthalate			0.1 U	0.1 U	0.1 U	0.1 U
Semivolatiles in µg/L						
Benzoic Acid			5 U	5 U	5 U	5 U
Benzyl Alcohol			1 U	1 U	1 U	1 U
Dibenzofuran			0.1 U	0.1 U	0.1 U	0.1 U
Hexachlorobenzene			0.1 U	0.1 U	0.1 U	0.1 U
Hexachlorobutadiene	90	9.3	0.1 U	0.1 U	0.1 U	0.1 U
N-Nitrosodiphenylamine			0.1 U	0.1 U	0.1 U	0.1 U

Note:
U = Undetected at or above the MRL

Table 7 - Summary of Surface Water Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Hart Crowser
J-5624-10

Lab ID Sample ID	Fresh Acute	Fresh Chronic	K9807169-023 HC-WS-03-B	K9807169-022 HC-WS-03-M	K9807169-024 HC-RB-100	K9807169-025 HC-RB-101
Metals in µg/L						
Antimony, Total	9000	1600	0.05	0.04	0.02 U	0.02 U
Arsenic, Total	360	190	0.6	0.6	0.5 U	0.5 U
Cadmium, Total	3.7	1.03	0.02 U	0.02 U	0.02 U	0.02 U
Chromium, Total	549	178	0.3	0.3	0.2 U	0.2 U
Copper, Total	17	11.4	1.9	1.6	1.5	1
Lead, Total	64.6	2.52	0.76	0.87	0.02	0.02 U
Mercury, Total	2.4	0.012	0.5 U	0.5 U	0.5 U	0.5 U
Nickel, Total	1415	157	0.6	0.6	0.2 U	0.2 U
Silver, Total	1.19	0.12	0.02 U	0.02 U	0.02 U	0.02 U
Thallium, Total	1400	40	0.02 U	0.02 U	0.02 U	0.02 U
Zinc, Total	114.4	104.5	3.6	4.4	0.5	0.8
Volatiles in µg/L						
1,2-Dichlorobenzene	1120	763	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	1120	763	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	1120	763	0.5 U	0.5 U	0.5 U	0.5 U
Benzene	5300		0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	32000		0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene (PCE)	5280	840	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	17500		0.5 U	0.5 U	0.9	0.8
Trichloroethene (TCE)	45000	21900	0.5 U	0.5 U	0.5 U	0.5 U
m- & p-Xylenes			0.5 U	0.5 U	0.5 U	0.5 U
o-Xylene			0.5 U	0.5 U	0.5 U	0.5 U
Total Xylenes			0.5 U	0.5 U	0.5 U	0.5 U
LPAHs in µg/L						
Acenaphthene	1700	520	0.1 U	0.1 U	0.1 U	0.1 U
Acenaphthylene			0.1 U	0.1 U	0.1 U	0.1 U
Anthracene			0.1 U	0.1 U	0.1 U	0.1 U
Fluorene			0.1 U	0.1 U	0.1 U	0.1 U
Naphthalene	2300	620	0.1 U	0.1 U	0.1 U	0.1 U
Phenanthrene			0.1 U	0.1 U	0.1 U	0.1 U
Total LPAHs			0.1 U	0.1 U	0.1 U	0.1 U
HPAHs in µg/L						
Benz(a)anthracene			0.1 U	0.1 U	0.1 U	0.1 U
Benzo(a)pyrene			0.1 U	0.1 U	0.1 U	0.1 U
Benzo(b)fluoranthene			0.1 U	0.1 U	0.1 U	0.1 U
Benzo(k)fluoranthene			0.1 U	0.1 U	0.1 U	0.1 U
Total Benzofluoranthenes			0.1 U	0.1 U	0.1 U	0.1 U
Benzo(g,h,i)perylene			0.1 U	0.1 U	0.1 U	0.1 U
Chrysene			0.1 U	0.1 U	0.1 U	0.1 U
Dibenz(a,h)anthracene			0.1 U	0.1 U	0.1 U	0.1 U
Fluoranthene	3980		0.1 U	0.1 U	0.1 U	0.1 U
Indeno(1,2,3-cd)pyrene			0.1 U	0.1 U	0.1 U	0.1 U
Pyrene			0.1 U	0.1 U	0.1 U	0.1 U
Total HPAHs			0.1 U	0.1 U	0.1 U	0.1 U

Note:
U = Undetected at or above the MRL

Table 7 - Summary of Surface Water Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Hart Crowser
J-5624-10

Lab ID Sample ID	Fresh Acute	Fresh Chronic	K9807169-023 HC-WS-03-B	K9807169-022 HC-WS-03-M	K9807169-024 HC-RB-100	K9807169-025 HC-RB-101
Phenols in µg/L						
2,4-Dimethylphenol	2120		0.5 U	0.5 U	0.5 U	0.5 U
2-Methylphenol			0.5 U	0.5 U	0.5 U	0.5 U
4-Methylphenol			0.5 U	0.5 U	0.5 U	0.5 U
Pentachlorophenol (PCP)	20	13	0.5 U	0.5 U	0.5 U	0.5 U
Phenol	10200	2560	0.5 U	0.5 U	0.5 U	0.5 U
Phthalates in µg/L						
Bis(2-ethylhexyl) Phthalate			0.2 U	0.7 U	0.6 U	5 U
Butyl Benzyl Phthalate			0.1 U	0.1 U	0.1 U	0.1 U
Di-n-butyl Phthalate			0.1	0.2	0.2	0.1 U
Di-n-octyl Phthalate			0.1 U	0.1 U	0.1 U	0.1 U
Diethyl Phthalate			0.1 U	0.1 U	13	10
Dimethyl Phthalate			0.1 U	0.1 U	0.1 U	0.1 U
Semivolatiles in µg/L						
Benzoic Acid			5 U	5 U	5 U	5 U
Benzyl Alcohol			1 U	1 U	1 U	1 U
Dibenzofuran			0.1 U	0.1 U	0.1 U	0.1 U
Hexachlorobenzene			0.1 U	0.1 U	0.1 U	0.1 U
Hexachlorobutadiene	90	9.3	0.1 U	0.1 U	0.1 U	0.1 U
N-Nitrosodiphenylamine			0.1 U	0.1 U	0.1 U	0.1 U

Note:
U = Undetected at or above the MRL

Table 8 - Percent Pencil Pitch and Diesel in Sediments
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample Name	Lab Code	Concentration (PPM)				% of TPH		
		Pencil Pitch1	Diesel2	TPH Background3	TPH4	Pencil Pitch	Diesel	TPH Background
HC-S-01	K9807097-031	5020	779	97	5896	85	13	2
HC-S-02	K9807097-032	3060	87	<50	3147	97	3	<5
HC-S-03	K9807097-033	2060	<50	<50	2060	100	<5	<5
HC-S-04	K9807097-034	979	183	88	1250	78	15	7
HC-S-05	K9807097-035	772	115	81	968	80	12	8
HC-S-06	K9807097-036	678	135	94	907	75	15	10
HC-S-07	K9807097-037	779	106	77	962	81	11	8
HC-S-12	K9807115-003	647	77	81	805	80	10	10
HC-S-16	K9807115-007	1070	115	108	1293	83	9	8
HC-S-23	K9807115-010	572	58	107	737	78	8	15
HC-S-24	K9807115-011	3200	77	67	3344	96	2	2
HC-S-25	K9807115-013	<50	962	<50	962	<5	100	<5
HC-S-33	K9807115-021	131	121	82	334	39	36	25
HC-S-36	K9807169-001	<50	96	22	118	<15	81	19
HC-S-34	K9807169-002	74.7	375	<50	450	17	83	<5
HC-S-40	K9807169-003	195	<50	85	280	70	<5	30
HC-S-39	K9807169-004	459	<50	122	581	79	<5	21
HC-S-38	K9807169-005	1300	<50	106	1406	92	<5	8
HC-S-19	K9807169-013	8430	<50	<50	8430	100	<5	<5
HC-S-31	K9807169-016	57.6	<50	79	137	42	<5	58
HC-S-30	K9807169-017	311	<50	62	373	83	<5	17

Notes:

[1] Calculated from the sum of LCRMA HPAHs.

[2] Calculated from the sum of Pristane + Phytane.

[3] Calculated from the sum of nC25 - nC31 odd alkanes.

[4] Total Petroleum Hydrocarbons (TPH) calculated as the sum of Pencil Pitch, Diesel and TPH Background.

NC = Not Calculated because the TPH concentration was too low to accurately differentiate Diesel from the TPH Background.

Table 9 - Surface Sediment Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Hart Crowser
J-5624-10

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
Metals in mg/kg						
HC-S-19	Cadmium, Total	5.6	5.1	1.10		
HC-S-25	Cadmium, Total	6.6 J	5.1	1.29		
HC-S-02	Lead, Total	837	450	1.86		
HC-S-09	Lead, Total	626	450	1.39		
HC-S-19	Lead, Total	1160	450	2.58		
HC-S-25	Lead, Total	644 J	450	1.43		
HC-S-02	Zinc, Total	855	410	2.09		
HC-S-04	Zinc, Total	450	410	1.10		
HC-S-09	Zinc, Total	563	410	1.37		
HC-S-13	Zinc, Total	798 J	410	1.95		
HC-S-19	Zinc, Total	1020 J	410	2.49		
HC-S-25	Zinc, Total	1330 J	410	3.24		
HC-S-26	Zinc, Total	435 J	410	1.06		
LPAHs in µg/kg						
HC-S-02	Acenaphthene	14000	500	28.00	2000	7.00
HC-S-04	Acenaphthene	1100	500	2.20		
HC-S-05	Acenaphthene	560	500	1.12		
HC-S-07	Acenaphthene	990	500	1.98		
HC-S-08	Acenaphthene	810	500	1.62		
HC-S-09	Acenaphthene	960	500	1.92		
HC-S-11	Acenaphthene	940	500	1.88		
HC-S-16	Acenaphthene	630	500	1.26		
HC-S-19	Acenaphthene	6100	500	12.20	2000	3.05
HC-S-20	Acenaphthene	1500	500	3.00		
HC-S-38	Acenaphthene	4000	500	8.00	2000	2.00
HC-S-41	Acenaphthene	1600	500	3.20		
HC-S-42	Acenaphthene	920	500	1.84		
HC-S-24	Acenaphthylene	3600	560	6.43	2000	1.80
HC-S-02	Anthracene	12000	960	12.50		
HC-S-04	Anthracene	1700	960	1.77		
HC-S-05	Anthracene	1400	960	1.46		
HC-S-07	Anthracene	1700	960	1.77		
HC-S-08	Anthracene	1200	960	1.25		
HC-S-09	Anthracene	1300	960	1.35		
HC-S-11	Anthracene	1700	960	1.77		
HC-S-16	Anthracene	1900	960	1.98		
HC-S-19	Anthracene	5900	960	6.15		
HC-S-20	Anthracene	2000	960	2.08		
HC-S-24	Anthracene	6600	960	6.88		
HC-S-38	Anthracene	4100	960	4.27		
HC-S-41	Anthracene	2000	960	2.08		
HC-S-42	Anthracene	1500	960	1.56		
HC-S-02	Fluorene	14000	540	25.93	3600	3.89
HC-S-04	Fluorene	670	540	1.24		
HC-S-05	Fluorene	570	540	1.06		
HC-S-07	Fluorene	730	540	1.35		
HC-S-11	Fluorene	590	540	1.09		

Refer to notes at the end of this table.

Table 9 - Surface Sediment Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
LPAHs in µg/kg						
HC-S-16	Fluorene	620	540	1.15		
HC-S-19	Fluorene	2500	540	4.63		
HC-S-20	Fluorene	700	540	1.30		
HC-S-24	Fluorene	1200	540	2.22		
HC-S-41	Fluorene	650	540	1.20		
HC-S-24	Naphthalene	2200	2100	1.05		
HC-S-01	Phenanthrene	49000	1500	32.67	21000	2.33
HC-S-02	Phenanthrene	74000	1500	49.33	21000	3.52
HC-S-03	Phenanthrene	16000	1500	10.67		
HC-S-04	Phenanthrene	6400	1500	4.27		
HC-S-05	Phenanthrene	4700	1500	3.13		
HC-S-06	Phenanthrene	3100	1500	2.07		
HC-S-07	Phenanthrene	6100	1500	4.07		
HC-S-08	Phenanthrene	4300	1500	2.87		
HC-S-09	Phenanthrene	5000	1500	3.33		
HC-S-11	Phenanthrene	5700	1500	3.80		
HC-S-13	Phenanthrene	2100	1500	1.40		
HC-S-14	Phenanthrene	2700	1500	1.80		
HC-S-16	Phenanthrene	4900	1500	3.27		
HC-S-19	Phenanthrene	26000	1500	17.33	21000	1.24
HC-S-20	Phenanthrene	7900	1500	5.27		
HC-S-22	Phenanthrene	1900	1500	1.27		
HC-S-24	Phenanthrene	15000	1500	10.00		
HC-S-28	Phenanthrene	1700	1500	1.13		
HC-S-30	Phenanthrene	1600	1500	1.07		
HC-S-38	Phenanthrene	23000	1500	15.33	21000	1.10
HC-S-39	Phenanthrene	4700	1500	3.13		
HC-S-41	Phenanthrene	7800	1500	5.20		
HC-S-42	Phenanthrene	5300	1500	3.53		
HC-S-01	Total LPAHs	99000	5200	19.04	29000	3.41
HC-S-02	Total LPAHs	124000	5200	23.85	29000	4.28
HC-S-03	Total LPAHs	41000	5200	7.88		
HC-S-04	Total LPAHs (1/2 U)	10470	5200	2.01		
HC-S-05	Total LPAHs (1/2 U)	8130	5200	1.56		
HC-S-07	Total LPAHs (1/2 U)	9920	5200	1.91		
HC-S-08	Total LPAHs (1/2 U)	7120	5200	1.37		
HC-S-09	Total LPAHs (1/2 U)	8110	5200	1.56		
HC-S-11	Total LPAHs (1/2 U)	9380	5200	1.80		
HC-S-16	Total LPAHs (1/2 U)	8980	5200	1.73		
HC-S-24	Total LPAHs (1/2 U)	29010	5200	5.58	29000	1.00
HPAHs in µg/kg						
HC-S-01	Benz(a)anthracene	77000	1300	59.23	5100	15.10
HC-S-02	Benz(a)anthracene	81000	1300	62.31	5100	15.88
HC-S-03	Benz(a)anthracene	28000	1300	21.54	5100	5.49
HC-S-04	Benz(a)anthracene	13000	1300	10.00	5100	2.55
HC-S-05	Benz(a)anthracene	8600	1300	6.62	5100	1.69
HC-S-06	Benz(a)anthracene	7000	1300	5.38	5100	1.37
HC-S-07	Benz(a)anthracene	12000	1300	9.23	5100	2.35

Refer to notes at the end of this table.

Table 9 - Surface Sediment Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
HPAHs in µg/kg						
HC-S-08	Benz(a)anthracene	8200	1300	6.31	5100	1.61
HC-S-09	Benz(a)anthracene	11000	1300	8.46	5100	2.16
HC-S-11	Benz(a)anthracene	11000	1300	8.46	5100	2.16
HC-S-13	Benz(a)anthracene	4600	1300	3.54		
HC-S-14	Benz(a)anthracene	4800	1300	3.69		
HC-S-16	Benz(a)anthracene	9000	1300	6.92	5100	1.76
HC-S-19	Benz(a)anthracene	44000	1300	33.85	5100	8.63
HC-S-20	Benz(a)anthracene	14000	1300	10.77	5100	2.75
HC-S-22	Benz(a)anthracene	4000	1300	3.08		
HC-S-24	Benz(a)anthracene	37000	1300	28.46	5100	7.25
HC-S-26	Benz(a)anthracene	2300	1300	1.77		
HC-S-28	Benz(a)anthracene	3200	1300	2.46		
HC-S-30	Benz(a)anthracene	2700	1300	2.08		
HC-S-35	Benz(a)anthracene	1500	1300	1.15		
HC-S-38	Benz(a)anthracene	29000	1300	22.31	5100	5.69
Hc-S-39	Benz(a)anthracene	6200	1300	4.77	5100	1.22
HC-S-41	Benz(a)anthracene	15000	1300	11.54	5100	2.94
HC-S-42	Benz(a)anthracene	11000	1300	8.46	5100	2.16
HC-S-01	Benzo(a)pyrene	86000	1600	53.75	3600	23.89
HC-S-02	Benzo(a)pyrene	82000	1600	51.25	3600	22.78
HC-S-03	Benzo(a)pyrene	33000	1600	20.63	3600	9.17
HC-S-04	Benzo(a)pyrene	15000	1600	9.38	3600	4.17
HC-S-05	Benzo(a)pyrene	9600	1600	6.00	3600	2.67
HC-S-06	Benzo(a)pyrene	9100	1600	5.69	3600	2.53
HC-S-07	Benzo(a)pyrene	13000	1600	8.13	3600	3.61
HC-S-08	Benzo(a)pyrene	11000	1600	6.88	3600	3.06
HC-S-09	Benzo(a)pyrene	12000	1600	7.50	3600	3.33
HC-S-11	Benzo(a)pyrene	13000	1600	8.13	3600	3.61
HC-S-13	Benzo(a)pyrene	5500	1600	3.44	3600	1.53
HC-S-14	Benzo(a)pyrene	5400	1600	3.38	3600	1.50
HC-S-16	Benzo(a)pyrene	11000	1600	6.88	3600	3.06
HC-S-19	Benzo(a)pyrene	55000	1600	34.38	3600	15.28
HC-S-20	Benzo(a)pyrene	18000	1600	11.25	3600	5.00
HC-S-22	Benzo(a)pyrene	4900	1600	3.06	3600	1.36
HC-S-24	Benzo(a)pyrene	39000	1600	24.38	3600	10.83
HC-S-26	Benzo(a)pyrene	2700	1600	1.69		
HC-S-28	Benzo(a)pyrene	4000	1600	2.50	3600	1.11
HC-S-30	Benzo(a)pyrene	3300	1600	2.06		
HC-S-35	Benzo(a)pyrene	1800	1600	1.13		
HC-S-38	Benzo(a)pyrene	31000	1600	19.38	3600	8.61
HC-S-39	Benzo(a)pyrene	6700	1600	4.19	3600	1.86
HC-S-40	Benzo(a)pyrene	1700	1600	1.06		
HC-S-41	Benzo(a)pyrene	20000	1600	12.50	3600	5.56
HC-S-42	Benzo(a)pyrene	14000	1600	8.75	3600	3.89
HC-S-01	Benzo(g,h,I)perylene	55000	670	82.09	3200	17.19
HC-S-02	Benzo(g,h,I)perylene	50000	670	74.63	3200	15.63
HC-S-03	Benzo(g,h,I)perylene	22000	670	32.84	3200	6.88

Refer to notes at the end of this table.

Table 9 - Surface Sediment Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
HPAHs in µg/kg						
HC-S-04	Benzo(g,h,I)perylene	11000	670	16.42	3200	3.44
HC-S-05	Benzo(g,h,I)perylene	7100	670	10.60	3200	2.22
HC-S-06	Benzo(g,h,I)perylene	5100	670	7.61	3200	1.59
HC-S-07	Benzo(g,h,I)perylene	9400	670	14.03	3200	2.94
HC-S-08	Benzo(g,h,I)perylene	6800	670	10.15	3200	2.13
HC-S-09	Benzo(g,h,I)perylene	8600	670	12.84	3200	2.69
HC-S-11	Benzo(g,h,I)perylene	8900	670	13.28	3200	2.78
HC-S-13	Benzo(g,h,i)perylene	3900	670	5.82	3200	1.22
HC-S-14	Benzo(g,h,i)perylene	4000	670	5.97	3200	1.25
HC-S-16	Benzo(g,h,i)perylene	7600	670	11.34	3200	2.38
HC-S-19	Benzo(g,h,i)perylene	38000	670	56.72	3200	11.88
HC-S-20	Benzo(g,h,i)perylene	13000	670	19.40	3200	4.06
HC-S-22	Benzo(g,h,i)perylene	3300	670	4.93	3200	1.03
HC-S-24	Benzo(g,h,i)perylene	27000	670	40.30	3200	8.44
HC-S-25	Benzo(g,h,i)perylene	1000	670	1.49		
HC-S-26	Benzo(g,h,i)perylene	1900	670	2.84		
HC-S-28	Benzo(g,h,i)perylene	2800	670	4.18		
HC-S-30	Benzo(g,h,i)perylene	2500	670	3.73		
HC-S-32	Benzo(g,h,i)perylene	1200	670	1.79		
HC-S-35	Benzo(g,h,i)perylene	1200	670	1.79		
HC-S-38	Benzo(g,h,i)perylene	23000	670	34.33	3200	7.19
HC-S-39	Benzo(g,h,i)perylene	5400	670	8.06	3200	1.69
HC-S-40	Benzo(g,h,i)perylene	1300	670	1.94		
HC-S-41	Benzo(g,h,i)perylene	16000	670	23.88	3200	5.00
HC-S-42	Benzo(g,h,i)perylene	11000	670	16.42	3200	3.44
HC-S-01	Chrysene	75000	1400	53.57	21000	3.57
HC-S-02	Chrysene	78000	1400	55.71	21000	3.71
HC-S-03	Chrysene	30000	1400	21.43	21000	1.43
HC-S-04	Chrysene	11000	1400	7.86		
HC-S-05	Chrysene	7800	1400	5.57		
HC-S-06	Chrysene	6300	1400	4.50		
HC-S-07	Chrysene	10000	1400	7.14		
HC-S-08	Chrysene	8600	1400	6.14		
HC-S-09	Chrysene	11000	1400	7.86		
HC-S-11	Chrysene	11000	1400	7.86		
HC-S-13	Chrysene	4500	1400	3.21		
HC-S-14	Chrysene	4500	1400	3.21		
HC-S-16	Chrysene	8900	1400	6.36		
HC-S-19	Chrysene	46000	1400	32.86	21000	2.19
HC-S-20	Chrysene	14000	1400	10.00		
HC-S-22	Chrysene	3800	1400	2.71		
HC-S-24	Chrysene	38000	1400	27.14	21000	1.81
HC-S-25	Chrysene	1500	1400	1.07		
HC-S-26	Chrysene	2200	1400	1.57		
HC-S-28	Chrysene	3200	1400	2.29		
HC-S-30	Chrysene	3000	1400	2.14		
HC-S-32	Chrysene	1200	1400	0.86		
HC-S-38	Chrysene	31000	1400	22.14	21000	1.48

Refer to notes at the end of this table.

Table 9 - Surface Sediment Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
HPAHs in µg/kg						
HC-S-39	Chrysene	7000	1400	5.00		
HC-S-40	Chrysene	1700	1400	1.21		
HC-S-41	Chrysene	16000	1400	11.43		
HC-S-42	Chrysene	11000	1400	7.86		
HC-S-04	Dibenz(a,h)anthracene	1200	230	5.22		
HC-S-05	Dibenz(a,h)anthracene	730	230	3.17		
HC-S-06	Dibenz(a,h)anthracene	670	230	2.91		
HC-S-07	Dibenz(a,h)anthracene	1200	230	5.22		
HC-S-08	Dibenz(a,h)anthracene	1100	230	4.78		
HC-S-09	Dibenz(a,h)anthracene	1300	230	5.65		
HC-S-11	Dibenz(a,h)anthracene	2200	230	9.57	1900	1.16
HC-S-13	Dibenz(a,h)anthracene	870	230	3.78		
HC-S-14	Dibenz(a,h)anthracene	570	230	2.48		
HC-S-16	Dibenz(a,h)anthracene	1700	230	7.39		
HC-S-19	Dibenz(a,h)anthracene	11000	230	47.83	1900	5.79
HC-S-20	Dibenz(a,h)anthracene	3100	230	13.48	1900	1.63
HC-S-22	Dibenz(a,h)anthracene	800	230	3.48	1900	
HC-S-24	Dibenz(a,h)anthracene	4700	230	20.43	1900	2.47
HC-S-26	Dibenz(a,h)anthracene	350	230	1.52		
HC-S-28	Dibenz(a,h)anthracene	630	230	2.74		
HC-S-30	Dibenz(a,h)anthracene	540	230	2.35		
HC-S-32	Dibenz(a,h)anthracene	290	230	1.26		
HC-S-35	Dibenz(a,h)anthracene	280	230	1.22		
HC-S-38	Dibenz(a,h)anthracene	7200	230	31.30	1900	3.79
HC-S-39	Dibenz(a,h)anthracene	1700	230	7.39		
HC-S-40	Dibenz(a,h)anthracene	290	230	1.26		
HC-S-41	Dibenz(a,h)anthracene	3900	230	16.96	1900	2.05
HC-S-42	Dibenz(a,h)anthracene	2600	230	11.30	1900	1.37
HC-S-01	Fluoranthene	120000	1700	70.59	30000	4.00
HC-S-02	Fluoranthene	130000	1700	76.47	30000	4.33
HC-S-03	Fluoranthene	42000	1700	24.71	30000	1.40
HC-S-04	Fluoranthene	21000	1700	12.35		
HC-S-05	Fluoranthene	18000	1700	10.59		
HC-S-06	Fluoranthene	13000	1700	7.65		
HC-S-07	Fluoranthene	19000	1700	11.18		
HC-S-08	Fluoranthene	13000	1700	7.65		
HC-S-09	Fluoranthene	16000	1700	9.41		
HC-S-11	Fluoranthene	21000	1700	12.35		
HC-S-13	Fluoranthene	9600	1700	5.65		
HC-S-14	Fluoranthene	13000	1700	7.65		
HC-S-16	Fluoranthene	21000	1700	12.35		
HC-S-19	Fluoranthene	70000 J	1700	41.18	30000	2.33
HC-S-20	Fluoranthene	26000	1700	15.29		
HC-S-22	Fluoranthene	7200	1700	4.24		
HC-S-24	Fluoranthene	84000	1700	49.41	30000	2.80
HC-S-25	Fluoranthene	3100	1700	1.82		
HC-S-26	Fluoranthene	5500	1700	3.24		
HC-S-28	Fluoranthene	6500	1700	3.82		

Refer to notes at the end of this table.

Table 9 - Surface Sediment Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
HPAHs in µg/kg						
HC-S-30	Fluoranthene	5200	1700	3.06		
HC-S-32	Fluoranthene	2000	1700	1.18		
HC-S-34	Fluoranthene	2300	1700	1.35		
HC-S-35	Fluoranthene	2700	1700	1.59		
HC-S-38	Fluoranthene	58000	1700	34.12	30000	1.93
HC-S-39	Fluoranthene	13000	1700	7.65		
HC-S-40	Fluoranthene	3000	1700	1.76		
HC-S-41	Fluoranthene	24000	1700	14.12		
HC-S-42	Fluoranthene	17000	1700	10.00		
HC-S-44	Fluoranthene	1800	1700	1.06		
HC-S-01	Indeno(1,2,3-cd)pyrene	110000	600	183.33	4400	25.00
HC-S-02	Indeno(1,2,3-cd)pyrene	92000	600	153.33	4400	20.91
HC-S-03	Indeno(1,2,3-cd)pyrene	40000	600	66.67	4400	9.09
HC-S-04	Indeno(1,2,3-cd)pyrene	19000	600	31.67	4400	4.32
HC-S-05	Indeno(1,2,3-cd)pyrene	10000	600	16.67	4400	2.27
HC-S-06	Indeno(1,2,3-cd)pyrene	10000	600	16.67	4400	2.27
HC-S-07	Indeno(1,2,3-cd)pyrene	17000	600	28.33	4400	3.86
HC-S-08	Indeno(1,2,3-cd)pyrene	12000	600	20.00	4400	2.73
HC-S-09	Indeno(1,2,3-cd)pyrene	15000	600	25.00	4400	3.41
HC-S-11	Indeno(1,2,3-cd)pyrene	14000	600	23.33	4400	3.18
HC-S-13	Indeno(1,2,3-cd)pyrene	7100	600	11.83	4400	1.61
HC-S-14	Indeno(1,2,3-cd)pyrene	6600	600	11.00	4400	1.50
HC-S-16	Indeno(1,2,3-cd)pyrene	13000	600	21.67	4400	2.95
HC-S-19	Indeno(1,2,3-cd)pyrene	60000	600	100.00	4400	13.64
HC-S-20	Indeno(1,2,3-cd)pyrene	21000	600	35.00	4400	4.77
HC-S-22	Indeno(1,2,3-cd)pyrene	6000	600	10.00	4400	1.36
HC-S-24	Indeno(1,2,3-cd)pyrene	41000	600	68.33	4400	9.32
HC-S-25	Indeno(1,2,3-cd)pyrene	1800	600	3.00		
HC-S-26	Indeno(1,2,3-cd)pyrene	3400	600	5.67	4400	0.77
HC-S-28	Indeno(1,2,3-cd)pyrene	5100	600	8.50	4400	1.16
HC-S-30	Indeno(1,2,3-cd)pyrene	4600	600	41.18	4400	1.05
HC-S-32	Indeno(1,2,3-cd)pyrene	1300	600	2.17		
HC-S-34	Indeno(1,2,3-cd)pyrene	1300	600	2.17		
HC-S-35	Indeno(1,2,3-cd)pyrene	2300	600	3.83		
HC-S-37	Indeno(1,2,3-cd)pyrene	900	600	1.50		
HC-S-38	Indeno(1,2,3-cd)pyrene	53000	600	88.33	4400	12.05
HC-S-39	Indeno(1,2,3-cd)pyrene	10000	600	16.67	4400	2.27
HC-S-40	Indeno(1,2,3-cd)pyrene	2600	600	4.33		
HC-S-41	Indeno(1,2,3-cd)pyrene	25000	600	41.67	4400	5.68
HC-S-42	Indeno(1,2,3-cd)pyrene	18000	600	30.00	4400	4.09
HC-S-43	Indeno(1,2,3-cd)pyrene	1700	600	2.83		
HC-S-44	Indeno(1,2,3-cd)pyrene	1400	600	2.33		
HC-S-01	Pyrene	98000	2600	37.69	16000	6.13
HC-S-02	Pyrene	100000	2600	38.46	16000	6.25
HC-S-03	Pyrene	40000	2600	15.38	16000	2.50
HC-S-04	Pyrene	21000	2600	8.08	16000	1.31
HC-S-05	Pyrene	20000	2600	7.69	16000	1.25
HC-S-05	Pyrene	20000	2600	7.69	16000	1.25

Refer to notes at the end of this table.

Table 9 - Surface Sediment Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
HPAHs in µg/kg						
HC-S-06	Pyrene	13000	2600	5.00		
HC-S-07	Pyrene	21000	2600	8.08	16000	1.31
HC-S-08	Pyrene	14000	2600	5.38		
HC-S-09	Pyrene	16000	2600	6.15	16000	1.00
HC-S-11	Pyrene	22000	2600	8.46	16000	1.38
HC-S-13	Pyrene	11000	2600	4.23		
HC-S-14	Pyrene	17000	2600	6.54	16000	1.06
HC-S-16	Pyrene	25000	2600	9.62	16000	1.56
HC-S-19	Pyrene	68000	2600	26.15	16000	4.25
HC-S-20	Pyrene	25000	2600	9.62	16000	1.56
HC-S-22	Pyrene	7500	2600	2.88		
HC-S-24	Pyrene	110000	2600	42.31	16000	6.88
HC-S-25	Pyrene	3700	2600	1.42		
HC-S-26	Pyrene	6800	2600	2.62		
HC-S-28	Pyrene	7000	2600	2.69		
HC-S-30	Pyrene	5000	2600	1.92		
HC-S-34	Pyrene	2800	2600	41.18		
HC-S-35	Pyrene	2700	2600	1.04		
HC-S-38	Pyrene	46000	2600	17.69	16000	2.88
HC-S-39	Pyrene	10000	2600	3.85		
HC-S-41	Pyrene	22000	2600	8.46	16000	1.38
HC-S-42	Pyrene	16000	2600	6.15	16000	1.00
HC-S-01	Total Benzofluoranthenes	144000	3200	45.00	9900	14.55
HC-S-02	Total Benzofluoranthenes	141000	3200	44.06	9900	14.24
HC-S-03	Total Benzofluoranthenes	5600	3200	1.75		
HC-S-04	Total Benzofluoranthenes	22100	3200	6.91	9900	2.23
HC-S-05	Total Benzofluoranthenes	13500	3200	4.22	9900	1.36
HC-S-06	Total Benzofluoranthenes	11300	3200	3.53	9900	1.14
HC-S-07	Total Benzofluoranthenes	20100	3200	6.28	9900	2.03
HC-S-08	Total Benzofluoranthenes	13800	3200	4.31	9900	1.39
HC-S-09	Total Benzofluoranthenes	16000	3200	5.00	9900	1.62
HC-S-11	Total Benzofluoranthenes	18400	3200	5.75	9900	1.86
HC-S-13	Total Benzofluoranthenes	7500	3200	2.34		
HC-S-14	Total Benzofluoranthenes	6500	3200	2.03		
HC-S-16	Total Benzofluoranthenes	14600	3200	4.56	9900	1.47
HC-S-22	Total Benzofluoranthenes	7000	3200	2.19		
HC-S-24	Total Benzofluoranthenes	47000	3200	14.69	9900	4.75
HC-S-26	Total Benzofluoranthenes	3400	3200	1.06		
HC-S-28	Total Benzofluoranthenes	5600	3200	1.75		
HC-S-01	Total HPAHs	775000	12000	64.58	69000	11.23
HC-S-02	Total HPAHs	759000	12000	63.25	69000	11.00
HC-S-03	Total HPAHs	296000	12000	24.67	69000	4.29
HC-S-04	Total HPAHs	134300	12000	11.19	69000	1.95
HC-S-05	Total HPAHs	95330	12000	7.94	69000	1.38
HC-S-06	Total HPAHs	75470	12000	41.18	69000	1.09
HC-S-07	Total HPAHs	122700	12000	10.23	69000	1.78
HC-S-08	Total HPAHs	88500	12000	7.38	69000	1.28
HC-S-09	Total HPAHs	106900	12000	8.91	69000	1.55

Refer to notes at the end of this table.

Table 9 - Surface Sediment Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
HPAHs in µg/kg						
HC-S-11	Total HPAHs	121500	12000	10.13	69000	1.76
HC-S-13	Total HPAHs	54570	12000	4.55		
HC-S-14	Total HPAHs	62370	12000	5.20		
HC-S-16	Total HPAHs	111800	12000	9.32	69000	1.62
HC-S-22	Total HPAHs	44500	12000	3.71		
HC-S-24	Total HPAHs	427700	12000	35.64	69000	6.20
HC-S-25	Total HPAHs	15450	12000	1.29		
HC-S-26	Total HPAHs	28550	12000	2.38		
HC-S-28	Total HPAHs	38030	12000	3.17		
HC-S-32	Total HPAHs	12890	12000	1.07		
HC-S-35	Total HPAHs	16780	12000	1.40		
Phenols in µg/kg						
HC-S-19	2,4-Dimethylphenol	31	29	1.07		
Semivolatiles in µg/kg						
HC-S-19	Dibenzofuran	660	540	1.22		
HC-S-38	Dibenzofuran	860	540	1.59		
Pesticides/PCBs µg/kg						
HC-S-16	Total DDT	39 J	6.9	5.65		
HC-S-28	Total DDT	23 J	6.9	3.33		
HC-S-36	Total DDT	15 J	6.9	2.17		
HC-S-39	Total DDT	7 J	6.9	1.01		
HC-S-43	Total DDT	28 J	6.9	4.06		

Notes:

J = Estimated concentration. Value is less than Method Reporting Limit, but greater than Method Detection Limit.

SL = Screening Level from LCRMA.

ML = Maximum Level from LCRMA.

Table 10 - Subsurface Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
Metals in mg/kg						
HC-VC-11-S2	Lead, Total	527	450	1.17		
HC-VC-7-S2	Lead, Total	576	450	1.28		
HC-VC-11-S2	Zinc, Total	656	410	1.60		
HC-VC-7-S1	Zinc, Total	469	410	1.14		
HC-VC-7-S2	Zinc, Total	650	410	1.59		
LPAHs in µg/kg						
HC-VC-18-S1	Acenaphthene	510	500	1.02		
HC-VC-11-S1	Anthracene	1000	960	1.04		
HC-VC-11-S1	Phenanthrene	4300	1500	2.87		
HC-VC-11-S2	Phenanthrene	8400	1500	5.60		
HC-VC-18-S1	Phenanthrene	2200	1500	1.47		
HC-VC-27-S1	Phenanthrene	2200	1500	1.47		
HC-VC-27-S2	Phenanthrene	2400	1500	1.60		
HC-VC-42-S1	Phenanthrene	4500	1500	3.00		
HC-VC-42-S2	Phenanthrene	10000	1500	6.67		
HC-VC-7-S2	Phenanthrene	6100	1500	4.07		
HC-VC-11-S1	Total LPAHs (1/2 U)	7300	5200	1.40		
HC-VC-11-S2	Total LPAHs (1/2 U)	18400	5200	3.54		
HC-VC-42-S2	Total LPAHs (1/2 U)	20000	5200	3.85		
HC-VC-7-S2	Total LPAHs (1/2 U)	16100	5200	3.10		
HPAHs in µg/kg						
HC-VC-11-S1	Benz(a)anthracene	7500	1300	5.77	1300	5.77
HC-VC-11-S2	Benz(a)anthracene	15000	1300	11.54	5100	2.94
HC-VC-18-S1	Benz(a)anthracene	4100	1300	3.15		
HC-VC-18-S2	Benz(a)anthracene	1600	1300	1.23		
HC-VC-27-S1	Benz(a)anthracene	3900	1300	3.00		
HC-VC-27-S2	Benz(a)anthracene	4400	1300	3.38		
HC-VC-42-S1	Benz(a)anthracene	9400	1300	7.23	5100	1.84
HC-VC-42-S2	Benz(a)anthracene	20000	1300	15.38	5100	3.92
HC-VC-7-S1	Benz(a)anthracene	20000	1300	15.38	5100	3.92
HC-VC-7-S2	Benz(a)anthracene	9300	1300	7.15	5100	1.82
HC-VC-11-S1	Benzo(a)pyrene	8200	1600	5.13	3600	2.28
HC-VC-11-S2	Benzo(a)pyrene	18000	1600	11.25	3600	5.00
HC-VC-18-S1	Benzo(a)pyrene	4800	1600	3.00	3600	1.33
HC-VC-18-S2	Benzo(a)pyrene	1900	1600	1.19		
HC-VC-27-S1	Benzo(a)pyrene	4300	1600	2.69	3600	1.19
HC-VC-27-S2	Benzo(a)pyrene	4800	1600	3.00	3600	1.33
HC-VC-42-S1	Benzo(a)pyrene	11000	1600	6.88	3600	3.06
HC-VC-42-S2	Benzo(a)pyrene	24000	1600	15.00	3600	6.67
HC-VC-7-S1	Benzo(a)pyrene	23000	1600	14.38	3600	6.39
HC-VC-7-S2	Benzo(a)pyrene	11000	1600	6.88	3600	3.06
HC-VC-11-S1	Benzo(g,h,i)perylene	5200	670	7.76	3200	1.63
HC-VC-11-S2	Benzo(g,h,i)perylene	9600	670	14.33	3200	3.00
HC-VC-18-S1	Benzo(g,h,i)perylene	2600	670	3.88		
HC-VC-18-S2	Benzo(g,h,i)perylene	1300	670	1.94		
HC-VC-27-S1	Benzo(g,h,i)perylene	3000	670	4.48		

Refer to notes at the end of this table.

Table 10 - Subsurface Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
HC-VC-27-S2	Benzo(g,h,i)perylene	3300	670	4.93	3200	1.03
HC-VC-42-S1	Benzo(g,h,i)perylene	7300	670	10.90	3200	2.28
HC-VC-42-S2	Benzo(g,h,i)perylene	16000	670	23.88	3200	5.00
HC-VC-7-S1	Benzo(g,h,i)perylene	14000	670	20.90	3200	4.38
HC-VC-7-S2	Benzo(g,h,i)perylene	6800	670	10.15	3200	2.13
HC-VC-11-S1	Chrysene	7300	1400	5.21		
HC-VC-11-S2	Chrysene	14000	1400	10.00		
HC-VC-18-S1	Chrysene	4000	1400	2.86		
HC-VC-18-S2	Chrysene	1800	1400	1.29		
HC-VC-27-S1	Chrysene	3800	1400	2.71		
HC-VC-27-S2	Chrysene	4200	1400	3.00		
HC-VC-42-S1	Chrysene	8900	1400	6.36		
HC-VC-42-S2	Chrysene	19000	1400	13.57		
HC-VC-7-S1	Chrysene	20000	1400	14.29		
HC-VC-7-S2	Chrysene	9800	1400	7.00		
HC-VC-11-S1	Fluoranthene	10000	1700	5.88		
HC-VC-11-S2	Fluoranthene	21000	1700	12.35		
HC-VC-18-S1	Fluoranthene	5700	1700	3.35		
HC-VC-18-S2	Fluoranthene	2300	1700	1.35		
HC-VC-27-S1	Fluoranthene	5500	1700	3.24		
HC-VC-27-S2	Fluoranthene	6200	1700	3.65		
HC-VC-42-S1	Fluoranthene	11000	1700	6.47		
HC-VC-42-S2	Fluoranthene	27000	1700	15.88		
HC-VC-7-S1	Fluoranthene	28000	1700	16.47		
HC-VC-7-S2	Fluoranthene	14000	1700	8.24		
HC-VC-11-S1	Indeno(1,2,3-cd)pyrene	9200	600	15.33	4400	2.09
HC-VC-11-S2	Indeno(1,2,3-cd)pyrene	18000	600	30.00	4400	4.09
HC-VC-18-S1	Indeno(1,2,3-cd)pyrene	4400	600	7.33		
HC-VC-18-S2	Indeno(1,2,3-cd)pyrene	2200	600	3.67		
HC-VC-27-S1	Indeno(1,2,3-cd)pyrene	5500	600	9.17	4400	1.25
HC-VC-27-S2	Indeno(1,2,3-cd)pyrene	6000	600	10.00	4400	1.36
HC-VC-32-S1	Indeno(1,2,3-cd)pyrene	690	600	1.15		
HC-VC-39-S1	Indeno(1,2,3-cd)pyrene	1100	600	1.83		
HC-VC-39-S2	Indeno(1,2,3-cd)pyrene	730	600	1.22		
HC-VC-42-S1	Indeno(1,2,3-cd)pyrene	15000	600	25.00	4400	3.41
HC-VC-42-S2	Indeno(1,2,3-cd)pyrene	32000	600	53.33	4400	7.27
HC-VC-7-S1	Indeno(1,2,3-cd)pyrene	25000	600	41.67	4400	5.68
HC-VC-7-S2	Indeno(1,2,3-cd)pyrene	12000	600	20.00	4400	2.73
HC-VC-11-S1	Pyrene	9100	2600	3.50		
HC-VC-11-S2	Pyrene	18000	2600	6.92	16000	1.13
HC-VC-18-S1	Pyrene	5000	2600	1.92		
HC-VC-27-S1	Pyrene	5000	2600	1.92		
HC-VC-27-S2	Pyrene	5600	2600	2.15		
HC-VC-42-S1	Pyrene	10000	2600	3.85		
HC-VC-42-S2	Pyrene	24000	2600	9.23	16000	1.50
HC-VC-7-S1	Pyrene	24000	2600	9.23	16000	1.50
HC-VC-7-S2	Pyrene	12000	2600	4.62		

Refer to notes at the end of this table.

Table 10 - Subsurface Locations that Exceeded LCRMA SLs or MLs
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	Chemical Constituent	Concentration (mg/kg)	SL	SL Enrichment Ratio	ML	ML Enrichment Ratio
HC-VC-11-S1	Total Benzofluoranthenes	13100	3200	4.09	9900	1.32
HC-VC-11-S2	Total Benzofluoranthenes	25000	3200	7.81		
HC-VC-18-S1	Total Benzofluoranthenes	7500	3200	2.34		
HC-VC-18-S2	Total Benzofluoranthenes	3400	3200	1.06		
HC-VC-27-S1	Total Benzofluoranthenes	7100	3200	2.22		
HC-VC-27-S2	Total Benzofluoranthenes	7300	3200	2.28		
HC-VC-42-S1	Total Benzofluoranthenes	17100	3200	5.34	9900	1.73
HC-VC-42-S2	Total Benzofluoranthenes	36000	3200	11.25	9900	3.64
HC-VC-7-S1	Total Benzofluoranthenes	36000	3200	11.25	9900	3.64
HC-VC-7-S2	Total Benzofluoranthenes	18000	3200	5 63	9900	1.82
HC-VC-11-S1	Total HPAHs	70100	12000	5.84	69000	1.02
HC-VC-11-S2	Total HPAHs	140600	12000	11.72	69000	2.04
HC-VC-18-S1	Total HPAHs	38300	12000	3.19		
HC-VC-18-S2	Total HPAHs	16500	12000	1.38		
HC-VC-27-S1	Total HPAHs	38600	12000	3.22		
HC-VC-27-S2	Total HPAHs	42300	12000	3.53		
HC-VC-42-S1	Total HPAHs	91700	12000	7.64	69000	1.33
HC-VC-42-S2	Total HPAHs	200000	12000	16.67	69000	2.90
HC-VC-7-S1	Total HPAHs	192000	12000	16.00	69000	2.78
HC-VC-7-S2	Total HPAHs	94900	12000	7.91	69000	1.38

Notes:

J = Estimated concentration. Value is less than Method Reporting Limit, but greater than Method Detection Limit.

SL = Screening Level from LCRMA.

ML = Maximum Level from LCRMA.

E-Ratio = The enrichment ratio of a sample concentration to the SL and ML value.

Table 11 - Vertical Distribution of Chemical Constituents above the LCRMA
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	HC-S-07	HC-VC-7-S1	HC-VC-7-S2	HC-S-11	HC-VC-11-S1	HC-VC-11-S2	HC-S-13	HC-VC-13-S1	HC-VC-13-S2	HC-S-18	HC-VC-18-S1	HC-VC-18-S2	HC-S-22	HC-VC-22-S1	HC-VC-22-S2
Depth in Feet	0 to 0 3	0 to 2.0	2 0 to 4.2	0 to 0.3	0 to 2.1	2 1 to 4 0	0 to 0.3	0 to 2.0	2 0 to 4.0	0 to 0.3	0 to 2 2	2 2 to 4 0	0 to 0.3	0 to 2 0	2 0 to 4.0
Metals in mg/kg															
Antimony	0.3	0.6	1 4	0.6	0.3	1 1	0.2	0.1	0 1	NR	NR	NR	0.2	0 1	0.1
Arsenic	7	8	15	9	7	12	5	2	2	NR	NR	NR	5	2	2
Cadmium	2	2.4	3.3	1.9	1.2	3.2	2	0 2	0 2	NR	NR	NR	1	0.1	0.1
Chromium	31.9	27.3	23.2	31.2	25.3	22.6	24.6	9	10 7	NR	NR	NR	23 1	11.8	9 6
Copper	64	62.8	83 2	70.4	52.1	78 3	45.3	13 3	15 2	NR	NR	NR	44 1	17.6	13 4
Lead	322	361	576	357	169	527	289	25.8	23 9	NR	NR	NR	125	12.1	3
Mercury	0.16	0 15	0.18	0.13	0.09	0 12	0 06	0 03	0 02	NR	NR	NR	0.09	0.02	0 02
Nickel	27	26	25	27	24	24	21	15	17	NR	NR	NR	23	17	16
Silver	0.8	0.9	1.4	0.7	0.6	1.2	0 4	0 1	0 1	NR	NR	NR	0.3	0 1	0 1
Zinc	399	469	650	397	273	656	798	61	65	NR	NR	NR	225	55	37
LPAHs in µg/kg															
Total LPAHs	9,920	12,000	16,100	9,380	7,300	18,400	3,500	182	148	NR	3,830	1,320	3,120	237	60
HPAHs in µg/kg															
Total HPAHs	122,700	192,000	94,900	121,500	70,100	140,600	54,570	2,258	2,073	NR	38,300	16,500	44,500	2,563	100
TPH in mg/kg															
Pencil Pitch	1,240	1,920	938	1,230	703	1,400	551	23	21	2,600	385	166	449	26	ND
Diesel	108	NR	NR	<100	<100	<100	<100	<25	NR	<100	NR	NR	<100	NR	NR

Notes:
exceeds LCRMA Screening Level
exceeds LCRMA Maximum Level
NR Not Reported
ND Not Detected

Table 11 - Vertical Distribution of Chemical Constituents above the LCRMA
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID	HC-S-27	HC-VC-27-S1	HC-VC-27-S2	HC-S-32	HC-VC-32-S1	HC-VC-32-S2	HC-S-39	HC-VC-39-S1	HC-VC-39-S2	HC-S-42	HC-VC-42-S1	HC-VC-42-S2
Depth in Feet	0 to 0 3	0 to 1.9	1.9 to 3 5	0 to 0 3	0 to 1 8	1.8 to 4 0	0 to 0 3	0 to 2.0	2.0 to 4.0	0 to 0 3	0 to 2 0	2 0 to 4 0
Metals in mg/kg												
Antimony	NR	0 3	0 2	0.1	NR	NR	0 2	0 1	0 1	0 2	0 1	0 2
Arsenic	NR	5	5	4	NR	NR	4	3	4	4	4	5
Cadmium	NR	0.8	1.1	0 5	NR	NR	0 2	0.2	0.2	0.3	0 2	0 7
Chromium	NR	22 1	18.5	21.8	NR	NR	26.4	23 8	27.4	27 3	25.5	29 4
Copper	NR	47.8	43	34.6	NR	NR	38	38.4	44 4	40 7	40.4	54.6
Lead	NR	116	144	51 6	NR	NR	30 1	19 3	27.6	36	23 9	79 1
Mercury	NR	0 08	0 08	0.07	NR	NR	0 08	0 08	0 08	0 07	0.07	0 13
Nickel	NR	22	22	22	NR	NR	22	22	24	22	23	23
Silver	NR	0 4	0 4	0 2	NR	NR	0 2	0.4	0.4	0 2	0.2	0 4
Zinc	NR	193	245	146	NR	NR	104	89	109	124	100	207
LPAHs in µg/kg												
Total LPAHs	NR	4,700	4,900	1,383	530	60	**6,269**	870	60	**8,255**	**14,500**	**20,000**
HPAHs in µg/kg												
Total HPAHs	NR	**38,600**	**42,300**	**12,890**	4,770	100	7,200	8,010	5,380	**120,500**	**91,700**	**200,000**
TPH in mg/kg												
Pencil Pitch	1,400	385	422	130	48	ND	727	80	54	1,220	906	2,000
Diesel	<100	NR	NR	<100	NR	NR	<50	NR	NR	<100	NR	NR

Notes:
bold exceeds LCRMA Screening Level
bold exceeds LCRMA Maximum Level
NR Not Reported
ND Not Detected

Table 12 - Summary of Pencil Pitch and Diesel Results
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample Name	Lab Code	Pencil Pitch[1]	Pencil Pitch[2]	Pencil Pitch[3]	Diesel[4]	Diesel[5]
HC-S-01	K9807097-031	-	7730	-	-	779
HC-S-02	K9807097-032	-	7620	-	-	87
HC-S-03	K9807097-033	-	2940	-	-	<50
HC-S-04	K9807097-034	-	1350	-	-	183
HC-S-05	K9807097-035	-	963	-	-	115
HC-S-06	K9807097-036	-	763	-	-	135
HC-S-07	K9807097-037	-	1240	-	-	106
HC-S-08	K9807097-038	-	894	-	<100	-
HC-S-09	K9807097-039	-	1080	-	<100	-
HC-S-101	K9807097-040	-	1260	-	<100	-
HC-S-10	K9807115-001	960	-	-	<100	-
HC-S-11	K9807115-002	-	1230	-	<100	-
HC-S-12	K9807115-003	-		647	-	77
HC-S-13	K9807115-004	-	551		<100	-
HC-S-14	K9807115-005	-	630	-	<100	-
HC-S-15	K9807115-006	350	-	-	<100	-
HC-S-16	K9807115-007	-	1130	-	-	115
HC-S-17	K9807115-008	1100	-	-	<100	-
HC-S-18	K9807169-012	2600	-	-	<100	-
HC-S-19	K9807169-013	-	-	8430	-	<50
HC-S-20	K9807169-014	-	1600	-	<100	-
HC-S-21	K9807169-015	1800	-	-	<100	-
HC-S-22	K9807115-009	-	449	-	<100	-
HC-S-23	K9807115-010	-	-	573	-	58
HC-S-24	K9807115-011	-	4320	-	-	77
HC-S-102	K9807115-012	-	1930	-	<25	-
HC-S-25	K9807115-013	-	157	-	-	962
HC-S-26	K9807115-014	-	289	-	<100	-
HC-S-27	K9807115-015	1400	-	-	<100	-
HC-S-28	K9807115-016	-	384	-	<100	-
HC-S-29	K9807115-017	910	-	-	<100	-
HC-S-30	K9807169-017	-	319	-	-	<50
HC-S-31	K9807169-016	-	-	57.6	-	<50
HC-S-32	K9807115-020	-	130	-	<100	-
HC-S-33	K9807115-021	-	-	131	-	212
HC-S-34	K9807169-002	-	100	-	-	375
HC-S-35	K9807115-018	-	170	-	<100	-
HC-S-36	K9807169-001	-	20.9	-	-	96
HC-S-37	K9807115-019	-	88.7	-	<100	-
HC-S-38	K9807169-005	-	3360	-	-	<50
HC-S-39	K9807169-004	-	727	-	-	<50
HC-S-40	K9807169-003	-	-	195	-	<50
HC-S-41	K9807169-009	-	1710	-	<100	-
HC-S-42	K9807169-008	-	1220	-	<100	-
HC-S-43	K9807169-007	-	101	-	<100	-
HC-S-44	K9807169-006	-	84.1	-	<100	-

Refer to notes at the end of this table.

Table 12 - Summary of Pencil Pitch and Diesel Results
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample Name	Lab Code	Pencil Pitch[1]	Pencil Pitch[2]	Pencil Pitch[3]	Diesel[4]	Diesel[5]
HC-VC-7-S1	K9807097-004	-	1920	-	NR	NR
HC-VC-7-S2	K9807097-005	-	938	-	NR	NR
HC-VC-11-S1	K9807097-013	-	703	-	<100	-
HC-VC-11-S2	K9807097-014	-	1400	-	<100	-
HC-VC-13-S1	K9807097-007	-	23	-	<25	-
HC-VC-13-S2	K9807097-008	-	21	-	NR	NR
HC-VC-18-S1	K9807097-001	-	385	-	NR	NR
HC-VC-18-S2	K9807097-002	-	166	-	NR	NR
HC-VC-22-S1	K9807097-016	-	26	-	NR	NR
HC-VC-22-S2	K9807097-017	-	ND	-	NR	NR
HC-VC-27-S1	K9807097-019	-	385	-	NR	NR
HC-VC-27-S2	K9807097-020	-	422	-	NR	NR
HC-VC-32-S1	K9807097-022	-	48	-	NR	NR
HC-VC-32-S2	K9807097-023	-	ND	-	NR	NR
HC-VC-39-S1	K9807097-025	-	80	-	NR	NR
HC-VC-39-S2	K9807097-026	-	54	-	NR	NR
HC-VC-42-S1	K9807097-028	-	906	-	NR	NR
HC-VC-42-S2	K9807097-029	-	2000	-	NR	NR

Notes:

[1] Pencil Pitch measured by NWTPH-Dx.

[2] Pencil Pitch calculated as a function of LCRMA HPAHs using the BNA extract for analysis.

[3] Pencil Pitch calculated as a function of LCRMA HPAHs + alkylated homologs of fluoranthene, pyrene and chrysene. The aromatic fraction of the NWTPH-Dx extract was used for the analysis.

[4] Diesel measured by NWTPH-Dx.

[5] Diesel calculated as a function of Pristane and Phytane. The aliphatic fraction of the NWTPH-Dx extract was used for the analysis.

NR = Not Reported

Table 13 - Presentation of Sediment Grain Size for Bioassay Samples and Selection of Appropriate Reference Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample #	% Fines [1]	Reference Sediment for Statistical Analyses
Phase 1		
HC-S-26	23.1	REF-C
HC-S-28	84.0	REF-B
HC-S-35	64.5	REF-B
HC-S-36	23.4	REF-C
HC-S-39	85.1	REF-B
HC-S-42	92.9	REF-B
Phase 2		
HC-S-01	80.8	REF-B
HC-S-04	81.6	REF-B
HC-S-05	60.4	REF-B
HC-S-07	87.1	REF-B
HC-S-11	86.6	REF-B
HC-S-16	70.4	REF-B
HC-S-19	31.9	REF-C
HC-S-22	61.0	REF-B
HC-S-24	40.8	REF-C
HC-S-30	40.8	REF-C
REF-B	99.1	--
REF-C	19.8	--

Notes:
[1] Percent Fines is the sum of % Silt and % Clay.

Table 14 - Summary of Sediment Bioassay Results - Amphipod Bioassay *(Hyallela azteca)*
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample Identification	Test Mean Mortality (M_T) in percent	Reference Mean Mortality (M_R) in percent	$M_T - M_R$	P-Value	Single-Hit Criteria [1] (M_T - M_R > 15%)	Two-Hit Criteria [2] (significant diff. btwn M_T and M_R)	Overall Result[3]
PHASE 1							
HC-S-26	7.5	1.3	6.2	0.04	Pass	yes	**Pass**
HC-S-28	16.3	3.8	12.5	0.01	Pass	yes	**Pass**
HC-S-35	5.0	3.8	1.2	-	Pass	no	**Pass**
HC-S-36	3.8	1.3	2.5	-	Pass	no	**Pass**
HC-S-39	6.3	3.8	2.5	-	Pass	no	**Pass**
HC-S-42	7.5	3.8	3.7	-	Pass	no	**Pass**
Ref B	3.8	-	-	-	-	-	-
Ref C	1.3	-	-	-	-	-	-
Neg. Control	1.3	-	-	-	-	-	-
PHASE 2							
HC-S-01	35.0	13.8	21.2	0.003	Fail	yes	**Fail**
HC-S-04	37.5	13.8	23.7	0.002	Fail	yes	**Fail**
HC-S-05	28.8	13.8	15	0.04	Pass	yes	**Fail**
HC-S-07	20.0	13.8	6.2	-	Pass	no	**Fail**
HC-S-11	18.8	13.8	5	-	Pass	no	**Pass**
HC-S-16	27.5	13.8	13.7	0.04	Pass	yes	**Fail**
HC-S-19	16.3	26.3	-10	-	Pass	no	**Pass**
HC-S-22	30.0	13.8	16.2	0.01	Fail	yes	**Fail**
HC-S-24	33.8	26.3	7.5	-	Pass	no	**Pass**
HC-S-30	12.5	26.3	-13.8	-	Pass	no	**Pass**
Ref B	13.8	-	-	-	-	-	-
Ref C	26.3	-	-	-	-	-	-
Neg. Control	15.0	-	-	-	-	-	-

Notes:

[1] One Hit Required to Fail Bioassay

[2] Two Hits Required to Fail Bioassay

[3] A test fails if either of the following is true:
"Fail" of the single-hit criteria for the corresponding sample from any of Tables 10, 11, or 12.
"Yes" for any two-hit criteria for the corresponding sample from any two of Tables 10, 11, or 12.

Table 15 - Summary of Sediment Bioassay Results - Midge Acute Bioassay *(Chironomus tentans)*
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample Identification	Test Mean Mortality (M_T) in percent	Reference Mean Mortality (M_R) in percent	$M_T - M_R$	P-Value	Single-Hit Criteria [1] ($M_T - M_R > 20\%$)	Two-Hit Criteria [2] (significant diff. btwn M_T and M_R)	Overall Result[3]
PHASE 1							
HC-S-26	27.5	20.0	7.5	-	Pass	no	**Pass**
HC-S-28	40.0	28.8	11.2	-	Pass	no	**Pass**
HC-S-35	35.0	28.8	6.2	-	Pass	no	**Pass**
HC-S-36	26.3	20.0	6.3	-	Pass	no	**Pass**
HC-S-39	41.3	28.8	12.5	0.03	Pass	yes	**Pass**
HC-S-42	28.8	28.8	0	-	Pass	no	**Pass**
Ref B	28.8	-	-	-	-	-	-
Ref C	20.0	-	-	-	-	-	-
Neg. Control	15.0	-	-	-	-	-	-
PHASE 2							
HC-S-01	47.5	12.5	35	0.00001	Fail	yes	**Fail**
HC-S-04	30.0	12.5	17.5	0.03	Pass	yes	**Fail**
HC-S-05	31.3	12.5	18.8	0.04	Pass	yes	**Fail**
HC-S-07	25.0	12.5	12.5	-	Pass	no	**Fail**
HC-S-11	26.3	12.5	13.8	-	Pass	no	**Pass**
HC-S-16	17.5	12.5	5	-	Pass	no	**Fail**
HC-S-19	12.5	21.3	-8.8	-	Pass	no	**Pass**
HC-S-22	33.8	12.5	21.3	0.007	Fail	yes	**Fail**
HC-S-24	30.0	21.3	8.7	-	Pass	no	**Pass**
HC-S-30	8.6	21.3	-12.7	-	Pass	no	**Pass**
Ref B	12.5	-	-	-	-	-	-
Ref C	21.3	-	-	-	-	-	-
Neg. Control	3.8	-	-	-	-	-	-

Notes:

[1] One Hit Required to Fail Bioassay

[2] Two Hits Required to Fail Bioassay

[3] A test fails if either of the following is true:
"Fail" of the single-hit criteria for the corresponding sample from any of Tables 10, 11, or 12.
"Yes" for any two-hit criteria for the corresponding sample from any two of Tables 10, 11, or 12.

Table 16 - Summary of Sediment Bioassay Results - Midge Chronic Bioassay *(Chironomus tentans)*
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample Identification	Test Mean Individual Biomass (B_T) in mg	Reference Mean Individual Biomass (B_R) in mg	B_T/B_R*100	P-Value	Single-Hit Criteria [1] (B_T/B_R < 60%)	Two-Hit Criteria [2] (significant diff. btwn M_T and M_R)	Overall Result[3]
PHASE 1							
HC-S-26	2.01	1.73	116.2	-	Pass	no	**Pass**
HC-S-28	1.32	1.60	82.5	-	Pass	no	**Pass**
HC-S-35	1.71	1.60	106.9	-	Pass	no	**Pass**
HC-S-36	1.50	1.73	86.7	-	Pass	no	**Pass**
HC-S-39	1.64	1.60	102.5	-	Pass	no	**Pass**
HC-S-42	1.46	1.60	91.3	-	Pass	no	**Pass**
Ref B	1.60	-	-	-	-	-	-
Ref C	1.73	-	-	-	-	-	-
Neg. Control	1.69	-	-	-	-	-	-
PHASE 2							
HC-S-01	0.19	1.15	16.5	0.00002	Fail	yes	Fail
HC-S-04	0.37	1.15	32.2	0.00001	Fail	yes	Fail
HC-S-05	0.51	1.15	44.3	0.00002	Fail	yes	Fail
HC-S-07	0.59	1.15	51.3	0.0003	Fail	yes	Fail
HC-S-11	0.81	1.15	70.4	0.009	Pass	yes	**Pass**
HC-S-16	0.74	1.15	64.3	0.002	Pass	yes	Fail
HC-S-19	1.09	1.37	79.6	-	Pass	no	**Pass**
HC-S-22	1.02	1.15	88.7	-	Pass	no	Fail
HC-S-24	0.96	1.37	70.1	0.08	Pass	yes	**Pass**
HC-S-30	0.95	1.37	69.3	0.01	Pass	yes	**Pass**
Ref B	1.15	-	-	-	-	-	-
Ref C	1.37	-	-	-	-	-	-
Neg. Control	1.46	-	-	-	-	-	-

Notes:

[1] One Hit Required to Fail Bioassay

[2] Two Hits Required to Fail Bioassay

[3] A test fails if either of the following is true:
"Fail" of the single-hit criteria for the corresponding sample from any of Tables 10, 11, or 12.
"Yes" for any two-hit criteria for the corresponding sample from any two of Tables 10, 11, or 12.

Table 17 - Analytical Results for Bioassay Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Hart Crowser
J-5624-10

Sample ID Depth in Feet	HC-S-01 0 to 0.3	HC-S-04 0 to 0.3	HC-S-05 0 to 0.3	HC-S-07 0 to 0 3	HC-S-11 0 to 0.3	HC-S-16 0 to 0.3	HC-S-19 0 to 0 3	HC-S-22 0 to 0 3	HC-S-24 0 to 0.3	HC-S-26 0 to 0.3
Metals in mg/kg										
Antimony, Total		0.4 J	0.8 J	0.3 J	0.6 J	0.4 J	4.4 J	0.2 J	0.3 J	0.2 J
Arsenic, Total		6	6	7	9	6	11	5	5	4
Cadmium, Total		2.6	2 2	2	1.9 J	1.3 J	5.6	1 J	1.5 J	2.5 J
Chromium, Total		29.2	23.6	31 9	31.2	29.4	18.3	23 1	23	14.3
Copper, Total		57.3	44.6	64	70.4	52.2	62.9	44.1	41 4	26
Lead, Total		294	272	322	357 J	210 J	1160	125 J	118 J	68.4 J
Mercury, Total		0.13	0 08	0.16	0.13	0.25	0.07	0 09	0.08	0.04
Nickel, Total		25	21	27	27	27	16	23	36	22
Silver, Total		0.8	0.8	0.8	0.7	0 1	1.9	0.3	0.3	0 1
Zinc, Total		450	385	399	397 J	306 J	1020 J	225 J	279 J	435 J
Volatiles in µg/kg										
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	25 U	5 U	5 U	10 U	10 U	5 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	25 U	5 U	5 U	10 U	10 U	5 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	25 U	5 U	5 U	10 U	10 U	5 U
Benzene	10 U	10 U	10 U	10 U	25 U	5 U	5 U	10 U	10 U	5 U
Ethylbenzene	10 U	10 U	10 U	10 U	*25 U*	5 U	5 U	10 U	10 U	5 U
Tetrachloroethene (PCE)	10 U	10 U	10 U	10 U	25 U	5 U	5 U	10 U	10 U	5 U
Toluene	10 U	10 U	10 U	10 U	25 U	5 U	5 U	10 U	10 U	5 U
Total Xylenes	10 U	10 U	10 U	10 U	25 U	5 U	5 U	10 U	10 U	5 U
Trichloroethene (TCE)	10 U	10 U	10 U	10 U	25 U	5 U	5 U	10 U	10 U	5 U
m- & p-Xylenes	10 U	10 U	10 U	10 U	25 U	5 U	5 U	10 U	10 U	5 U
o-Xylene	10 U	10 U	10 U	10 U	25 U	5 U	5 U	10 U	10 U	5 U
TPH in mg/kg										
Diesel	779	183	115	106	100 U	115	50 U	100 U	77	100 U
Pencil Pitch	7730	1350	963	1240	1230	1130	8430	449	4320	289
LPAHs in µg/kg										
Acenaphthene	*20000 U*	1100	560	990	940	630	6100	310	410	73
Acenaphthylene	*20000 U*	400 U	460	400 U	200	480	71	110	3600	140
Anthracene	*20000 U*	1700	1400	1700	1700	1900	5900	560	6600	350
Fluorene	*20000 U*	670	570	730	590	620	2500	230	1200	100
Naphthalene	*20000 U*	400	440	400 U	250	450	1400	20 U	2200	100
Phenanthrene	49000	6400	4700	6100	5700	4900	26000	1900	15000	1000
Total LPAHs	99000	10470	8130	9920	9380	8980	41971	3120	29010	1763
HPAHs in µg/kg										
Benz(a)anthracene	77000	13000	8600	12000	11000	9000	44000	4000	37000	2300
Benzo(a)pyrene	86000	15000	9600	13000	13000	11000	55000	4900	39000	2700

Table 17 - Analytical Results for Bioassay Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Hart Crowser
J-5624-10

Sample ID Depth in Feet	HC-S-01 0 to 0.3	HC-S-04 0 to 0.3	HC-S-05 0 to 0.3	HC-S-07 0 to 0.3	HC-S-11 0 to 0 3	HC-S-16 0 to 0 3	HC-S-19 0 to 0 3	HC-S-22 0 to 0.3	HC-S-24 0 to 0.3	HC-S-26 0 to 0.3
Benzo(b)fluoranthene	83000	13000	7700	12000	10000	7600	44000	3700	23000	1600
Benzo(g,h,i)perylene	55000	11000	7100	9400	8900	7600	38000	3300	27000	1900
Benzo(k)fluoranthene	61000	9100	5800	8100	8400	7000	35000	3300	24000	1800
Chrysene	75000	11000	7800	10000	11000	8900	46000	3800	38000	2200
Dibenz(a,h)anthracene	*20000* U	1200	730	1200	2200	1700	11000	800	4700	350
Fluoranthene	120000	21000	18000	19000	21000	21000	70000 J	7200	84000	5500
Indeno(1,2,3-cd)pyrene	110000	19000	10000	17000	14000	13000	60000	6000	41000	3400
Pyrene	98000	21000	20000	21000	22000	25000	68000	7500	110000	6800
Total HPAHs	775000	134300	95330	122700	121500	111800	471000	44500	427700	28550
Total Benzofluoranthenes	144000	22100	13500	20100	18400	14600	79000	7000	47000	3400
Phenols in µg/kg										
2,4-Dimethylphenol	*6000* U	*120* U	*120* U	*120* U	6 U	6 U	31	6 U	6 U	6 U
2-Methylphenol	*6000* U	*120* U	*120* U	*120* U	6 U	6 U	51	6 U	6 U	6 U
4-Methylphenol	*20000* U	400 U	400 U	400 U	20 U	20 U	130	20 U	20 U	20 U
Pentachlorophenol (PCP)	*60000* U	*1200* U	*1200* U	*1200* U	60 U	60 U	60 U	60 U	60 U	60 U
Phenol	*20000* U	400 U	400 U	400 U	20 U	20 U	110	20 U	20 U	20 U
Phthalates in µg/kg										
Bis(2-ethylhexyl) Phthalate	*20000* U	460	400 U	540	450	420	360	310	2000 U	110
Butyl Benzyl Phthalate	*20000* U	400 U	400 U	400 U	36	47	20 U	24	*2000* U	20 U
Di-n-butyl Phthalate	*20000* U	400 U	400 U	400 U	20 U	20 U	20 U	20 U	20 U	20 U
Di-n-octyl Phthalate	*20000* U	400 U	400 U	400 U	20 U	20 U	20 U	20 U	2000 U	20 U
Diethyl Phthalate	*20000* U	400 U	400 U	400 U	20 U	20 U	20 U	20 U	20 U	20 U
Dimethyl Phthalate	*20000* U	400 U	400 U	400 U	20 U	20 U	20 U	20 U	20 U	20 U
Semivolatiles in µg/kg										
Benzoic Acid	*100000* U	*2000* U	*2000* U	*2000* U	100 U	100 U	110	100 U	100 U	100 U
Benzyl Alcohol	*6000* U	*120* U	*120* U	*120* U	6 U	6 U	6 U	6 U	6 U	6 U
Dibenzofuran	*20000* U	400 U	400 U	400 U	200	160	660	75	170	30
Hexachlorobenzene	*20000* U	*400* U	*400* U	*400* U	20 U	20 U	20 U	20 U	20 U	20 U
Hexachlorobutadiene	*20000* U	*400* U	*400* U	*400* U	20 U	20 U	20 U	20 U	20 U	20 U
N-Nitrosodiphenylamine	*12000* U	*240* U	*240* U	*240* U	12 U	12 U	12 U	12 U	12 U	12 U

Table 17 - Analytical Results for Bioassay Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

Sample ID Depth in Feet	HC-S-28 0 to 0.3		HC-S-30 0 to 0.3		HC-S-35 0 to 0.3		HC-S-36 0 to 0.3		HC-S-39 0 to 0.3		HC-S-42 0 to 0.3		HC-REF-B 0 to 0.3		HC-REF-C 0 to 0.3	
Metals in mg/kg																
Antimony, Total	0.2	J	0.2	UJ	0.1	J	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ
Arsenic, Total	5		4		4		3		4		4		9		3	
Cadmium, Total	0.9	J	0.6		0.4	J	0.2		0.2		0.3		0.9		0 3	
Chromium, Total	28.4		21.1		23.3		15 2		26.4		27.3		25 4		10.1	
Copper, Total	50.4		62		35.5		20.9		38		40.7		36.8		10.7	
Lead, Total	87.6	J	80.7		39	J	15.2		30.1		36		23.5		7.3	
Mercury, Total	0.1		0.06		0.08		0.05		0.08		0 07		0.12		0.06	
Nickel, Total	25		22		21		17		22		22		21		10	
Silver, Total	0.3		0.3		0.2		0.1		0.2		0 2		0.2		0.1	U
Zinc, Total	220	J	167	J	122	J	82	J	104	J	124	J	142	J	84	J
Volatiles in µg/kg																
1,2-Dichlorobenzene	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
1,3-Dichlorobenzene	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
1,4-Dichlorobenzene	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
Benzene	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
Ethylbenzene	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
Tetrachloroethene (PCE)	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
Toluene	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
Total Xylenes	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
Trichloroethene (TCE)	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
m- & p-Xylenes	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
o-Xylene	10	U	5	U	10	U	5	U	10	U	10	U	25	U	5	U
TPH in mg/kg																
Diesel	100	U	50	U	100	U	96		50	U	100	U				
Pencil Pitch	384		319		170		20 9		727		1220					
LPAHs in µg/kg																
Acenaphthene	260		260		120		23		520		920		20	U	20	U
Acenaphthylene	120		44		30		20	U	20	U	23		20	U	20	U
Anthracene	510		370		220		27		600		1500		20	U	20	U
Fluorene	200		160		85		20	U	390		420		20	U	20	U
Naphthalene	100		64		40		33		49		92		20	U	20	U
Phenanthrene	1700		1600		730		150		4700		5300		20	U	20	U
Total LPAHs	2890		2498		1225		253		6269		8255					
HPAHs in µg/kg																
Benz(a)anthracene	3200		2700		1500		170		6200		11000		35		20	U
Benzo(a)pyrene	4000		3300		1800		180		6700		14000		43		20	U

Table 17 Analytical Results for Bioassay Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation
Portland, Oregon

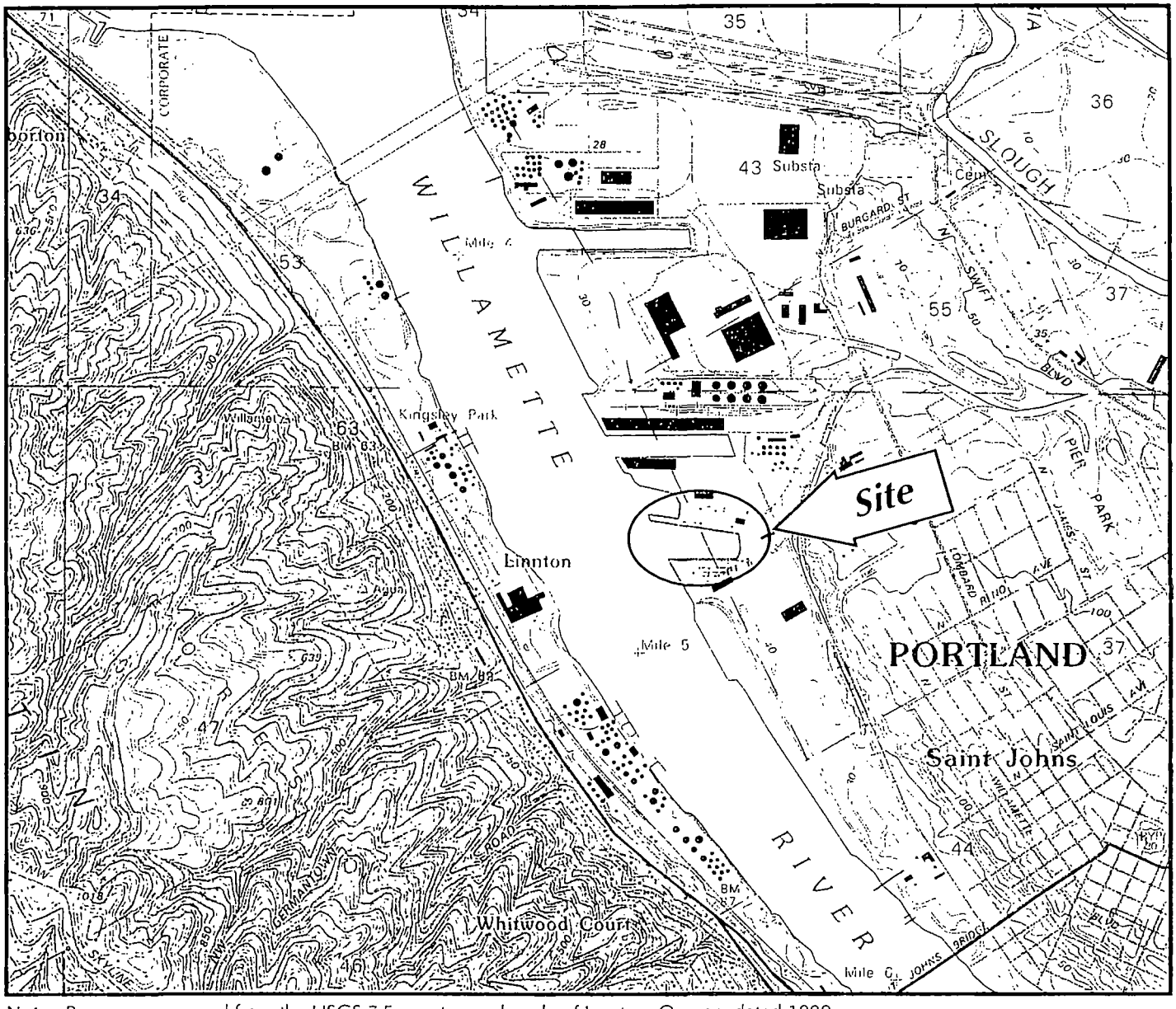
Sample ID Depth in Feet	HC-S-28 0 to 0.3		HC-S-30 0 to 0.3		HC-S-35 0 to 0.3		HC-S-36 0 to 0.3		HC-S-39 0 to 0.3		HC-S-42 0 to 0.3		HC-REF-B 0 to 0.3		HC-REF-C 0 to 0.3	
Benzo(b)fluoranthene	2900		2400		1500		150		6500		11000		37		20	U
Benzo(g,h,i)perylene	2800		2500		1200		220		5400		11000		57		23	
Benzo(k)fluoranthene	2700		2400		1300		98		5500		8900		22		20	U
Chrysene	3200		3000		1500		170		7000		11000		35		20	U
Dibenz(a,h)anthracene	630		540		280		50		1700		2600		20	U	20	U
Fluoranthene	6500		5200		2700		310		13000		17000		63		23	
Indeno(1,2,3-cd)pyrene	5100		4600		2300		340		10000		18000		110		43	
Pyrene	7000		5000		2700		380		10000		16000		68		27	
Total HPAHs	38030		31640		16780		2068		72000		120500					
Total Benzofluoranthenes	5600		4800		2800		248		12000		19900					
Phenols in µg/kg																
2,4-Dimethylphenol	6	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U
2-Methylphenol	6	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U
4-Methylphenol	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
Pentachlorophenol (PCP)	60	U	60	U	60	U	60	U	60	U	60	U	60	U	60	U
Phenol	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
Phthalates in µg/kg																
Bis(2-ethylhexyl) Phthalate	370		300		260		50		290		500		62		20	U
Butyl Benzyl Phthalate	20	U	20	U	20	U	20	U	20	U	37		20	U	20	U
Di-n-butyl Phthalate	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
Di-n-octyl Phthalate	20	U	20	U	20	U	20	U	20	U	100		20	U	20	U
Diethyl Phthalate	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
Dimethyl Phthalate	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
Semivolatiles in µg/kg																
Benzoic Acid	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
Benzyl Alcohol	6	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U
Dibenzofuran	62		52		31		20	U	160		170		20	U	20	U
Hexachlorobenzene	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
Hexachlorobutadiene	20	U	20	U	20	U	20	U	20	U	20	U	20	U	20	U
N-Nitrosodiphenylamine	12	U	12	U	12	U	12	U	12	U	12	U	12	U	12	U

Notes:
Indicates Exceedence of SL
Indicates Exceedence of ML
DUP = Duplicate
U = Undetected
J = Estimated concentration
Italics = Detection limit exceeds SL or ML.

TABLES

Site Location Map

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: Base map prepared from the USGS 7 5-minute quadrangle of Linnton, Oregon, dated 1990

SCALE 1 : 24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

CONTOUR INTERVAL 10 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

N

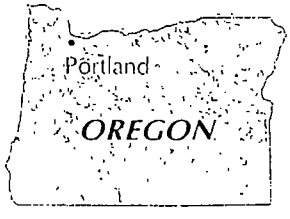


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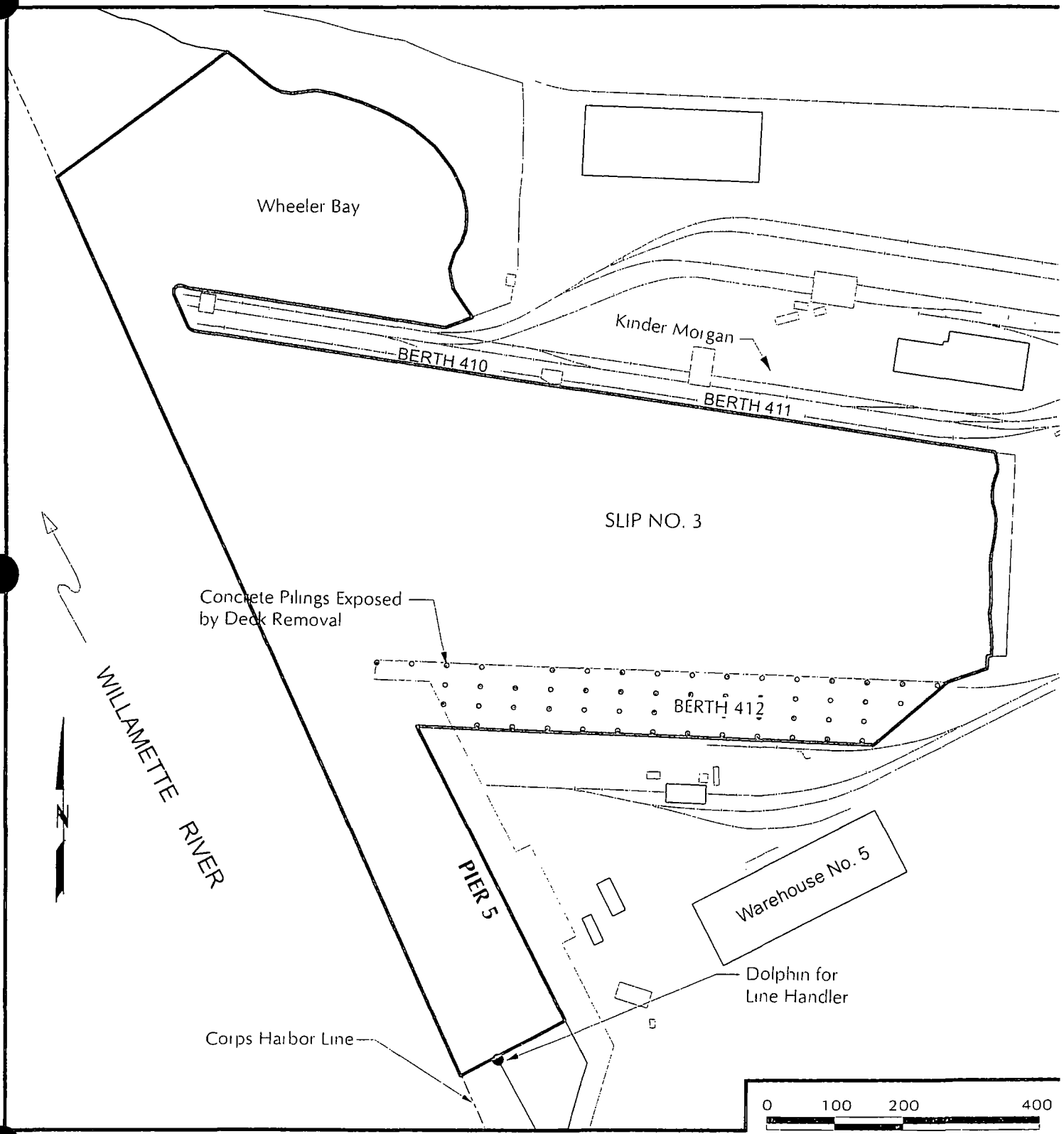
Figure 1

Study Area Map - Slip 3, Pier 5, and Wheeler Bay

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1 Base map prepared from a Terminal 4 site plan, provided by Port of Portland

Legend:

Study Area

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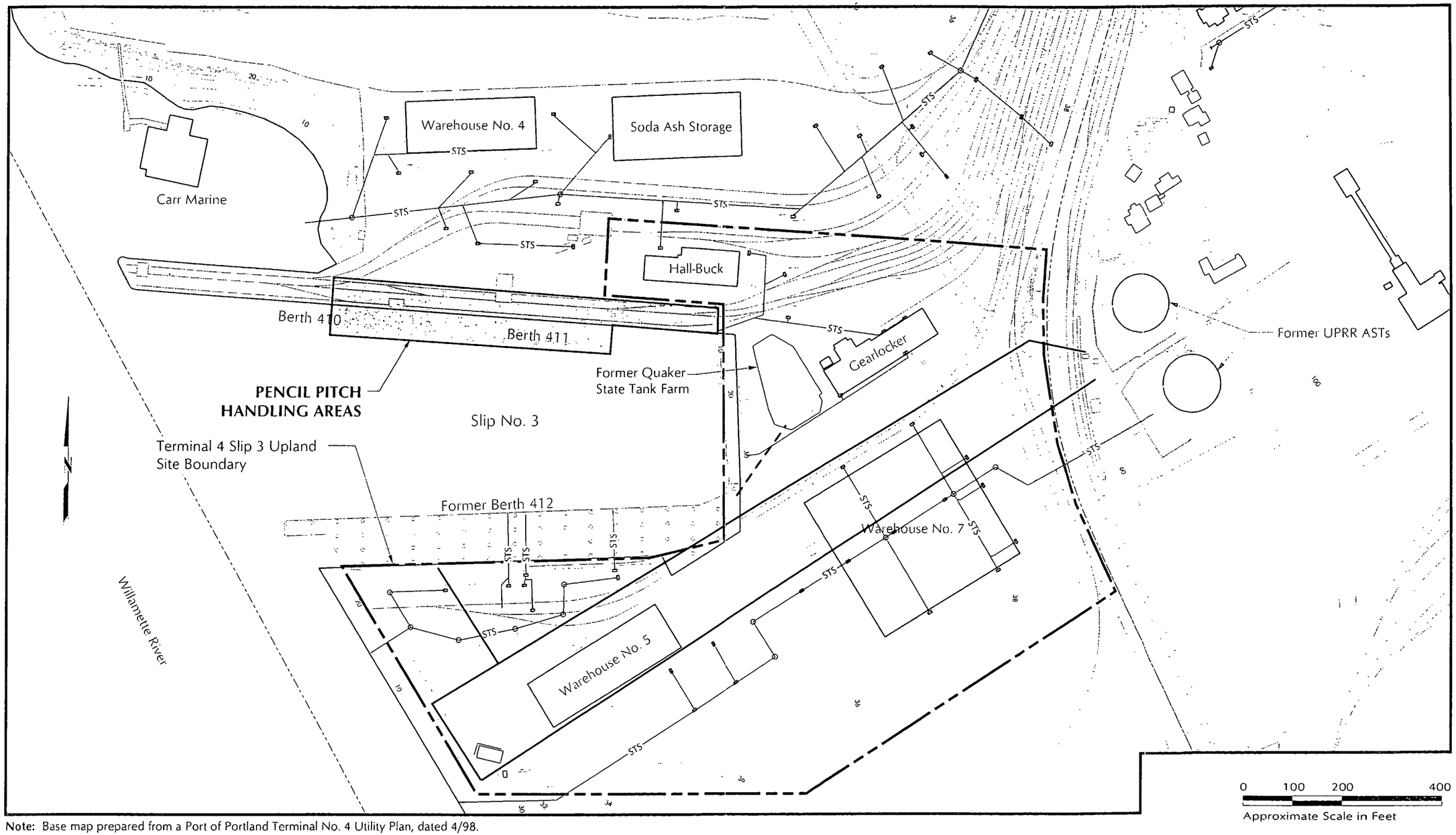
Figure 2

Location of Pipelines and Storm Drains

Port of Portland, Terminal 4 - Slip 3 Sediment Characterization



Note: Base map prepared from a Port of Portland Terminal No. 4 Utility Plan, dated 4/98.

Legend:

—STS— Underground Storm Sewer Line

——— Decommissioned Abandoned UPRR Fuel Line

– – – Former Quaker State Oil Line

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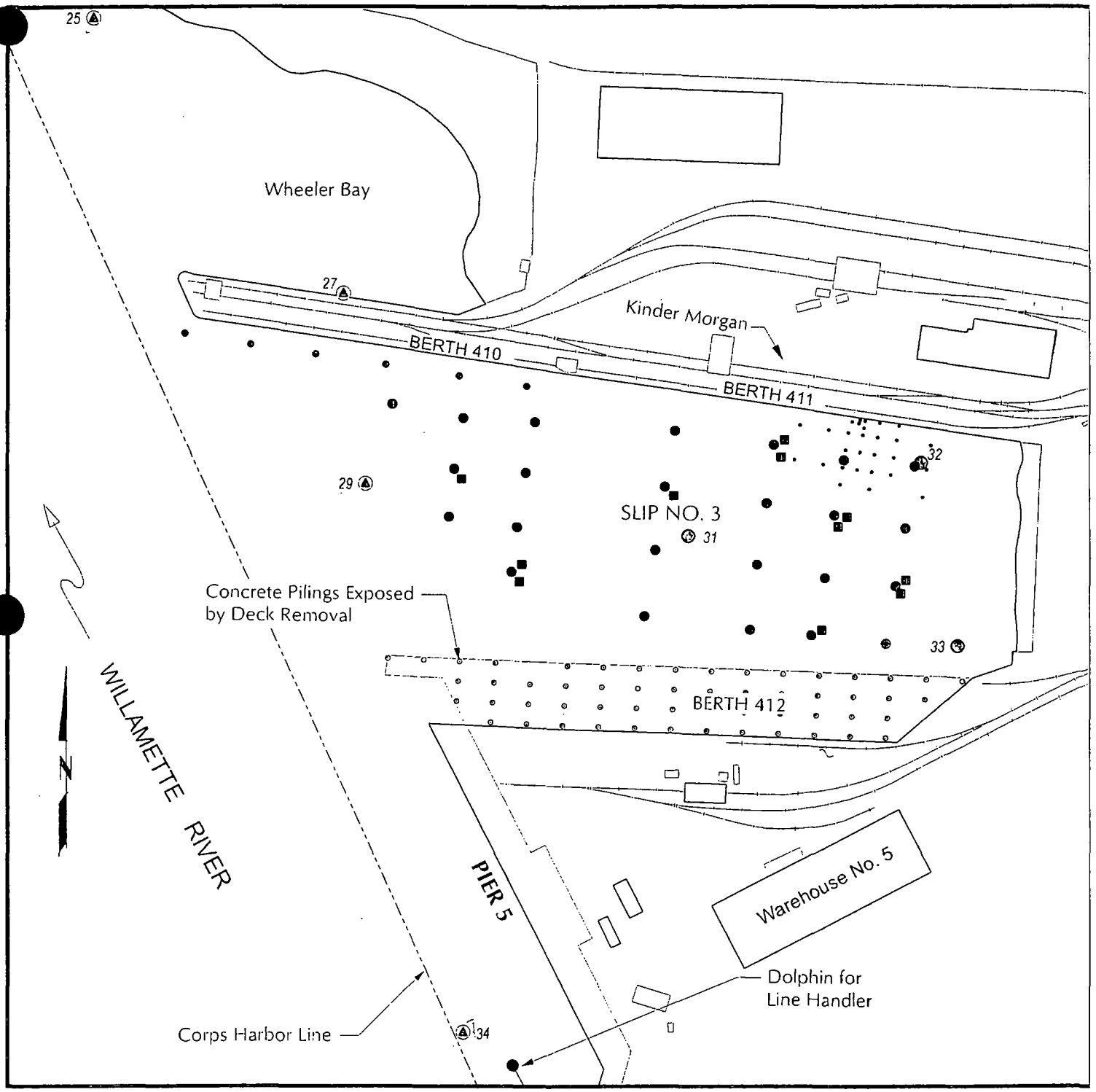
Figure 3

Historical Sediment Sample Location Plan

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

Legend:

- Grab Sample Location (1994)
- Core Sample Location (1994) (Dredged 1995)
- 31 Portland Harbor Study Split Sediment Sample Location and Number (9/97)
- 34 Portland Harbor Study Sediment Sample Location and Number (9/97)
- Pencil Pitch Sediment Sample Location (7/97)
- Maintenance Dredging Sediment Sample Location (5/97)

0 100 200 400

Approximate Scale in Feet

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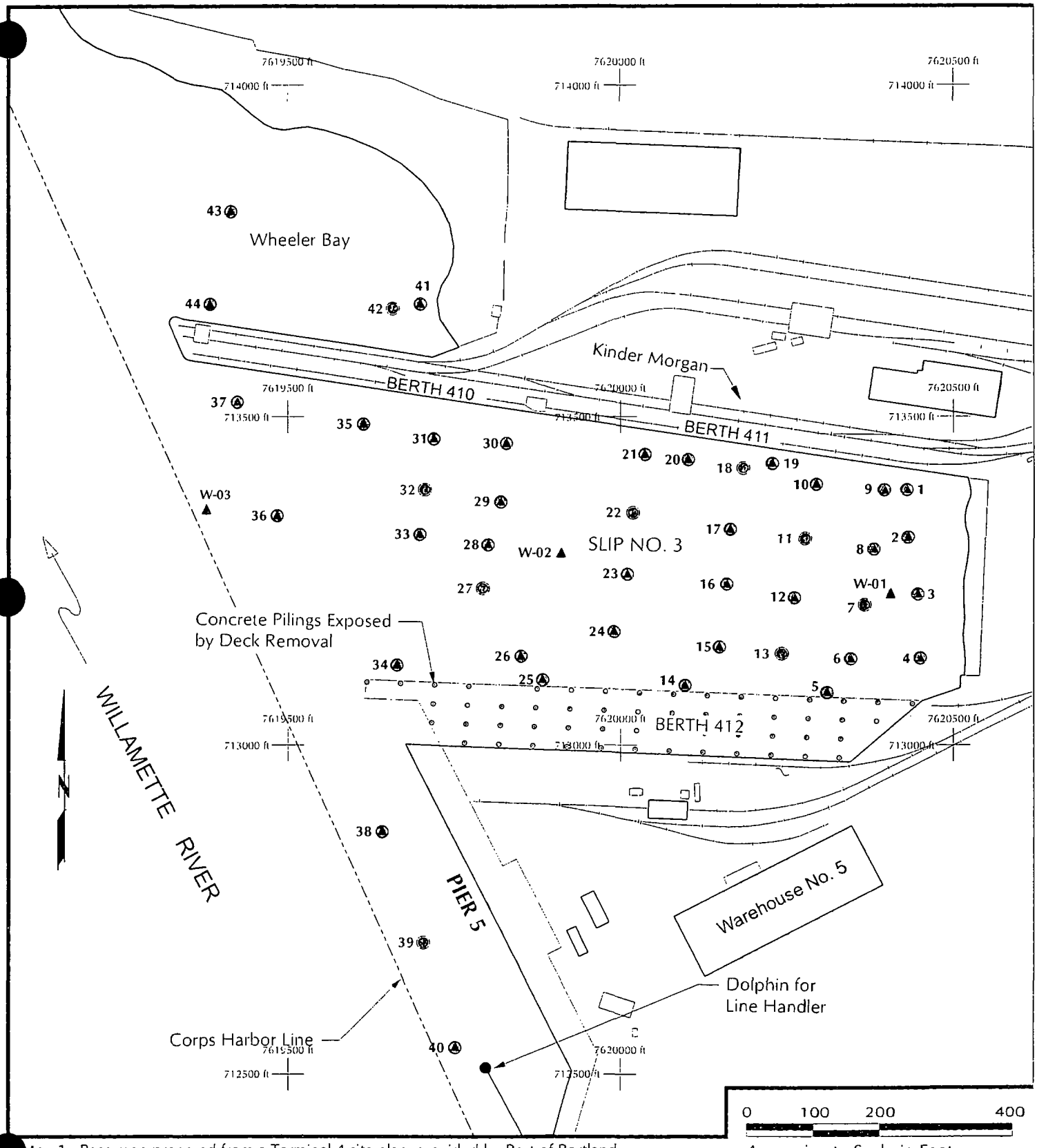
Figure 4

RI Sample Location Plan

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

Legend:

- 40 ▲ Surface Sediment Sample Location and Number (Referred in Text and Tables as HC-S-#)
- 39 ◉ Collocated Surface and Subsurface Sediment Sample Location and Number (Referred in Text and Tables as HC-S-#/HC-VC-#)
- W-03 ▲ Water Sample Location and Number (Referred in Text and Tables as HC-W-#)

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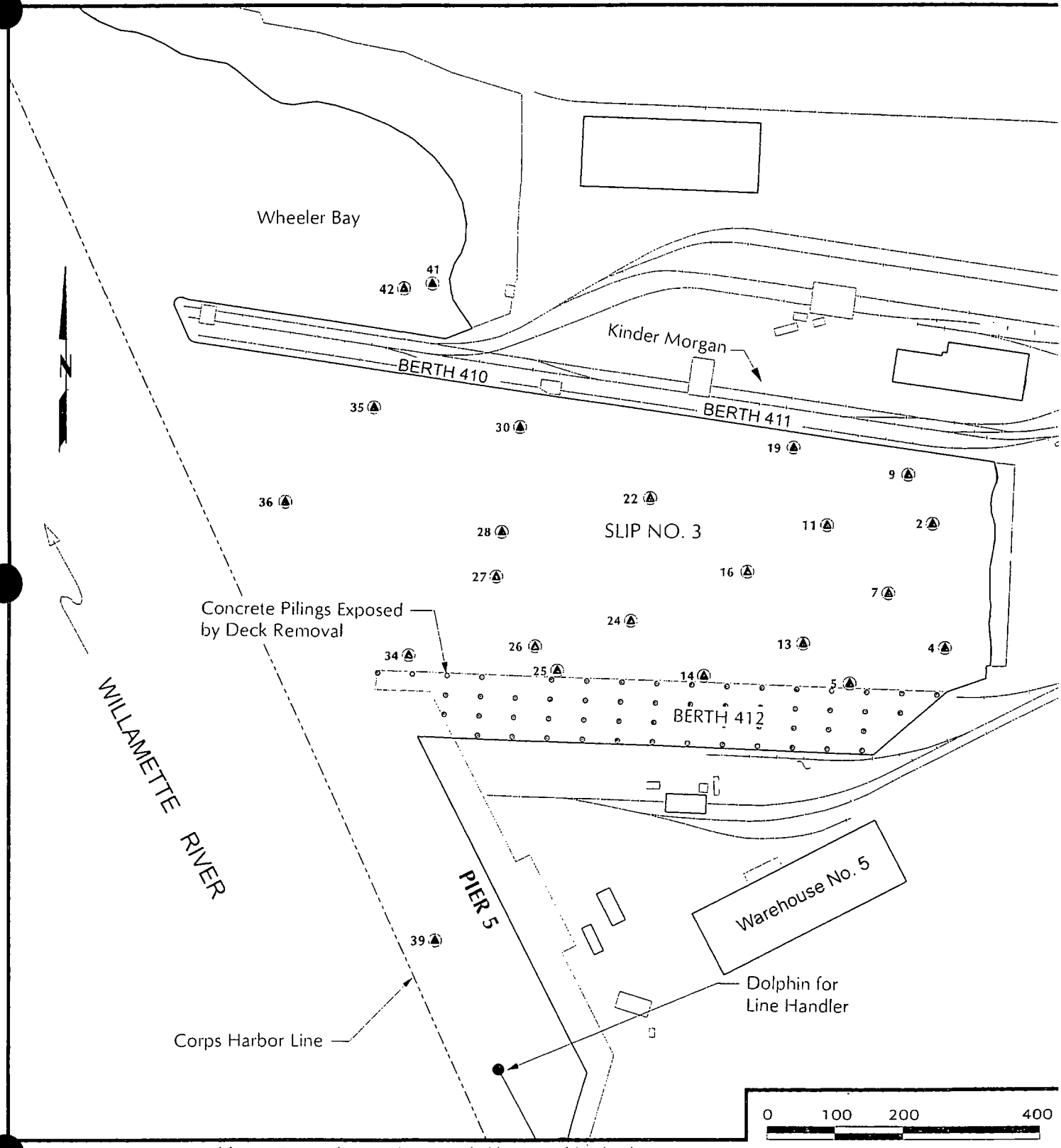
Figure 5

Sediment Sampling Location Plan for Metals Analysis

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

Legend:

39 Sediment Sampling Location and Number

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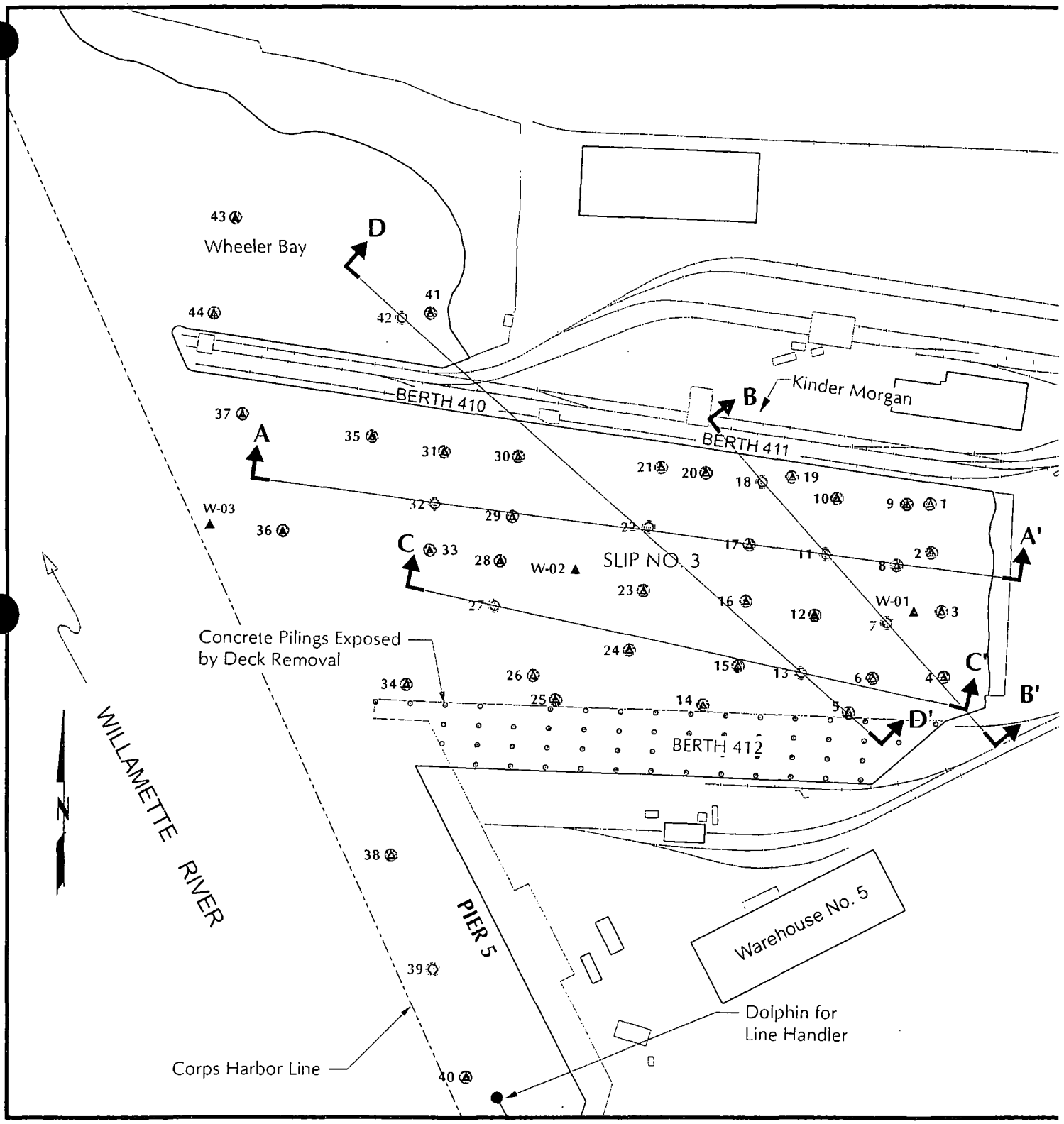
Figure 6

Cross Section Location Plan

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

Legend:

- 40 ⊕ Surface Sediment Sample Location and Number (Referred in Text and Tables as HC-S-#)
- 39 ⊕ Collocated Surface and Subsurface Sediment Sample Location and Number (Referred in Text and Tables as HC-S-#/HC-VC-#)
- W-03 ▲ Water Sample Location and Number (Referred in Text and Tables as HC-W-#)
- C C' Cross Section Location and Designation

0 100 200 400

Approximate Scale in Feet

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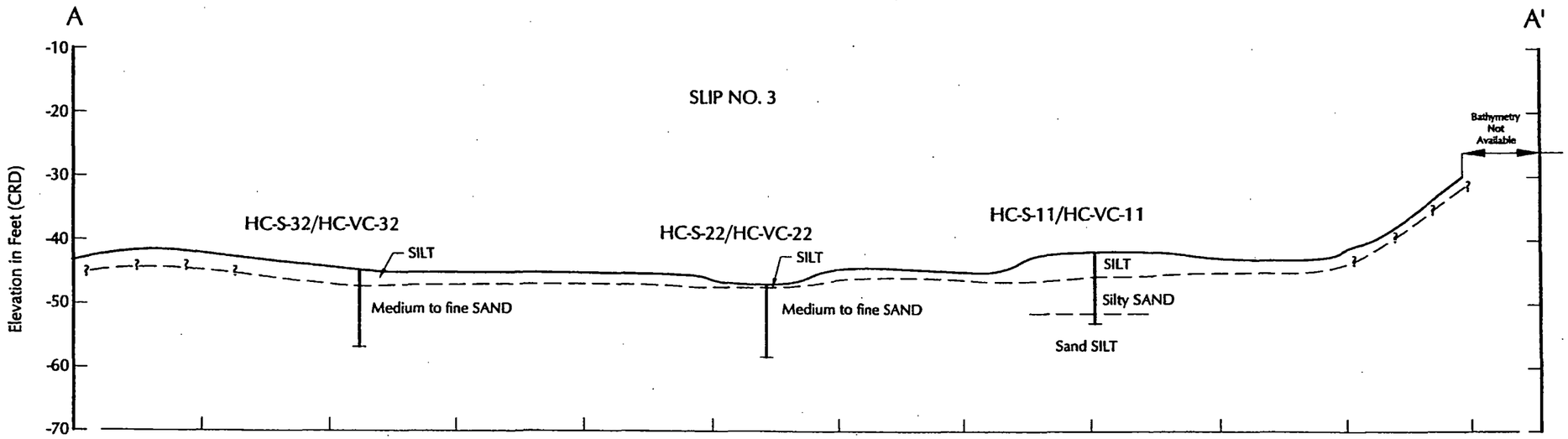
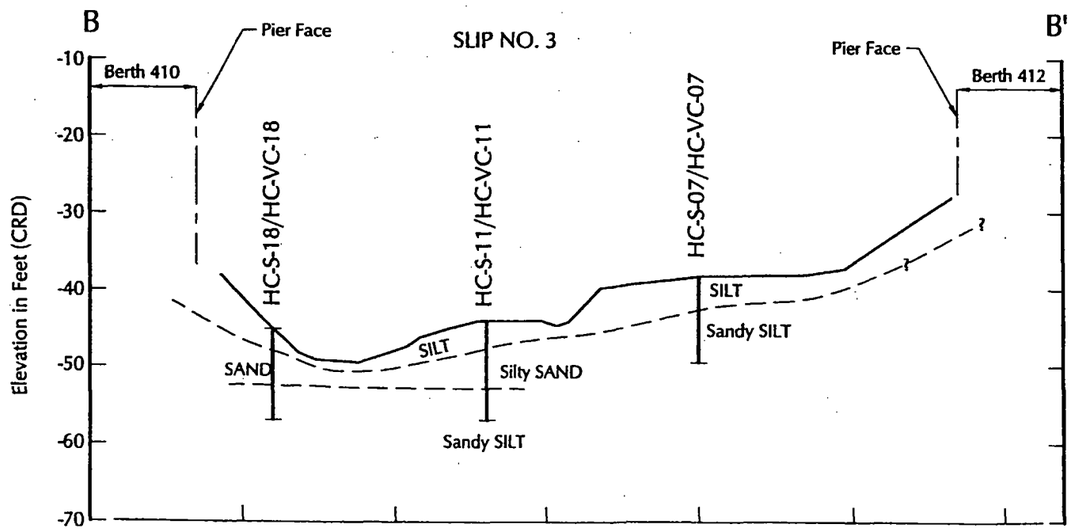
Figure 7

Generalized Subsurface Cross Sections A-A' and B-B'

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation





HC-S-11 Sediment Boring Number

Sediment Boring Location

Berth 412 Location of Pier Structures

Horizontal Scale in Feet
0 100 200
0 20 40
Vertical Scale in Feet
Vertical Exaggeration x 5

Notes:
1. Contacts between sediment units are based upon interpretation between explorations and represent our interpretation of subsurface conditions based on currently available data.
2. Cross section locations shown on Figure 7.
3. Elevations are referenced to Columbia River datum (CRD).

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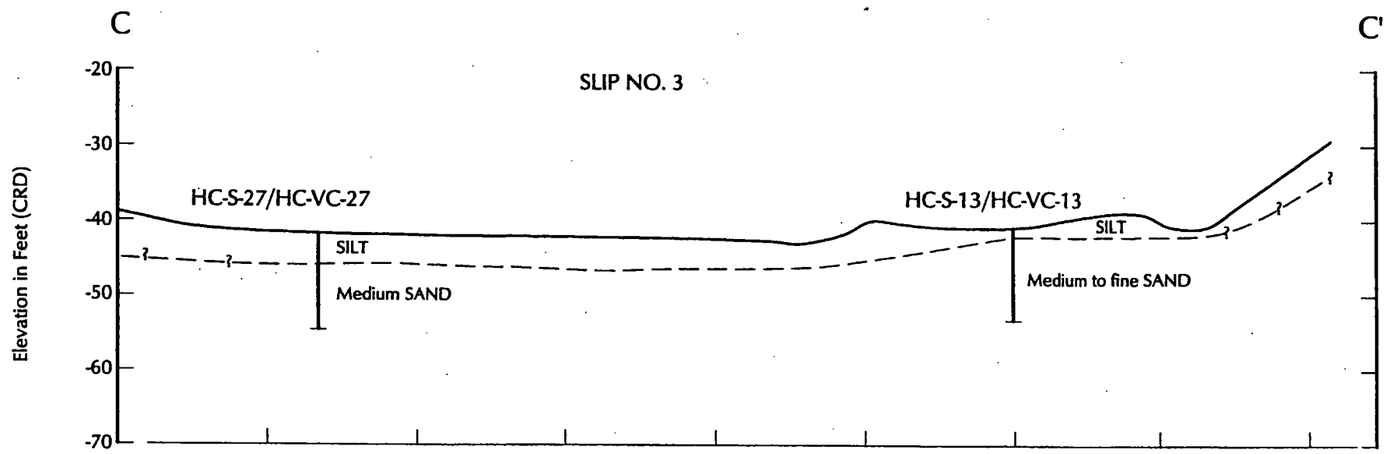
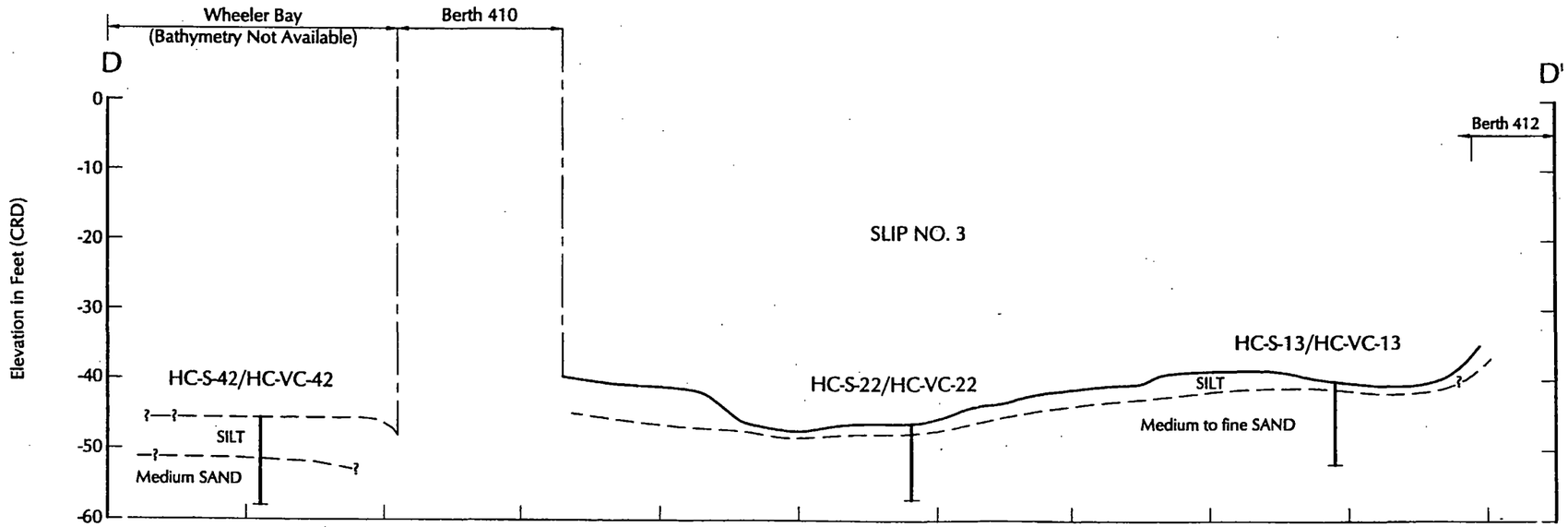
Figure 8

Generalized Subsurface Cross Sections C-C' and D-D'

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation





HC-S-11 Sediment Boring Number

Sediment Boring Location

Berth 412 Location of Pier Structures

Horizontal Scale in Feet
0 100 200
0 20 40
Vertical Scale in Feet
Vertical Exaggeration x 5

Notes:
1. Contacts between sediment units are based upon interpretation between explorations and represent our interpretation of subsurface conditions based on currently available data.
2. Cross section locations shown on Figure 7.
3. Elevations are referenced to Columbia River datum (CRD).

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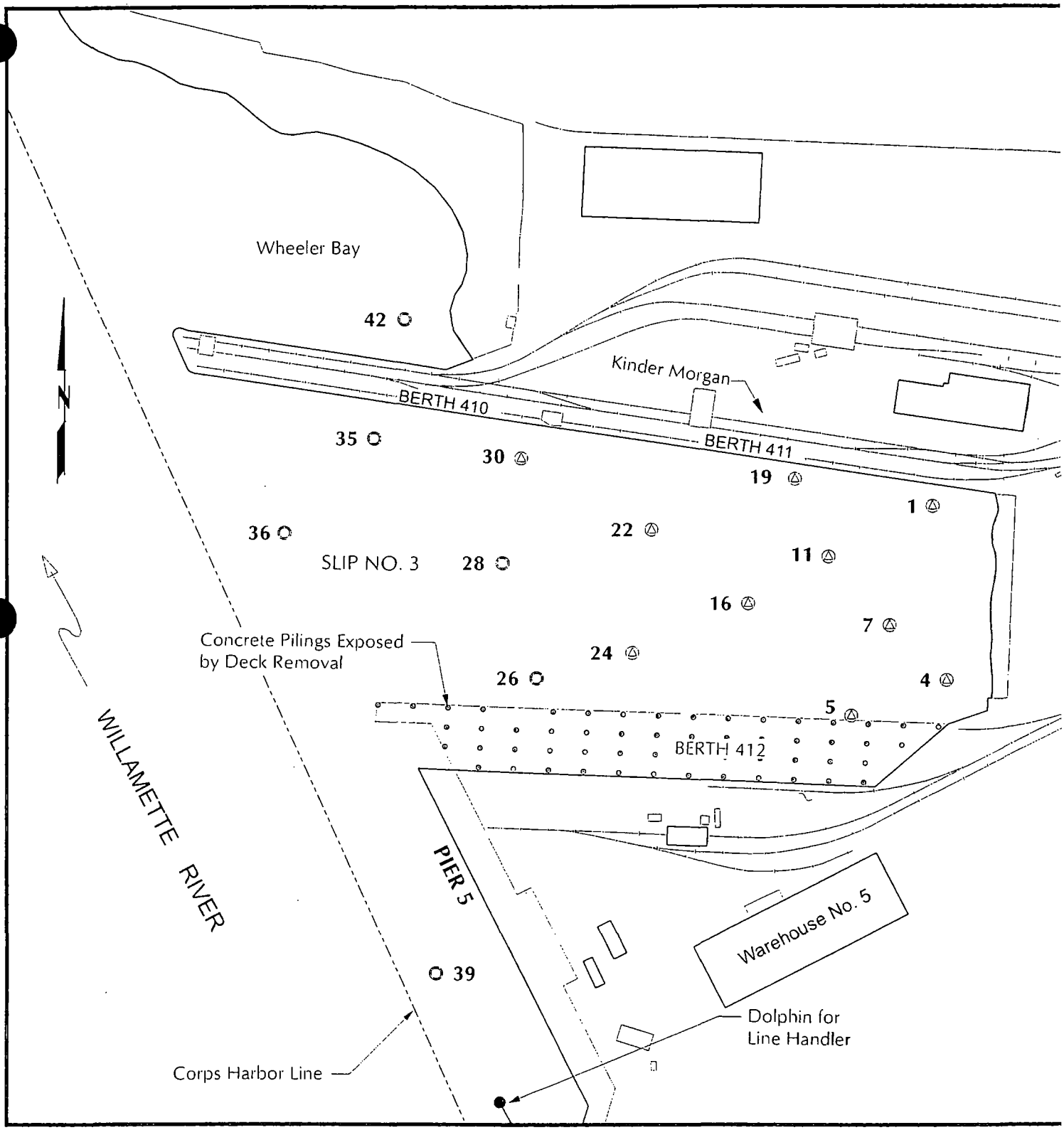
Figure 9

Bioassay Sampling Location Plan

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

0 100 200 400

Approximate Scale in Feet

Legend:

39 ○ Phase I Bioassay Sediment Sampling Location and Number

16 △ Phase II Bioassay Sediment Sampling Location and Number

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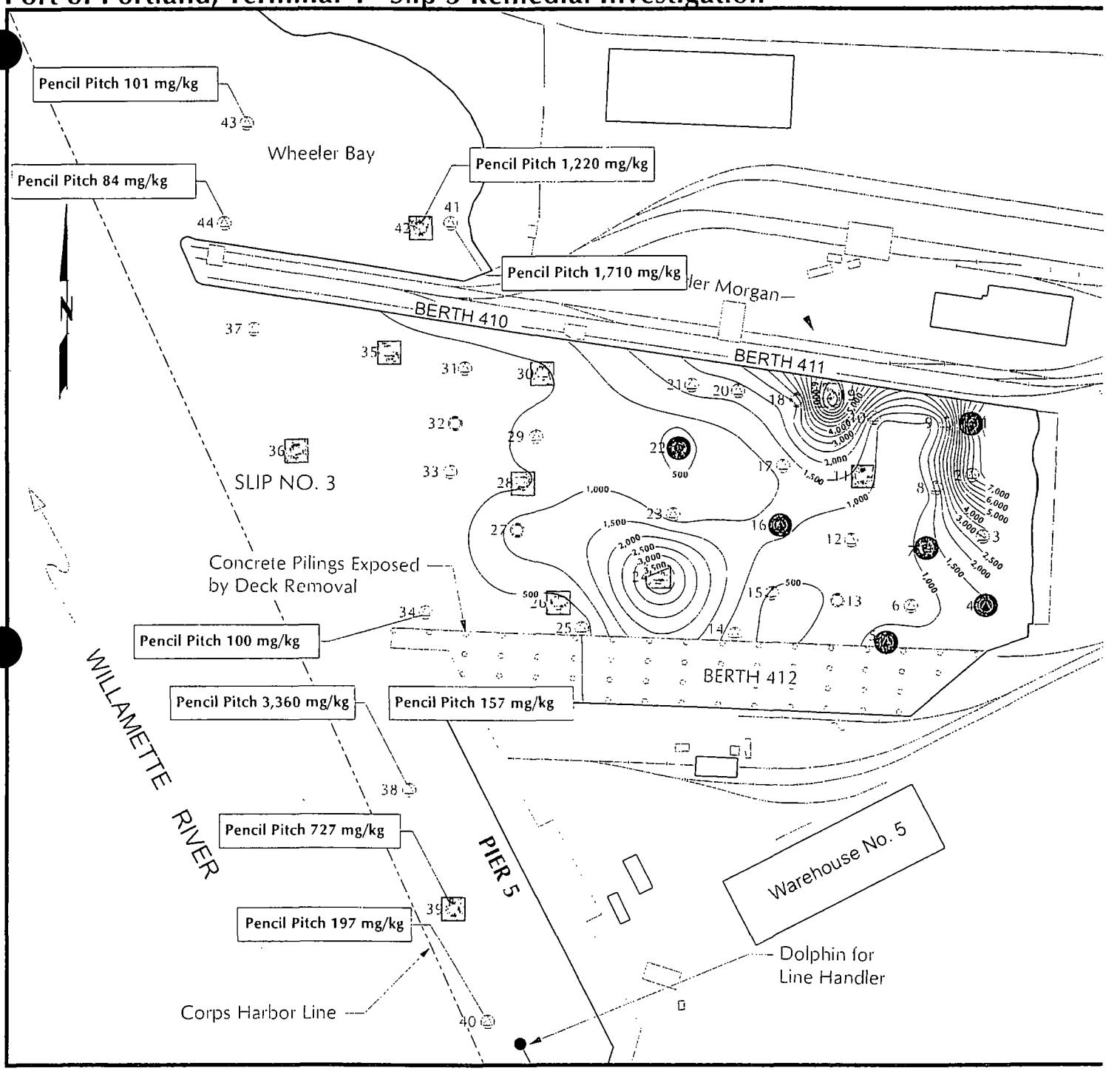
Figure 10

Pencil Pitch Concentration Contour Plan

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

0 100 200 400

Approximate Scale in Feet

Legend:

- 40 — Surface Sediment Sample Location and Number
- 39 — Collocated Surface and Subsurface Sediment Sample Location and Number
- Pencil Pitch Concentration Contour in mg/kg
- Bioassay Failure
- Bioassay Pass

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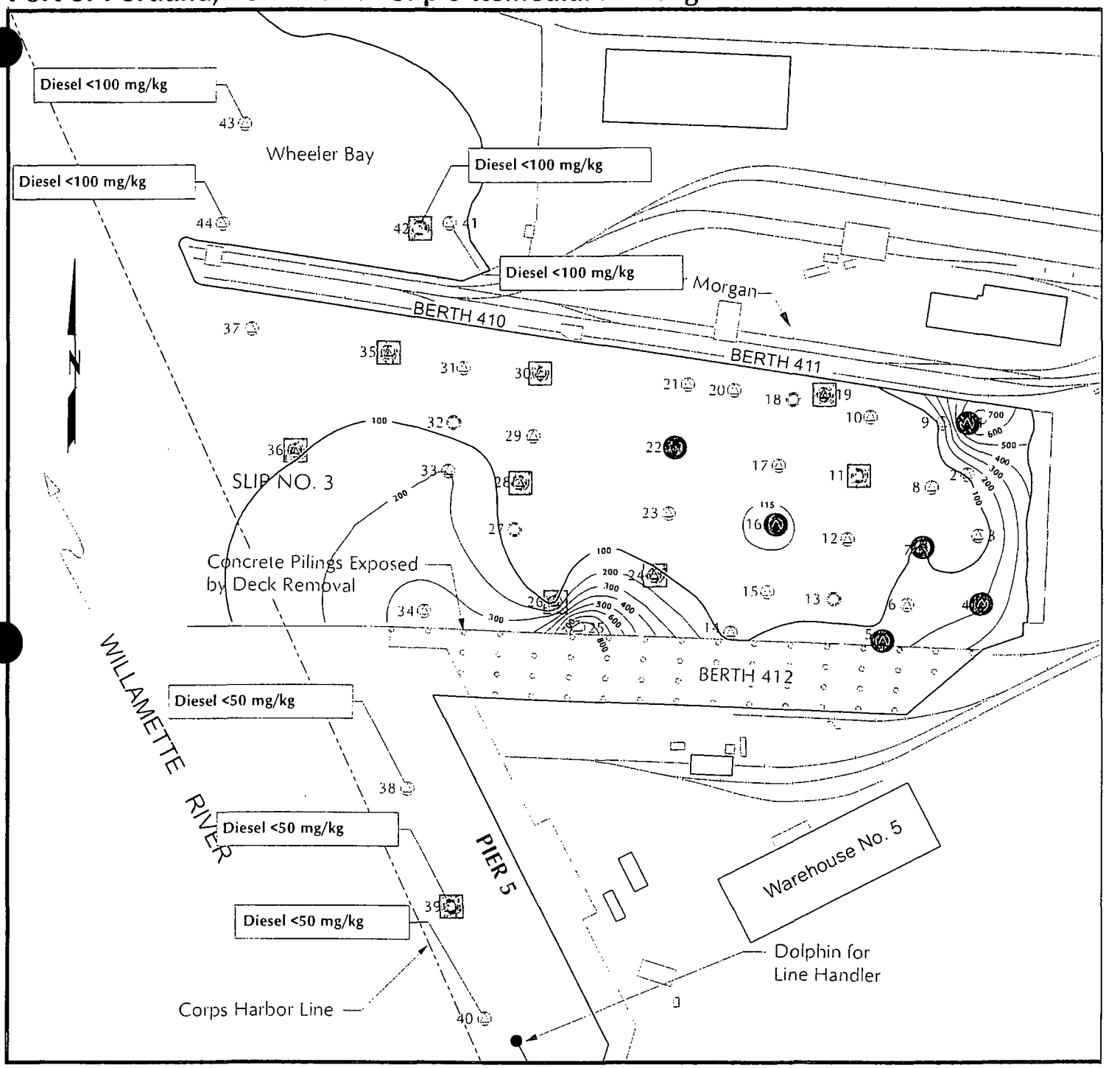
Figure 11

Diesel Concentration Contour Plan

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

0 100 200 400

Approximate Scale in Feet

Legend:

- 40 — Surface Sediment Sample Location and Number
- 39 — Collocated Surface and Subsurface Sediment Sample Location and Number
- Diesel Concentration Contour in mg/kg
- Bioassay Failure
- Bioassay Pass

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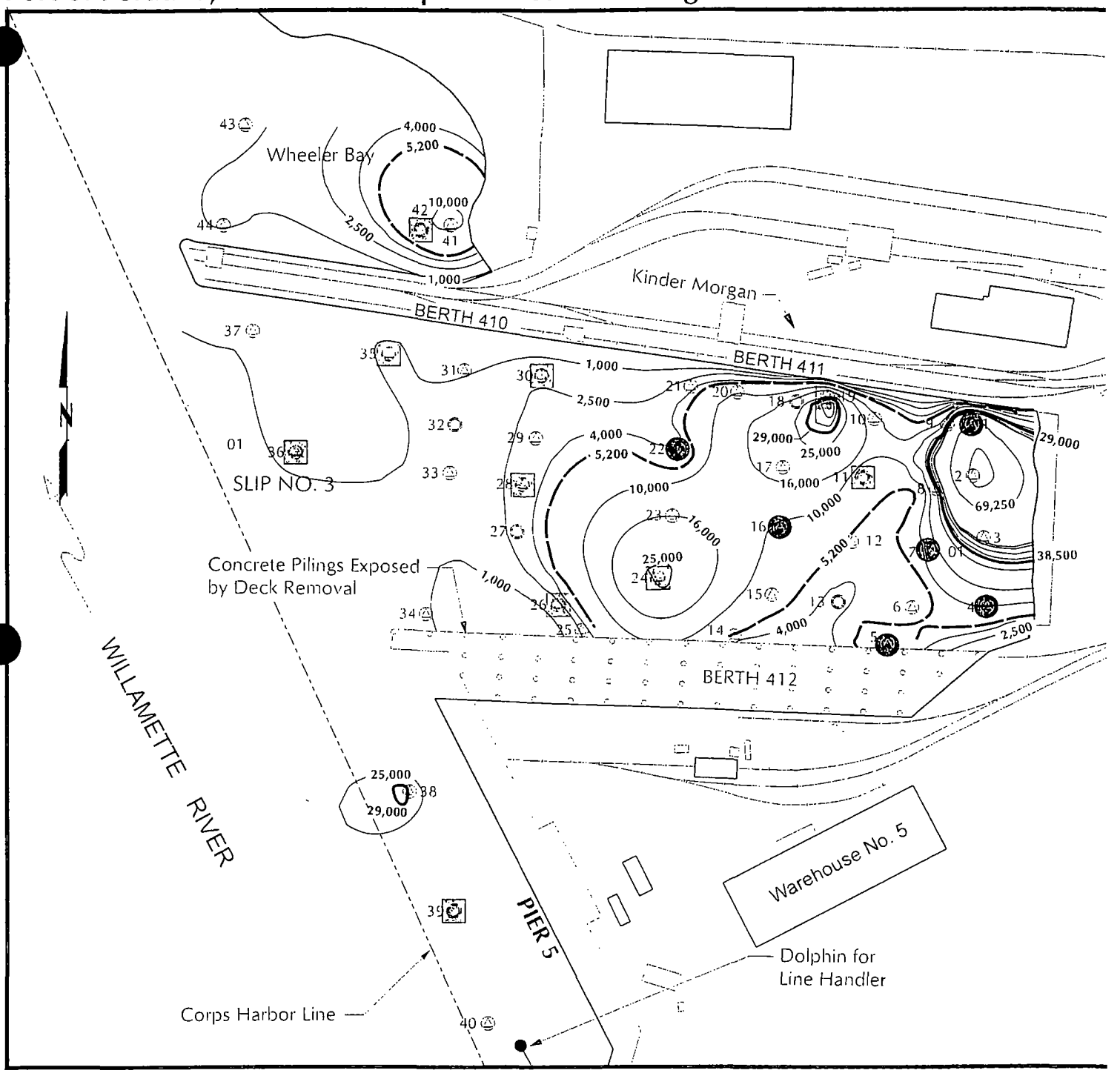
J-5624-10 4/00

Figure 12

LPAH Concentration Contour Plan

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

Legend:

- 40 — Surface Sediment Sample Location and Number
- 39 — Collocated Surface and Subsurface Sediment Sample Location and Number
- LPAH Concentration Contour in µg/kg
- LPAH LCRMA Maximum Level (ML) Contour in µg/kg
- LPAH LCRMA Screening Level (SL) Contour in µg/kg
- Bioassay Failure
- Bioassay Pass

0 100 200 400

Approximate Scale in Feet

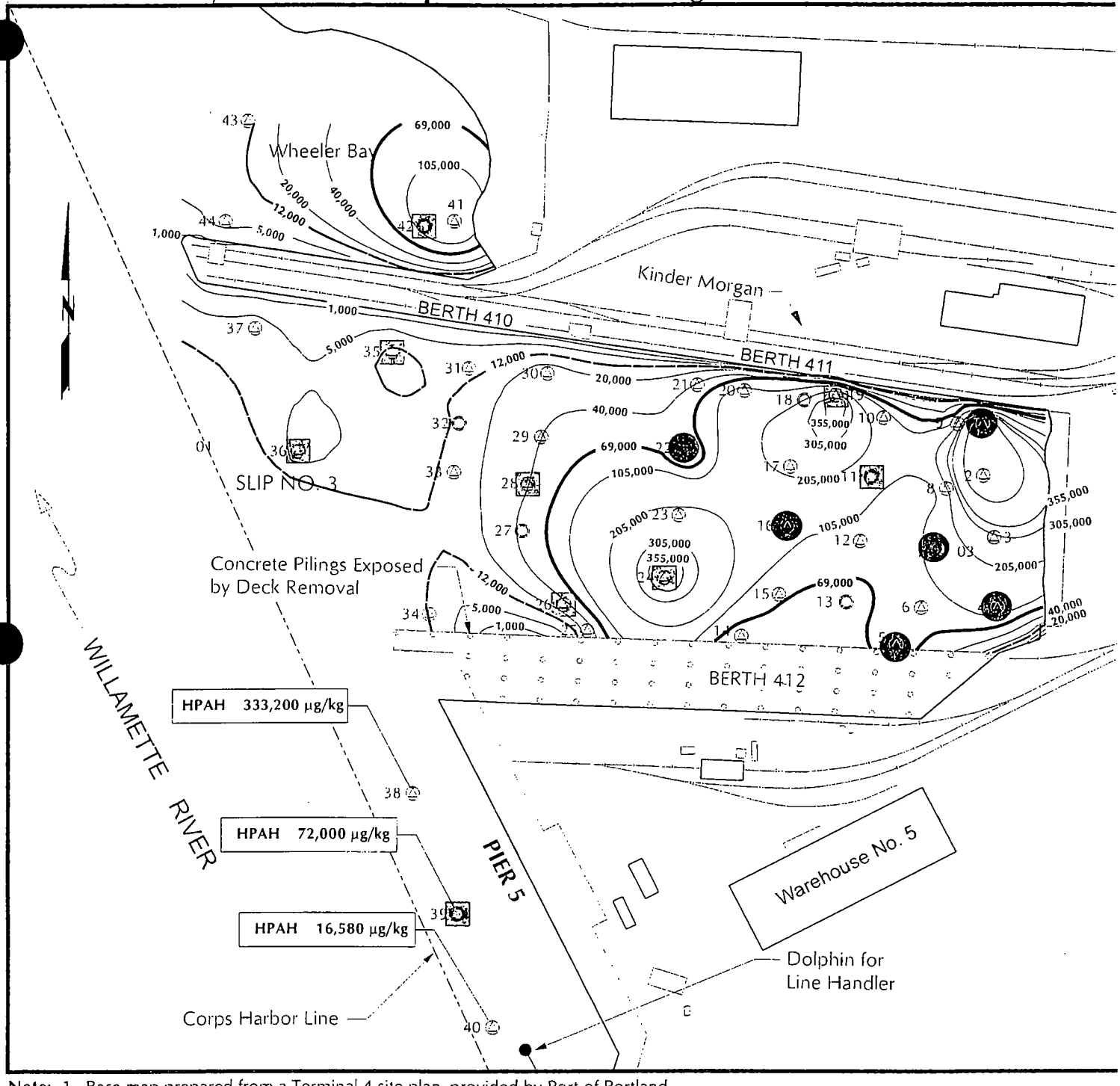
HARTCROWSER

J-5624-10 4/00

Figure 13

HPAH Concentration Contour Plan

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

0 100 200 400

Approximate Scale in Feet

Legend:

- 40 — Surface Sediment Sample Location and Number
- 39 — Collocated Surface and Subsurface Sediment Sample Location and Number
- HPAH Concentration Contour in µg/kg
- HPAH LCRMA Maximum Level (ML) Contour in µg/kg
- HPAH LCRMA Screening Level (SL) Contour in µg/kg
- Bioassay Failure
- Bioassay Pass

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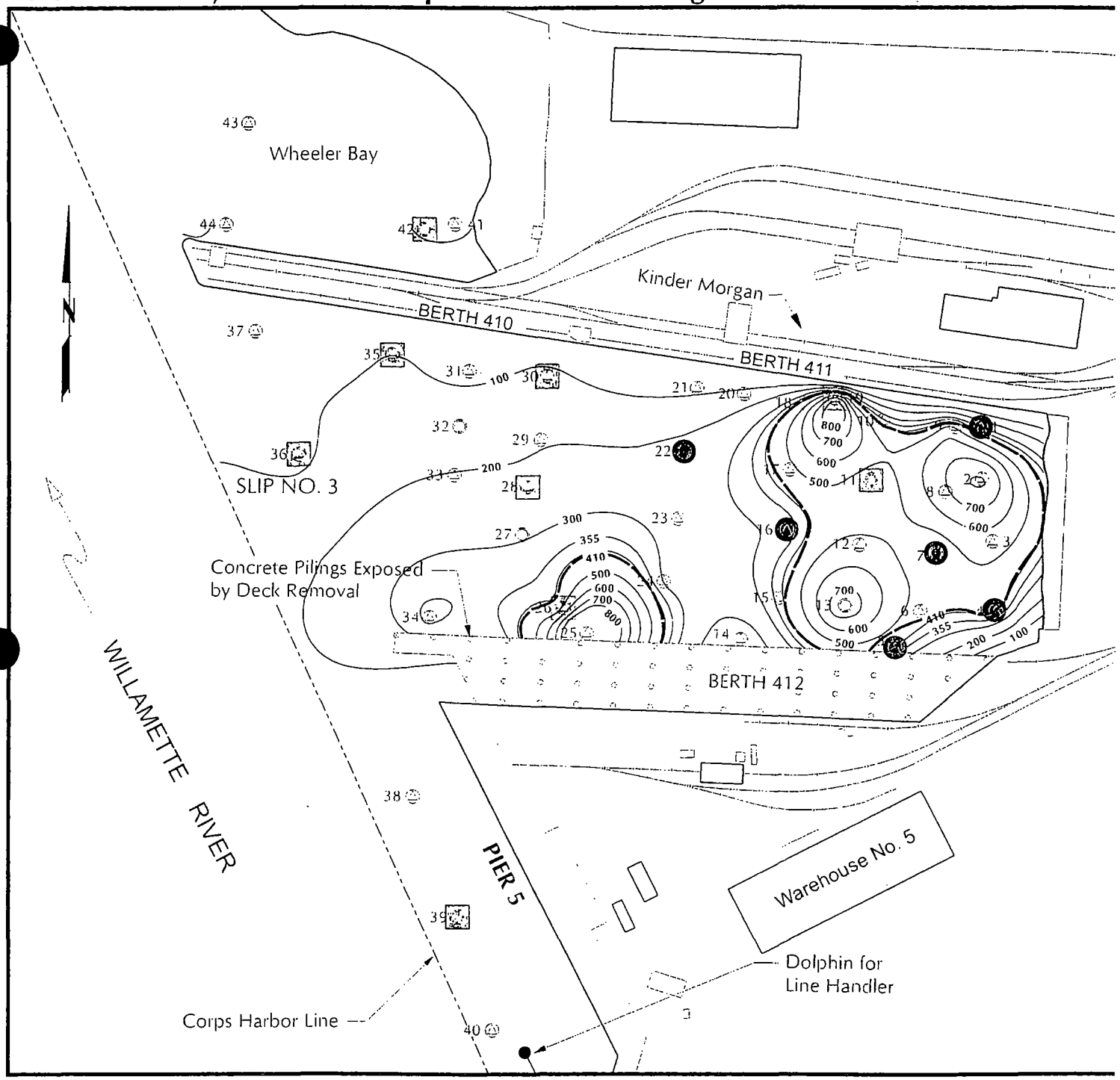
J-5624-10 4/00

Figure 14

Zinc Concentration Contour Plan

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

0 100 200 400

Approximate Scale in Feet

Legend:

- 40 — Surface Sediment Sample Location and Number
- 39 — Collocated Surface and Subsurface Sediment Sample Location and Number
- Zinc Concentration Contour in mg/kg
- Zinc LCRMA Screening Level (SL) Contour in mg/kg
- Bioassay Failure
- Bioassay Pass

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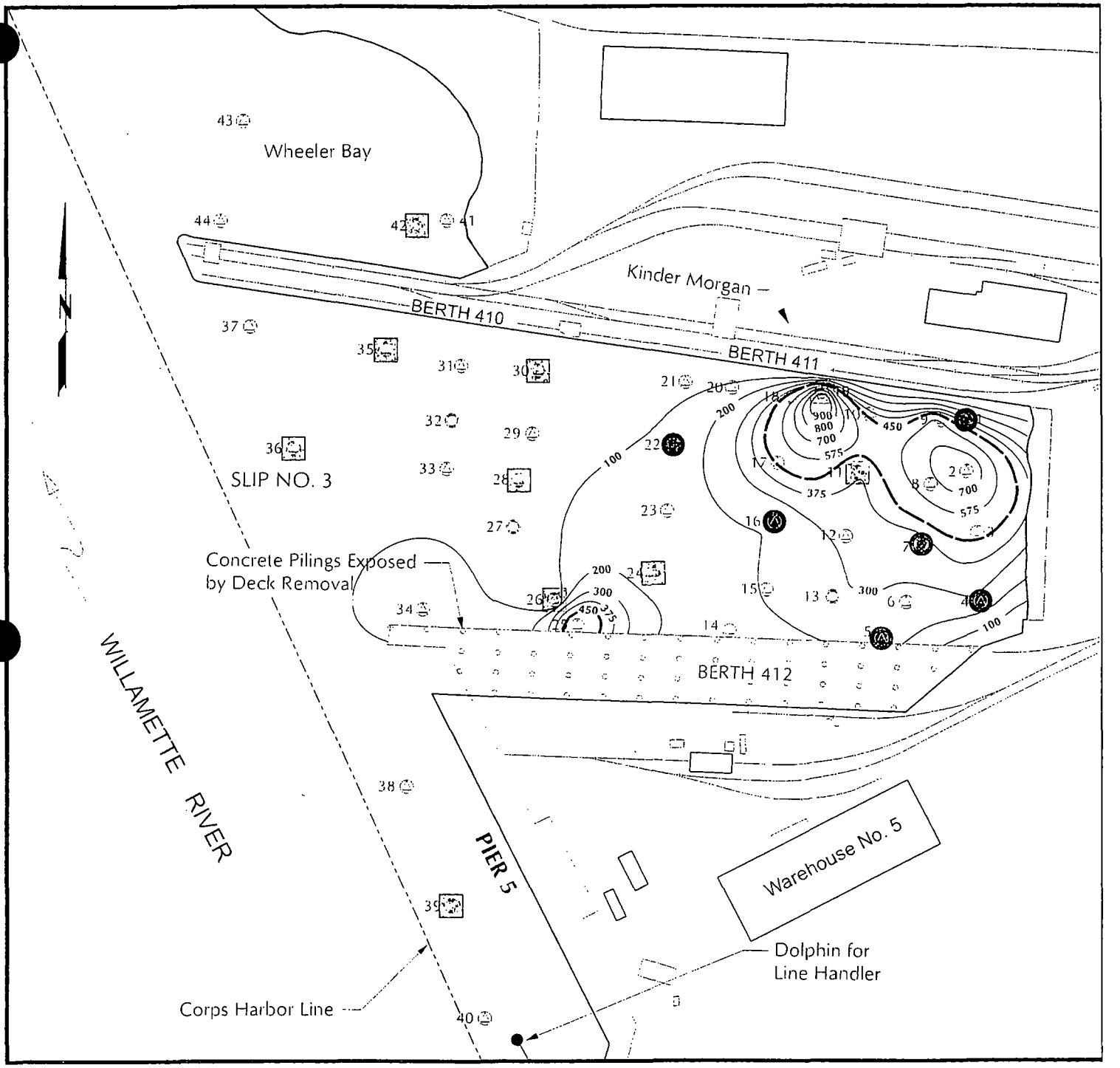
Figure 15

Lead Concentration Contour Plan

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

0 100 200 400

Approximate Scale in Feet

Legend:

- 40 — Surface Sediment Sample Location and Number
- 39 — Collocated Surface and Subsurface Sediment Sample Location and Number
- Lead Concentration Contour in mg/kg
- Lead LCRMA Screening Level (SL) Contour in mg/kg
- Bioassay Failure
- Bioassay Pass

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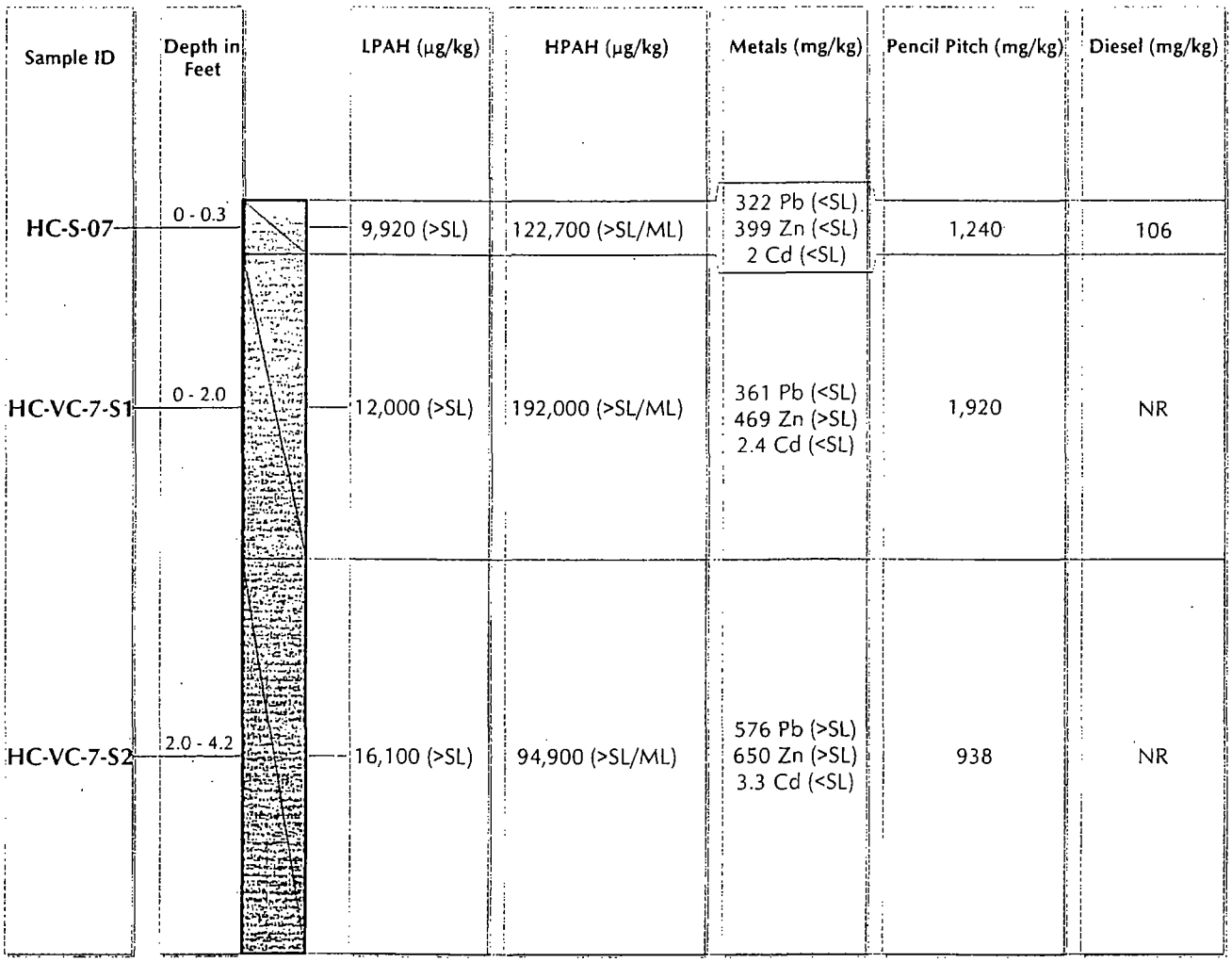
J-5624-10 4/00

Figure 16

Vertical Distribution of Chemical Constituents: HC-7

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Legend:

SL Screening Level

ML Maximum Level

NR Not Reported

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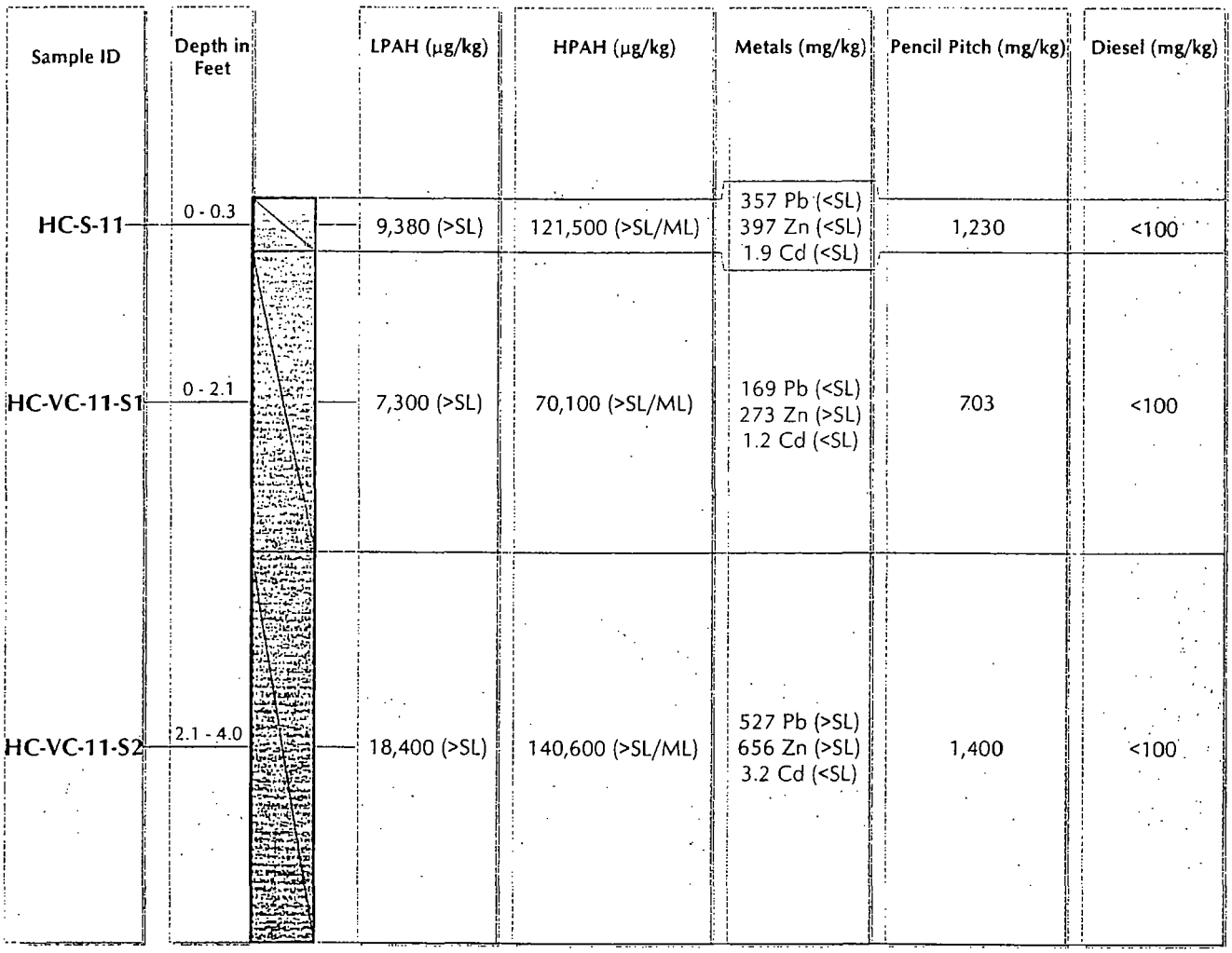
J-5624-10 4/00

Figure 17

Vertical Distribution of Chemical Constituents: HC-11

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Sample ID	Depth in Feet	LPAH (µg/kg)	HPAH (µg/kg)	Metals (mg/kg)	Pencil Pitch (mg/kg)	Diesel (mg/kg)
HC-S-11	0 - 0.3	9,380 (>SL)	121,500 (>SL/ML)	357 Pb (<SL) 397 Zn (<SL) 1.9 Cd (<SL)	1,230	<100
HC-VC-11-S1	0 - 2.1	7,300 (>SL)	70,100 (>SL/ML)	169 Pb (<SL) 273 Zn (>SL) 1.2 Cd (<SL)	703	<100
HC-VC-11-S2	2.1 - 4.0	18,400 (>SL)	140,600 (>SL/ML)	527 Pb (>SL) 656 Zn (>SL) 3.2 Cd (<SL)	1,400	<100

Legend:

SL Screening Level

ML Maximum Level

NR Not Reported

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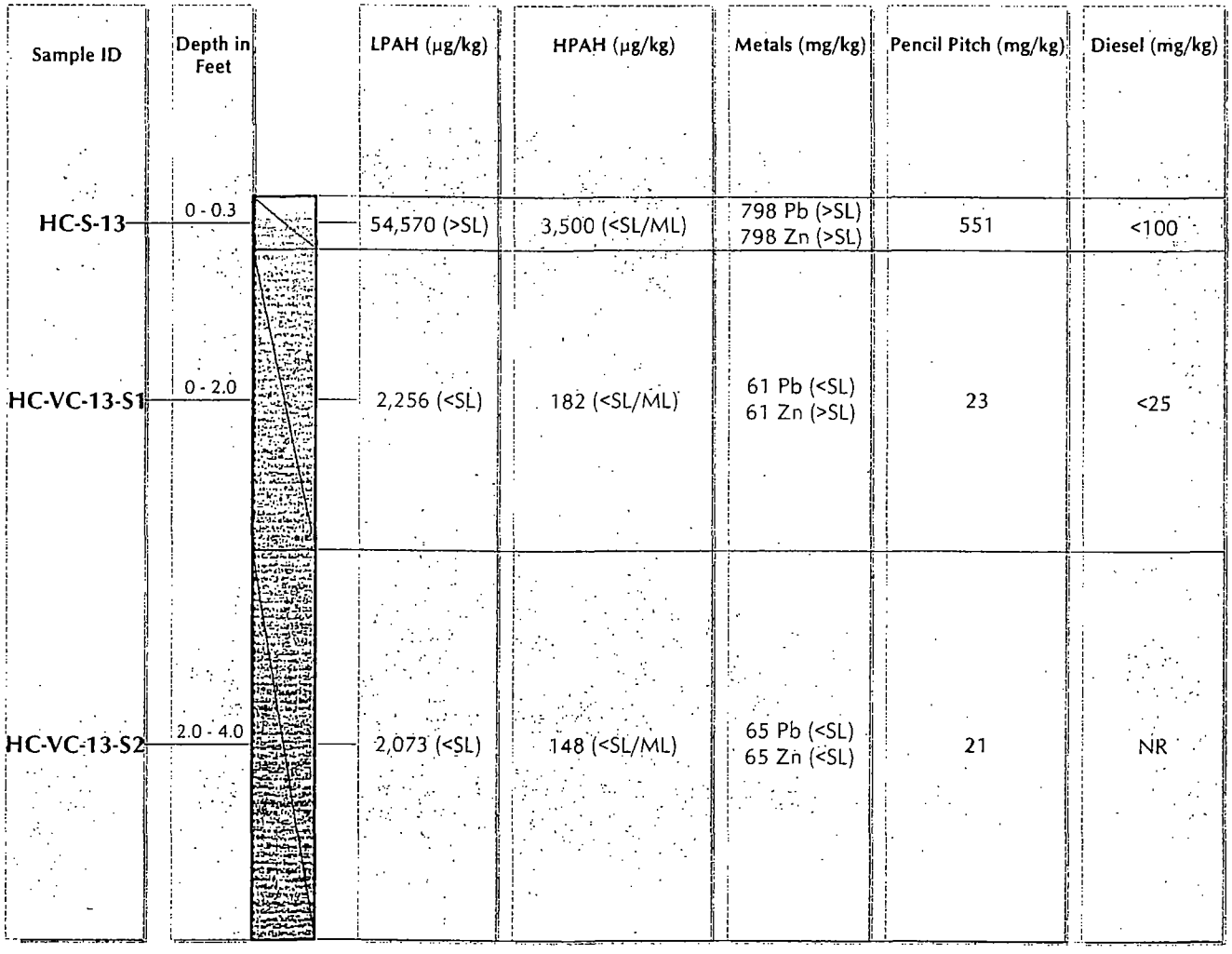
J-5624-10 4/00

Figure 18

Vertical Distribution of Chemical Constituents: HC-13

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Sample ID	Depth in Feet	LPAH (µg/kg)	HPAH (µg/kg)	Metals (mg/kg)	Pencil Pitch (mg/kg)	Diesel (mg/kg)
HC-S-13	0 - 0.3	54,570 (>SL)	3,500 (<SL/ML)	798 Pb (>SL) 798 Zn (>SL)	551	<100
HC-VC-13-S1	0 - 2.0	2,256 (<SL)	182 (<SL/ML)	61 Pb (<SL) 61 Zn (>SL)	23	<25
HC-VC-13-S2	2.0 - 4.0	2,073 (<SL)	148 (<SL/ML)	65 Pb (<SL) 65 Zn (<SL)	21	NR

Legend:

SL Screening Level

ML Maximum Level

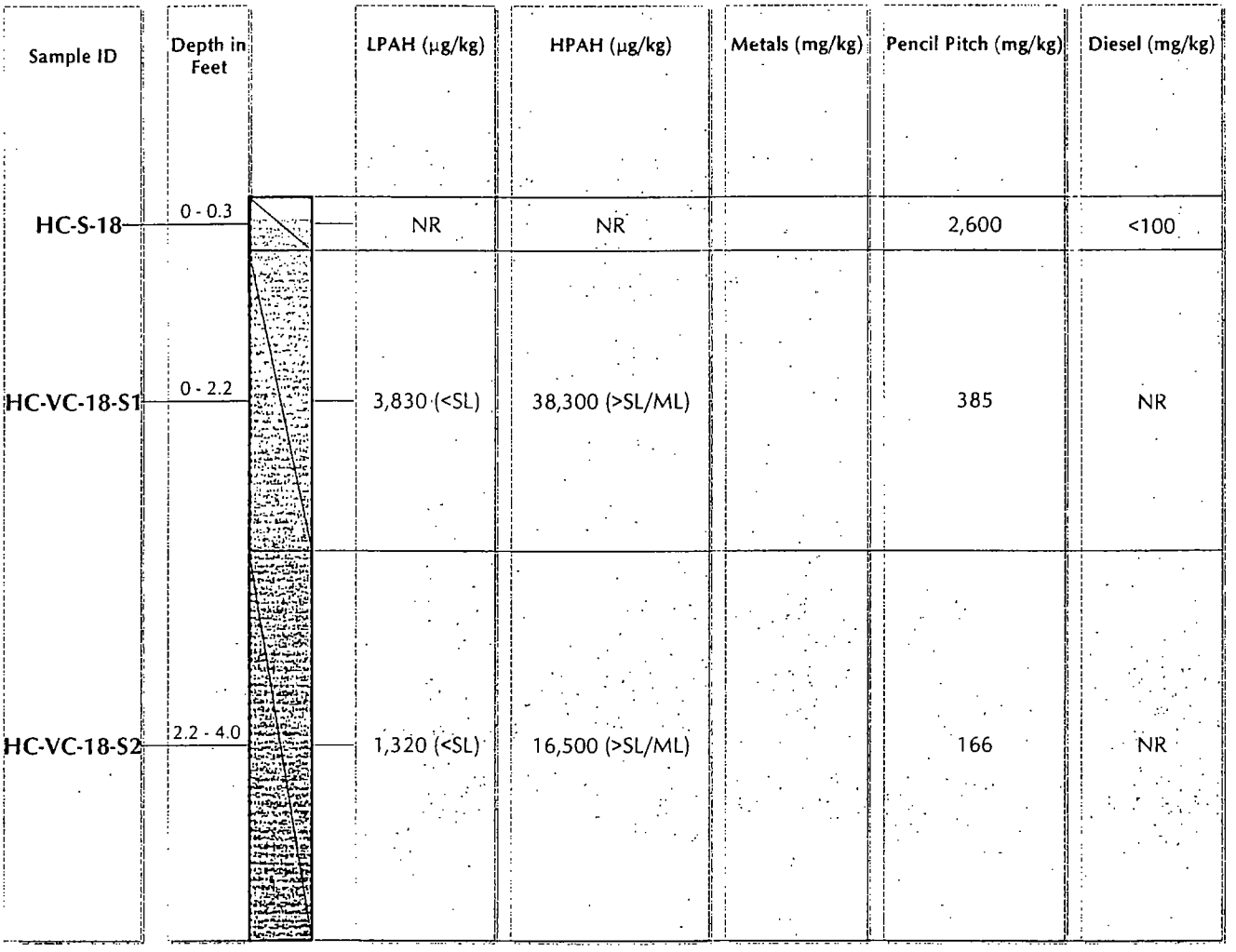
NR Not Reported

HARTCROWSER

J-5624-10 4/00

Figure 19

Vertical Distribution of Chemical Constituents: HC-18
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Sample ID	Depth in Feet	LPAH (µg/kg)	HPAH (µg/kg)	Metals (mg/kg)	Pencil Pitch (mg/kg)	Diesel (mg/kg)
HC-S-18	0 - 0.3	NR	NR		2,600	<100
HC-VC-18-S1	0 - 2.2	3,830 (<SL)	38,300 (>SL/ML)		385	NR
HC-VC-18-S2	2.2 - 4.0	1,320 (<SL)	16,500 (>SL/ML)		166	NR

Legend:

SL Screening Level

ML Maximum Level

NR Not Reported

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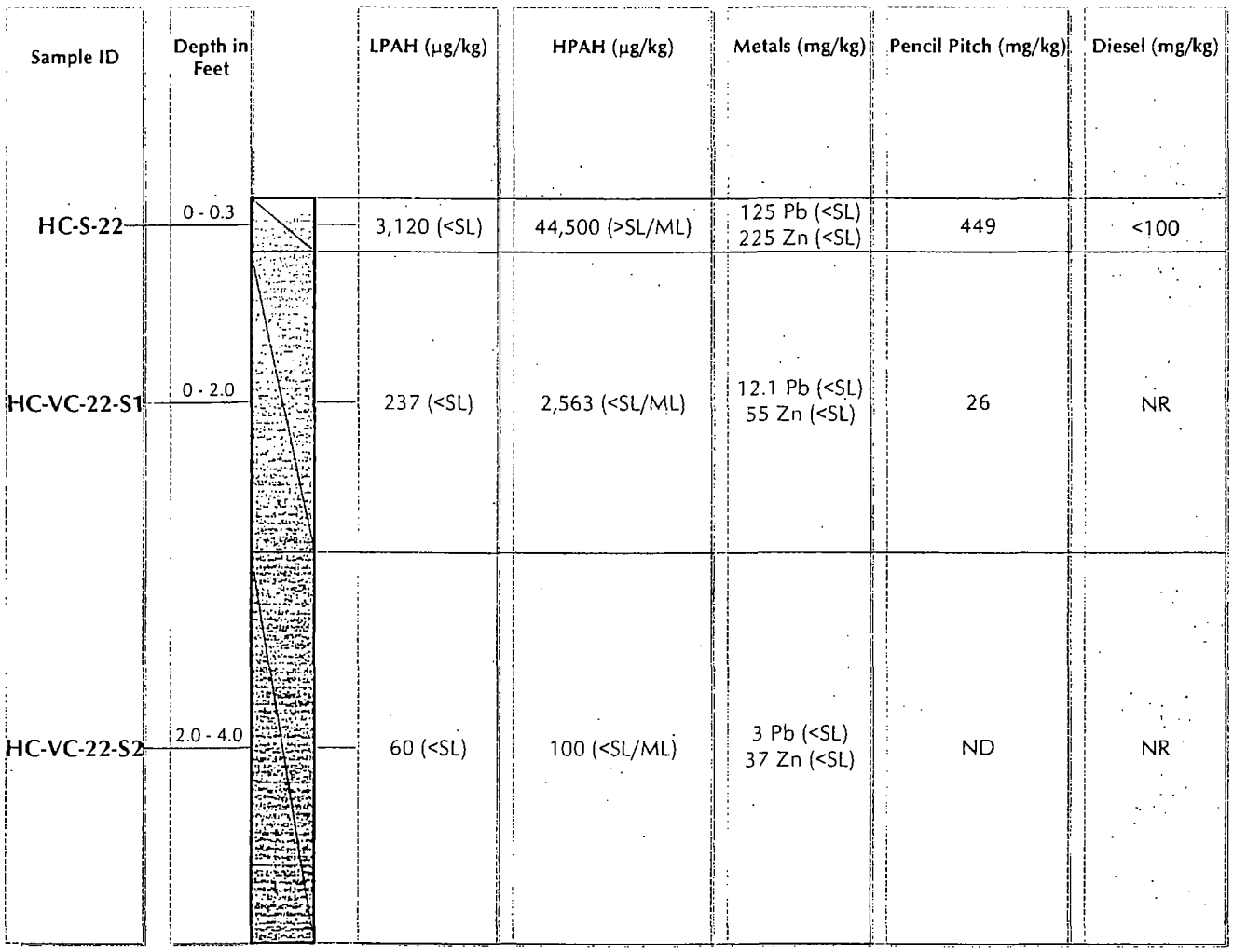
Figure 20

Vertical Distribution of Chemical Constituents: HC-22

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Sample ID	Depth in Feet	LPAH (µg/kg)	HPAH (µg/kg)	Metals (mg/kg)	Pencil Pitch (mg/kg)	Diesel (mg/kg)
HC-S-22	0 - 0.3	3,120 (<SL)	44,500 (>SL/ML)	125 Pb (<SL) 225 Zn (<SL)	449	<100
HC-VC-22-S1	0 - 2.0	237 (<SL)	2,563 (<SL/ML)	12.1 Pb (<SL) 55 Zn (<SL)	26	NR
HC-VC-22-S2	2.0 - 4.0	60 (<SL)	100 (<SL/ML)	3 Pb (<SL) 37 Zn (<SL)	ND	NR

Legend:

SL Screening Level

ML Maximum Level

NR Not Reported

ND Not Detected

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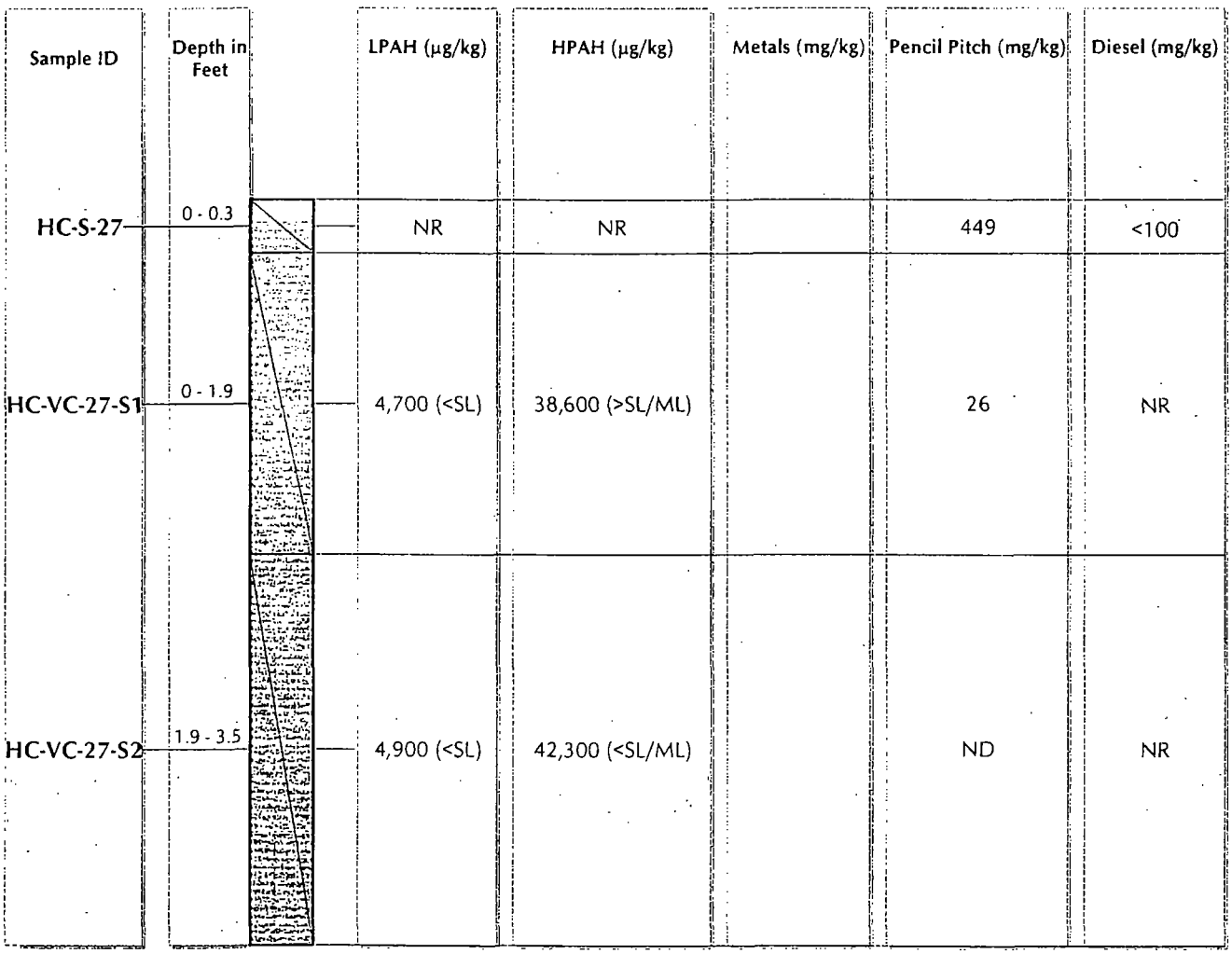
Figure 21

Vertical Distribution of Chemical Constituents: HC-27

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Sample ID	Depth in Feet	LPAH (µg/kg)	HPAH (µg/kg)	Metals (mg/kg)	Pencil Pitch (mg/kg)	Diesel (mg/kg)
HC-S-27	0 - 0.3	NR	NR		449	<100
HC-VC-27-S1	0 - 1.9	4,700 (<SL)	38,600 (>SL/ML)		26	NR
HC-VC-27-S2	1.9 - 3.5	4,900 (<SL)	42,300 (<SL/ML)		ND	NR

Legend:

SL Screening Level

ML Maximum Level

NR Not Reported

ND Not Detected

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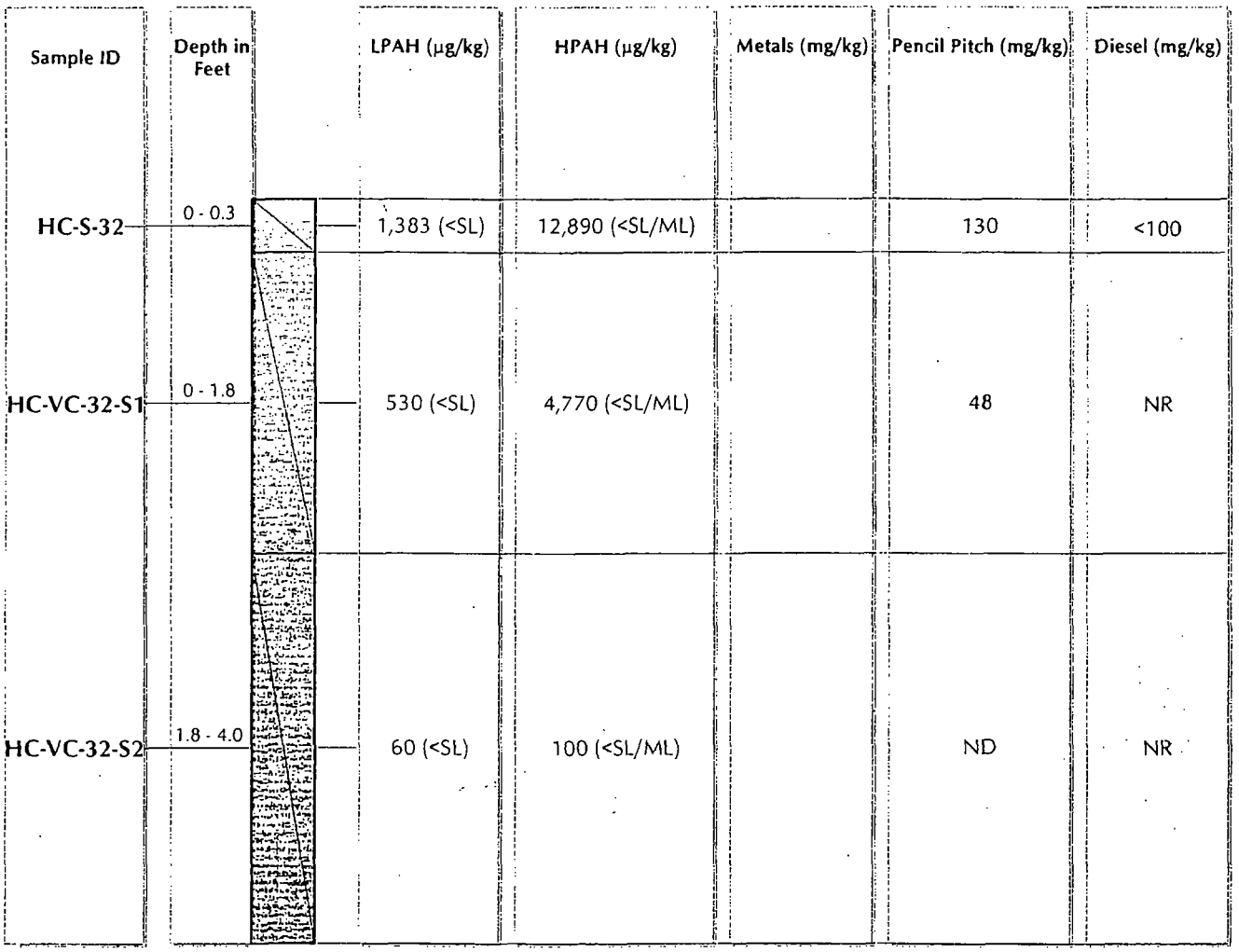
Figure 22

Vertical Distribution of Chemical Constituents: HC-32

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Sample ID	Depth in Feet	LPAH (µg/kg)	HPAH (µg/kg)	Metals (mg/kg)	Pencil Pitch (mg/kg)	Diesel (mg/kg)
HC-S-32	0 - 0.3	1,383 (<SL)	12,890 (<SL/ML)		130	<100
HC-VC-32-S1	0 - 1.8	530 (<SL)	4,770 (<SL/ML)		48	NR
HC-VC-32-S2	1.8 - 4.0	60 (<SL)	100 (<SL/ML)		ND	NR

Legend:

SL Screening Level

ML Maximum Level

NR Not Reported

ND Not Detected

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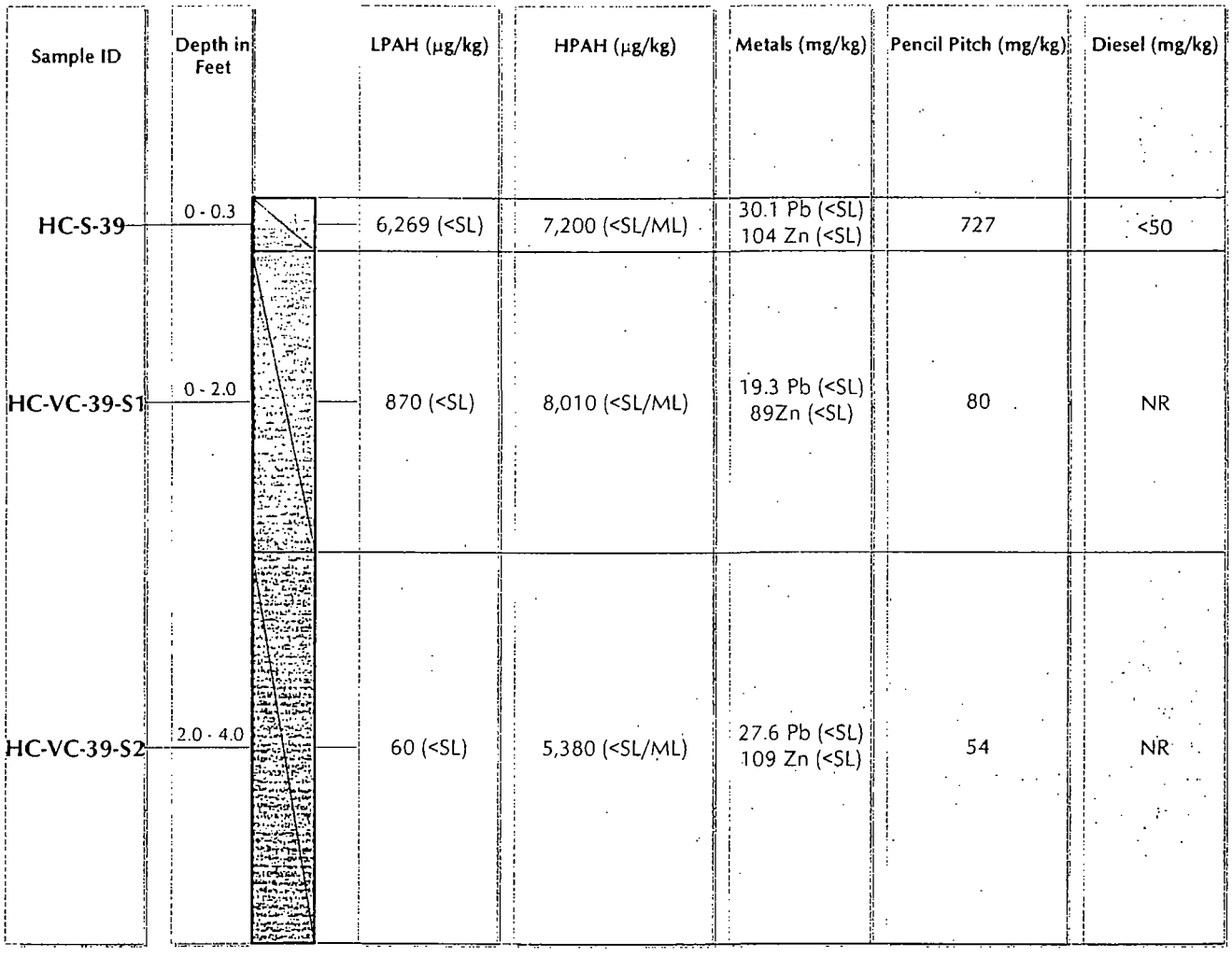
Figure 23

Vertical Distribution of Chemical Constituents: HC-39
Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Sample ID	Depth in Feet	LPAH (µg/kg)	HPAH (µg/kg)	Metals (mg/kg)	Pencil Pitch (mg/kg)	Diesel (mg/kg)
HC-S-39	0 - 0.3	6,269 (<SL)	7,200 (<SL/ML)	30.1 Pb (<SL) 104 Zn (<SL)	727	<50
HC-VC-39-S1	0 - 2.0	870 (<SL)	8,010 (<SL/ML)	19.3 Pb (<SL) 89Zn (<SL)	80	NR
HC-VC-39-S2	2.0 - 4.0	60 (<SL)	5,380 (<SL/ML)	27.6 Pb (<SL) 109 Zn (<SL)	54	NR

Legend:

SL Screening Level

ML Maximum Level

NR Not Reported

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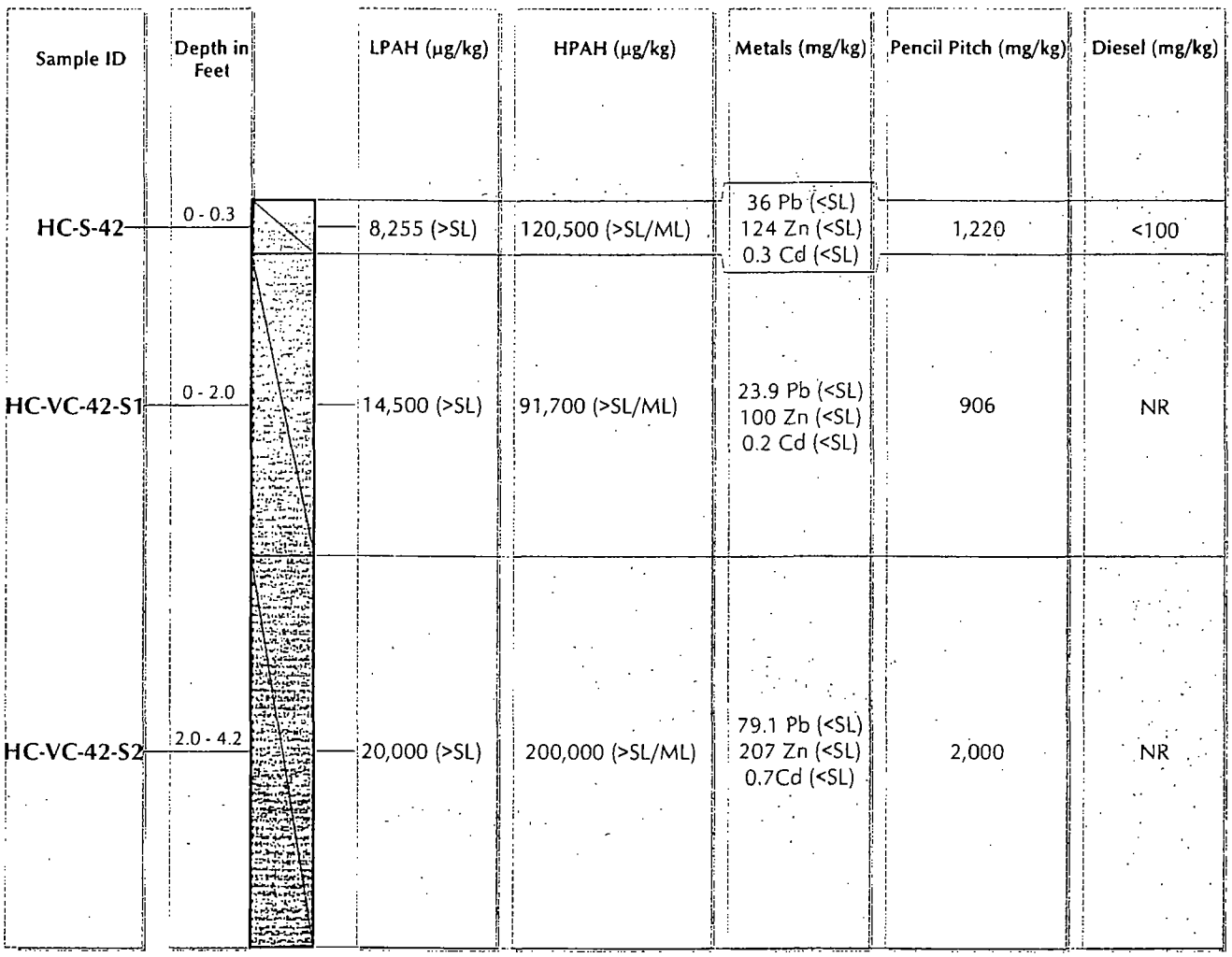
Figure 24

Vertical Distribution of Chemical Constituents: HC-42

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Legend:

SL Screening Level

ML Maximum Level

NR Not Reported

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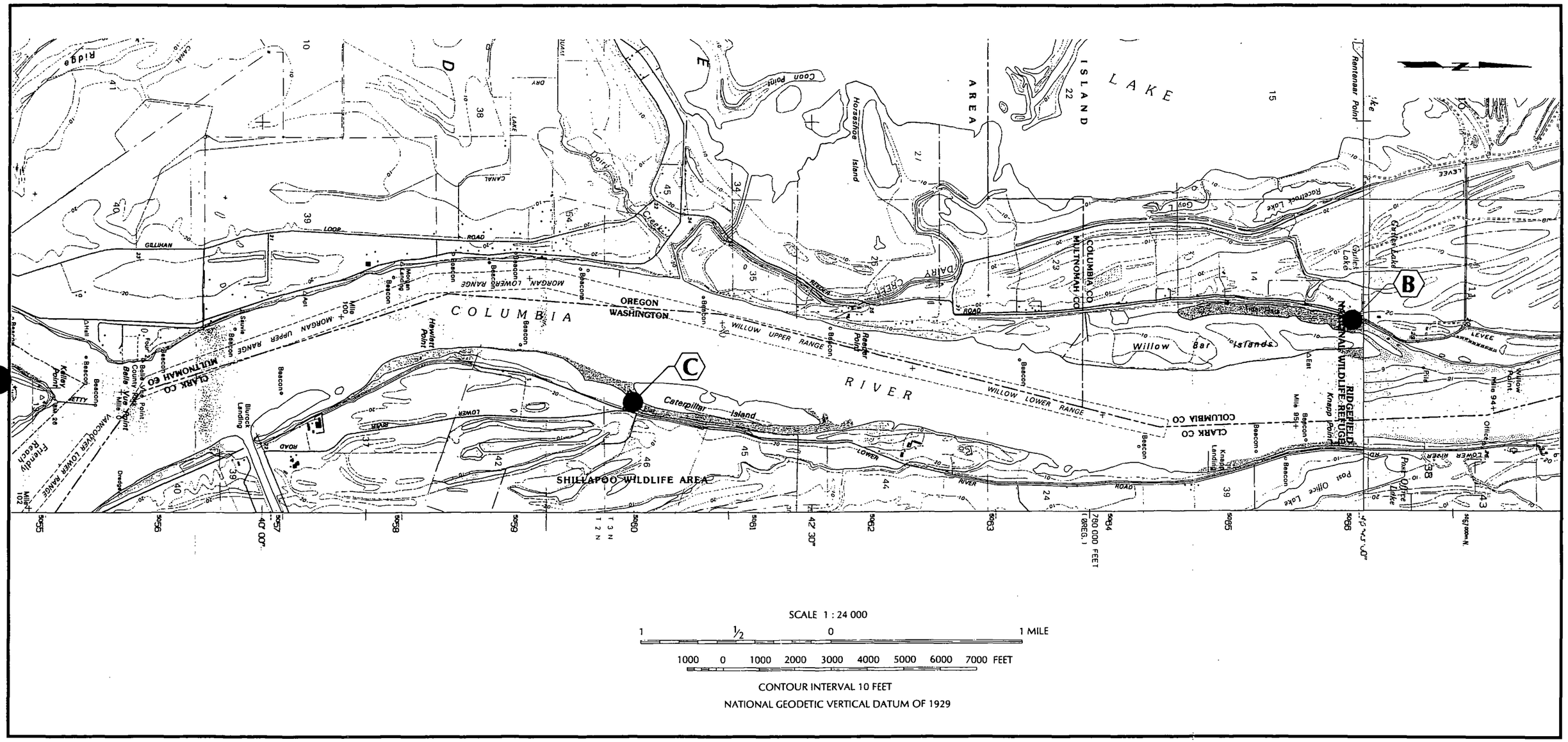
Figure 25

Bioassay Reference Sediment Sample Locations

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



SCALE 1 : 24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

CONTOUR INTERVAL 10 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Note: Base map prepared from the USGS 7.5-minute quadrangle of Sauvie Island, Oregon, dated 1990.

Legend:

(C) ● Reference Sediment Sample Location and Site Designation

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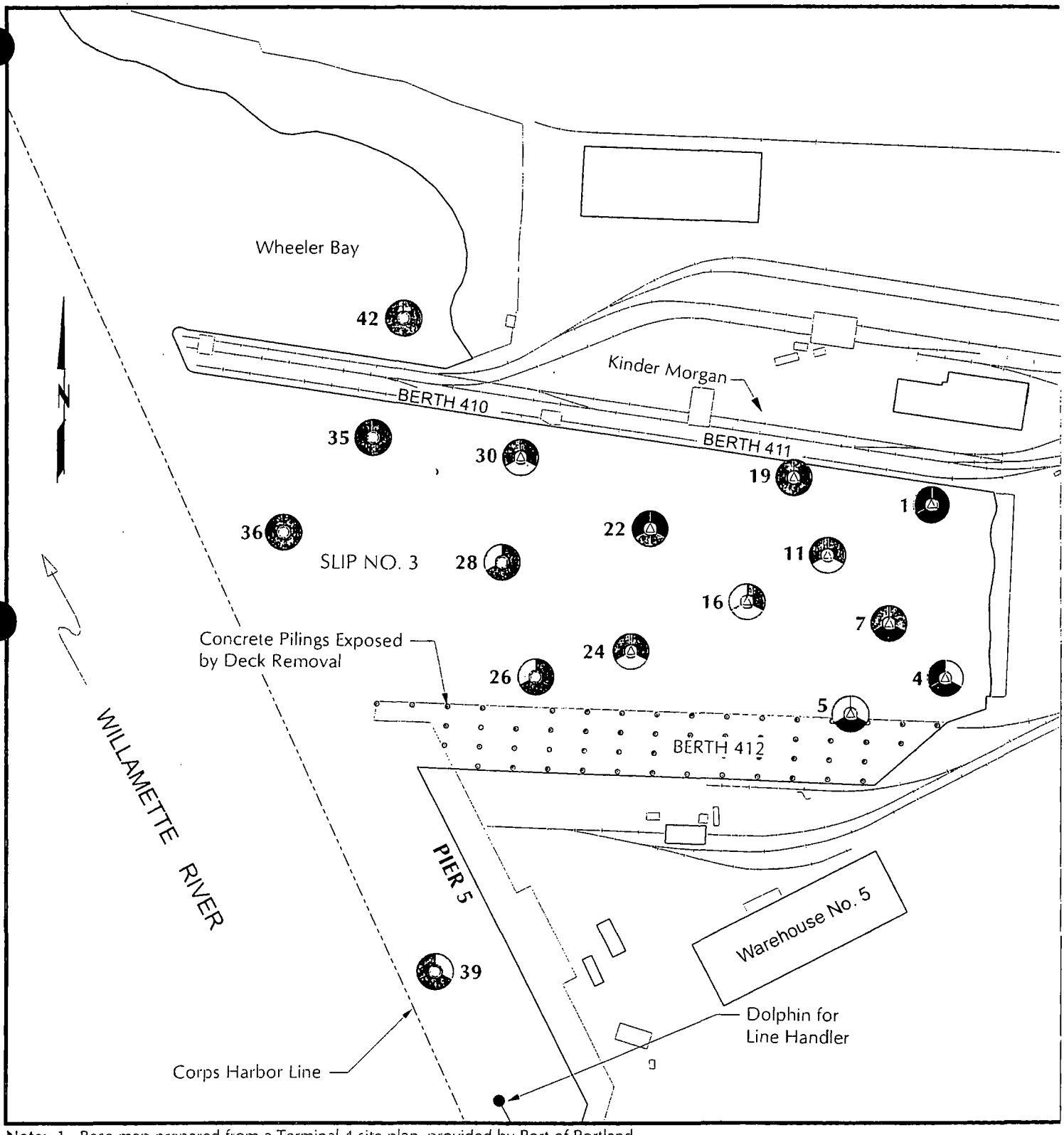
Figure 26

Bioassay Testing Results

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

0 100 200 400

Approximate Scale in Feet

Legend:

39 ○ Phase I Bioassay Sediment Sampling Location and Number

16 △ Phase II Bioassay Sediment Sampling Location and Number

AS = Amphipod Survival
MS = Midge Survival
MG = Midge Growth

Color Code:

Green = Pass
Yellow = 2-Hit Criteria

One failure of 1-hit criteria required for overall bioassay failure.

Two failures of 2-hit criteria required for overall bioassay failure.

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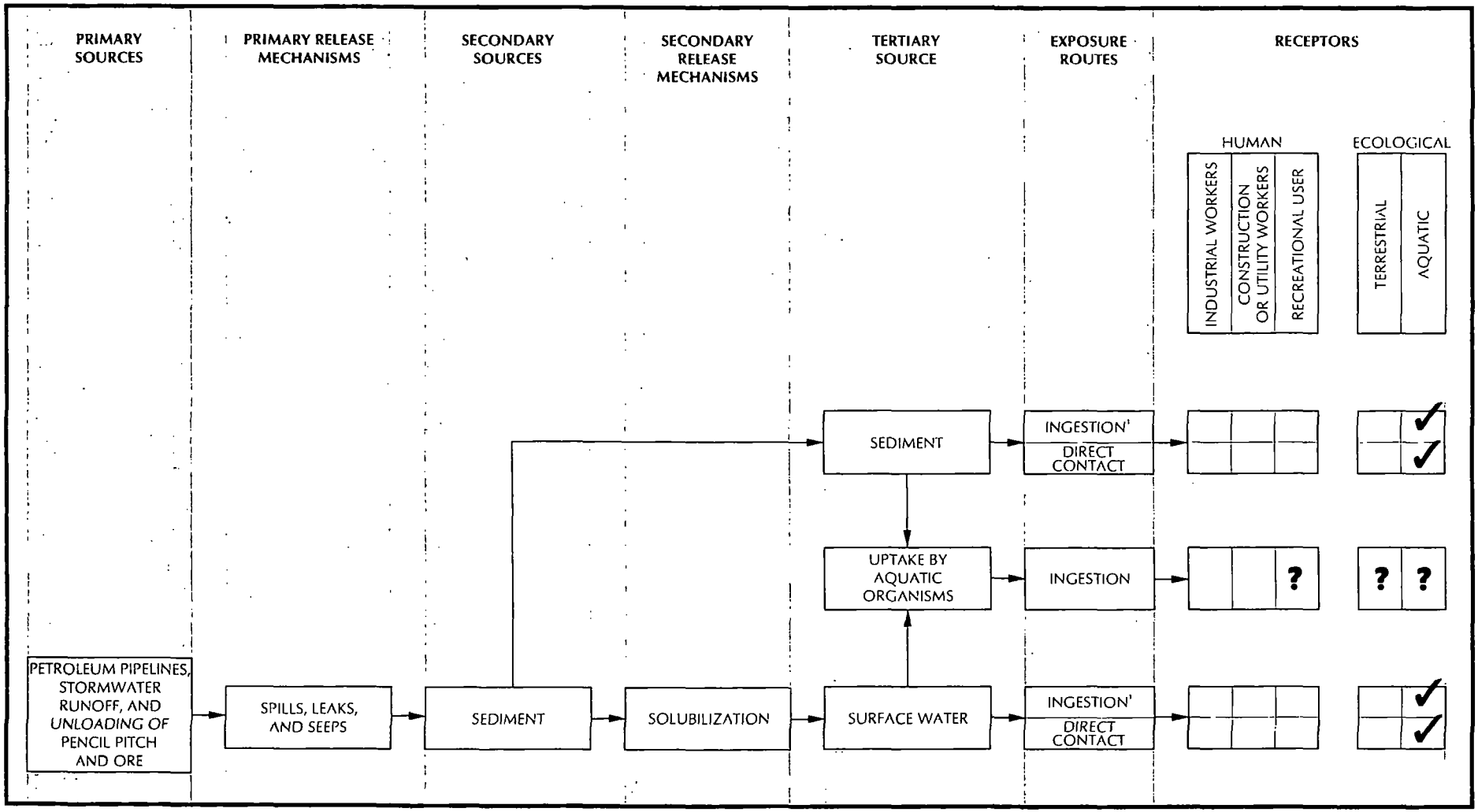
Figure 27

Exposure Pathway Evaluation

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Legend:

✓ Complete Exposure Pathway

? Uncertain Exposure Pathway Pending Future Analysis

Notes:

'Ingestion also includes incidental ingestion.

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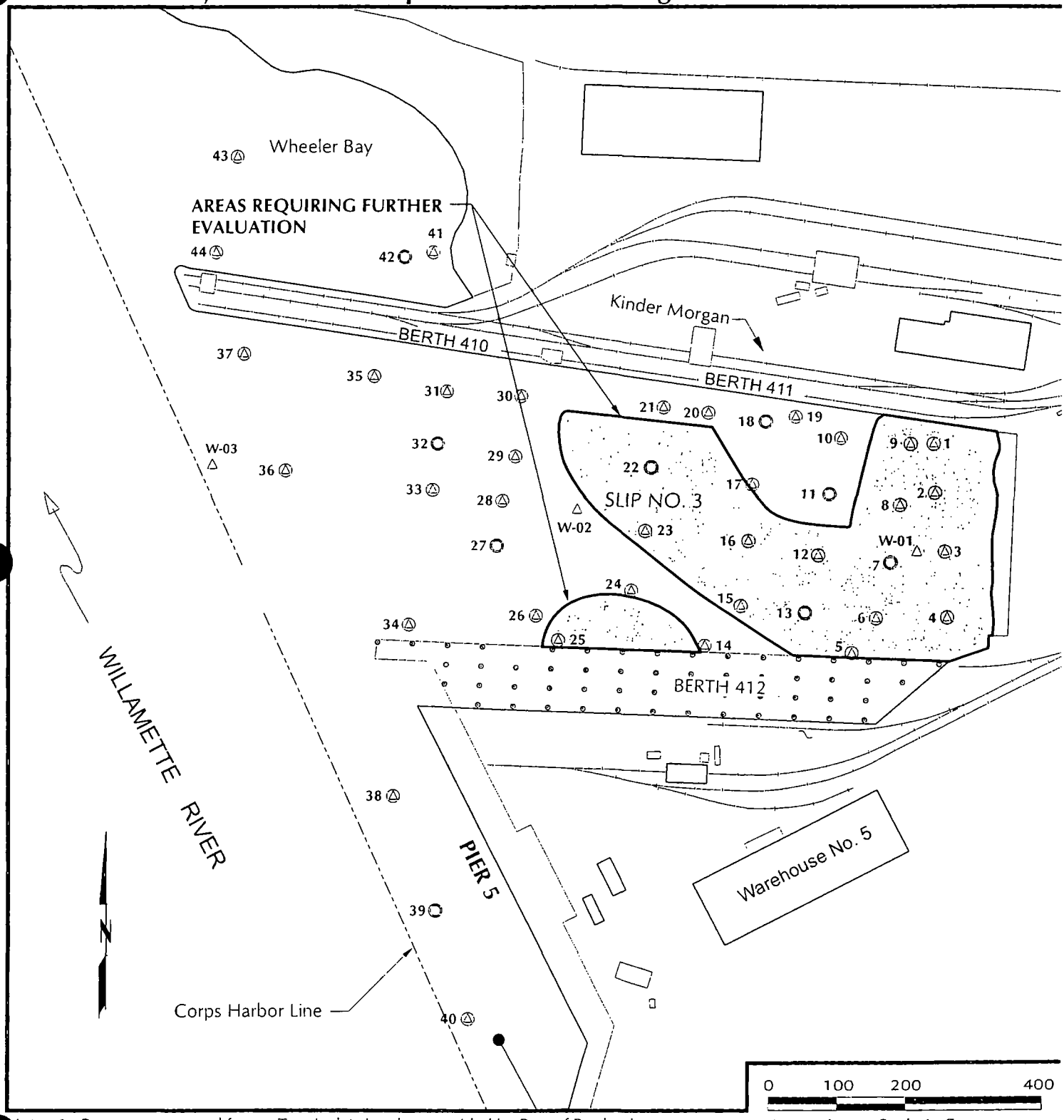
J-5624-10
Figure 28
7/99

Delineation of Areas Requiring Further Evaluation Based on Confirmatory Bioassay Tests

Port of Portland, Terminal 4 - Slip 3 Remedial Investigation



Note: 1. Base map prepared from a Terminal 4 site plan, provided by Port of Portland.

Legend:

40 ◬ Surface Sediment Sample Location and Number

39 ○ Collocated Surface and Subsurface Sediment Sample Location and Number

W-03 △ Water Sample Location and Number

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Figure 29

APPENDIX A

APPENDIX A
FIELD ACTIVITIES SUMMARY

APPENDIX A
FIELD ACTIVITIES SUMMARY
TERMINAL 4, SLIP 3 REMEDIAL INVESTIGATION

This appendix summarizes the field activities conducted October 12 through 15, 1998, as part of the Terminal 4, Slip 3 (Slip 3) Remedial Investigation (RI). All sediment sampling and handling activities were performed in accordance with the Oregon Department of Environmental Quality (DEQ)-approved Sampling and Analysis Plan (SAP) developed for this project (Hart Crowser, 1998a). A brief summary of the specific field activities and sample collection methods is presented below along with a discussion of modifications to the approved plan.

Summary of Field Activities

Surface sediment, subsurface sediment, and water quality sampling was performed in the Marine Terminal 4 Area (T-4). The T-4 study area consisted of the sediments located upriver at Pier 5 Willamette River Dock (Pier 5), Slip 3, and in Wheeler Bay, which is immediately down river and adjacent to Slip 3. This sampling was performed by Hart Crowser and subcontractor personnel. Field activities included the following:

- Hydraulic grab sampling of surface sediments;
- Subsurface sediment core sampling; and
- Water column sampling.

Surface Sediment Sampling Methods

Surface sediment samples (0 to 10 centimeters) were collected at forty-four locations, including nine surface samples collocated with core locations using hydraulic grab methods briefly described below. All samples were submitted for chemical and physical testing and fifteen of these samples plus two reference site samples were also submitted for sediment bioassay analyses. Surface sediment sampling was conducted in general accordance with the approved project plan; modifications are described at the end of each section.

Surface sediment locations are presented on Figure 5. A summary of surface sediment sample locations, dates, coordinates, and mudline elevations are presented in Table 2.

Hydraulic Surface Grab Sampling

Sediment samples were collected from 0 to 10 centimeters, in depth, using a hydraulic grab sampler. The sampler deployed from the vessel *R/V Nancy Anne* was used to collect surficial sediment samples for chemical, biological, and physical testing. This sampler was designed by Marine Sampling Systems (MSS) to collect large volumes of sediment from difficult matrices and bottom conditions. Other instruments used to collect surficial samples included a siphon hose to remove standing water, and stainless steel trowels, spoons, and bowls to sample and mix the sediments as described in Section 4.4.3 of the SAP. A qualified geologist logged each sample after hydraulic grab retrieval and acceptance. Sample information recorded at each location included coordinates, mudline elevation, date, time, visual description of sediment, estimations of percent wood by volume, number of deployments, recovery depth, sample I.D., and types of analysis to be performed.

Sampling equipment was decontaminated prior to and between sampling activities as outlined in Section 4.4.3 of the SAP. Sample containers were placed in cooled ice chests until transfer to the specified laboratory as described in Section 6.4 of the Quality Assurance Project Plan (QAPP).

Field QA/QC. Two homogenized field duplicates were collected from surface sample locations HC-S-09 and HC-S-24 and labeled HC-S-101 and HC-S-102, respectively. Homogenized duplicates were collected as separate jars filled from the same mixing bowl to assess laboratory variability. Duplicates were analyzed for the chemicals of potential concern (COPCs) identified by the Port of Portland (Port) and DEQ as well as total ammonia, total volatile solids, total sulfides, total organic carbon (TOC), and grain size.

Modifications to the Surface Sediment Sampling Plan

All proposed sampling locations along the shoreline of Slip 3 were slightly modified to avoid riprap and debris, which was abundant in the failed attempts. The proposed sampling location HC-S-41, in Wheeler Bay, was modified as it was located on the riprapped bank.

Subsurface Sediment Core Sampling and Processing

Subsurface sediment sampling was completed with the collection of nine cores on October 12, 1998. Sediment cores were collected using a vibracore with a

4-inch-diameter aluminum core tube deployed from the research vessel *R/V Nancy Anne*. Sediment core sampling, decontamination, and processing were conducted in general accordance with the approved project plan. Core locations are presented on Figure 5. Subsurface locations, dates sampled, positioning coordinates, and sediment elevations are presented in Table 2. Core logs and geologic descriptions are compiled on Figures B-2 through B-10. A key to sediment log descriptions is presented on Figure B-1 (Appendix B).

Subsurface Sediment Core Sampling

After the cores were retrieved and accepted, cores were capped, labeled, and sealed tightly enough to prevent leakage or disturbance and stored upright in an insulated core box filled with Blue-Ice until transport to the on-site location (Warehouse 7) where processing was performed. Cores were handled in general accordance with Sections 4.4 through 4.8 of the SAP.

Core samples were divided into three separate sections: top and bottom. Top samples consisted of sediments 0 to -2 feet (consistent with the grab samples); bottom samples consisted of sediments from -2 to -4 feet in the sediment column. A deeper layer representing the -4 to -6 feet sediment column was also sampled. These deeper sediment sections were archived for potential future chemical analyses.

Sediment sections were placed in separate stainless steel bowls for mixing. The samples were thoroughly homogenized using stainless steel spoons until uniform in texture and color. Homogenized sediments were placed into a pre-cleaned sample container, labeled, and transferred immediately to cooled ice chests until transport to the laboratory. Each sample container was clearly labeled with the project name, sample identification number, type of analysis to be performed, date and time, and initials of person(s) preparing the sample, and referenced by entry into the log book. Samples were stored at approximately 4°C until withdrawn for analysis.

Field QA/QC. Three homogenized field duplicates were collected from subsurface sample locations HC-VC-13-S1, HC-VC-13-S2, and HC-VC-11-S1, and were labeled HC-VC-103, HC-VC-104, and HC-VC-105, respectively. Homogenized duplicates were collected as separate jars filled from the same mixing bowl to assess laboratory variability. Duplicate HC-VC-103 was analyzed for total sulfide, total volatile solids, and volatile organics. Duplicate HC-VC-104 was analyzed for total volatile solids and semivolatile organics. Duplicate HC-VC-105 was analyzed for total and dissolved priority pollutant metals, total volatile solids, total ammonia, and total organic carbon (TOC).

Modifications to the Subsurface Sediment Core Sampling Plans

The core samples were collected at the proposed location except for HC-VC-22, which was moved approximately 38 feet toward the Hall Buck pier face after three low-recovery attempts. It appeared that the proposed location was positioned in the propeller scour zone for the berth. This condition was evidenced by the lack of soft, recently deposited material overlying medium to fine sand.

Water Sampling

Water Column Sampling

Water samples were collected from three locations to assess the contributions of various sources (both aquatic and upland) to the water quality in the slip (Figure 5). Water samples were collected using a 2-liter Van Dorn Bottle deployed from the research vessel *R/V Nancy Anne* on October 15, 1998. Samples were collected in general accordance with Response to DEQ's Comments on the Remedial Investigation Work Plan (Hart Crowser, 1998b).

Water samples were collected at the mid-point between the water surface and mudline and 1 meter above the sediment surface. Three water sampling locations; HC-WS-01, HC-WS-02, and HC-WS-03 represented two depths: middle water column (M) and bottom water column (B). Water samples were preserved with Hydrogen Chloride (HCL) and analyzed for total suspended solids (TSS); benzene, toluene, ethylbenzene, and total xylenes (BTEX); polycyclic aromatic hydrocarbons (PAHs); and total and dissolved priority pollutant metals (Table 6). A summary of analytical surface water results are presented in Table 7.

QA/QC Samples. Two rinseate blanks were collected during water column sampling activities to assess the effectiveness of decontamination procedures. The rinseate blanks were labeled HC-RB-100 and HC-RB-101. Rinseate blanks were analyzed for TSS; BTEX; PAHs; and total and dissolved priority metals.

Modifications to the Water Sampling Plans

The number of water column samples proposed in the initial work plan was reduced from 12 to 6. Samples were collected in general accordance with Response to DEQ's Comments on the Remedial Investigation Work Plan (Hart Crowser, 1998b).

Location Control and Documentation

Sampling location control was performed in accordance with the SAP. The objective of the positioning procedure was to accurately determine and record the positions (±3 m) of sampling locations. This determination was achieved by referencing each sampling location to state plane coordinates with the use of known survey control points and differential global positioning system (DGPS).

The following parameters were documented at each sampling location:

- Horizontal location in state plane coordinates, as appropriate;
- Vertical elevation in feet (including mudline and river elevation above the mudline);
- Time and date; and
- River elevation referenced to Columbia River Datum (CRD).

These parameters were measured using combinations of DGPS, river elevation gages, and back-up methods (i.e., triangulation or taping to survey control points and/or terminal landmarks or structures).

Positioning while sampling was performed using a DGPS, which provided positions every second with submeter accuracy for precise positioning of sample locations. The navigation system onboard the vessel provided the vessel pilot with a navigation display to enable piloting to sample locations and recording of the exact location of the sediment core.

Modifications to the Location Control Plans

Modifications to the RI/FS Project Plans and significant comments for location control methods include the following:

- The proposed sampling locations along the shoreline of Slip 3 were slightly modified to avoid riprap and debris which was abundant in the failed attempts.
- The proposed sampling location HC-S-41, in Wheeler Bay, was modified as it was located on the riprapped bank.
- The proposed sampling location HC-VC-22 was moved approximately 38 feet toward the Hall Buck pier face after three low-recovery attempts. It appeared that the proposed location was positioned in the propeller

scour zone for the berth. This condition was evidenced by the lack of soft, recently deposited material overlying medium to fine sand.

Sediment Quality Sample Handling

Sediment quality sample handling (collecting, packaging, transporting, and documenting) was performed in general accordance with the SAP. On the sampling vessel, the field representative in the "support zone" labeled each jar with the sample identification information, filled out and signed the custody forms, and checked each sample set before transport to the laboratory. The person working in the "hot zone" composited and mixed the sediment surface grab samples, filled the sample jars with sediment, and placed the jars into cooled ice chests until transport to the specific laboratory.

Subsurface core samples were processed in Warehouse 7 located at the site. Cores were extruded (pushed or cut with a circular saw), logged, composited, and processed in this designated area. Samples were transported to Columbia Analytical Services and Northwestern Aquatic Sciences, every one or two days following proper chain of custody procedures outlined in the QAPP. The sediment samples were submitted to the laboratories for selected chemical, physical, and biological analyses in accordance with the project plans. The results of the laboratory analysis and bioassays are presented in Appendices G and H (presented in Volume II) of this document.

APPENDIX B

APPENDIX B
SEDIMENT CORE LOGS

Key for Soil/Sediment 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 perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

Minor Constituents

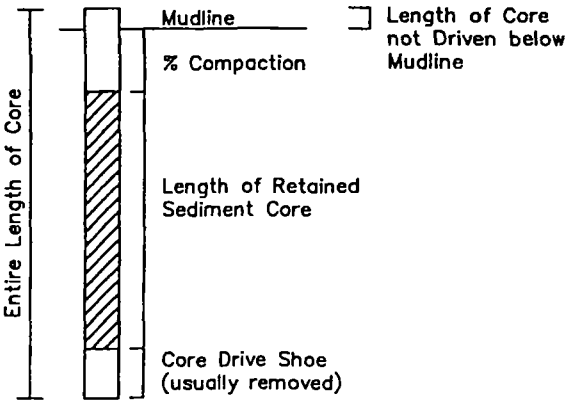
	Estimated Percentage
Not identified in description	0 – 5
Slightly (clayey, silty, etc.)	5 – 12
Clayey, silty, sandy, gravelly	12 – 30
Very (clayey, silty, etc.)	30 – 50

Legends

Sample Acceptability Criteria:

1. Overlying water is present
2. Water has low turbidity
3. Sampler is not overfilled
4. Surface is flat
5. Penetration depth is acceptable
6. Compaction is less than 25 percent
7. Core tube is intact

Core Observations



A-1\sed_key 1=1

——————— Major Sediment Unit Contacts
— — — — — Minor Sediment Unit Contacts

Estimated Percentage of Other Minor Constituents

(i.e.. shells, wood, organics, plastic, metal brick, refuse)

Description	Estimated Percentage
Dusting	Trace on Surface
Trace	Discernible
Scattered	0–5
Moderate	5–20
Substantial	20–50
Major Constituent	>50

Test Symbols

CHEM	Chemical Testing
GS	Grain Size
ARCH	Archive
▨	Continuous Vibracore
AL	Atterberg Limits
SP GR	Specfic Gravity
Rad	Radio Isotopes Pb–210 and Cs–137

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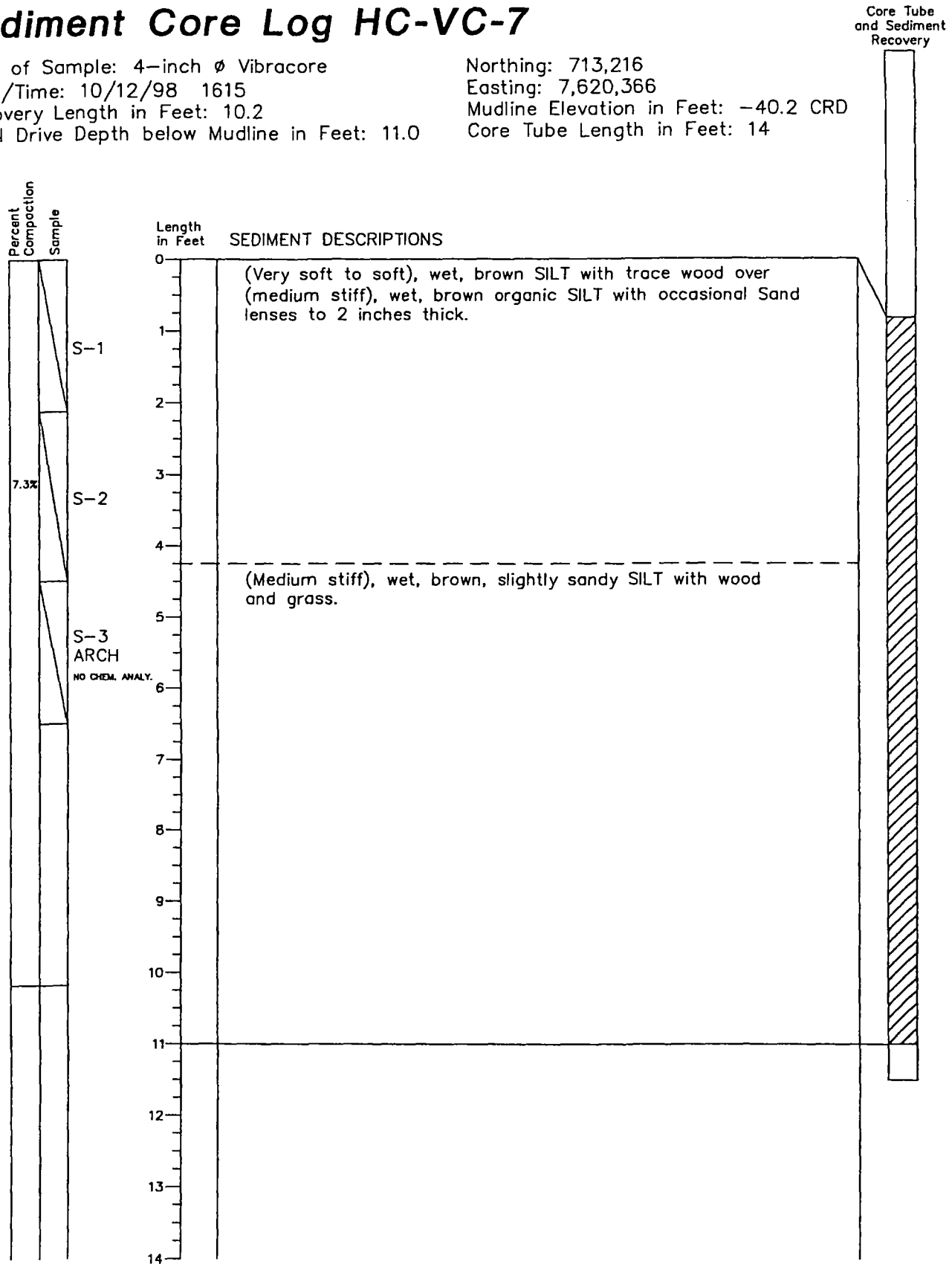
Figure B-1

Sediment Core Log HC-VC-7

Type of Sample: 4–inch ø Vibracore
Date/Time: 10/12/98 1615
Recovery Length in Feet: 10.2
Total Drive Depth below Mudline in Feet: 11.0

Northing: 713,216
Easting: 7,620,366
Mudline Elevation in Feet: –40.2 CRD
Core Tube Length in Feet: 14



Notes: 1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum – (DGPS) – Oregon State Plane North and vertical control is based on MLLW datum.

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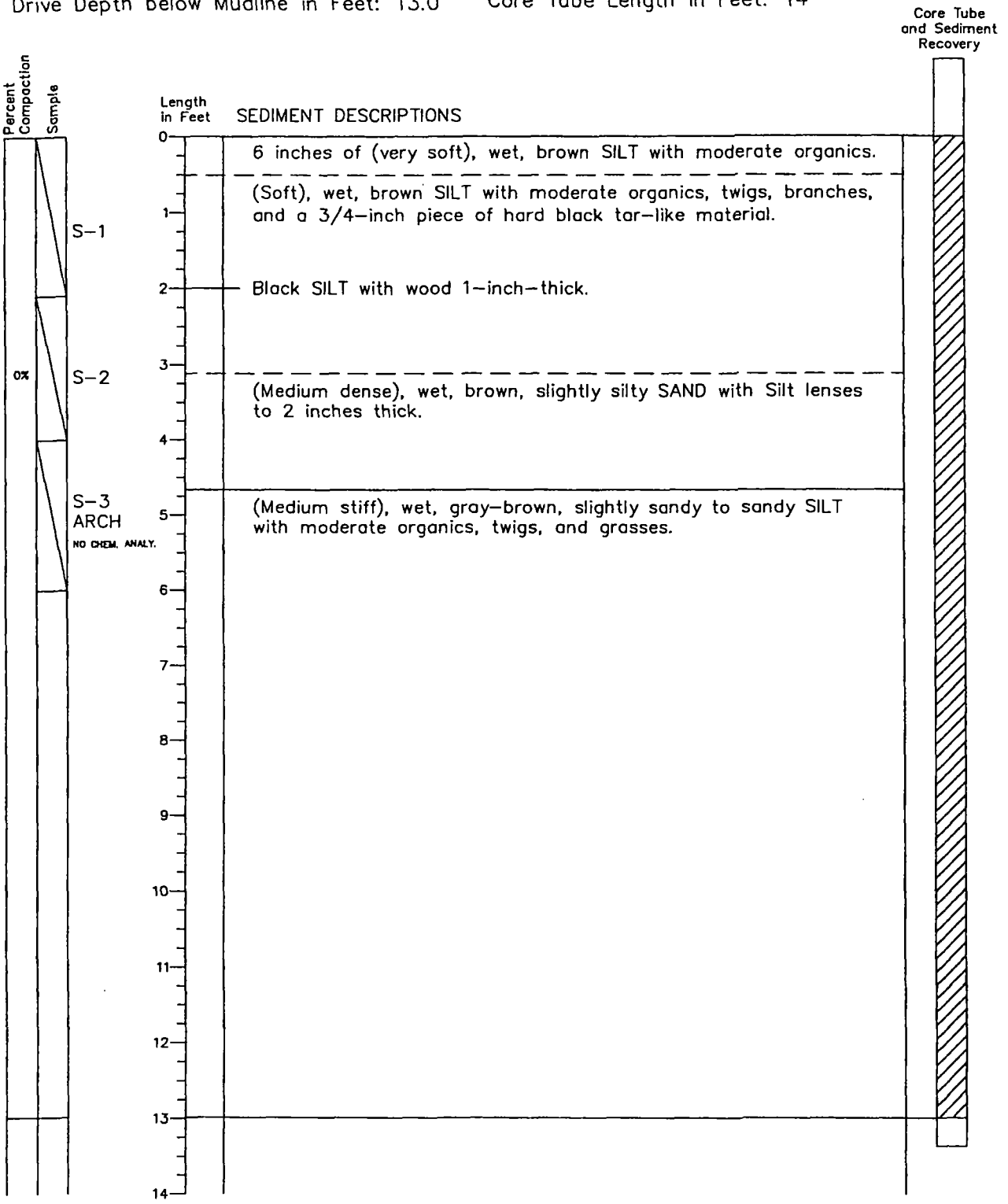
Figure B-2

1=1 ACAD LOG

Sediment Core Log HC-VC-11

Type of Sample: 4–inch ø Vibracore
Date/Time: 10/12/98 1030
Recovery Length in Feet: 13.0
Total Drive Depth below Mudline in Feet: 13.0

Northing: 713,314
Easting: 7,620,275
Mudline Elevation in Feet: –44 CRD
Core Tube Length in Feet: 14



Notes: 1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum – (DGPS) – Oregon State Plane North and vertical control is based on MLLW datum.

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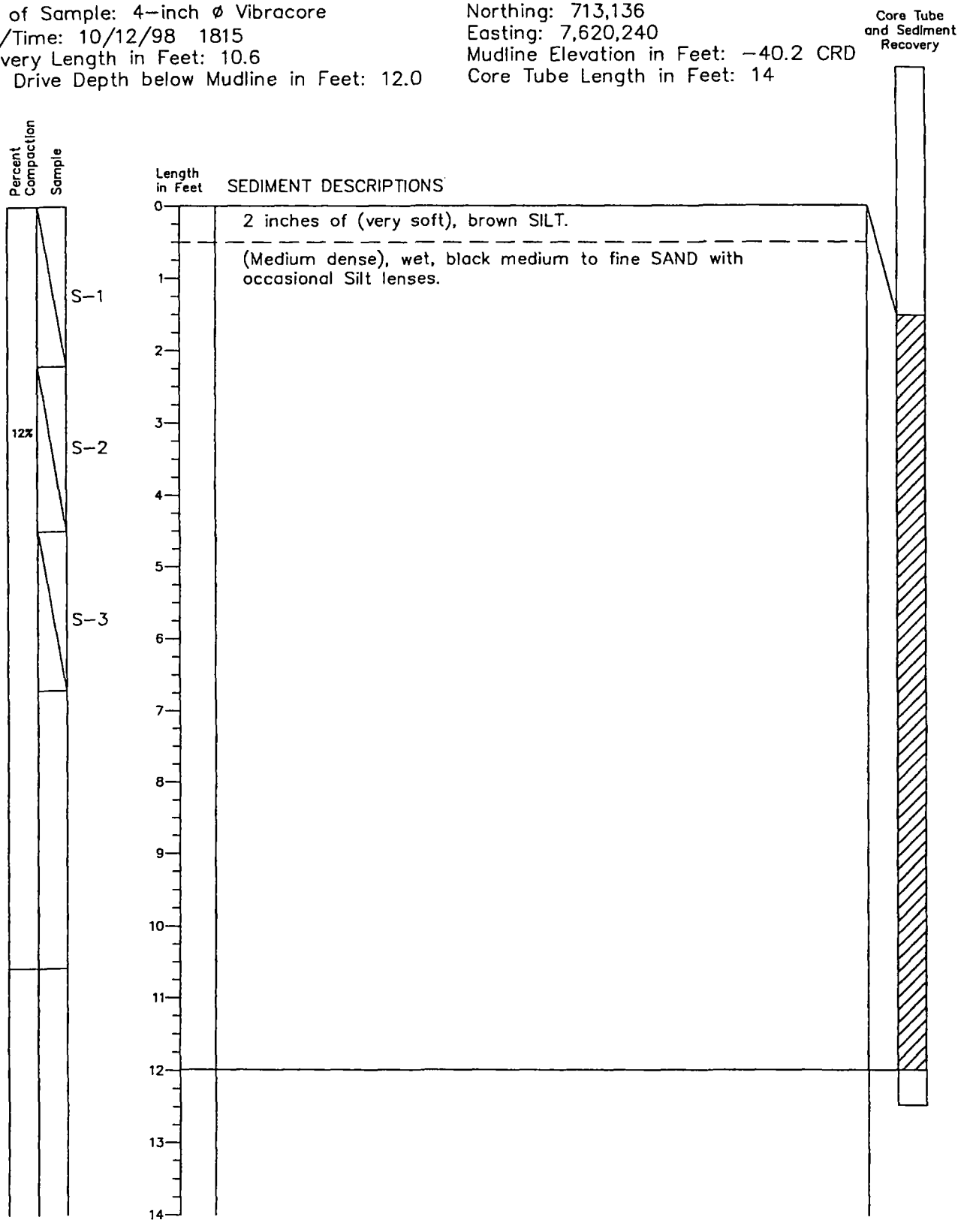
Figure B-3

1=1 ACAD LOG

Sediment Core Log HC-VC-13

Type of Sample: 4-inch ø Vibracore
Date/Time: 10/12/98 1815
Recovery Length in Feet: 10.6
Total Drive Depth below Mudline in Feet: 12.0

Northing: 713,136
Easting: 7,620,240
Mudline Elevation in Feet: -40.2 CRD
Core Tube Length in Feet: 14



Notes: 1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum – (DGPS) – Oregon State Plane North and vertical control is based on MLLW datum.

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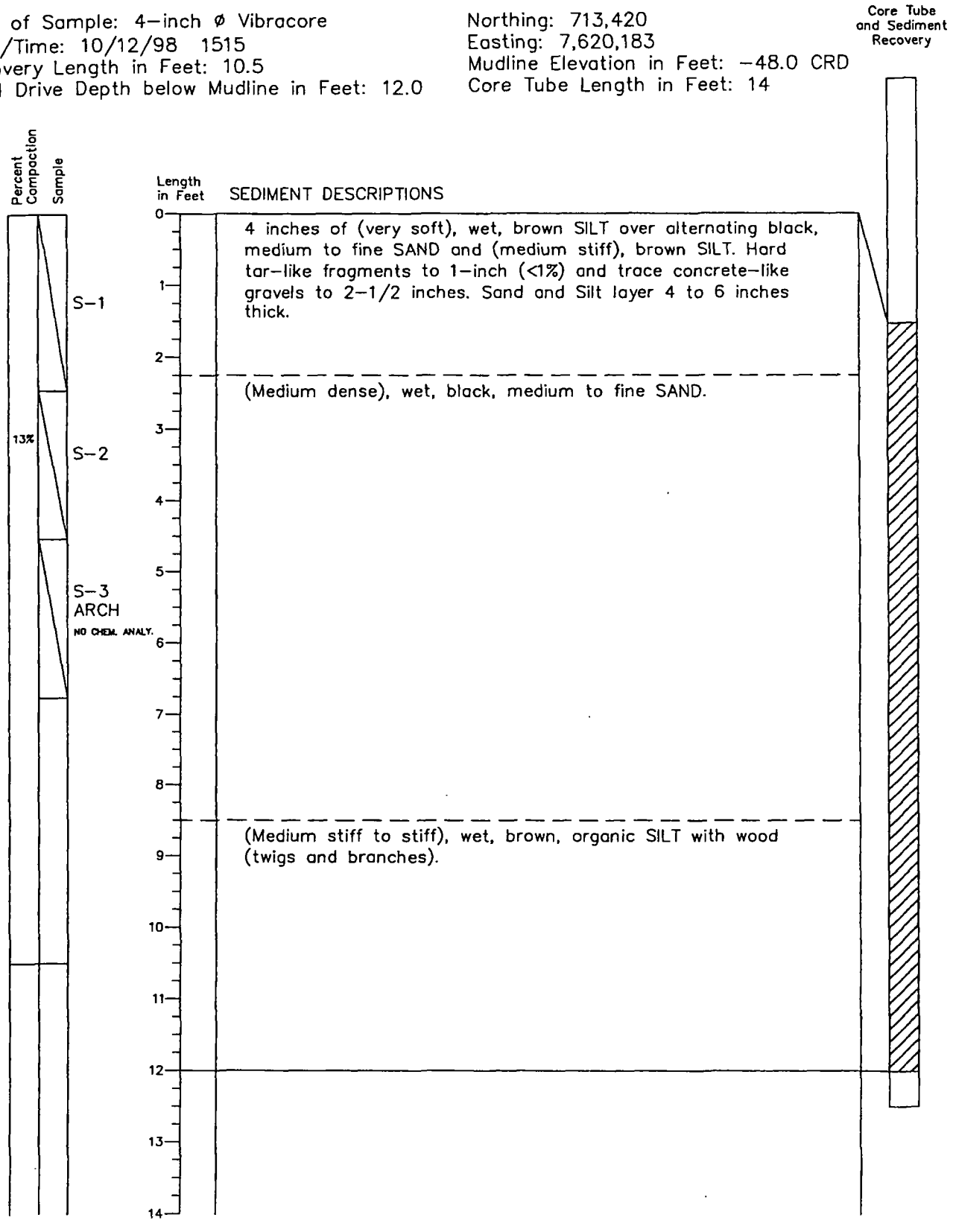
Figure B-4

1=1 ACAD LOG

Sediment Core Log HC-VC-18

Type of Sample: 4–inch ø Vibracore
Date/Time: 10/12/98 1515
Recovery Length in Feet: 10.5
Total Drive Depth below Mudline in Feet: 12.0

Northing: 713,420
Easting: 7,620,183
Mudline Elevation in Feet: –48.0 CRD
Core Tube Length in Feet: 14



Notes: 1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum – (DGPS) – Oregon State Plane North and vertical control is based on MLLW datum.

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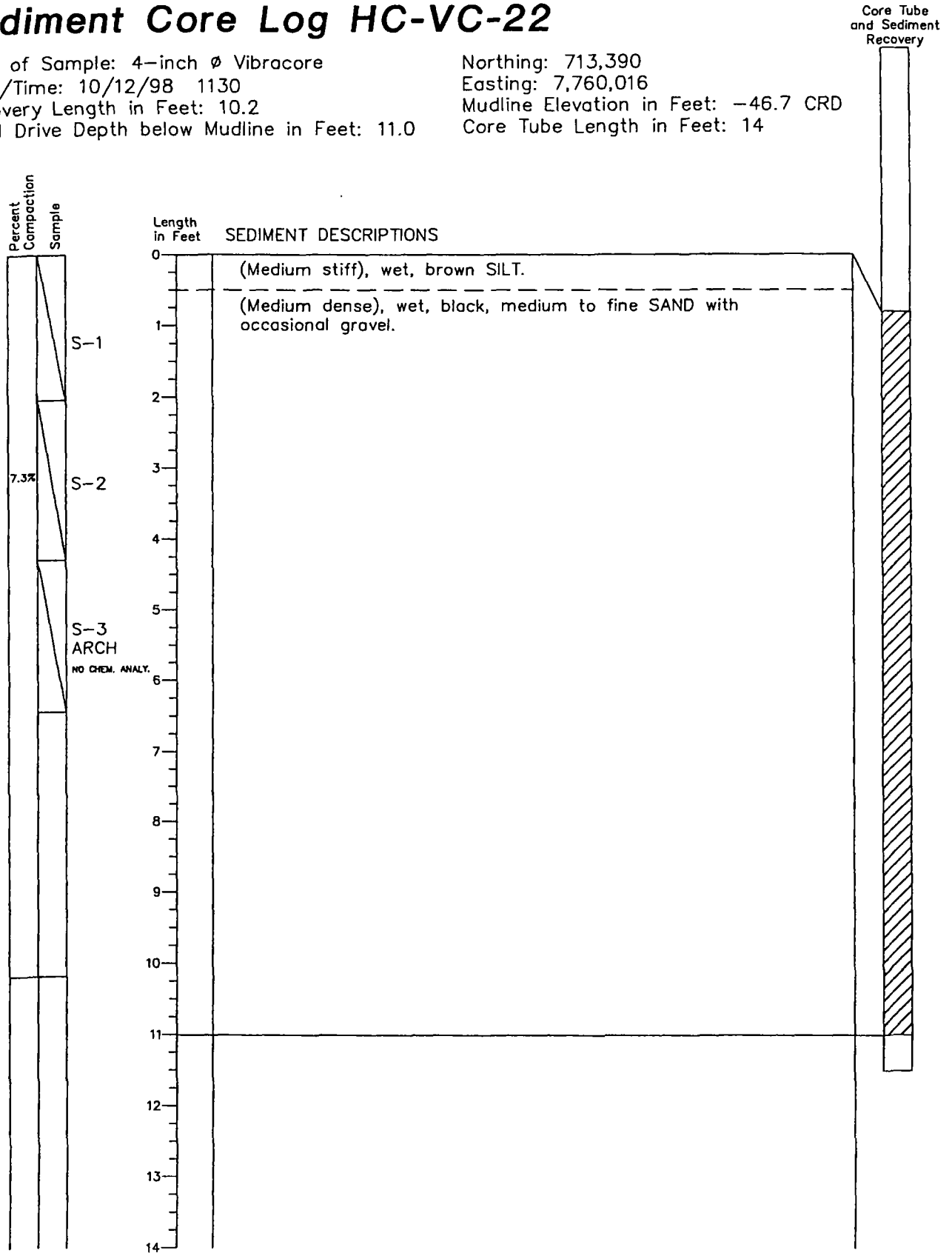
Figure B-5

1=1 ACAD LOG

Sediment Core Log HC-VC-22

Type of Sample: 4–inch ø Vibracore
Date/Time: 10/12/98 1130
Recovery Length in Feet: 10.2
Total Drive Depth below Mudline in Feet: 11.0

Northing: 713,390
Easting: 7,760,016
Mudline Elevation in Feet: –46.7 CRD
Core Tube Length in Feet: 14



Notes: 1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum – (DGPS) – Oregon State Plane North and vertical control is based on MLLW datum.

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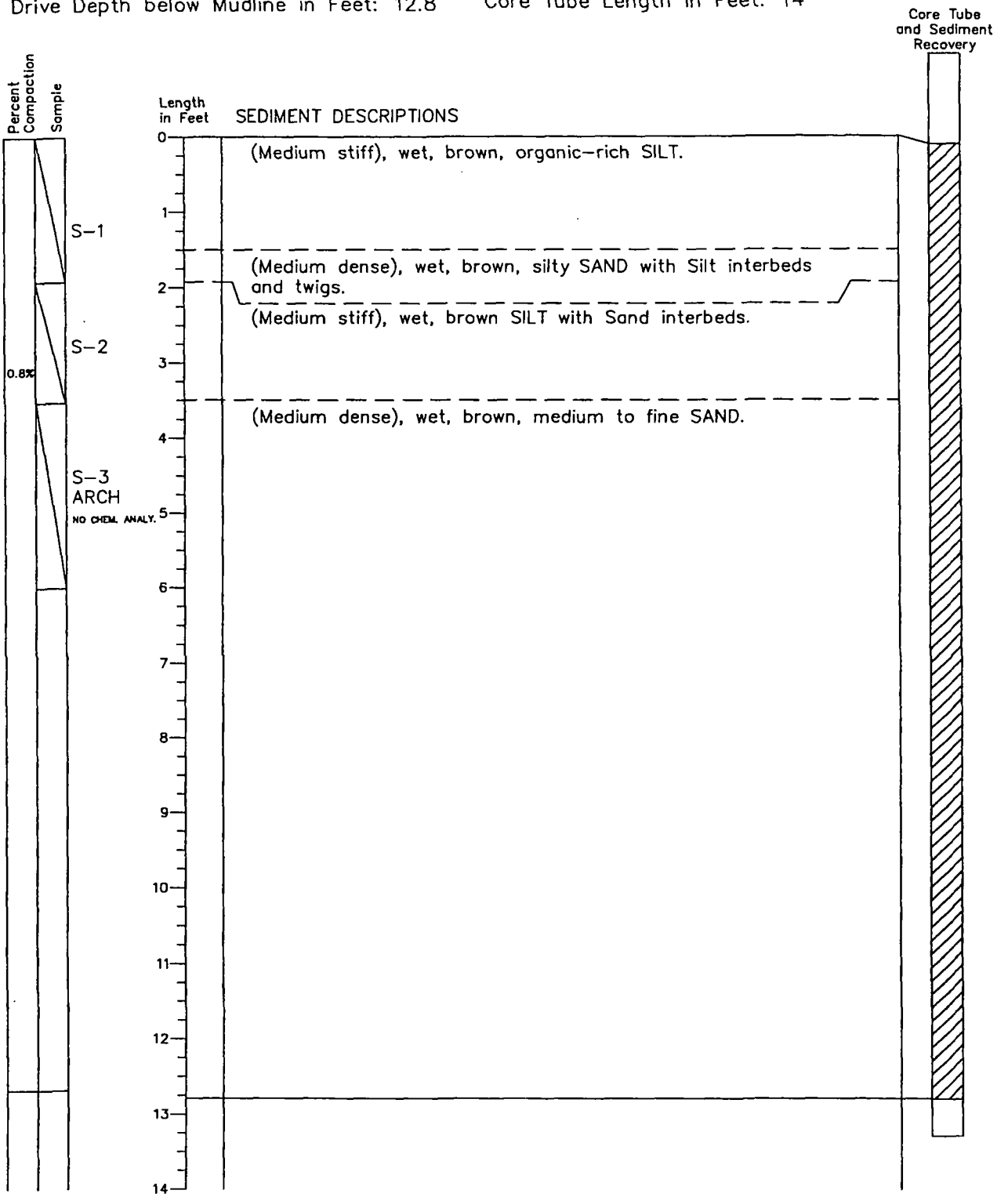
Figure B-6

1=1 ACAD LOG

Sediment Core Log HC-VC-27

Type of Sample: 4–inch ø Vibracore
Date/Time: 10/12/98 1215
Recovery Length in Feet: 12.7
Total Drive Depth below Mudline in Feet: 12.8

Northing: 713,243
Easting: 7,619,799
Mudline Elevation in Feet: –43.0 CRD
Core Tube Length in Feet: 14



Notes: 1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum – (DGPS) – Oregon State Plane North and vertical control is based on MLLW datum.

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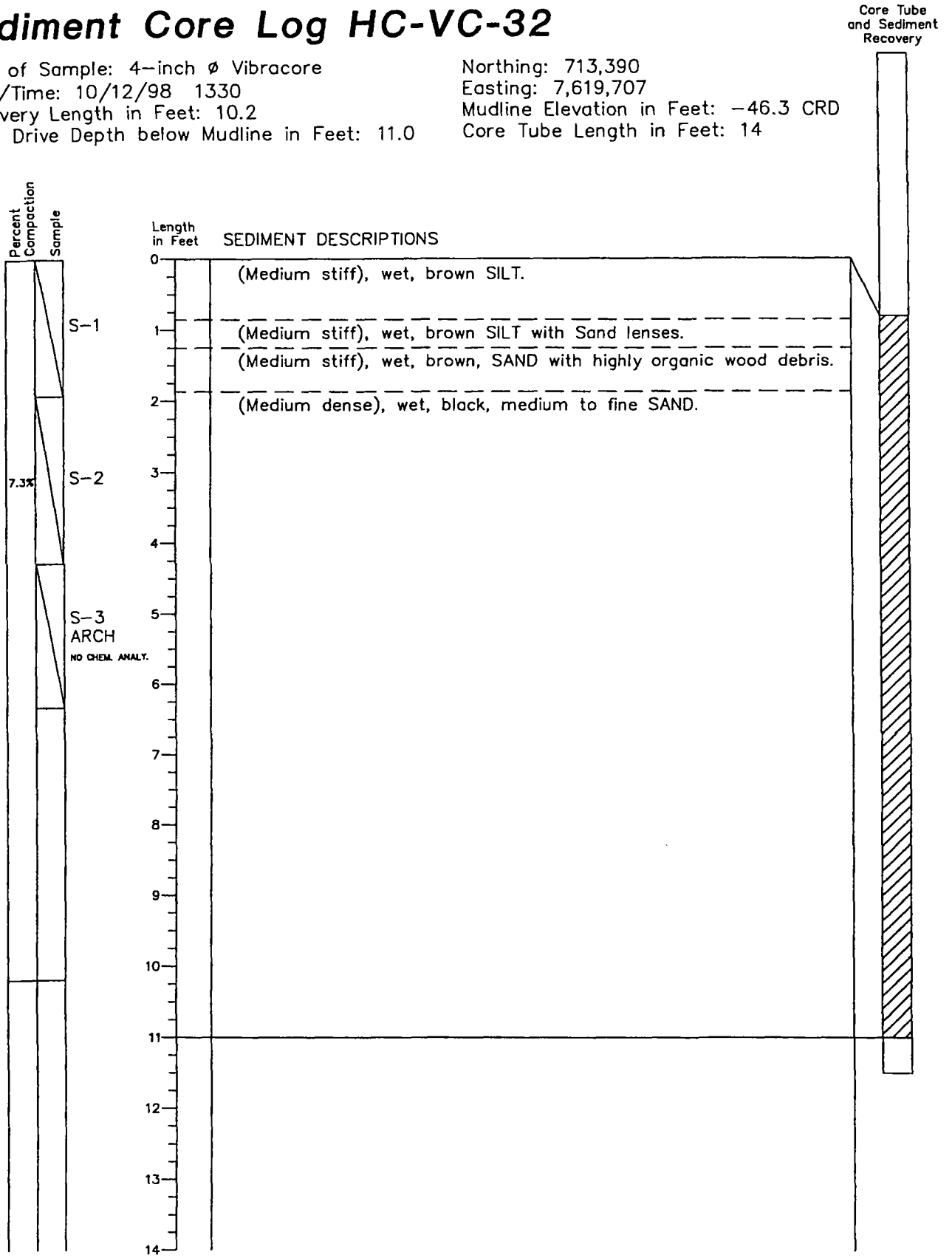
Figure B-7

1=1 ACAD LOG

Sediment Core Log HC-VC-32

Type of Sample: 4–inch ø Vibracore
Date/Time: 10/12/98 1330
Recovery Length in Feet: 10.2
Total Drive Depth below Mudline in Feet: 11.0

Northing: 713,390
Easting: 7,619,707
Mudline Elevation in Feet: –46.3 CRD
Core Tube Length in Feet: 14



Notes: 1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum – (DGPS) – Oregon State Plane North and vertical control is based on MLLW datum.

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J-5624-10 7/99

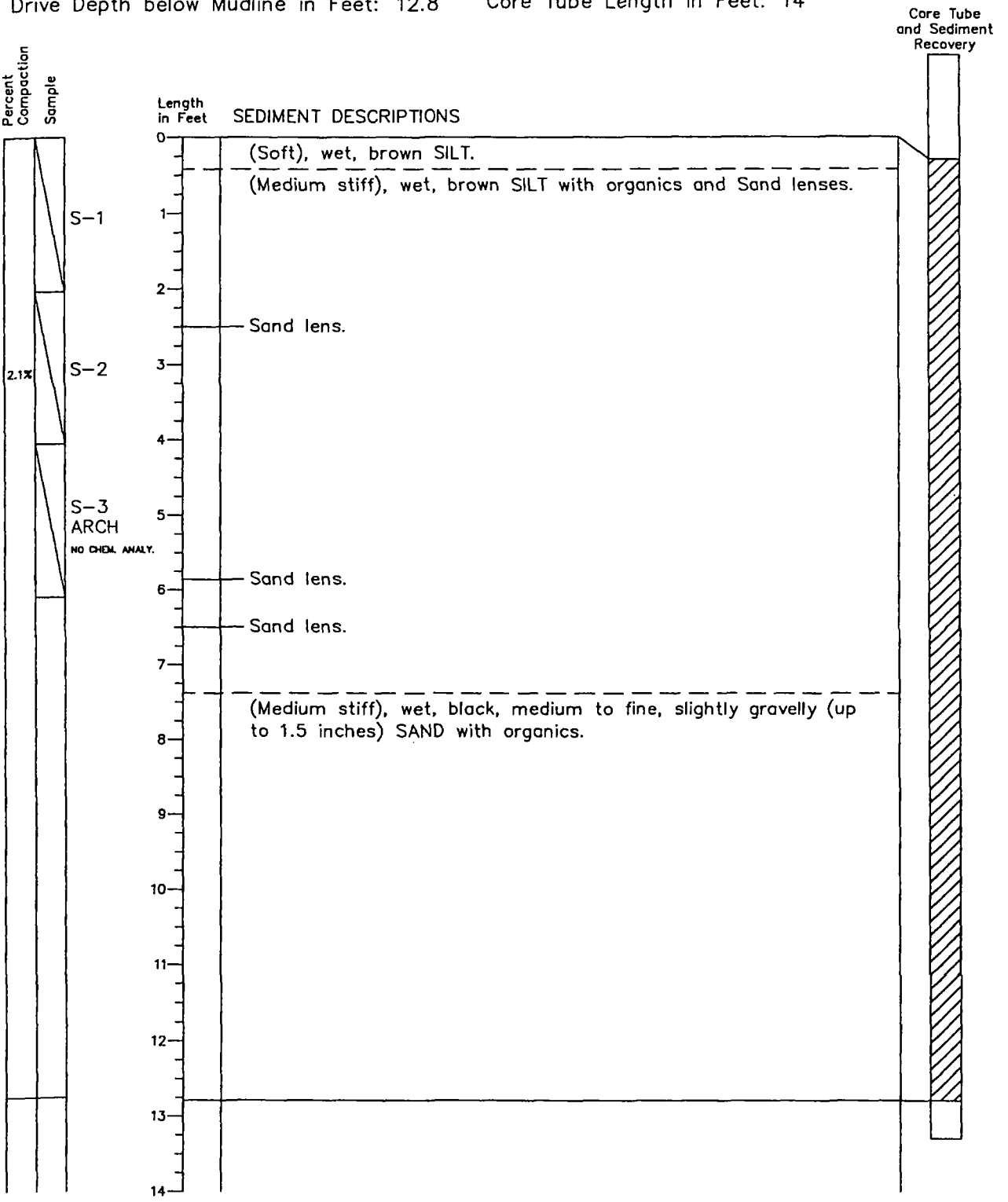
Figure B-8

1=1 ACAD LOG

Sediment Core Log HC-VC-39

Type of Sample: 4–inch ø Vibracore
Date/Time: 10/12/98 1430
Recovery Length in Feet: 12.5
Total Drive Depth below Mudline in Feet: 12.8

Northing: 712,699
Easting: 7,619,693
Mudline Elevation in Feet: –27.1 CRD
Core Tube Length in Feet: 14



Notes: 1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum – (DGPS) – Oregon State Plane North and vertical control is based on MLLW datum.

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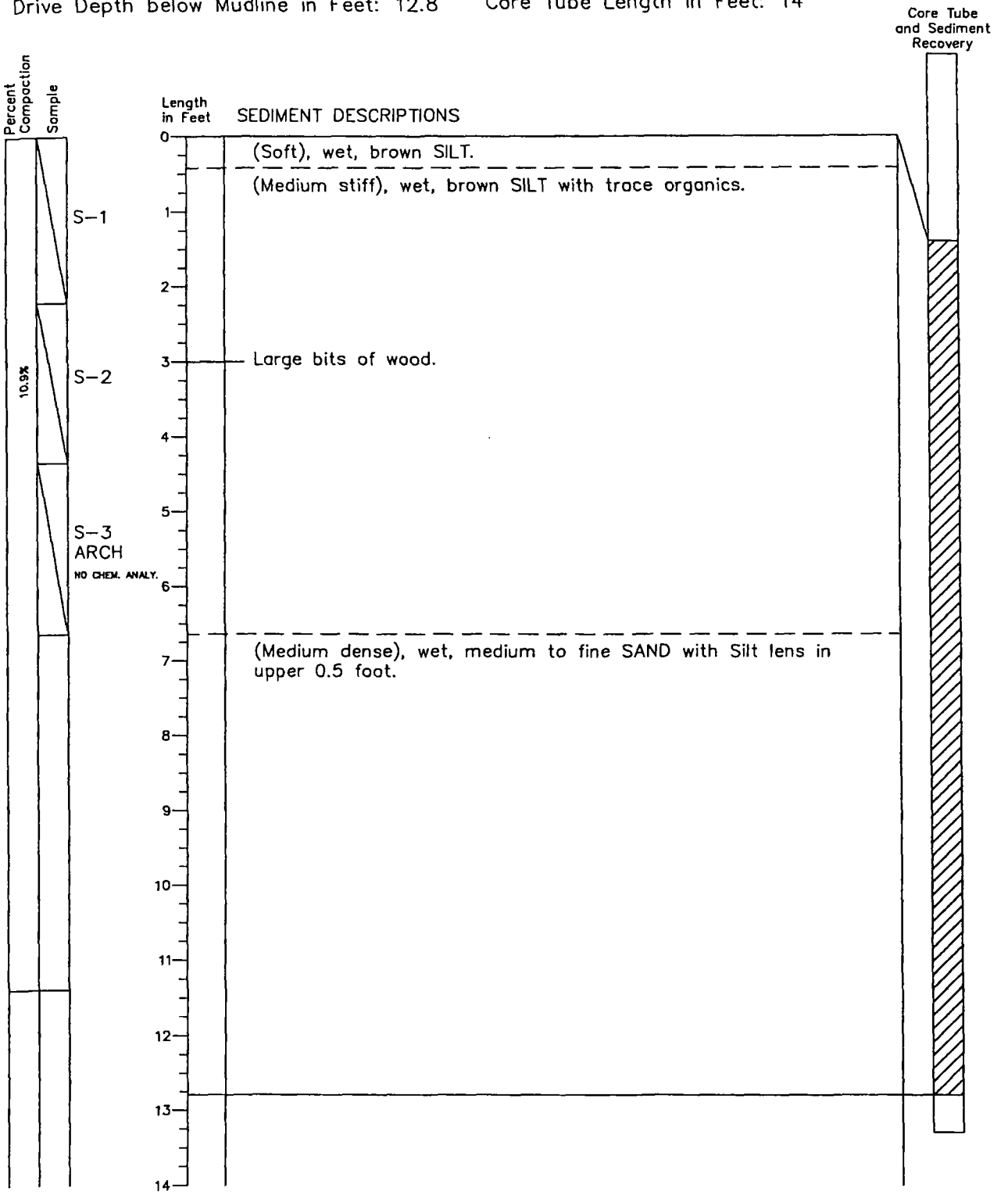
Figure B-9

1=1 ACAD LOG

Sediment Core Log HC-VC-42

Type of Sample: 4-inch ø Vibracore
Date/Time: 10/12/98 1515
Recovery Length in Feet: 11.4
Total Drive Depth below Mudline in Feet: 12.8

Northing: 713,669
Easting: 7,619,653
Mudline Elevation in Feet: -46.3 CRD
Core Tube Length in Feet: 14



Notes: 1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum – (DGPS) – Oregon State Plane North and vertical control is based on MLLW datum.

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Figure B-10

1=1 ACAD LOG

APPENDIX C
ANALYTICAL RESULTS FOR SURFACE AND SUBSURFACE SEDIMENT SAMPLES

SURFACE SEDIMENT

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Hart Crowser
J-5624-10

Lab ID			K9807169-010		K9807169-011		K9807097-031		K9807097-032		K9807097-033		K9807097-034	
Sample ID			HC-REF-B		HC-REF-C		HC-S-01		HC-S-02		HC-S-03		HC-S-04	
Sampling Date			Oct 15,1998		Oct 15,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Conventionals in mg/kg														
Ammonia as Nitrogen			82.9		6		224		107		70.1		112	
Sulfide, Total			3.8		0.7	U	249	J	127	J	90.3	J	6.6	J
Conventionals in %														
Carbon, Total Organic (TOC)			2.3		0.38		3.69		2.42		2.38	J	2.74	J
Solids, Total			34.8		72		38.9		54.1		55		40.7	
Solids, Total Volatile			6.37		1.38		9.28		12.9		5.65		7.97	
Gravel			0		1.1				0.3				0.7	
Sand			0.9		79.1				54.5				17.7	
Silt			73.6		16.6				33.1				66.6	
Clay			25.5		3.2				12.1				15	
Metals in mg/kg														
Antimony, Total	150	200	0.2	UJ	0.2	UJ			2	J			0.4	J
Arsenic, Total	57	700	9		3				14				6	
Cadmium, Total	5.1	14	0.9		0.3				4.2				2.6	
Chromium, Total			25.4		10.1				23.7				29.2	
Copper, Total	390	1300	36.8		10.7				90.1				57.3	
Lead, Total	450	1200	23.5		7.3				837				294	
Mercury, Total	0.41	2.3	0.12		0.06				0.14				0.13	
Nickel, Total	140	370	21		10				22				25	
Silver, Total	6.1	8.4	0.2		0.1	U			2				0.8	
Zinc, Total	410	3800	142	J	84	J			855				450	
Volatiles in µg/kg														
1,2-Dichlorobenzene	35	110	25	U	5	U	10	U	5	U	5	U	10	U
1,3-Dichlorobenzene	170		25	U	5	U	10	U	5	U	5	U	10	U
1,4-Dichlorobenzene	110	120	25	U	5	U	10	U	5	U	5	U	10	U
Benzene			25	U	5	U	10	U	5	U	5	U	10	U
Ethylbenzene	10	50	25	U	5	U	10	U	5	U	5	U	10	U
Tetrachloroethene (PCE)	57	210	25	U	5	U	10	U	5	U	5	U	10	U
Toluene			25	U	5	U	10	U	5	U	5	U	10	U
Total Xylenes	40	160	25	U	5	U	10	U	5	U	5	U	10	U
Trichloroethene (TCE)	160	1600	25	U	5	U	10	U	5	U	5	U	10	U
m- & p-Xylenes			25	U	5	U	10	U	5	U	5	U	10	U
o-Xylene			25	U	5	U	10	U	5	U	5	U	10	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807169-010		K9807169-011		K9807097-031		K9807097-032		K9807097-033		K9807097-034	
Sample ID			HC-REF-B		HC-REF-C		HC-S-01		HC-S-02		HC-S-03		HC-S-04	
Sampling Date			Oct 15,1998		Oct 15,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
TPH in mg/kg														
Diesel							779		87		50	U	183	
Fluoranthene	1700	30000					120		58		37		18	
Lube Oil							100	U	100	U	100	U	100	U
Pencil Pitch							7730		7620		2940		1350	
Phytane							5.5		0.8		0.5	U	0.9	
Pristane							5.3		0.6		0.5	U	1.3	
LPAHs in µg/kg														
Acenaphthene	500	2000	20	U	20	U	20000	U	14000		10000	U	1100	
Acenaphthylene	560	1300	20	U	20	U	20000	U	10000	U	10000	U	400	U
Anthracene	960	13000	20	U	20	U	20000	U	12000		10000	U	1700	
Fluorene	540	3600	20	U	20	U	20000	U	14000		10000	U	670	
Naphthalene	2100	2400	20	U	20	U	20000	U	10000	U	10000	U	400	
Phenanthrene	1500	21000	20	U	20	U	49000		74000		16000		6400	
Total LPAHs	5200	29000					99000		124000		41000		10470	
HPAHs in µg/kg														
Benz(a)anthracene	1300	5100	35		20	U	77000		81000		28000		13000	
Benzo(a)pyrene	1600	3600	43		20	U	86000		82000		33000		15000	
Benzo(b)fluoranthene			37		20	U	83000		78000		30000		13000	
Benzo(g,h,i)perylene	670	3200	57		23		55000		50000		22000		11000	
Benzo(k)fluoranthene			22		20	U	61000		63000		26000		9100	
Chrysene	1400	21000	35		20	U	75000		78000		30000		11000	
Dibenz(a,h)anthracene	230	1900	20	U	20	U	20000	U	10000	U	10000	U	1200	
Fluoranthene	1700	30000	63		23		120000		130000		42000		21000	
Indeno(1,2,3-cd)pyrene	600	4400	110		43		110000		92000		40000		19000	
Pyrene	2600	16000	68		27		98000		100000		40000		21000	
Total HPAHs	12000	69000					775000		759000		296000		134300	
Total Benzofluoranthenes	3200	9900					144000		141000		56000		22100	
Phenols in µg/kg														
2,4-Dimethylphenol	29	210	6	U	6	U	6000	U	3000	U	3000	U	120	U
2-Methylphenol	63	77	6	U	6	U	6000	U	3000	U	3000	U	120	U
4-Methylphenol	670	3600	20	U	20	U	20000	U	10000	U	10000	U	400	U
Pentachlorophenol (PCP)	400	690	60	U	60	U	60000	U	30000	U	30000	U	1200	U
Phenol	420	1200	20	U	20	U	20000	U	10000	U	10000	U	400	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807169-010		K9807169-011		K9807097-031		K9807097-032		K9807097-033		K9807097-034	
Sample ID			HC-REF-B		HC-REF-C		HC-S-01		HC-S-02		HC-S-03		HC-S-04	
Sampling Date			Oct 15,1998		Oct 15,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Phthalates in µg/kg														
Bis(2-ethylhexyl) Phthalate	8300		62		20	U	20000	U	10000	U	10000	U	460	
Butyl Benzyl Phthalate	970		20	U	20	U	20000	U	10000	U	10000	U	400	U
Di-n-butyl Phthalate	5100		20	U	20	U	20000	U	10000	U	10000	U	400	U
Di-n-octyl Phthalate	6200		20	U	20	U	20000	U	10000	U	10000	U	400	U
Diethyl Phthalate	1200		20	U	20	U	20000	U	10000	U	10000	U	400	U
Dimethyl Phthalate	1400		20	U	20	U	20000	U	10000	U	10000	U	400	U
Semivolatiles in µg/kg														
Benzoic Acid	650	760	100	U	100	U	100000	U	50000	U	50000	U	2000	U
Benzyl Alcohol	57	870	6	U	6	U	6000	U	3000	U	3000	U	120	U
Dibenzofuran	540	1700	20	U	20	U	20000	U	10000	U	10000	U	400	U
Hexachlorobenzene	22	230	20	U	20	U	20000	U	10000	U	10000	U	400	U
Hexachlorobutadiene	29	290	20	U	20	U	20000	U	10000	U	10000	U	400	U
N-Nitrosodiphenylamine	28	130	12	U	12	U	12000	U	6000	U	6000	U	240	U

Notes:

= Indicates Exceedence of Screening Level (SL)

= Indicates Exceedence of Maximum Level (ML)

DUP = Duplicate

U = Undetected at or above Method Reporting Limit (MRL)

J = Estimated concentration - the value is less than MRL, but greater than Method Detection Limit (MDL).

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-035		K9807097-036	K9807097-037		K9807097-038		K9807097-039		K9807097-040	
Sample ID			HC-S-05		HC-S-06	HC-S-07		HC-S-08		HC-S-09		HC-S-101 (DUP)	
Sampling Date			Oct 13,1998		Oct 13,1998	Oct 13,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Conventionals in mg/kg													
Ammonia as Nitrogen			114			121		118		114		116	
Sulfide, Total			590	J		92.4	J	49.7	J	44.9	J	40.6	J
Conventionals in %													
Carbon, Total Organic (TOC)			3	J		2.61	J	2.38	J	2.41	J	2.35	J
Solids, Total			47.3		35.1	36.3		35		35.1		34.2	
Solids, Total Volatile			7.15		8.89	8.81		9		8.91		8.96	
Gravel			0			0		0					
Sand			39.6			12.9		5.6					
Silt			45.8			68.3		73.7					
Clay			14.6			18.8		20.7					
Metals in mg/kg													
Antimony, Total	150	200	0.8	J		0.3	J			0.7	J	1.4	J
Arsenic, Total	57	700	6			7				9		9	
Cadmium, Total	5.1	14	2.2			2				3.2		3.1	J
Chromium, Total			23.6			31.9				30		29.2	
Copper, Total	390	1300	44.6			64				68.1		68.8	
Lead, Total	450	1200	272			322				626		640	J
Mercury, Total	0.41	2.3	0.08			0.16				0.13		0.17	
Nickel, Total	140	370	21			27				25		23	
Silver, Total	6.1	8.4	0.8			0.8				1.3		1.5	
Zinc, Total	410	3800	385			399				563		584	J
Volatiles in µg/kg													
1,2-Dichlorobenzene	35	110	10	U		10	U	10	U	10	U	10	U
1,3-Dichlorobenzene	170		10	U		10	U	10	U	10	U	10	U
1,4-Dichlorobenzene	110	120	10	U		10	U	10	U	10	U	10	U
Benzene			10	U		10	U	10	U	10	U	10	U
Ethylbenzene	10	50	10	U		10	U	10	U	10	U	10	U
Tetrachloroethene (PCE)	57	210	10	U		10	U	10	U	10	U	10	U
Toluene			10	U		10	U	10	U	10	U	10	U
Total Xylenes	40	160	10	U		10	U	10	U	10	U	10	U
Trichloroethene (TCE)	160	1600	10	U		10	U	10	U	10	U	10	U
m- & p-Xylenes			10	U		10	U	10	U	10	U	10	U
o-Xylene			10	U		10	U	10	U	10	U	10	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-035		K9807097-036		K9807097-037		K9807097-038		K9807097-039		K9807097-040	
Sample ID			HC-S-05		HC-S-06		HC-S-07		HC-S-08		HC-S-09		HC-S-101 (DUP)	
Sampling Date			Oct 13,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
TPH in mg/kg														
Diesel			115		135		106		100	U	100	U	100	U
Fluoranthene	1700	30000	15		12		15		16	J	36		16	
Lube Oil			100	U	100	U	100	U	100	UJ	100	U	100	U
Pencil Pitch			963		763		1240		894		1080		1260	
Phytane			0.9		1		0.6		1	UJ	1	U	1	U
Pristane			1.5		1		0.8		0.6	J	0.6		1	U
LPAHs in µg/kg														
Acenaphthene	500	2000	560		500		990		810		960		1300	
Acenaphthylene	560	1300	460		200	U	400	U	200	U	200	U	400	U
Anthracene	960	13000	1400		870		1700		1200		1300		1700	
Fluorene	540	3600	570		340		730		490		540		710	
Naphthalene	2100	2400	440		200	U	400	U	220		210		400	U
Phenanthrene	1500	21000	4700		3100		6100		4300		5000		6300	
Total LPAHs	5200	29000	8130		5010		9920		7120		8110		10410	
HPAHs in µg/kg														
Benz(a)anthracene	1300	5100	8600		7000		12000		8200		11000		13000	
Benzo(a)pyrene	1600	3600	9600		9100		13000		11000		12000		14000	
Benzo(b)fluoranthene			7700		6800		12000		8100		10000		13000	
Benzo(g,h,i)perylene	670	3200	7100		5100		9400		6800		8600		9800	
Benzo(k)fluoranthene			5800		4500		8100		5700		6000		8400	
Chrysene	1400	21000	7800		6300		10000		8600		11000		11000	
Dibenz(a,h)anthracene	230	1900	730		670		1200		1100		1300		1600	
Fluoranthene	1700	30000	18000		13000		19000		13000		16000		18000	
Indeno(1,2,3-cd)pyrene	600	4400	10000		10000		17000		12000		15000		18000	
Pyrene	2600	16000	20000		13000		21000		14000		16000		18000	
Total HPAHs	12000	69000	95330		75470		122700		88500		106900		124800	
Total Benzofluoranthenes	3200	9900	13500		11300		20100		13800		16000		21400	
Phenols in µg/kg														
2,4-Dimethylphenol	29	210	120	U	60	U	120	U	60	U	60	U	120	U
2-Methylphenol	63	77	120	U	60	U	120	U	60	U	60	U	120	U
4-Methylphenol	670	3600	400	U	200	U	400	U	200	U	200	U	400	U
Pentachlorophenol (PCP)	400	690	1200	U	600	U	1200	U	600	U	600	U	1200	U
Phenol	420	1200	400	U	200	U	400	U	200	U	200	U	400	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-035		K9807097-036		K9807097-037		K9807097-038		K9807097-039		K9807097-040	
Sample ID			HC-S-05		HC-S-06		HC-S-07		HC-S-08		HC-S-09		HC-S-101 (DUP)	
Sampling Date			Oct 13,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998		Oct 13,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Phthalates in µg/kg														
Bis(2-ethylhexyl) Phthalate	8300		400	U	420		540		480		370		560	
Butyl Benzyl Phthalate	970		400	U	200	U	400	U	200	U	200	U	400	U
Di-n-butyl Phthalate	5100		400	U	200	U	400	U	200	U	200	U	400	U
Di-n-octyl Phthalate	6200		400	U	200	U	400	U	200	U	200	U	400	U
Diethyl Phthalate	1200		400	U	200	U	400	U	200	U	200	U	400	U
Dimethyl Phthalate	1400		400	U	200	U	400	U	200	U	200	U	400	U
Semivolatiles in µg/kg														
Benzoic Acid	650	760	2000	U	1000	U	2000	U	1000	U	1000	U	2000	U
Benzyl Alcohol	57	870	120	U	60	U	120	U	60	U	60	U	120	U
Dibenzofuran	540	1700	400	U	200	U	400	U	200	U	200	U	400	U
Hexachlorobenzene	22	230	400	U	200	U	400	U	200	U	200	U	400	U
Hexachlorobutadiene	29	290	400	U	200	U	400	U	200	U	200	U	400	U
N-Nitrosodiphenylamine	28	130	240	U	120	U	240	U	120	U	120	U	240	U

Notes:

= Indicates Exceedence of Screening Level (SL)

= Indicates Exceedence of Maximum Level (ML)

DUP = Duplicate

U = Undetected at or above Method Reporting Limit (MRL)

J = Estimated concentration - the value is less than MRL, but greater than Method Detection Limit (MDL).

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-001		K9807115-002		K9807115-003	K9807115-004		K9807115-005		K9807115-006
Sample ID			HC-S-10		HC-S-11		HC-S-12	HC-S-13		HC-S-14		HC-S-15
Sampling Date			Oct 14,1998		Oct 14,1998		Oct 14,1998	Oct 14,1998		Oct 14,1998		Oct 14,1998
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3	0 to 0.3		0 to 0.3		0 to 0.3
Conventionals in mg/kg												
Ammonia as Nitrogen					99.2			85.9		29.9		
Sulfide, Total					65.5	J		102	J	34.9	J	
Conventionals in %												
Carbon, Total Organic (TOC)					2.71			1.85		0.42		
Solids, Total			30.1		36.9		35.5	41		72.4		71.5
Solids, Total Volatile					8.41			7.15		1.76		
Gravel					0			0.1				
Sand					13.4			39.1				
Silt					69.8			46.4				
Clay					16.8			14.4				
Metals in mg/kg												
Antimony, Total	150	200			0.6	J		0.2	J	0.1	UJ	
Arsenic, Total	57	700			9			5		3		
Cadmium, Total	5.1	14			1.9	J		2	J	0.5	J	
Chromium, Total					31.2			24.6		35.3		
Copper, Total	390	1300			70.4			45.3		15.3		
Lead, Total	450	1200			357	J		289	J	174	J	
Mercury, Total	0.41	2.3			0.13			0.06		0.02	U	
Nickel, Total	140	370			27			21		12		
Silver, Total	6.1	8.4			0.7			0.4		0.6		
Zinc, Total	410	3800			397	J		798	J	109	J	
Volatiles in µg/kg												
1,2-Dichlorobenzene	35	110			25	U		10	U	5	U	
1,3-Dichlorobenzene	170				25	U		10	U	5	U	
1,4-Dichlorobenzene	110	120			25	U		10	U	5	U	
Benzene					25	U		10	U	5	U	
Ethylbenzene	10	50			25	U		10	U	5	U	
Tetrachloroethene (PCE)	57	210			25	U		10	U	5	U	
Toluene					25	U		10	U	5	U	
Total Xylenes	40	160			25	U		10	U	5	U	
Trichloroethene (TCE)	160	1600			25	U		10	U	5	U	
m- & p-Xylenes					25	U		10	U	5	U	
o-Xylene					25	U		10	U	5	U	

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-001		K9807115-002		K9807115-003		K9807115-004		K9807115-005		K9807115-006	
Sample ID			HC-S-10		HC-S-11		HC-S-12		HC-S-13		HC-S-14		HC-S-15	
Sampling Date			Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
TPH in mg/kg														
Diesel			100	U	100	U	77		100	U	100	U	100	U
Fluoranthene	1700	30000	7.4		6.6		14		4.1		7.2		5.8	
Lube Oil			100	U	100	U	100	U	100	U	100	U	100	U
Pencil Pitch			960		1230		643		551		630		350	
Phytane			0.5	U	0.5	U	0.5		0.5	U	0.5	U	0.5	U
Pristane			0.5	U	0.5	U	0.8		0.5	U	0.5	U	0.5	U
LPAHs in µg/kg														
Acenaphthene	500	2000			940				270		54			
Acenaphthylene	560	1300			200				140		350			
Anthracene	960	13000			1700				600		590			
Fluorene	540	3600			590				250		250			
Naphthalene	2100	2400			250				140		220			
Phenanthrene	1500	21000			5700				2100		2700			
Total LPAHs	5200	29000			9380				3500		4164			
HPAHs in µg/kg														
Benz(a)anthracene	1300	5100			11000				4600		4800			
Benzo(a)pyrene	1600	3600			13000				5500		5400			
Benzo(b)fluoranthene					10000				4100		3200			
Benzo(g,h,i)perylene	670	3200			8900				3900		4000			
Benzo(k)fluoranthene					8400				3400		3300			
Chrysene	1400	21000			11000				4500		4500			
Dibenz(a,h)anthracene	230	1900			2200				870		570			
Fluoranthene	1700	30000			21000				9600		13000			
Indeno(1,2,3-cd)pyrene	600	4400			14000				7100		6600			
Pyrene	2600	16000			22000				11000		17000			
Total HPAHs	12000	69000			121500				54570		62370			
Total Benzofluoranthenes	3200	9900			18400				7500		6500			
Phenols in µg/kg														
2,4-Dimethylphenol	29	210			6	U			6	UJ	6	UJ		
2-Methylphenol	63	77			6	U			6	UJ	6	UJ		
4-Methylphenol	670	3600			20	U			20	UJ	20	UJ		
Pentachlorophenol (PCP)	400	690			60	U			60	UJ	60	UJ		
Phenol	420	1200			20	U			20	UJ	20	UJ		

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-001		K9807115-002		K9807115-003		K9807115-004		K9807115-005		K9807115-006
Sample ID			HC-S-10		HC-S-11		HC-S-12		HC-S-13		HC-S-14		HC-S-15
Sampling Date			Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3
Phthalates in µg/kg													
Bis(2-ethylhexyl) Phthalate	8300				450				360		51		
Butyl Benzyl Phthalate	970				36				20	U	20	U	
Di-n-butyl Phthalate	5100				20	U			20	U	20	U	
Di-n-octyl Phthalate	6200				20	U			20	U	20	U	
Diethyl Phthalate	1200				20	U			20	U	20	U	
Dimethyl Phthalate	1400				20	U			20	U	20	U	
Semivolatiles in µg/kg													
Benzoic Acid	650	760			100	U			100	U	100	U	
Benzyl Alcohol	57	870			6	U			6	U	6	U	
Dibenzofuran	540	1700			200				20	U	33		
Hexachlorobenzene	22	230			20	U			20	U	20	U	
Hexachlorobutadiene	29	290			20	U			20	U	20	U	
N-Nitrosodiphenylamine	28	130			12	U			12	U	12	U	

Notes:

= Indicates Exceedence of Screening Level (SL)

= Indicates Exceedence of Maximum Level (ML)

DUP = Duplicate

U = Undetected at or above Method Reporting Limit (MRL)

J = Estimated concentration - the value is less than MRL, but greater than Method Detection Limit (MDL).

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-007		K9807115-008	K9807169-012	K9807169-013		K9807169-014		K9807169-015
Sample ID			HC-S-16		HC-S-17	HC-S-18	HC-S-19		HC-S-20		HC-S-21
Sampling Date			Oct 14,1998		Oct 14,1998	Oct 15,1998	Oct 15,1998		Oct 15,1998		Oct 15,1998
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3	0 to 0.3	0 to 0.3		0 to 0.3		0 to 0.3
Conventionals in mg/kg											
Ammonia as Nitrogen			74.7				44.8		86.8		
Sulfide, Total			96.3	J			9.2		11.1		
Conventionals in %											
Carbon, Total Organic (TOC)			2.5				1.24		2.54		
Solids, Total			43.3		45.1	47	78		42.2		41.3
Solids, Total Volatile			7.75				3.44		7.34		
Gravel			0				3.7				
Sand			29.6				64.4				
Silt			55.3				24.4				
Clay			15.1				7.5				
Metals in mg/kg											
Antimony, Total	150	200	0.4	J			4.4	J			
Arsenic, Total	57	700	6				11				
Cadmium, Total	5.1	14	1.3	J			5.6				
Chromium, Total			29.4				18.3				
Copper, Total	390	1300	52.2				62.9				
Lead, Total	450	1200	210	J			1160				
Mercury, Total	0.41	2.3	0.25				0.07				
Nickel, Total	140	370	27				16				
Silver, Total	6.1	8.4	0.1				1.9				
Zinc, Total	410	3800	306	J			1020	J			
Volatiles in µg/kg											
1,2-Dichlorobenzene	35	110	5	U			5	U	10	U	
1,3-Dichlorobenzene	170		5	U			5	U	10	U	
1,4-Dichlorobenzene	110	120	5	U			5	U	10	U	
Benzene			5	U			5	U	10	U	
Ethylbenzene	10	50	5	U			5	U	10	U	
Tetrachloroethene (PCE)	57	210	5	U			5	U	10	U	
Toluene			5	U			5	U	10	U	
Total Xylenes	40	160	5	U			5	U	10	U	
Trichloroethene (TCE)	160	1600	5	U			5	U	10	U	
m- & p-Xylenes			5	U			5	U	10	U	
o-Xylene			5	U			5	U	10	U	

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-007		K9807115-008		K9807169-012		K9807169-013		K9807169-014		K9807169-015	
Sample ID			HC-S-16		HC-S-17		HC-S-18		HC-S-19		HC-S-20		HC-S-21	
Sampling Date			Oct 14,1998		Oct 14,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
TPH in mg/kg														
Diesel			115		100	U	100	U	50	U	100	U	100	U
Fluoranthene	1700	30000	26		9.3		26	J	180	J	36	J	10	J
Lube Oil			100	U	100	U	100	UJ	100	UJ	100	UJ	100	UJ
Pencil Pitch			1130		1100		2600		8650		1600		1800	
Phytane			0.6		0.5	U	0.5	UJ	1	UJ	0.5	J	0.5	UJ
Pristane			0.7		0.5	U	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ
LPAHs in µg/kg														
Acenaphthene	500	2000	630						6100		1500			
Acenaphthylene	560	1300	480						71		160			
Anthracene	960	13000	1900						5900		2000			
Fluorene	540	3600	620						2500		700			
Naphthalene	2100	2400	450						1400		370			
Phenanthrene	1500	21000	4900						26000		7900			
Total LPAHs	5200	29000	8980						41971		12630			
HPAHs in µg/kg														
Benz(a)anthracene	1300	5100	9000						44000		14000			
Benzo(a)pyrene	1600	3600	11000						55000		18000			
Benzo(b)fluoranthene			7600						44000		13000			
Benzo(g,h,i)perylene	670	3200	7600						38000		13000			
Benzo(k)fluoranthene			7000						35000		11000			
Chrysene	1400	21000	8900						46000		14000			
Dibenz(a,h)anthracene	230	1900	1700						11000		3100			
Fluoranthene	1700	30000	21000						70000	J	26000			
Indeno(1,2,3-cd)pyrene	600	4400	13000						60000		21000			
Pyrene	2600	16000	25000						68000		25000			
Total HPAHs	12000	69000	111800						471000		158100			
Total Benzofluoranthenes	3200	9900	14600						79000		24000			
Phenols in µg/kg														
2,4-Dimethylphenol	29	210	6	U					31		7			
2-Methylphenol	63	77	6	U					51		6	U		
4-Methylphenol	670	3600	20	U					130		24			
Pentachlorophenol (PCP)	400	690	60	U					60	U	60	U		
Phenol	420	1200	20	U					110		20	U		

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-007		K9807115-008		K9807169-012		K9807169-013		K9807169-014		K9807169-015	
Sample ID			HC-S-16		HC-S-17		HC-S-18		HC-S-19		HC-S-20		HC-S-21	
Sampling Date			Oct 14,1998		Oct 14,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Phthalates in µg/kg														
Bis(2-ethylhexyl) Phthalate	8300		420						360		430			
Butyl Benzyl Phthalate	970		47						20	U	56			
Di-n-butyl Phthalate	5100		20	U					20	U	43			
Di-n-octyl Phthalate	6200		20	U					20	U	20	U		
Diethyl Phthalate	1200		20	U					20	U	20	U		
Dimethyl Phthalate	1400		20	U					20	U	20	U		
Semivolatiles in µg/kg														
Benzoic Acid	650	760	100	U					110		100	U		
Benzyl Alcohol	57	870	6	U					6	U	6	U		
Dibenzofuran	540	1700	160						660		260			
Hexachlorobenzene	22	230	20	U					20	U	20	U		
Hexachlorobutadiene	29	290	20	U					20	U	20	U		
N-Nitrosodiphenylamine	28	130	12	U					12	U	12	U		

Notes:

= Indicates Exceedence of Screening Level (SL)

= Indicates Exceedence of Maximum Level (ML)

DUP = Duplicate

U = Undetected at or above Method Reporting Limit (MRL)

J = Estimated concentration - the value is less than MRL, but greater than Method Detection Limit (MDL).

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-009		K9807115-010	K9807115-011		K9807115-012		K9807115-013		K9807115-014	
Sample ID			HC-S-22		HC-S-23	HC-S-24		HC-S-102 (DUP)		HC-S-25		HC-S-26	
Sampling Date			Oct 14,1998		Oct 14,1998	Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Conventionals in mg/kg													
Ammonia as Nitrogen			76.9			84.2		70.5		189		39.1	
Sulfide, Total			17.5	J		181	J	130	J	1830	J	7.8	J
Conventionals in %													
Carbon, Total Organic (TOC)			1.89			1.67		1.98		2.48		0.78	
Solids, Total			44.1		36.8	50		61.6		50.7		60.5	
Solids, Total Volatile			6.34			6.3		4.78		7.21		3.63	
Gravel			0			0.7							
Sand			39			58.5							
Silt			46.9			30.4							
Clay			14.1			10.4							
Metals in mg/kg													
Antimony, Total	150	200	0.2	J		0.3	J	0.1	J	0.8	J	0.2	J
Arsenic, Total	57	700	5			5		5		12		4	
Cadmium, Total	5.1	14	1	J		1.5	J	1.2	J	6.6	J	2.5	J
Chromium, Total			23.1			23		18.7		30.1		14.3	
Copper, Total	390	1300	44.1			41.4		35.9		84.4		26	
Lead, Total	450	1200	125	J		118	J	101	J	644	J	68.4	J
Mercury, Total	0.41	2.3	0.09			0.08		0.08		0.34		0.04	
Nickel, Total	140	370	23			36		30		56		22	
Silver, Total	6.1	8.4	0.3			0.3		0.2		1		0.1	
Zinc, Total	410	3800	225	J		279	J	216	J	1330	J	435	J
Volatiles in µg/kg													
1,2-Dichlorobenzene	35	110	10	U		10	U	5	U	5	U	5	U
1,3-Dichlorobenzene	170		10	U		10	U	5	U	5	U	5	U
1,4-Dichlorobenzene	110	120	10	U		10	U	5	U	5	U	5	U
Benzene			10	U		10	U	5	U	5	U	5	U
Ethylbenzene	10	50	10	U		10	U	5	U	5	U	5	U
Tetrachloroethene (PCE)	57	210	10	U		10	U	5	U	5	U	5	U
Toluene			10	U		10	U	5	U	5	U	5	U
Total Xylenes	40	160	10	U		10	U	5	U	5	U	5	U
Trichloroethene (TCE)	160	1600	10	U		10	U	5	U	5	U	5	U
m- & p-Xylenes			10	U		10	U	5	U	5	U	5	U
o-Xylene			10	U		10	U	5	U	5	U	5	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-009		K9807115-010		K9807115-011		K9807115-012		K9807115-013		K9807115-014	
Sample ID			HC-S-22		HC-S-23		HC-S-24		HC-S-102 (DUP)		HC-S-25		HC-S-26	
Sampling Date			Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
TPH in mg/kg														
Diesel			100	U	58		77		25	U	962		100	U
Fluoranthene	1700	30000	7.4		14		100		33		4.1		5	
Lube Oil			100	U	100	U	100	U	100	U	1100	J	100	U
Pencil Pitch			449		591		4320		1930		157		289	
Phytane			0.5	U	0.5	U	0.5	U	0.5	U	6.1		0.5	U
Pristane			0.5	U	0.5		0.5		0.5	U	7		0.5	U
LPAHs in µg/kg														
Acenaphthene	500	2000	310				410		420		210		73	
Acenaphthylene	560	1300	110				3600		2000		100		140	
Anthracene	960	13000	560				6600		4600		270		350	
Fluorene	540	3600	230				1200		1200		230		100	
Naphthalene	2100	2400	20	U			2200		980		140		100	
Phenanthrene	1500	21000	1900				15000		9900		1100		1000	
Total LPAHs	5200	29000	3120				29010		19100		2050		1763	
HPAHs in µg/kg														
Benz(a)anthracene	1300	5100	4000				37000		14000		1300		2300	
Benzo(a)pyrene	1600	3600	4900				39000		17000		1400		2700	
Benzo(b)fluoranthene			3700				23000		8800		880		1600	
Benzo(g,h,i)perylene	670	3200	3300				27000		13000		1000		1900	
Benzo(k)fluoranthene			3300				24000		11000		600		1800	
Chrysene	1400	21000	3800				38000		14000		1500		2200	
Dibenz(a,h)anthracene	230	1900	800				4700		2100		170		350	
Fluoranthene	1700	30000	7200				84000		40000		3100		5500	
Indeno(1,2,3-cd)pyrene	600	4400	6000				41000		21000		1800		3400	
Pyrene	2600	16000	7500				110000		50000		3700		6800	
Total HPAHs	12000	69000	44500				427700		190900		15450		28550	
Total Benzofluoranthenes	3200	9900	7000				47000		19800		1480		3400	
Phenols in µg/kg														
2,4-Dimethylphenol	29	210	6	U			6	U	6	U	6	U	6	U
2-Methylphenol	63	77	6	U			6	U	6	U	6	U	6	U
4-Methylphenol	670	3600	20	U			20	U	20	U	20	U	20	U
Pentachlorophenol (PCP)	400	690	60	U			60	U	60	U	60	U	60	U
Phenol	420	1200	20	U			20	U	20	U	20	U	20	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-009		K9807115-010		K9807115-011		K9807115-012		K9807115-013		K9807115-014	
Sample ID			HC-S-22		HC-S-23		HC-S-24		HC-S-102 (DUP)		HC-S-25		HC-S-26	
Sampling Date			Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 14,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Phthalates in µg/kg														
Bis(2-ethylhexyl) Phthalate	8300		310				2000	U	300		300		110	
Butyl Benzyl Phthalate	970		24				2000	U	20	U	20	U	20	U
Di-n-butyl Phthalate	5100		20	U			20	U	20	U	20	U	20	U
Di-n-octyl Phthalate	6200		20	U			2000	U	20	U	20	U	20	U
Diethyl Phthalate	1200		20	U			20	U	47		25		20	U
Dimethyl Phthalate	1400		20	U			20	U	20	U	20	U	20	U
Semivolatiles in µg/kg														
Benzoic Acid	650	760	100	U			100	U	100	U	100	U	100	U
Benzyl Alcohol	57	870	6	U			6	U	6	U	6	U	6	U
Dibenzofuran	540	1700	75				170		160		48		30	
Hexachlorobenzene	22	230	20	U			20	U	20	U	20	U	20	U
Hexachlorobutadiene	29	290	20	U			20	U	20	U	20	U	20	U
N-Nitrosodiphenylamine	28	130	12	U			12	U	12	U	12	U	12	U

Notes:

= Indicates Exceedence of Screening Level (SL)

= Indicates Exceedence of Maximum Level (ML)

DUP = Duplicate

U = Undetected at or above Method Reporting Limit (MRL)

J = Estimated concentration - the value is less than MRL, but greater than Method Detection Limit (MDL).

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-015		K9807115-016		K9807115-017	K9807169-017		K9807169-016	K9807115-020	
Sample ID			HC-S-27		HC-S-28		HC-S-29	HC-S-30		HC-S-31	HC-S-32	
Sampling Date			Oct 14,1998		Oct 14,1998		Oct 14,1998	Oct 15,1998		Oct 15,1998	Oct 14,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3	0 to 0.3		0 to 0.3	0 to 0.3	
Conventionals in mg/kg												
Ammonia as Nitrogen					110			67			87.2	
Sulfide, Total					65.8	J		12.6			9.6	J
Conventionals in %												
Carbon, Total Organic (TOC)					2.35			1.28			1.43	
Solids, Total			40.5		42.2		44.8	52.8		48	46.4	
Solids, Total Volatile					7.89			4.19			6.11	
Gravel					0			0			0	
Sand					16			59.2			43.8	
Silt					65			30.6			38.6	
Clay					19			10.2			17.6	
Metals in mg/kg												
Antimony, Total	150	200			0.2	J		0.2	UJ		0.1	J
Arsenic, Total	57	700			5			4			4	
Cadmium, Total	5.1	14			0.9	J		0.6			0.5	J
Chromium, Total					28.4			21.1			21.8	
Copper, Total	390	1300			50.4			62			34.6	
Lead, Total	450	1200			87.6	J		80.7			51.6	J
Mercury, Total	0.41	2.3			0.1			0.06			0.07	
Nickel, Total	140	370			25			22			22	
Silver, Total	6.1	8.4			0.3			0.3			0.2	
Zinc, Total	410	3800			220	J		167	J		146	J
Volatiles in µg/kg												
1,2-Dichlorobenzene	35	110			10	U		5	U		10	U
1,3-Dichlorobenzene	170				10	U		5	U		10	U
1,4-Dichlorobenzene	110	120			10	U		5	U		10	U
Benzene					10	U		5	U		10	U
Ethylbenzene	10	50			10	U		5	U		10	U
Tetrachloroethene (PCE)	57	210			10	U		5	U		10	U
Toluene					10	U		5	U		10	U
Total Xylenes	40	160			10	U		5	U		10	U
Trichloroethene (TCE)	160	1600			10	U		5	U		10	U
m- & p-Xylenes					10	U		5	U		10	U
o-Xylene					10	U		5	U		10	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-015		K9807115-016		K9807115-017		K9807169-017		K9807169-016		K9807115-020	
Sample ID			HC-S-27		HC-S-28		HC-S-29		HC-S-30		HC-S-31		HC-S-32	
Sampling Date			Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 15,1998		Oct 15,1998		Oct 14,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
TPH in mg/kg														
Diesel			100	U	100	U	100	U	50	U	50	U	100	U
Fluoranthene	1700	30000	8.1		6.1		3.8		6.5	J	1.1	J	2.8	
Lube Oil			100	U	100	U	100	U	100	UJ	310	J	100	U
Pencil Pitch			1400		384		910		319		58.8		130	
Phytane			0.5	U	0.5	U	0.5	U	0.5	UJ	0.5	UJ	0.5	U
Pristane			0.5	U	0.5		0.5	U	0.5	UJ	0.5	UJ	0.5	U
LPAHs in µg/kg														
Acenaphthene	500	2000			260				260				120	
Acenaphthylene	560	1300			120				44				35	
Anthracene	960	13000			510				370				210	
Fluorene	540	3600			200				160				82	
Naphthalene	2100	2400			100				64				36	
Phenanthrene	1500	21000			1700				1600				900	
Total LPAHs	5200	29000			2890				2498				1383	
HPAHs in µg/kg														
Benz(a)anthracene	1300	5100			3200				2700				1100	
Benzo(a)pyrene	1600	3600			4000				3300				1600	
Benzo(b)fluoranthene					2900				2400				1400	
Benzo(g,h,i)perylene	670	3200			2800				2500				1200	
Benzo(k)fluoranthene					2700				2400				1100	
Chrysene	1400	21000			3200				3000				1200	
Dibenz(a,h)anthracene	230	1900			630				540				290	
Fluoranthene	1700	30000			6500				5200				2000	
Indeno(1,2,3-cd)pyrene	600	4400			5100				4600				1300	
Pyrene	2600	16000			7000				5000				1700	
Total HPAHs	12000	69000			38030				31640				12890	
Total Benzofluoranthenes	3200	9900			5600				4800				2500	
Phenols in µg/kg														
2,4-Dimethylphenol	29	210			6	U			6	U			6	U
2-Methylphenol	63	77			6	U			6	U			6	U
4-Methylphenol	670	3600			20	U			20	U			20	U
Pentachlorophenol (PCP)	400	690			60	U			60	U			60	U
Phenol	420	1200			20	U			20	U			20	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-015		K9807115-016		K9807115-017		K9807169-017		K9807169-016		K9807115-020	
Sample ID			HC-S-27		HC-S-28		HC-S-29		HC-S-30		HC-S-31		HC-S-32	
Sampling Date			Oct 14,1998		Oct 14,1998		Oct 14,1998		Oct 15,1998		Oct 15,1998		Oct 14,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Phthalates in µg/kg														
Bis(2-ethylhexyl) Phthalate	8300				370				300				250	
Butyl Benzyl Phthalate	970				20	U			20	U			20	U
Di-n-butyl Phthalate	5100				20	U			20	U			20	U
Di-n-octyl Phthalate	6200				20	U			20	U			20	U
Diethyl Phthalate	1200				20	U			20	U			20	U
Dimethyl Phthalate	1400				20	U			20	U			20	U
Semivolatiles in µg/kg														
Benzoic Acid	650	760			100	U			100	U			100	U
Benzyl Alcohol	57	870			6	U			6	U			6	U
Dibenzofuran	540	1700			62				52				29	
Hexachlorobenzene	22	230			20	U			20	U			20	U
Hexachlorobutadiene	29	290			20	U			20	U			20	U
N-Nitrosodiphenylamine	28	130			12	U			12	U			12	U

Notes:

= Indicates Exceedence of Screening Level (SL)

= Indicates Exceedence of Maximum Level (ML)

DUP = Duplicate

U = Undetected at or above Method Reporting Limit (MRL)

J = Estimated concentration - the value is less than MRL, but greater than Method Detection Limit (MDL).

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-021		K9807169-002		K9807115-018		K9807169-001		K9807115-019		K9807169-005	
Sample ID			HC-S-33		HC-S-34		HC-S-35		HC-S-36		HC-S-37		HC-S-38	
Sampling Date			Oct 14,1998		Oct 15,1998		Oct 14,1998		Oct 15,1998		Oct 14,1998		Oct 15,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Conventionals in mg/kg														
Ammonia as Nitrogen					142		68.2		12.2		82.7		80.6	
Sulfide, Total					704		10.8	J	13.4		8.6	J	7.3	
Conventionals in %														
Carbon, Total Organic (TOC)					2.12		1.59		0.69		1.68		1.63	
Solids, Total			46.3		57.3		46.9		68.9		42		44.3	
Solids, Total Volatile					5.24		6.34		2.3		6.62		6.7	
Gravel					0.1		0		0.2					
Sand					38.2		35.5		76.4					
Silt					47.2		50.2		17.1					
Clay					14.5		14.3		6.3					
Metals in mg/kg														
Antimony, Total	150	200			0.2	J	0.1	J	0.2	UJ	0.1	UJ	0.2	UJ
Arsenic, Total	57	700			5		4		3		4		4	
Cadmium, Total	5.1	14			1.1		0.4	J	0.2		0.3	J	0.3	
Chromium, Total					23.4		23.3		15.2		24.4		28.3	
Copper, Total	390	1300			37.1		35.5		20.9		37		37.7	
Lead, Total	450	1200			153		39	J	15.2		28.3	J	49.9	
Mercury, Total	0.41	2.3			0.2		0.08		0.05		0.08		0.06	
Nickel, Total	140	370			24		21		17		22		24	
Silver, Total	6.1	8.4			0.4		0.2		0.1		0.2		0.2	
Zinc, Total	410	3800			376	J	122	J	82	J	116	J	126	J
Volatiles in µg/kg														
1,2-Dichlorobenzene	35	110			5	U	10	U	5	U	10	U	10	U
1,3-Dichlorobenzene	170				5	U	10	U	5	U	10	U	10	U
1,4-Dichlorobenzene	110	120			5	U	10	U	5	U	10	U	10	U
Benzene					5	U	10	U	5	U	10	U	10	U
Ethylbenzene	10	50			5	U	10	U	5	U	10	U	10	U
Tetrachloroethene (PCE)	57	210			5	U	10	U	5	U	10	U	10	U
Toluene					5	U	10	U	5	U	10	U	10	U
Total Xylenes	40	160			5	U	10	U	5	U	10	U	10	U
Trichloroethene (TCE)	160	1600			5	U	10	U	5	U	10	U	10	U
m- & p-Xylenes					5	U	10	U	5	U	10	U	10	U
o-Xylene					5	U	10	U	5	U	10	U	10	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-021		K9807169-002		K9807115-018		K9807169-001		K9807115-019		K9807169-005	
Sample ID			HC-S-33		HC-S-34		HC-S-35		HC-S-36		HC-S-37		HC-S-38	
Sampling Date			Oct 14,1998		Oct 15,1998		Oct 14,1998		Oct 15,1998		Oct 14,1998		Oct 15,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
TPH in mg/kg														
Diesel			212		375		100	U	96		100	U	50	U
Fluoranthene	1700	30000	2.3		1.7	J	2.3		0.5	J	1.5		26	J
Lube Oil			400	J	650	J	100	U	160	J	340	J	100	UJ
Pencil Pitch			133		100		170		20.9		88.7		3360	
Phytane			0.5	U	2.4	J	0.5	U	0.5	UJ	0.5	U	0.5	UJ
Pristane			0.5	U	2.6	J	0.5	U	0.5	UJ	0.5	U	0.5	UJ
LPAHs in µg/kg														
Acenaphthene	500	2000			200		120		23		88		4000	
Acenaphthylene	560	1300			50		30		20	U	20		20	U
Anthracene	960	13000			100		220		27		140		4100	
Fluorene	540	3600			53		85		20	U	75		20	U
Naphthalene	2100	2400			100		40		33		27		540	
Phenanthrene	1500	21000			540		730		150		580		23000	
Total LPAHs	5200	29000			1043		1225		253		930		31660	
HPAHs in µg/kg														
Benz(a)anthracene	1300	5100			690		1500		170		800		29000	
Benzo(a)pyrene	1600	3600			490		1800		180		1100		31000	
Benzo(b)fluoranthene					540		1500		150		1000		34000	
Benzo(g,h,i)perylene	670	3200			610		1200		220		610		23000	
Benzo(k)fluoranthene					340		1300		98		510		21000	
Chrysene	1400	21000			730		1500		170		900		31000	
Dibenz(a,h)anthracene	230	1900			110		280		50		170		7200	
Fluoranthene	1700	30000			2300		2700		310		1500		58000	
Indeno(1,2,3-cd)pyrene	600	4400			1300		2300		340		900		53000	
Pyrene	2600	16000			2800		2700		380		1300		46000	
Total HPAHs	12000	69000			9910		16780		2068		8790		333200	
Total Benzofluoranthenes	3200	9900			880		2800		248		1510		55000	
Phenols in µg/kg														
2,4-Dimethylphenol	29	210			6	U	6	U	6	U	6	U	9	
2-Methylphenol	63	77			6	U	6	U	6	U	6	U	17	
4-Methylphenol	670	3600			20	U	20	U	20	U	20	U	51	
Pentachlorophenol (PCP)	400	690			60	U	60	U	60	U	60	U	60	U
Phenol	420	1200			20	U	20	U	20	U	20	U	55	

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807115-021		K9807169-002		K9807115-018		K9807169-001		K9807115-019		K9807169-005	
Sample ID			HC-S-33		HC-S-34		HC-S-35		HC-S-36		HC-S-37		HC-S-38	
Sampling Date			Oct 14,1998		Oct 15,1998		Oct 14,1998		Oct 15,1998		Oct 14,1998		Oct 15,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Phthalates in µg/kg														
Bis(2-ethylhexyl) Phthalate	8300				80		260		50		290		310	
Butyl Benzyl Phthalate	970				20	U	20	U	20	U	20	U	20	U
Di-n-butyl Phthalate	5100				20	U	20	U	20	U	20	U	20	U
Di-n-octyl Phthalate	6200				20	U	20	U	20	U	20	U	20	U
Diethyl Phthalate	1200				20	U	20	U	20	U	20	U	20	U
Dimethyl Phthalate	1400				20	U	20	U	20	U	20	U	20	U
Semivolatiles in µg/kg														
Benzoic Acid	650	760			100	U	100	U	100	U	100	U	100	U
Benzyl Alcohol	57	870			6	U	6	U	6	U	6	U	6	U
Dibenzofuran	540	1700			23		31		20	U	30		860	
Hexachlorobenzene	22	230			20	U	20	U	20	U	20	U	20	U
Hexachlorobutadiene	29	290			20	U	20	U	20	U	20	U	20	U
N-Nitrosodiphenylamine	28	130			12	U	12	U	12	U	12	U	12	U

Notes:

= Indicates Exceedence of Screening Level (SL)

= Indicates Exceedence of Maximum Level (ML)

DUP = Duplicate

U = Undetected at or above Method Reporting Limit (MRL)

J = Estimated concentration - the value is less than MRL, but greater than Method Detection Limit (MDL).

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807169-004		K9807169-003		K9807169-009		K9807169-008		K9807169-007		K9807169-006	
Sample ID			HC-S-39		HC-S-40		HC-S-41		HC-S-42		HC-S-43		HC-S-44	
Sampling Date			Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Conventionals in mg/kg														
Ammonia as Nitrogen			96.8		85		90.2		84.8		85.8		99.9	
Sulfide, Total			6.2		1.6		8.8		3.3		2.4		2.1	
Conventionals in %														
Carbon, Total Organic (TOC)			1.87		1.74		1.91		1.93		2.26		2.11	
Solids, Total			43.9		42.6		48.4		43.2		39.2		44.1	
Solids, Total Volatile			6.09		6.37		5.95		6.28		6.35		5.97	
Gravel			0						0				0	
Sand			14.9						7.1				11.2	
Silt			69.4						78.3				72	
Clay			15.7						14.6				16.8	
Metals in mg/kg														
Antimony, Total	150	200	0.2	UJ			0.2	UJ	0.2	UJ				
Arsenic, Total	57	700	4				4		4					
Cadmium, Total	5.1	14	0.2				0.3		0.3					
Chromium, Total			26.4				25.5		27.3					
Copper, Total	390	1300	38				37.2		40.7					
Lead, Total	450	1200	30.1				30.3		36					
Mercury, Total	0.41	2.3	0.08				0.11		0.07					
Nickel, Total	140	370	22				23		22					
Silver, Total	6.1	8.4	0.2				0.2		0.2					
Zinc, Total	410	3800	104	J			133	J	124	J				
Volatiles in µg/kg														
1,2-Dichlorobenzene	35	110	10	U	10	U	10	U	10	U	25	U	10	U
1,3-Dichlorobenzene	170		10	U	10	U	10	U	10	U	25	U	10	U
1,4-Dichlorobenzene	110	120	10	U	10	U	10	U	10	U	25	U	10	U
Benzene			10	U	10	U	10	U	10	U	25	U	10	U
Ethylbenzene	10	50	10	U	10	U	10	U	10	U	25	U	10	U
Tetrachloroethene (PCE)	57	210	10	U	10	U	10	U	10	U	25	U	10	U
Toluene			10	U	10	U	10	U	10	U	25	U	10	U
Total Xylenes	40	160	10	U	10	U	10	U	10	U	25	U	10	U
Trichloroethene (TCE)	160	1600	10	U	10	U	10	U	10	U	25	U	10	U
m- & p-Xylenes			10	U	10	U	10	U	10	U	25	U	10	U
o-Xylene			10	U	10	U	10	U	10	U	25	U	10	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807169-004		K9807169-003		K9807169-009		K9807169-008		K9807169-007		K9807169-006	
Sample ID			HC-S-39		HC-S-40		HC-S-41		HC-S-42		HC-S-43		HC-S-44	
Sampling Date			Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
TPH in mg/kg														
Diesel			50	U	50	U	100	U	100	U	100	U	100	U
Fluoranthene	1700	30000	9.8	J	4.4	J	23	J	15	J	3.2	J	1.6	J
Lube Oil			100	UJ	100	UJ	100	UJ	100	UJ	100	UJ	390	J
Pencil Pitch			727		197		1710		1220		101		84.1	
Phytane			0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ
Pristane			0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ
LPAHs in µg/kg														
Acenaphthene	500	2000	520		130		1600		920		60		150	
Acenaphthylene	560	1300	20	U	20	U	20	U	23		20	U	20	U
Anthracene	960	13000	600		170		2000		1500		99		170	
Fluorene	540	3600	390		20	U	650		420		42		180	
Naphthalene	2100	2400	49		23		160		92		20	U	39	
Phenanthrene	1500	21000	4700		1000		7800		5300		430		970	
Total LPAHs	5200	29000	6269		1343		12220		8255		651		1519	
HPAHs in µg/kg														
Benz(a)anthracene	1300	5100	6200		1300		15000		11000		830		640	
Benzo(a)pyrene	1600	3600	6700		1700		20000		14000		1100		670	
Benzo(b)fluoranthene			6500		1500		15000		11000		820		670	
Benzo(g,h,i)perylene	670	3200	5400		1300		16000		11000		580		520	
Benzo(k)fluoranthene			5500		690		12000		8900		510		380	
Chrysene	1400	21000	7000		1700		16000		11000		1100		610	
Dibenz(a,h)anthracene	230	1900	1700		290		3900		2600		170		140	
Fluoranthene	1700	30000	13000		3000		24000		17000		1700		1800	
Indeno(1,2,3-cd)pyrene	600	4400	10000		2600		25000		18000		1700		1400	
Pyrene	2600	16000	10000		2500		22000		16000		1500		1500	
Total HPAHs	12000	69000	72000		16580		168900		120500		10010		8330	
Total Benzofluoranthenes	3200	9900	12000		2190		27000		19900		1330		1050	
Phenols in µg/kg														
2,4-Dimethylphenol	29	210	6	U	6	U	6	U	6	U	6	U	6	U
2-Methylphenol	63	77	6	U	6	U	6	U	6	U	6	U	6	U
4-Methylphenol	670	3600	20	U	20	U	24		20	U	20	U	20	U
Pentachlorophenol (PCP)	400	690	60	U	60	U	60	U	60	U	60	U	60	U
Phenol	420	1200	20	U	20	U	20	U	20	U	20	U	20	U

Analytical Results for Surface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807169-004		K9807169-003		K9807169-009		K9807169-008		K9807169-007		K9807169-006	
Sample ID			HC-S-39		HC-S-40		HC-S-41		HC-S-42		HC-S-43		HC-S-44	
Sampling Date			Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998		Oct 15,1998	
Depth in Feet	SL	ML	0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3		0 to 0.3	
Phthalates in µg/kg														
Bis(2-ethylhexyl) Phthalate	8300		290		350		220		500		550		270	
Butyl Benzyl Phthalate	970		20	U	20	U	110		37		20		20	U
Di-n-butyl Phthalate	5100		20	U	20	U	20	U	20	U	20	U	20	U
Di-n-octyl Phthalate	6200		20	U	20	U	20	U	100		40		20	U
Diethyl Phthalate	1200		20	U	20	U	20	U	20	U	20	U	20	U
Dimethyl Phthalate	1400		20	U	20	U	20	U	20	U	20	U	20	U
Semivolatiles in µg/kg														
Benzoic Acid	650	760	100	U	100	U	100	U	100	U	100	U	100	U
Benzyl Alcohol	57	870	6	U	6	U	6	U	6	U	6	U	6	U
Dibenzofuran	540	1700	160		43		270		170		20	U	91	
Hexachlorobenzene	22	230	20	U	20	U	20	U	20	U	20	U	20	U
Hexachlorobutadiene	29	290	20	U	20	U	20	U	20	U	20	U	20	U
N-Nitrosodiphenylamine	28	130	12	U	12	U	12	U	12	U	12	U	12	U

Notes:

= Indicates Exceedence of Screening Level (SL)

= Indicates Exceedence of Maximum Level (ML)

DUP = Duplicate

U = Undetected at or above Method Reporting Limit (MRL)

J = Estimated concentration - the value is less than MRL, but greater than Method Detection Limit (MDL).

SUBSURFACE SEDIMENT

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Hart Crowser
J-5624-10

Lab ID			K9807097-004		K9807097-005		K9807097-013		K9807097-014		K9807097-007		K9807097-008	
Sample ID			HC-VC-7-S1		HC-VC-7-S2		HC-VC-11-S1		HC-VC-11-S2		HC-VC-13-S1		HC-VC-13-S2	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	0 to 2.0		2.0 to 4.2		0 to 2.1		2.1 to 4.0		0 to 2.0		2.0 to 4.0	
Conventionals in mg/kg														
Ammonia as Nitrogen			301		239		201		159		22.9		16.9	
Sulfide, Total			161	J	796	J	276	J	228	J	21	J	9.4	J
Conventionals in %														
Carbon, Total Organic (TOC)			2.36		1.38		2.09		1.69		0.08		0.09	
Solids, Total			51.3		61.7		49		59.2		75.9		75.7	
Solids, Total Volatile			7.93		5.62		10.5		6.13		1.82		1.77	
Gravel					0.1				0				0.1	
Sand					47.8				47.8				96.9	
Silt					36.3				39.7				2.1	
Clay					15.8				12.5				0.9	
Metals in mg/kg														
Antimony, Total	150	200	0.6	J	1.4	J	0.3	J	1.1	J	0.1	UJ	0.1	UJ
Arsenic, Total	57	700	8		15		7		12		2		2	
Cadmium, Total	5.1	14	2.4		3.3		1.2		3.2		0.2		0.2	
Chromium, Total			27.3		23.2		25.3		22.6		9		10.7	
Copper, Total	390	1300	62.8		83.2		52.1		78.3		13.3		15.2	
Lead, Total	450	1200	361		576		169		527		25.8		23.9	
Mercury, Total	0.41	2.3	0.15		0.18		0.09		0.12		0.03		0.02	U
Nickel, Total	140	370	26		25		24		24		15		17	
Silver, Total	6.1	8.4	0.9		1.4		0.6		1.2		0.1	U	0.1	U
Zinc, Total	410	3800	469		650		273		656		61		65	
Volatiles in µg/kg														
1,2-Dichlorobenzene	35	110	5	U	5	U	10	U	5	U	5	U	5	U
1,3-Dichlorobenzene	170		5	U	5	U	10	U	5	U	5	U	5	U
1,4-Dichlorobenzene	110	120	5	U	5	U	10	U	5	U	5	U	5	U
Benzene			5	U	5	U	10	U	5	U	5	U	5	U
Ethylbenzene	10	50	5	U	5	U	10	U	5	U	5	U	5	U
Tetrachloroethene (PCE)	57	210	5	U	5	U	10	U	5	U	5	U	5	U
Toluene			5	U	5	U	10	U	5	U	5	U	5	U
Total Xylenes	40	160	5	U	5	U	10	U	5	U	5	U	5	U
Trichloroethene (TCE)	160	1600	5	U	5	U	10	U	5	U	5	U	5	U
m- & p-Xylenes			5	U	5	U	10	U	5	U	5	U	5	U
o-Xylene			5	U	5	U	10	U	5	U	5	U	5	U

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-004		K9807097-005		K9807097-013		K9807097-014		K9807097-007		K9807097-008	
Sample ID			HC-VC-7-S1		HC-VC-7-S2		HC-VC-11-S1		HC-VC-11-S2		HC-VC-13-S1		HC-VC-13-S2	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	0 to 2.0		2.0 to 4.2		0 to 2.1		2.1 to 4.0		0 to 2.0		2.0 to 4.0	
TPH in mg/kg														
Diesel							100	U	100	U	25	U		
Fluoranthene	1700	30000					11		24		0.5	U		
Lube Oil							100	U	100	U	100	U		
Pencil Pitch			1920		938		703		1400		23		21	
Phytane							0.5	U	0.5	U	0.5	U		
Pristane							0.5	U	0.5	U	0.5	U		
LPAHs in µg/kg														
Acenaphthene	500	2000	4000	U	4000	U	1000	U	4000	U	20	U	20	U
Acenaphthylene	560	1300	4000	U	4000	U	1000	U	4000	U	20	U	20	U
Anthracene	960	13000	4000	U	4000	U	1000		4000	U	32		21	
Fluorene	540	3600	4000	U	4000	U	1000	U	4000	U	20	U	20	U
Naphthalene	2100	2400	4000	U	4000	U	1000	U	4000	U	20	U	20	U
Phenanthrene	1500	21000	4000	U	6100		4300		8400		110		87	
Total LPAHs	5200	29000	12000		16100		7300		18400		182		148	
HPAHs in µg/kg														
Benz(a)anthracene	1300	5100	20000		9300		7500		15000		190		210	
Benzo(a)pyrene	1600	3600	23000		11000		8200		18000		240		250	
Benzo(b)fluoranthene			19000		9200		7100		13000		180		220	
Benzo(g,h,i)perylene	670	3200	14000		6800		5200		9600		120		110	
Benzo(k)fluoranthene			17000		8800		6000		12000		170		180	
Chrysene	1400	21000	20000		9800		7300		14000		190		200	
Dibenz(a,h)anthracene	230	1900	4000	U	4000	U	1000	U	4000	U	36		43	
Fluoranthene	1700	30000	28000		14000		10000		21000		450		350	
Indeno(1,2,3-cd)pyrene	600	4400	25000		12000		9200		18000		200		190	
Pyrene	2600	16000	24000		12000		9100		18000		480		320	
Total HPAHs	12000	69000	192000		94900		70100		140600		2256		2073	
Total Benzofluoranthenes	3200	9900	36000		18000		13100		25000		350		400	
Phenols in µg/kg														
2,4-Dimethylphenol	29	210	1200	U	1200	U	300	U	1200	U	6	U	6	U
2-Methylphenol	63	77	1200	U	1200	U	300	U	1200	U	6	U	6	U
4-Methylphenol	670	3600	4000	U	4000	U	1000	U	4000	U	20	U	20	U
Pentachlorophenol (PCP)	400	690	12000	U	12000	U	3000	U	12000	U	60	U	60	U
Phenol	420	1200	4000	U	4000	U	1000	U	4000	U	20	U	20	U

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-004		K9807097-005		K9807097-013		K9807097-014		K9807097-007		K9807097-008	
Sample ID			HC-VC-7-S1		HC-VC-7-S2		HC-VC-11-S1		HC-VC-11-S2		HC-VC-13-S1		HC-VC-13-S2	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	0 to 2.0		2.0 to 4.2		0 to 2.1		2.1 to 4.0		0 to 2.0		2.0 to 4.0	
Phthalates in µg/kg														
Di-n-octyl Phthalate	6200		4000	U	4000	U	1000	U	4000	U	20	U	20	U
Diethyl Phthalate	1200		4000	U	4000	U	1000	U	4000	U	20	U	20	U
Dimethyl Phthalate	1400		4000	U	4000	U	1000	U	4000	U	20	U	20	U
Semivolatiles in µg/kg														
Benzoic Acid	650	760	20000	U	20000	U	5000	U	20000	U	100	U	100	U
Benzyl Alcohol	57	870	1200	U	1200	U	300	U	1200	U	6	U	6	U
Dibenzofuran	540	1700	4000	U	4000	U	1000	U	4000	U	20	U	20	U
Hexachlorobenzene	22	230	4000	U	4000	U	1000	U	4000	U	20	U	20	U
Hexachlorobutadiene	29	290	4000	U	4000	U	1000	U	4000	U	20	U	20	U
N-Nitrosodiphenylamine	28	130	2400	U	2400	U	600	U	2400	U	12	U	12	U

= Indicates Exceedence of Screening Level (SL)
= Indicates Exceedence of Maximum Level (ML)
DUP = Duplicate
U = Not Detected at or above the Method Reporting Limit (MRL)

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-010		K9807097-011		K9807097-012		K9807097-001		K9807097-002		K9807097-016	
Sample ID			HC-VC-103 (DUP)		HC-VC-104 (DUP)		HC-VC-105 (DUP)		HC-VC-18-S1		HC-VC-18-S2		HC-VC-22-S1	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	0 to 2.0		2.0 to 4.0		0 to 2.1		0 to 2.2		2.2 to 4.0		0 to 2.0	
Conventionals in mg/kg														
Ammonia as Nitrogen							216		75.7		45.2		19.2	
Sulfide, Total			21.7	J					31.4	J	2	J	6.6	J
Conventionals in %														
Carbon, Total Organic (TOC)							2.05		0.91		0.29		0.71	
Solids, Total			77.1		74.7		49		68.6		78.3		79.7	
Solids, Total Volatile			1.93		3.19		7.67		4.04		2.14		2.7	
Gravel											0			
Sand											96.8			
Silt											2.3			
Clay											0.9			
Metals in mg/kg														
Antimony, Total	150	200					0.4	J					0.1	UJ
Arsenic, Total	57	700					6						2	
Cadmium, Total	5.1	14					1.1						0.1	
Chromium, Total							25.6						11.8	
Copper, Total	390	1300					52.4						17.6	
Lead, Total	450	1200					190						12.1	
Mercury, Total	0.41	2.3					0.08						0.02	
Nickel, Total	140	370					24						17	
Silver, Total	6.1	8.4					0.5						0.1	U
Zinc, Total	410	3800					267						55	
Volatiles in µg/kg														
1,2-Dichlorobenzene	35	110	5	U					5	U	5	U	5	U
1,3-Dichlorobenzene	170		5	U					5	U	5	U	5	U
1,4-Dichlorobenzene	110	120	5	U					5	U	5	U	5	U
Benzene			5	U					5	U	5	U	5	U
Ethylbenzene	10	50	5	U					5	U	5	U	5	U
Tetrachloroethene (PCE)	57	210	5	U					5	U	5	U	5	U
Toluene			5	U					5	U	5	U	5	U
Total Xylenes	40	160	5	U					5	U	5	U	5	U
Trichloroethene (TCE)	160	1600	5	U					5	U	5	U	5	U
m- & p-Xylenes			5	U					5	U	5	U	5	U
o-Xylene			5	U					5	U	5	U	5	U

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-010		K9807097-011		K9807097-012	K9807097-001		K9807097-002		K9807097-016	
Sample ID			HC-VC-103 (DUP)		HC-VC-104 (DUP)		HC-VC-105 (DUP)	HC-VC-18-S1		HC-VC-18-S2		HC-VC-22-S1	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998	Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	0 to 2.0		2.0 to 4.0		0 to 2.1	0 to 2.2		2.2 to 4.0		0 to 2.0	
TPH in mg/kg													
Diesel													
Fluoranthene	1700	30000											
Lube Oil													
Pencil Pitch								385		166		26	
Phytane													
Pristane													
LPAHs in µg/kg													
Acenaphthene	500	2000			100	U		510		200	U	30	
Acenaphthylene	560	1300			100	U		400	U	200	U	20	U
Anthracene	960	13000			100	U		520		200	U	27	
Fluorene	540	3600			100	U		400	U	200	U	20	U
Naphthalene	2100	2400			100	U		400	U	200	U	20	U
Phenanthrene	1500	21000			280			2200		820		150	
Total LPAHs	5200	29000			530			3830		1320		237	
HPAHs in µg/kg													
Benz(a)anthracene	1300	5100			480			4100		1600		250	
Benzo(a)pyrene	1600	3600			460			4800		1900		280	
Benzo(b)fluoranthene					470			4000		1800		280	
Benzo(g,h,i)perylene	670	3200			320			2600		1300		220	
Benzo(k)fluoranthene					410			3500		1600		200	
Chrysene	1400	21000			520			4000		1800		240	
Dibenz(a,h)anthracene	230	1900			100	U		400	U	200	U	23	
Fluoranthene	1700	30000			800			5700		2300		370	
Indeno(1,2,3-cd)pyrene	600	4400			560			4400		2200		360	
Pyrene	2600	16000			680			5000		1900		340	
Total HPAHs	12000	69000			4750			38300		16500		2563	
Total Benzofluoranthenes	3200	9900			880			7500		3400		480	
Phenols in µg/kg													
2,4-Dimethylphenol	29	210			30	U		120	U	60	U	6	U
2-Methylphenol	63	77			30	U		120	U	60	U	6	U
4-Methylphenol	670	3600			100	U		400	U	200	U	20	U
Pentachlorophenol (PCP)	400	690			300	U		1200	U	600	U	60	U
Phenol	420	1200			100	U		400	U	200	U	20	U

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-010		K9807097-011		K9807097-012		K9807097-001		K9807097-002		K9807097-016	
Sample ID			HC-VC-103 (DUP)		HC-VC-104 (DUP)		HC-VC-105 (DUP)		HC-VC-18-S1		HC-VC-18-S2		HC-VC-22-S1	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	0 to 2.0		2.0 to 4.0		0 to 2.1		0 to 2.2		2.2 to 4.0		0 to 2.0	
Phthalates in µg/kg														
Di-n-octyl Phthalate	6200				100	U			400	U	200	U	20	U
Diethyl Phthalate	1200				100	U			400	U	200	U	20	U
Dimethyl Phthalate	1400				100	U			400	U	200	U	20	U
Semivolatiles in µg/kg														
Benzoic Acid	650	760			500	U			2000	U	1000	U	100	U
Benzyl Alcohol	57	870			30	U			120	U	60	U	6	U
Dibenzofuran	540	1700			100	U			400	U	200	U	20	U
Hexachlorobenzene	22	230			100	U			400	U	200	U	20	U
Hexachlorobutadiene	29	290			100	U			400	U	200	U	20	U
N-Nitrosodiphenylamine	28	130			60	U			240	U	120	U	12	U

= Indicates Exceedence of Screening Level (SL)
= Indicates Exceedence of Maximum Level (ML)
DUP = Duplicate
U = Not Detected at or above the Method Reporting Limit (MRL)

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-017		K9807097-019		K9807097-020		K9807097-022		K9807097-023		K9807097-025	
Sample ID			HC-VC-22-S2		HC-VC-27-S1		HC-VC-27-S2		HC-VC-32-S1		HC-VC-32-S2		HC-VC-39-S1	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	2.0 to 4.0		0 to 1.9		1.9 to 3.5		0 to 1.8		1.8 to 4.0		0 to 2.0	
Conventionals in mg/kg														
Ammonia as Nitrogen			15.7		185		150		107		1.4		194	
Sulfide, Total			2	J	33.5	J	50.2	J						
Conventionals in %														
Carbon, Total Organic (TOC)			0.03		1.67		1.67		1.98		0.04		1.91	
Solids, Total			77.8		55.5		63.7		57.4		81.4		49.1	
Solids, Total Volatile			1.73		7.35		5.02		7.41		1.8		7.87	
Gravel											0			
Sand											96.5			
Silt											2.6			
Clay											0.9			
Metals in mg/kg														
Antimony, Total	150	200	0.1	UJ	0.3	J	0.2	J					0.1	UJ
Arsenic, Total	57	700	2		5		5						3	
Cadmium, Total	5.1	14	0.1	U	0.8		1.1						0.2	
Chromium, Total			9.6		22.1		18.5						23.8	
Copper, Total	390	1300	13.4		47.8		43						38.4	
Lead, Total	450	1200	3		116		144						19.3	
Mercury, Total	0.41	2.3	0.02	U	0.08		0.08						0.08	
Nickel, Total	140	370	16		22		22						22	
Silver, Total	6.1	8.4	0.1	U	0.4		0.4						0.4	
Zinc, Total	410	3800	37		193		245						89	
Volatiles in µg/kg														
1,2-Dichlorobenzene	35	110	5	U	5	U	5	U	5	U	5	U	10	U
1,3-Dichlorobenzene	170		5	U	5	U	5	U	5	U	5	U	10	U
1,4-Dichlorobenzene	110	120	5	U	5	U	5	U	5	U	5	U	10	U
Benzene			5	U	5	U	5	U	5	U	5	U	10	U
Ethylbenzene	10	50	5	U	5	U	5	U	5	U	5	U	10	U
Tetrachloroethene (PCE)	57	210	5	U	5	U	5	U	5	U	5	U	10	U
Toluene			5	U	5	U	5	U	5	U	5	U	10	U
Total Xylenes	40	160	5	U	5	U	5	U	5	U	5	U	10	U
Trichloroethene (TCE)	160	1600	5	U	5	U	5	U	5	U	5	U	10	U
m- & p-Xylenes			5	U	5	U	5	U	5	U	5	U	10	U
o-Xylene			5	U	5	U	5	U	5	U	5	U	10	U

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-017		K9807097-019		K9807097-020		K9807097-022		K9807097-023		K9807097-025	
Sample ID			HC-VC-22-S2		HC-VC-27-S1		HC-VC-27-S2		HC-VC-32-S1		HC-VC-32-S2		HC-VC-39-S1	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	2.0 to 4.0		0 to 1.9		1.9 to 3.5		0 to 1.8		1.8 to 4.0		0 to 2.0	
TPH in mg/kg														
Diesel														
Fluoranthene	1700	30000												
Lube Oil														
Pencil Pitch					385		422		48				80	
Phytane														
Pristane														
LPAHs in µg/kg														
Acenaphthene	500	2000	20	U	1000	U	1000	U	100	U	20	U	100	U
Acenaphthylene	560	1300	20	U	1000	U	1000	U	100	U	20	U	100	U
Anthracene	960	13000	20	U	1000	U	1000	U	100	U	20	U	100	U
Fluorene	540	3600	20	U	1000	U	1000	U	100	U	20	U	100	U
Naphthalene	2100	2400	20	U	1000	U	1000	U	100	U	20	U	100	U
Phenanthrene	1500	21000	20	U	2200		2400		280		20	U	620	
Total LPAHs	5200	29000	60		4700		4900		530		60		870	
HPAHs in µg/kg														
Benz(a)anthracene	1300	5100	20	U	3900		4400		500		20	U	790	
Benzo(a)pyrene	1600	3600	20	U	4300		4800		510		20	U	830	
Benzo(b)fluoranthene			20	U	3800		3800		470		20	U	960	
Benzo(g,h,i)perylene	670	3200	20	U	3000		3300		380		20	U	590	
Benzo(k)fluoranthene			20	U	3300		3500		340		20	U	560	
Chrysene	1400	21000	20	U	3800		4200		470		20	U	830	
Dibenz(a,h)anthracene	230	1900	20	U	1000	U	1000	U	100	U	20	U	100	U
Fluoranthene	1700	30000	20	U	5500		6200		710		20	U	1300	
Indeno(1,2,3-cd)pyrene	600	4400	20	U	5500		6000		690		20	U	1100	
Pyrene	2600	16000	20	U	5000		5600		650		20	U	1000	
Total HPAHs	12000	69000	100		38600		42300		4770		100		8010	
Total Benzofluoranthenes	3200	9900	20	U	7100		7300		810		20	U	1520	
Phenols in µg/kg														
2,4-Dimethylphenol	29	210	6	U	300	U	300	U	30	U	6	U	30	U
2-Methylphenol	63	77	6	U	300	U	300	U	30	U	6	U	30	U
4-Methylphenol	670	3600	20	U	1000	U	1000	U	100	U	20	U	100	U
Pentachlorophenol (PCP)	400	690	60	U	3000	U	3000	U	300	U	60	U	300	U
Phenol	420	1200	20	U	1000	U	1000	U	100	U	20	U	100	U

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-017		K9807097-019		K9807097-020		K9807097-022		K9807097-023		K9807097-025	
Sample ID			HC-VC-22-S2		HC-VC-27-S1		HC-VC-27-S2		HC-VC-32-S1		HC-VC-32-S2		HC-VC-39-S1	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	2.0 to 4.0		0 to 1.9		1.9 to 3.5		0 to 1.8		1.8 to 4.0		0 to 2.0	
Phthalates in µg/kg														
Di-n-octyl Phthalate	6200		20	U	1000	U	1000	U	100	U	20	U	100	U
Diethyl Phthalate	1200		20	U	1000	U	1000	U	100	U	20	U	100	U
Dimethyl Phthalate	1400		20	U	1000	U	1000	U	100	U	20	U	100	U
Semivolatiles in µg/kg														
Benzoic Acid	650	760	100	U	5000	U	5000	U	500	U	100	U	500	U
Benzyl Alcohol	57	870	6	U	300	U	300	U	30	U	6	U	30	U
Dibenzofuran	540	1700	20	U	1000	U	1000	U	100	U	20	U	100	U
Hexachlorobenzene	22	230	20	U	1000	U	1000	U	100	U	20	U	100	U
Hexachlorobutadiene	29	290	20	U	1000	U	1000	U	100	U	20	U	100	U
N-Nitrosodiphenylamine	28	130	12	U	600	U	600	U	60	U	12	U	60	U

= Indicates Exceedence of Screening Level (SL)
= Indicates Exceedence of Maximum Level (ML)
DUP = Duplicate
U = Not Detected at or above the Method Reporting Limit (MRL)

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-026		K9807097-028		K9807097-029	
Sample ID			HC-VC-39-S2		HC-VC-42-S1		HC-VC-42-S2	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	2.0 to 4.0		0 to 2.0		2.0 to 4.0	
Conventionals in mg/kg								
Ammonia as Nitrogen			327		120		216	
Sulfide, Total								
Conventionals in %								
Carbon, Total Organic (TOC)			2.39		2.11		2.95	
Solids, Total			52.2		49.5		53.3	
Solids, Total Volatile			7.95		7.65		8.7	
Gravel								
Sand								
Silt								
Clay								
Metals in mg/kg								
Antimony, Total	150	200	0.1	UJ	0.1	UJ	0.2	J
Arsenic, Total	57	700	4		4		5	
Cadmium, Total	5.1	14	0.2		0.2		0.7	
Chromium, Total			27.4		25.5		29.4	
Copper, Total	390	1300	44.4		40.4		54.6	
Lead, Total	450	1200	27.6		23.9		79.1	
Mercury, Total	0.41	2.3	0.08		0.07		0.13	
Nickel, Total	140	370	24		23		23	
Silver, Total	6.1	8.4	0.4		0.2		0.4	
Zinc, Total	410	3800	109		100		207	
Volatiles in µg/kg								
1,2-Dichlorobenzene	35	110	5	U	10	U	5	U
1,3-Dichlorobenzene	170		5	U	10	U	5	U
1,4-Dichlorobenzene	110	120	5	U	10	U	5	U
Benzene			5	U	10	U	5	U
Ethylbenzene	10	50	5	U	10	U	5	U
Tetrachloroethene (PCE)	57	210	5	U	10	U	5	U
Toluene			5	U	10	U	5	U
Total Xylenes	40	160	5	U	10	U	5	U
Trichloroethene (TCE)	160	1600	5	U	10	U	5	U
m- & p-Xylenes			5	U	10	U	5	U
o-Xylene			5	U	10	U	5	U

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

Lab ID			K9807097-026		K9807097-028		K9807097-029	
Sample ID			HC-VC-39-S2		HC-VC-42-S1		HC-VC-42-S2	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	2.0 to 4.0		0 to 2.0		2.0 to 4.0	
TPH in mg/kg								
Diesel								
Fluoranthene	1700	30000						
Lube Oil								
Pencil Pitch			54		906		2000	
Phytane								
Pristane								
LPAHs in µg/kg								
Acenaphthene	500	2000	100	U	4000	U	4000	U
Acenaphthylene	560	1300	100	U	4000	U	4000	U
Anthracene	960	13000	100	U	4000	U	4000	U
Fluorene	540	3600	100	U	4000	U	4000	U
Naphthalene	2100	2400	100	U	4000	U	4000	U
Phenanthrene	1500	21000	370		4500		10000	
Total LPAHs	5200	29000	620		14500		20000	
HPAHs in µg/kg								
Benz(a)anthracene	1300	5100	530		9400		20000	
Benzo(a)pyrene	1600	3600	540		11000		24000	
Benzo(b)fluoranthene			600		9900		21000	
Benzo(g,h,i)perylene	670	3200	370		7300		16000	
Benzo(k)fluoranthene			350		7200		15000	
Chrysene	1400	21000	550		8900		19000	
Dibenz(a,h)anthracene	230	1900	100	U	4000	U	4000	U
Fluoranthene	1700	30000	910		11000		27000	
Indeno(1,2,3-cd)pyrene	600	4400	730		15000		32000	
Pyrene	2600	16000	750		10000		24000	
Total HPAHs	12000	69000	5380		91700		200000	
Total Benzofluoranthenes	3200	9900	950		17100		36000	
Phenols in µg/kg								
2,4-Dimethylphenol	29	210	30	U	1200	U	1200	U
2-Methylphenol	63	77	30	U	1200	U	1200	U
4-Methylphenol	670	3600	100	U	4000	U	4000	U
Pentachlorophenol (PCP)	400	690	300	U	12000	U	12000	U
Phenol	420	1200	100	U	4000	U	4000	U

Analytical Results for Subsurface Sediment Samples
Port of Portland, Terminal 4 - Slip 3 Sediment Characterization
Portland, Oregon

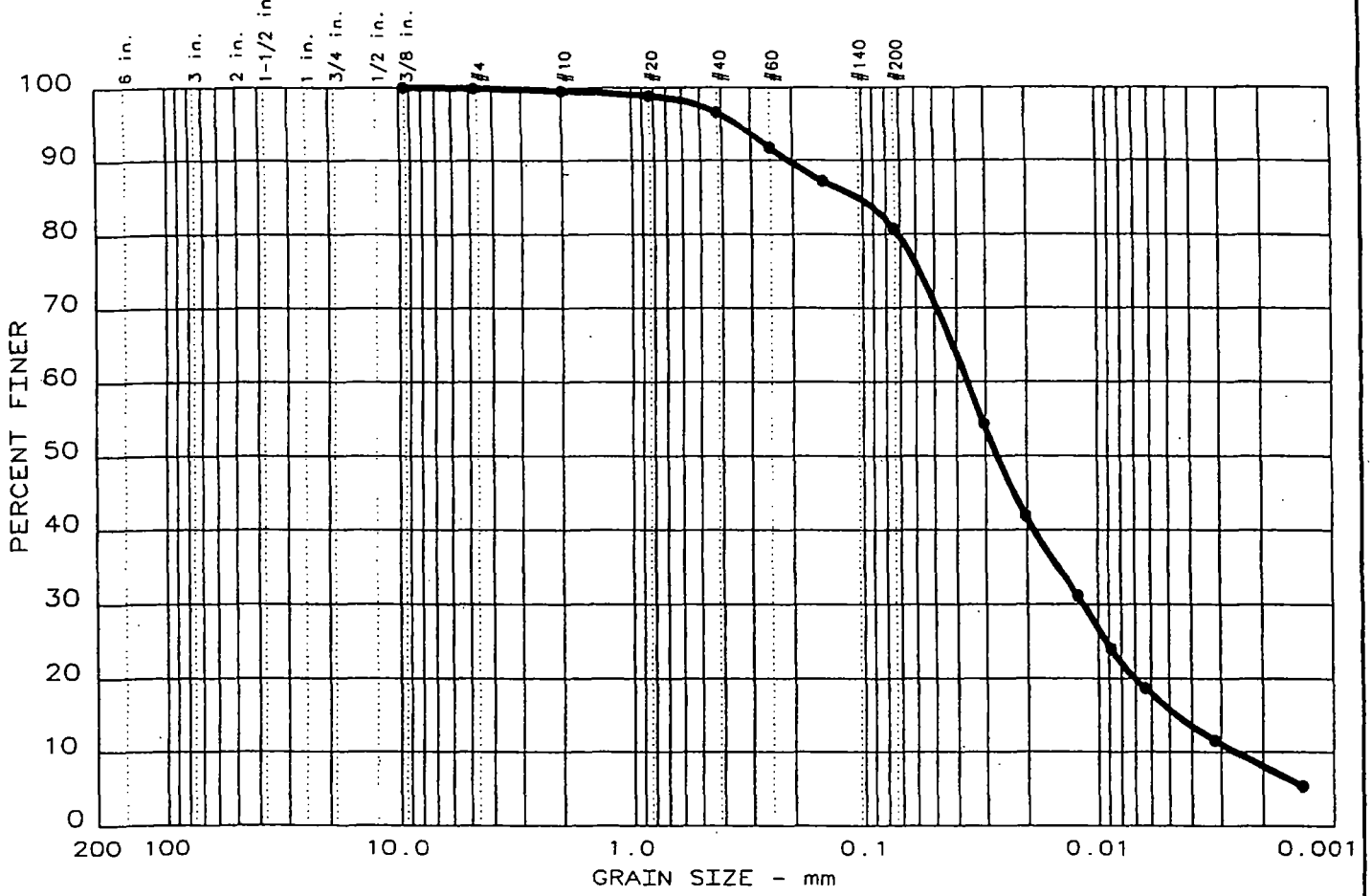
Lab ID			K9807097-026		K9807097-028		K9807097-029	
Sample ID			HC-VC-39-S2		HC-VC-42-S1		HC-VC-42-S2	
Sampling Date			Oct 12,1998		Oct 12,1998		Oct 12,1998	
Depth in Feet	SL	ML	2.0 to 4.0		0 to 2.0		2.0 to 4.0	
Phthalates in µg/kg								
Di-n-octyl Phthalate	6200		100	U	4000	U	4000	U
Diethyl Phthalate	1200		100	U	4000	U	4000	U
Dimethyl Phthalate	1400		100	U	4000	U	4000	U
Semivolatiles in µg/kg								
Benzoic Acid	650	760	500	U	20000	U	20000	U
Benzyl Alcohol	57	870	30	U	1200	U	1200	U
Dibenzofuran	540	1700	100	U	4000	U	4000	U
Hexachlorobenzene	22	230	100	U	4000	U	4000	U
Hexachlorobutadiene	29	290	100	U	4000	U	4000	U
N-Nitrosodiphenylamine	28	130	60	U	2400	U	2400	U

= Indicates Exceedence of Screening Level (SL)
= Indicates Exceedence of Maximum Level (ML)
DUP = Duplicate
U = Not Detected at or above the Method Reporting Limit (MRL)

APPENDIX D

APPENDIX D
SEDIMENT GRAIN SIZE DATA

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.1	19.1	65.0	15.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.10		0.03	0.012	0.0046	0.0026	1.42	13.7

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Clayey, sandy SILT	ML	

Remarks:

Project: Port of Portland T-4

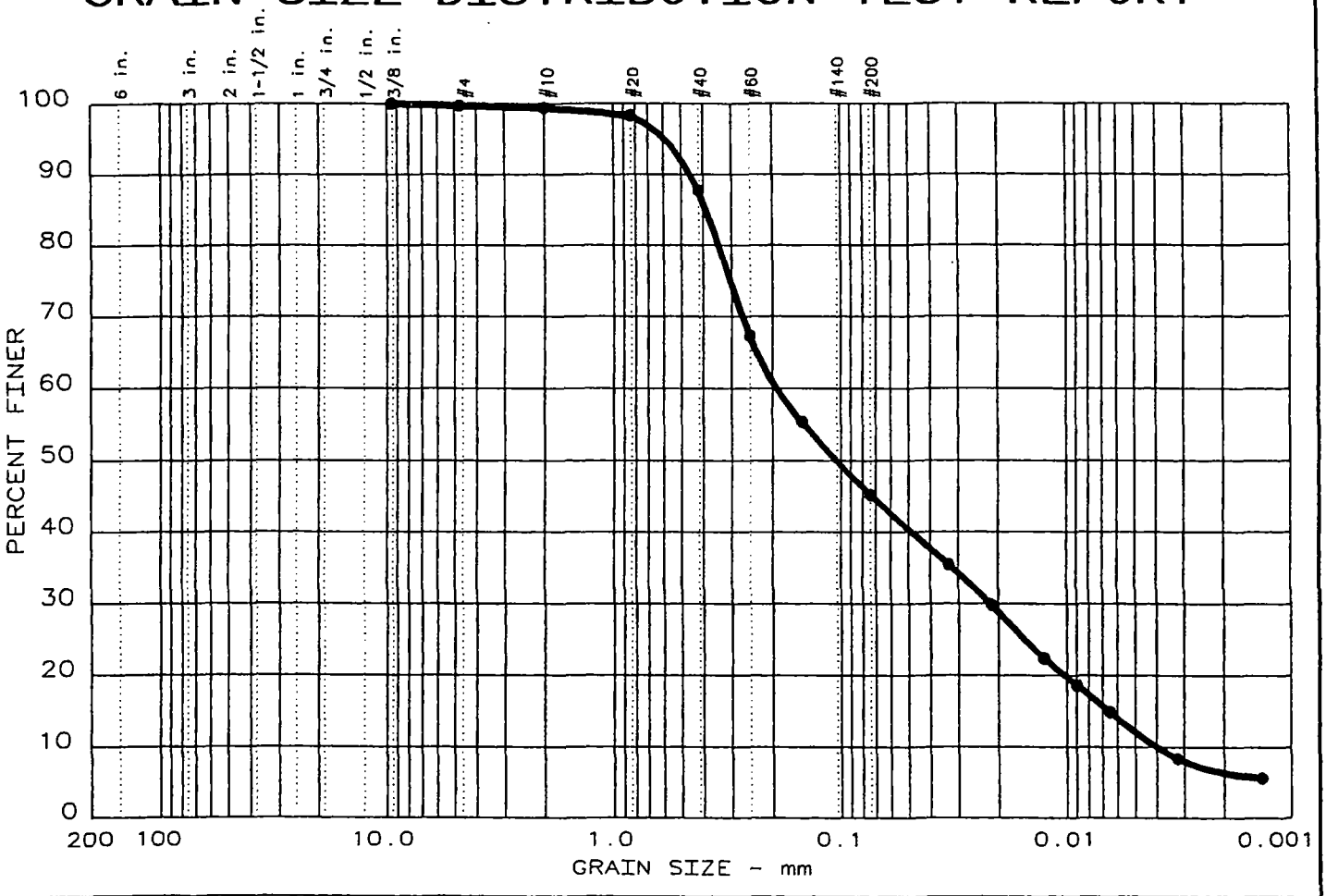
● Location: HC-S-01

HART CROWSER

J-5624-10 1/29/99

Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.3	54.5	33.1	12.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.39	0.19	0.10	0.022	0.0065	0.0040	0.62	47.9

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Clayey, very silty SAND	SM	

Remarks:

Project: Port of Portland T-4

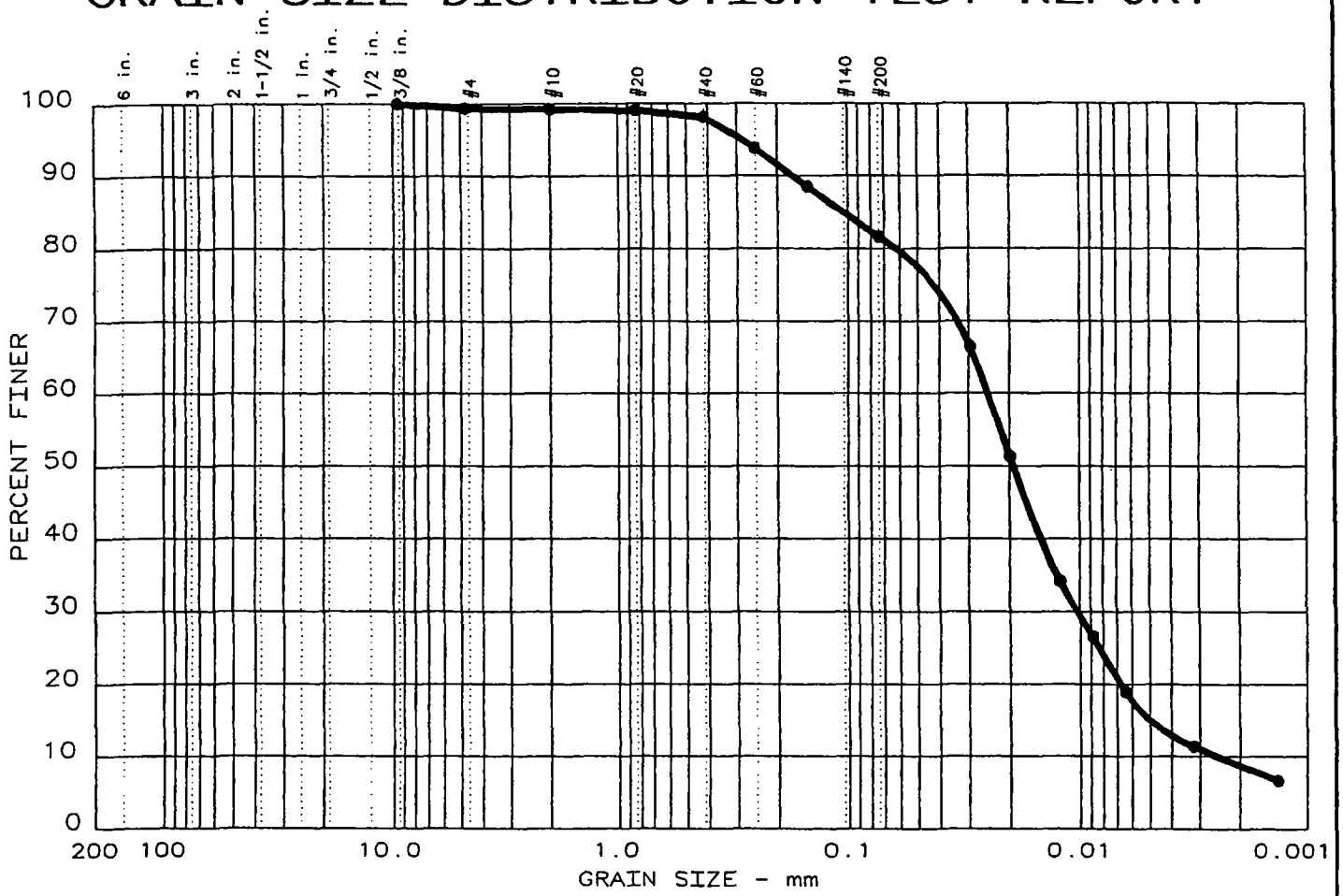
● Location: HC-S-02

HART CROWSER

J-5624-06 11/11/98

Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.7	17.7	66.6	15.0

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.10		0.02	0.010	0.0049	0.0025	1.69	9.8

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Clayey, sandy SILT	ML	

Remarks:

Project: Port of Portland T-4

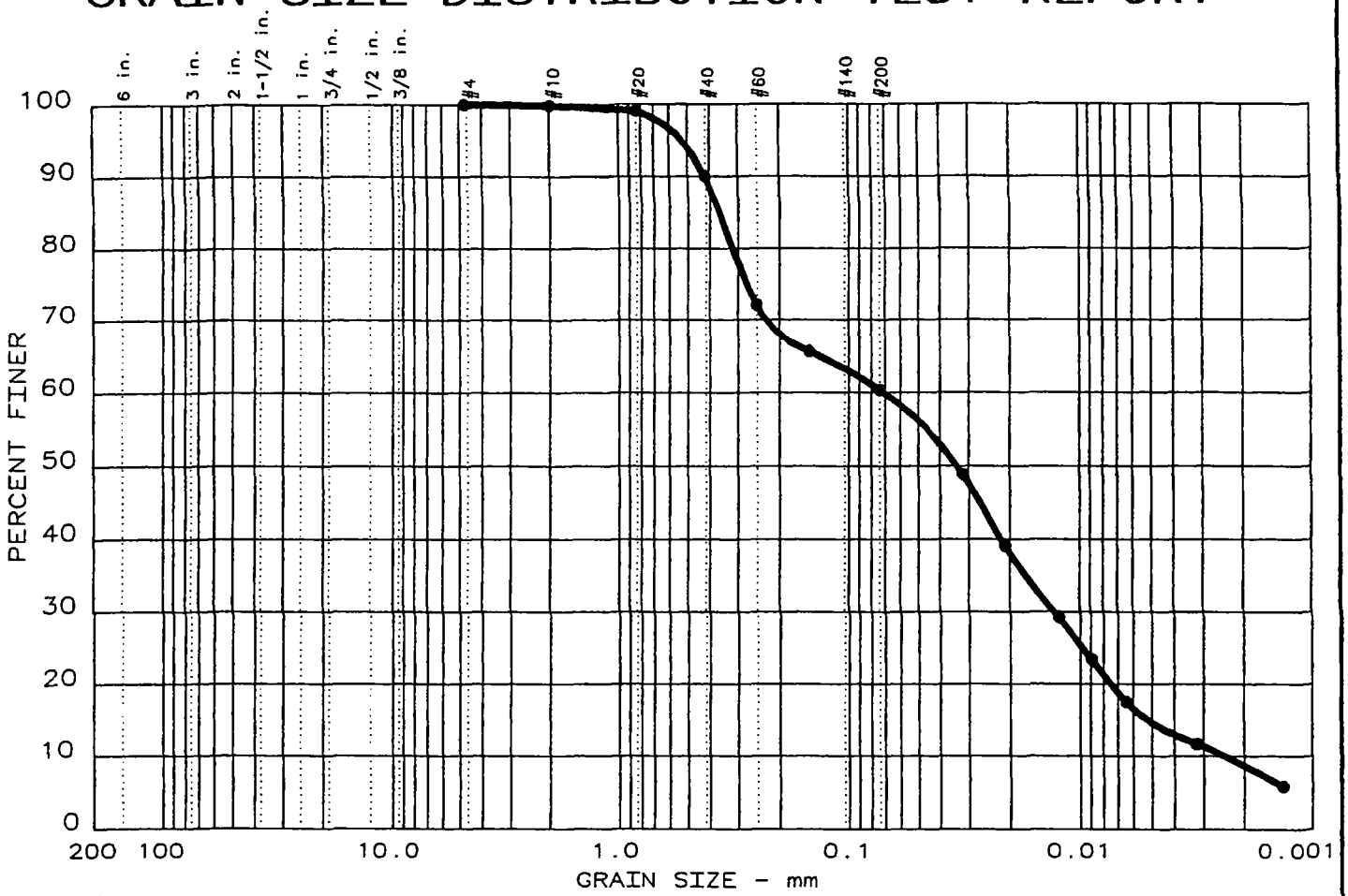
● Location: HC-S-04

HARTCROWSER

J-5624-06 11/11/98

Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	39.6	45.8	14.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.36		0.03	0.013	0.0051	0.0024	0.97	29.2

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Clayey, very sandy SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-05

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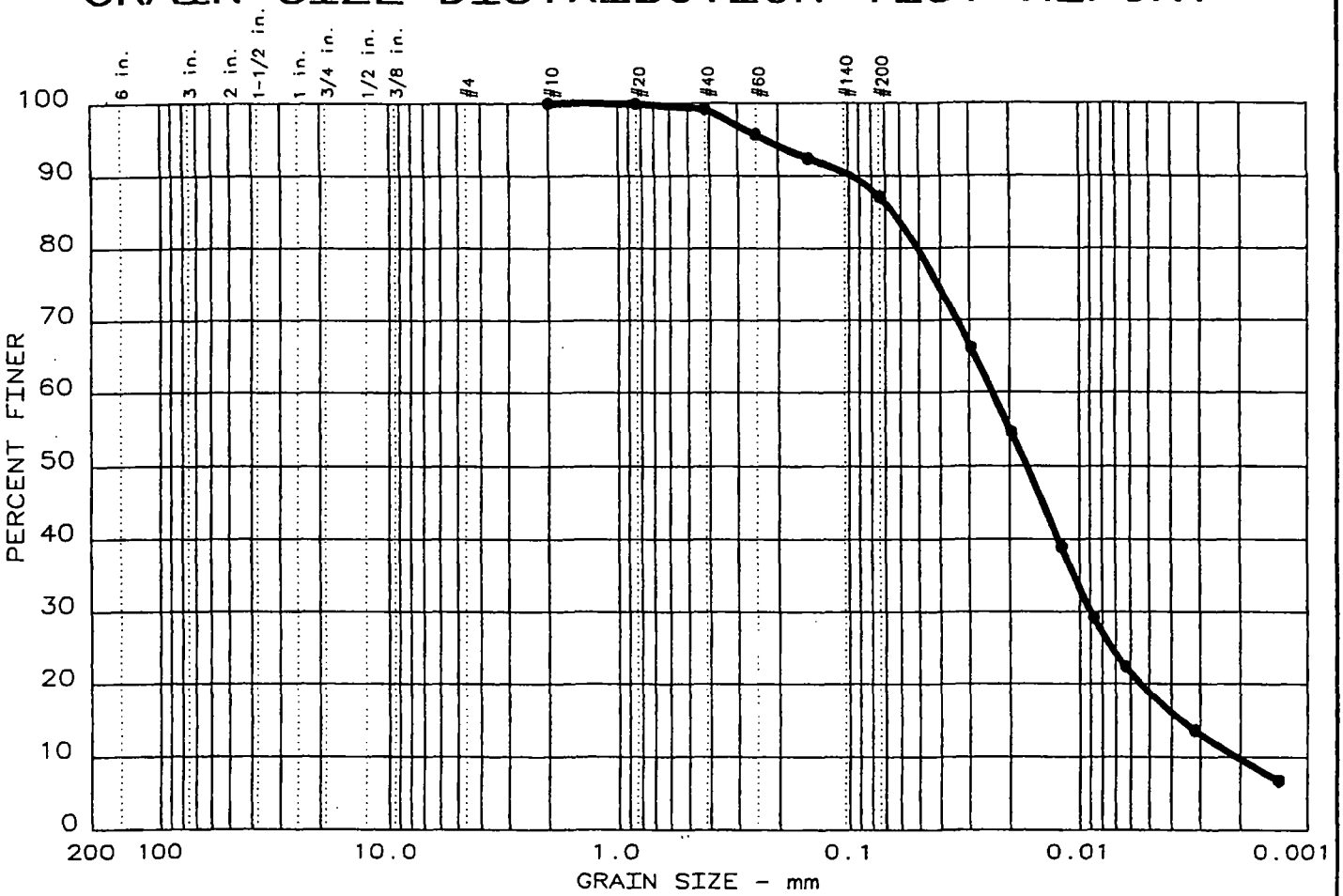
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	12.9	68.3	18.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●					0.02	0.009	0.0036	0.0021	1.64	11.4

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	Sandy, clayey SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-07

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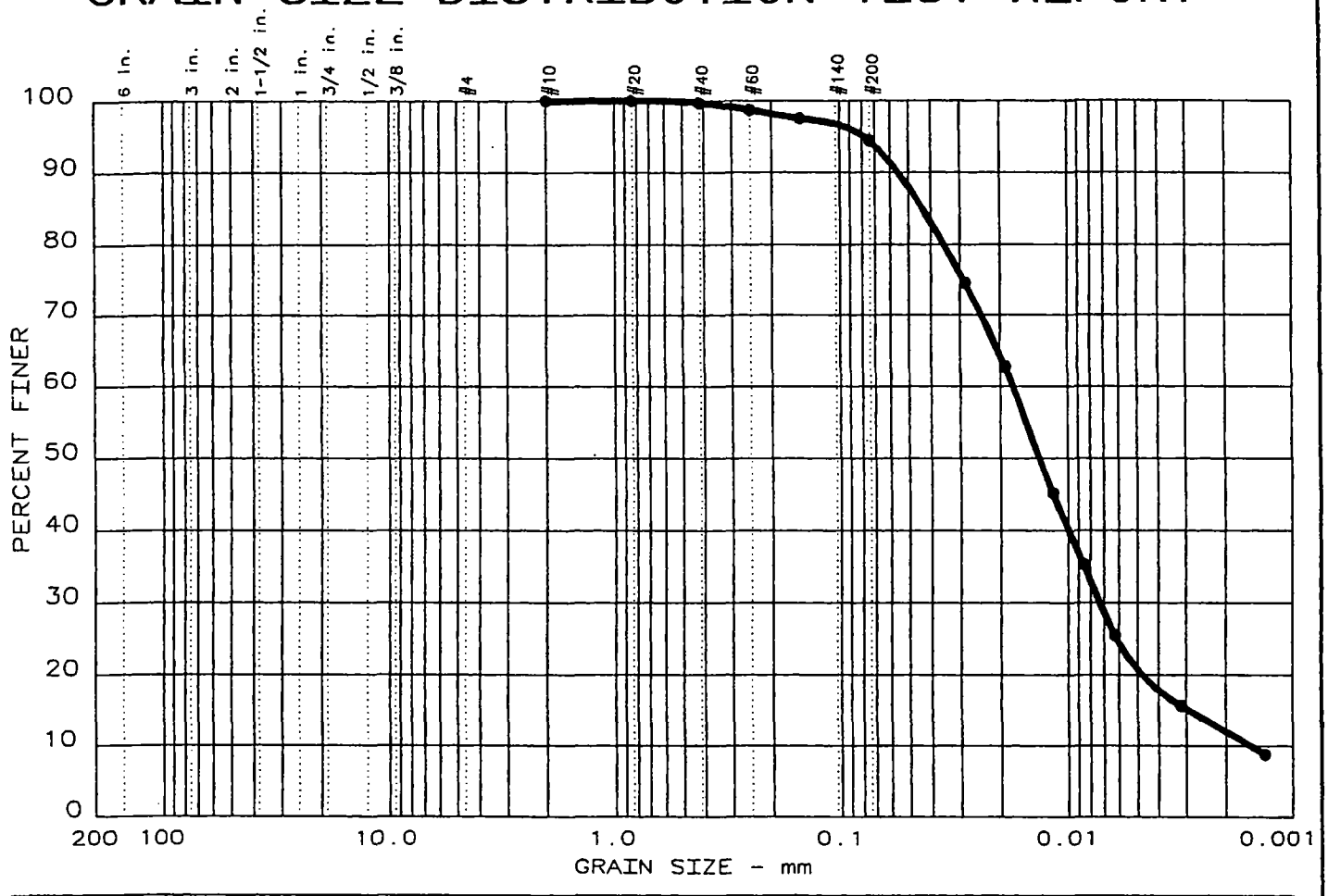
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	5.6	73.7	20.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●					0.01	0.007	0.0029	0.0016	1.94	11.3

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Slightly sandy, clayey SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-08

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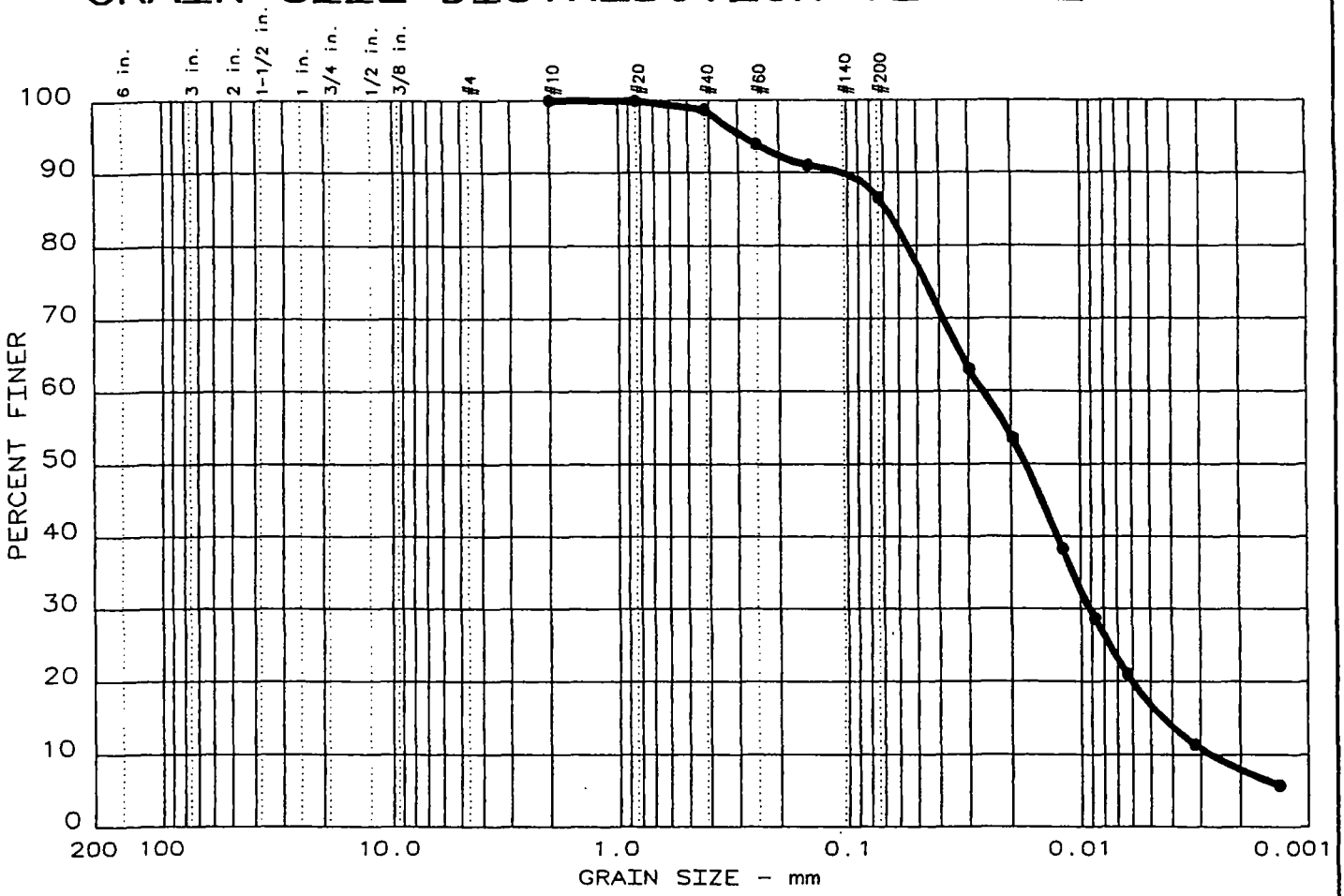
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	13.4	69.8	16.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●					0.02	0.009	0.0044	0.0027	1.19	9.7

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Sandy, clayey SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-11

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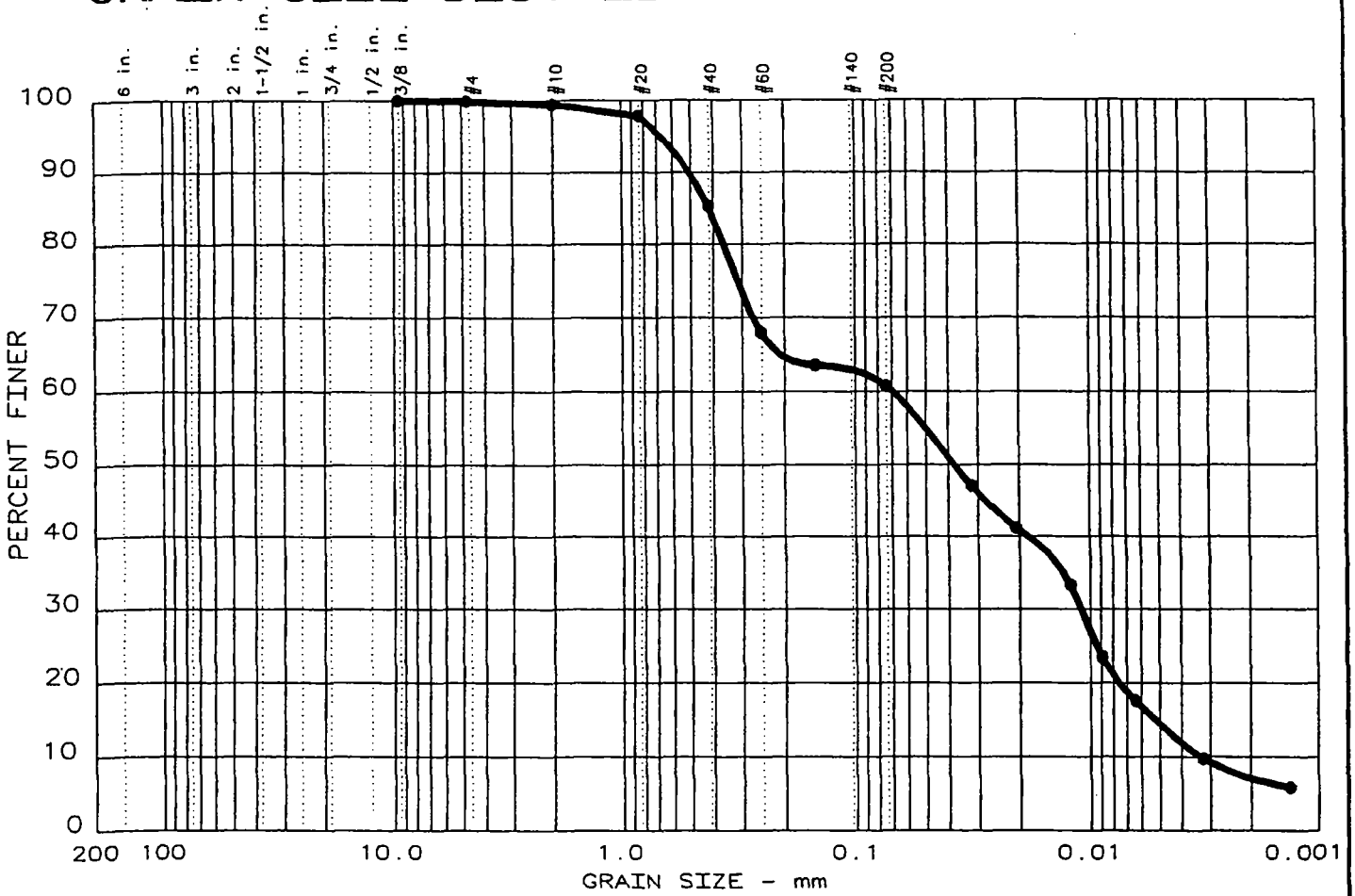
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.1	39.1	46.4	14.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.42		0.04	0.011	0.0052	0.0033	0.54	20.9

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Clayey, very sandy SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-13

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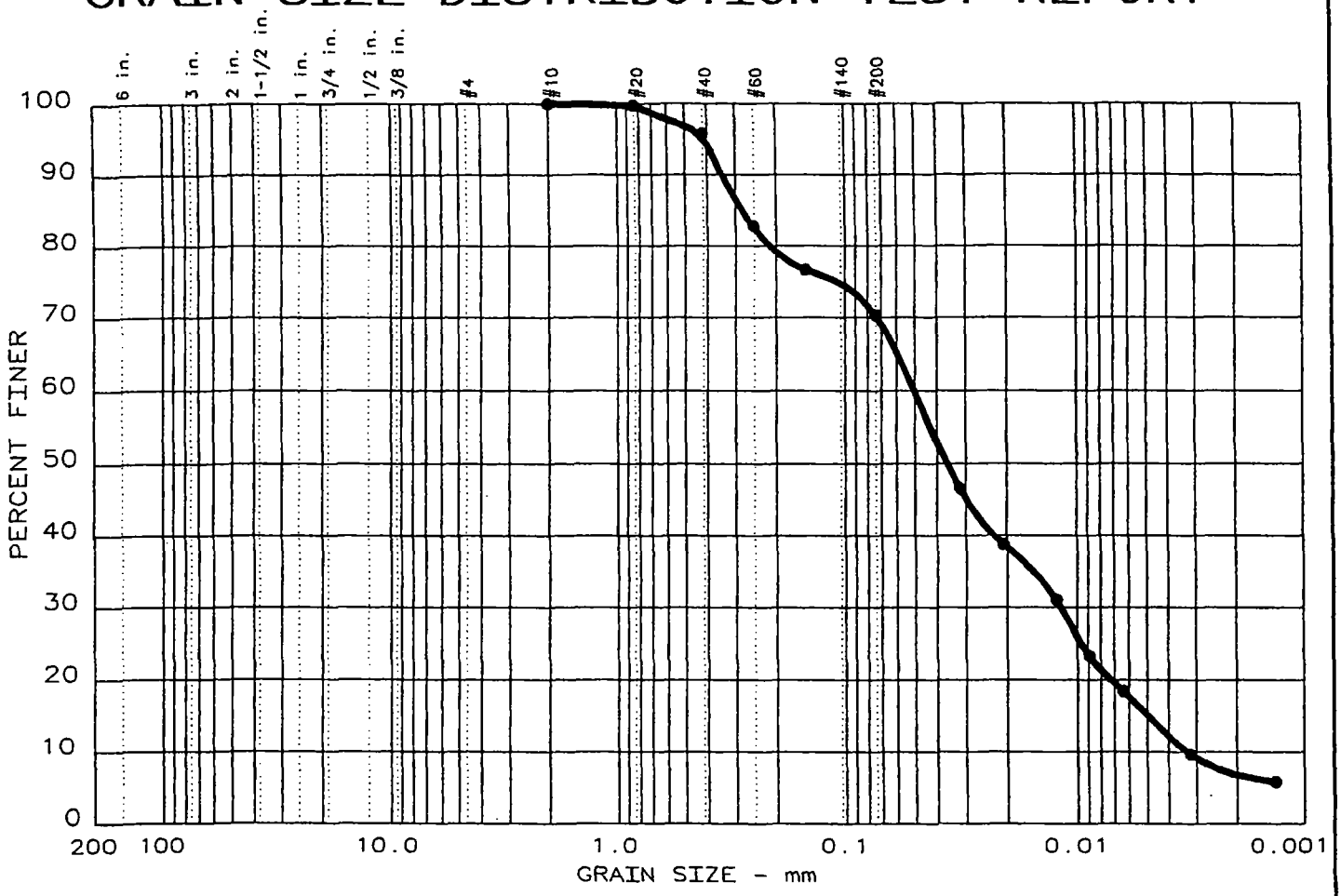
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	29.6	55.3	15.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.28		0.04	0.012	0.0049	0.0033	0.83	15.2

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Clayey, sandy SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-16

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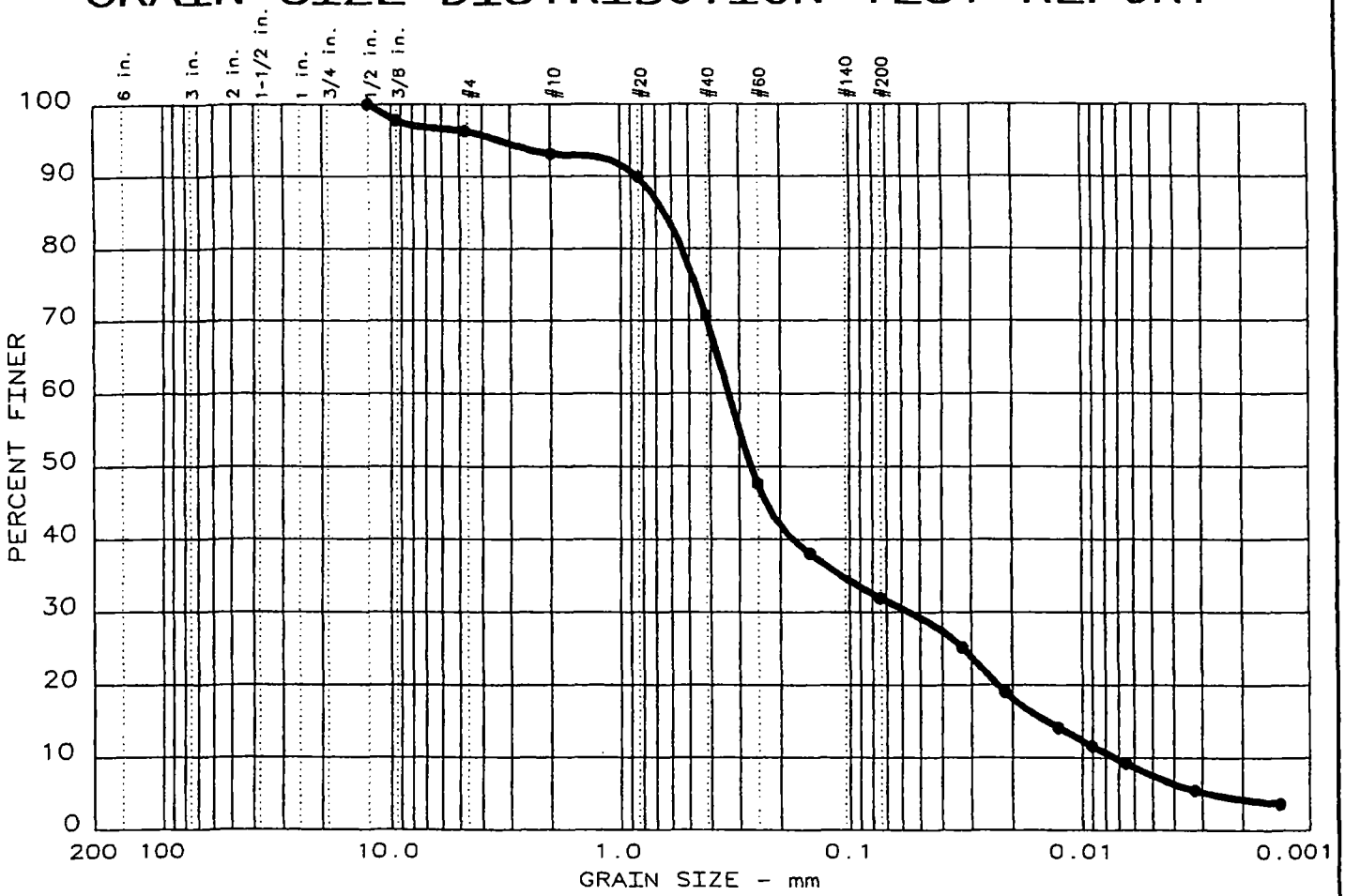
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	3.7	64.4	24.4	7.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.64	0.33	0.27	0.055	0.0142	0.0072	1.27	46.5

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Slightly clayey, silty SAND	SM	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-19

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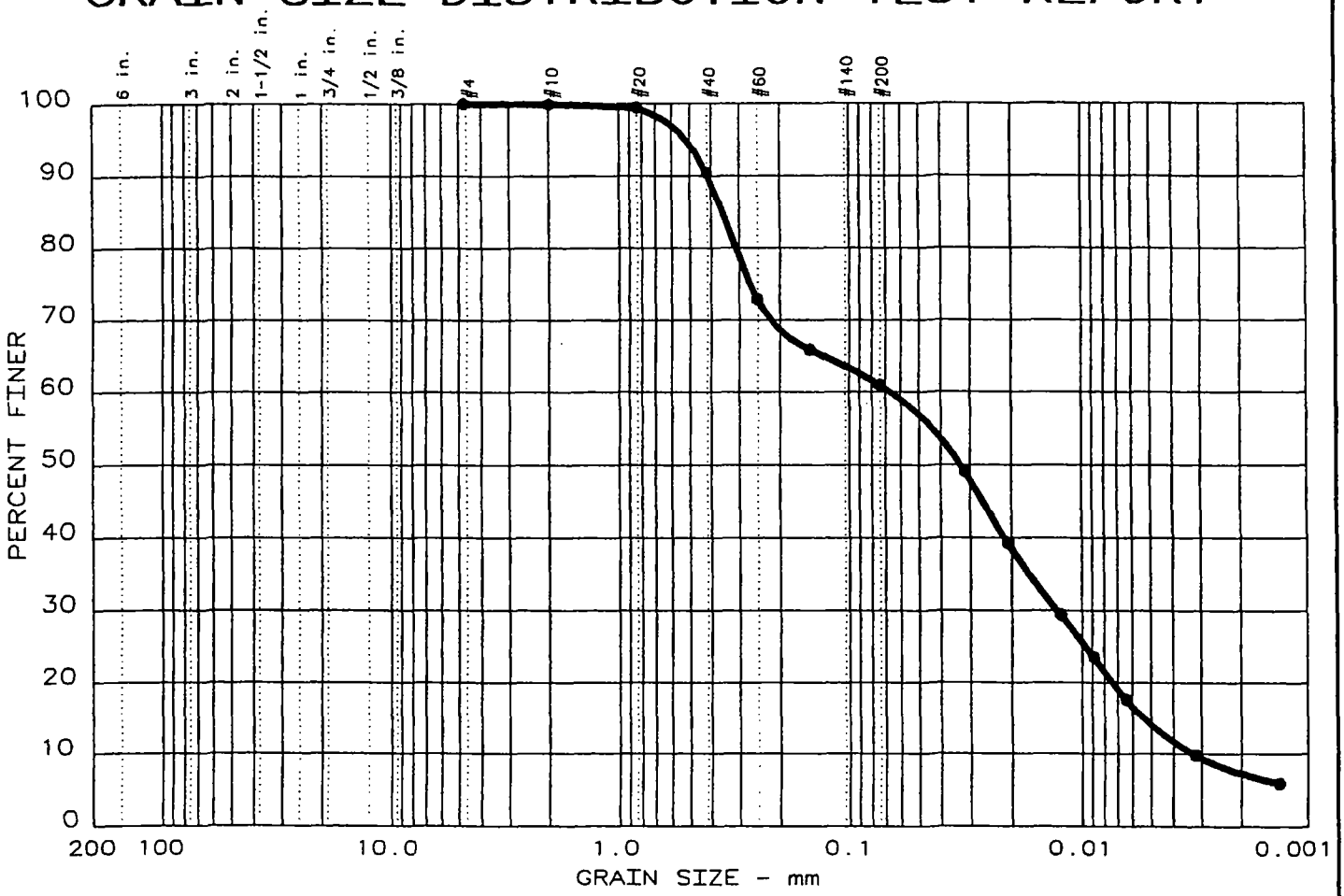
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	39.0	46.9	14.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.35		0.03	0.013	0.0053	0.0033	0.76	20.0

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	Clayey, very sandy SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-22

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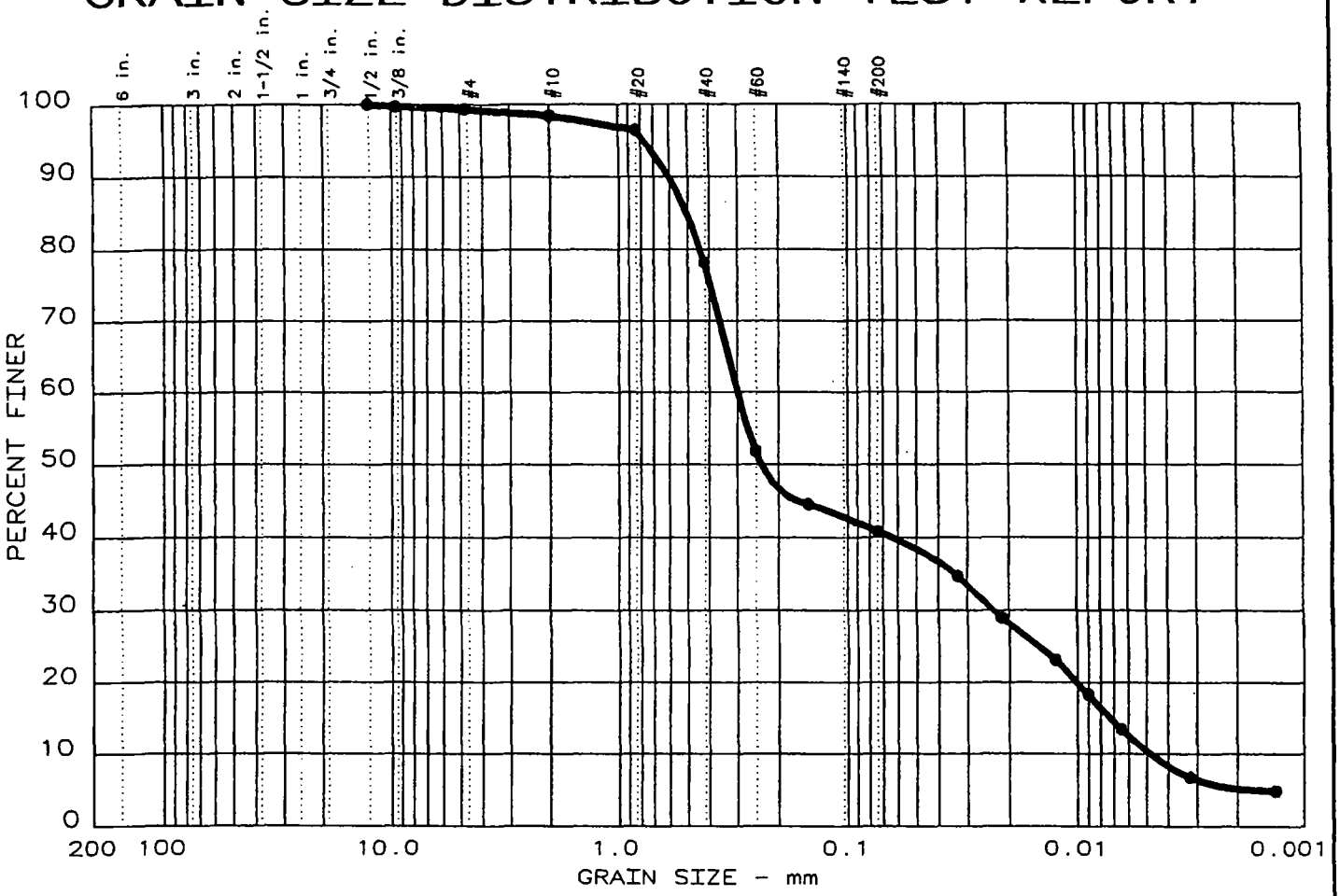
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.7	58.5	30.4	10.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.50	0.30	0.24	0.023	0.0072	0.0048	0.38	62.4

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Slightly clayey, silty SAND	SM	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-24

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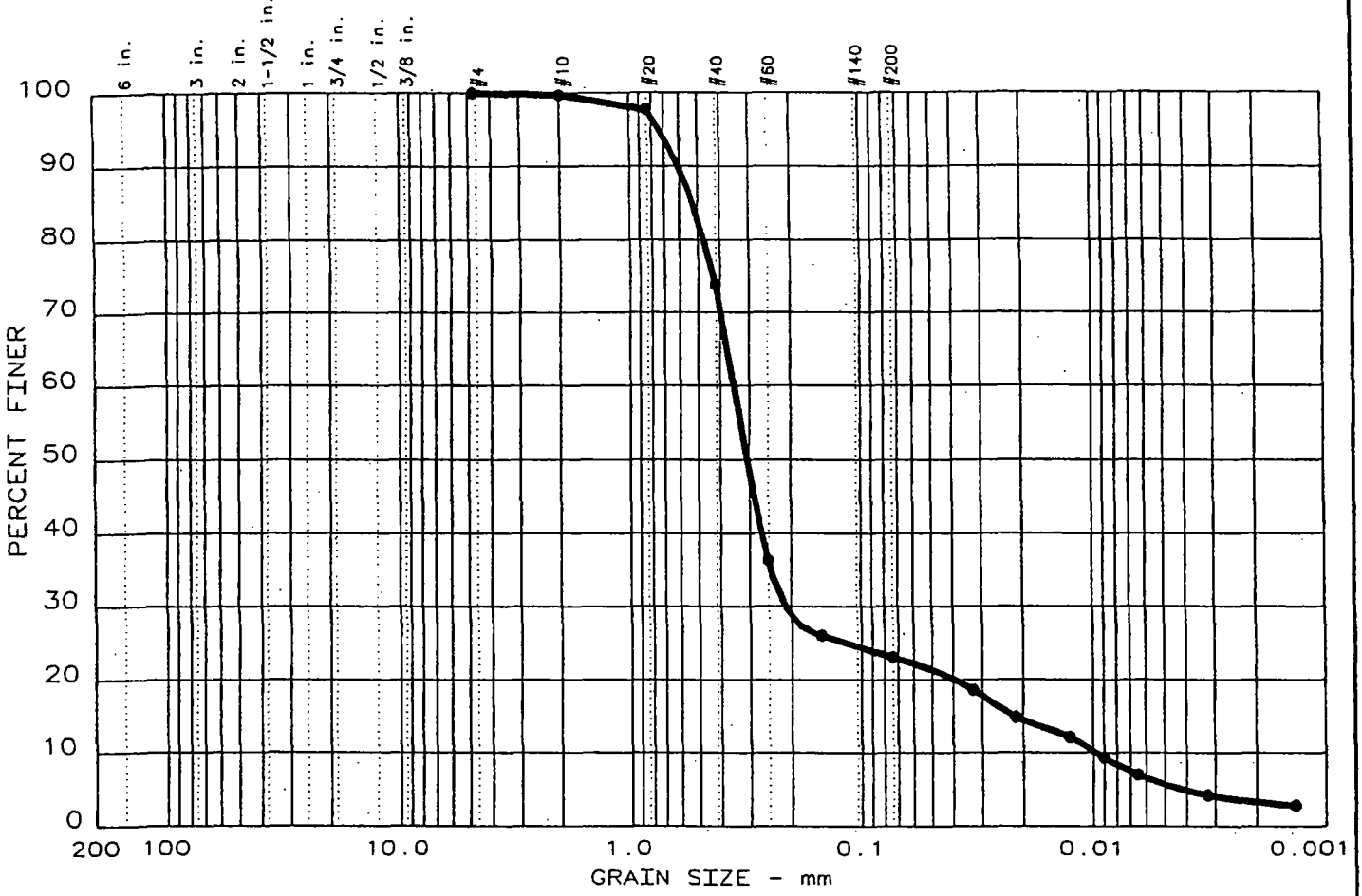
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	76.9	17.4	5.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.52	0.35	0.31	0.210	0.0215	0.0097	13.03	35.9

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Slightly clayey, silty SAND	SM	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-26

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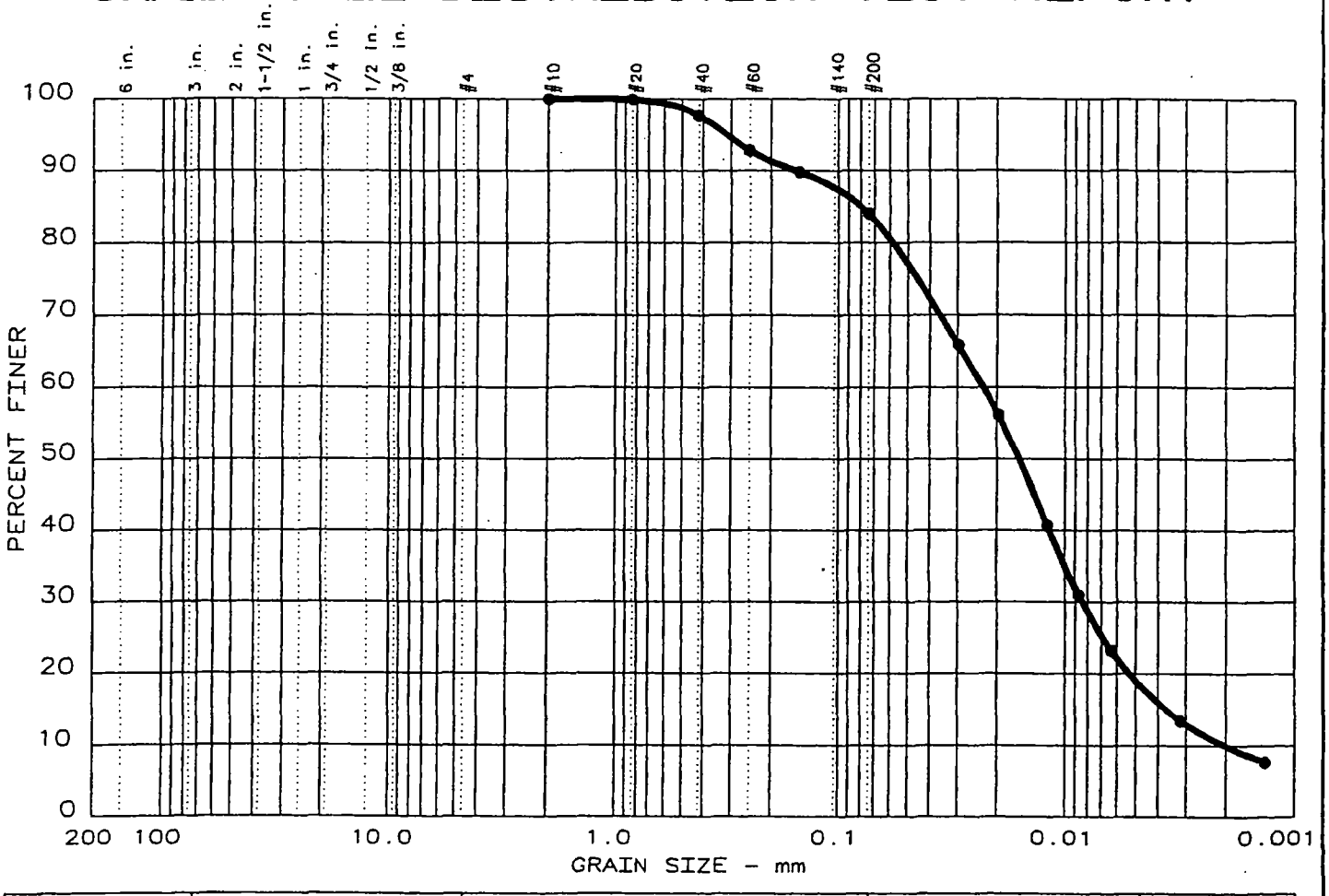
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	16.0	65.0	19.0

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.08		0.02	0.008	0.0037	0.0020	1.56	11.4

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	Sandy, clayey SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-28

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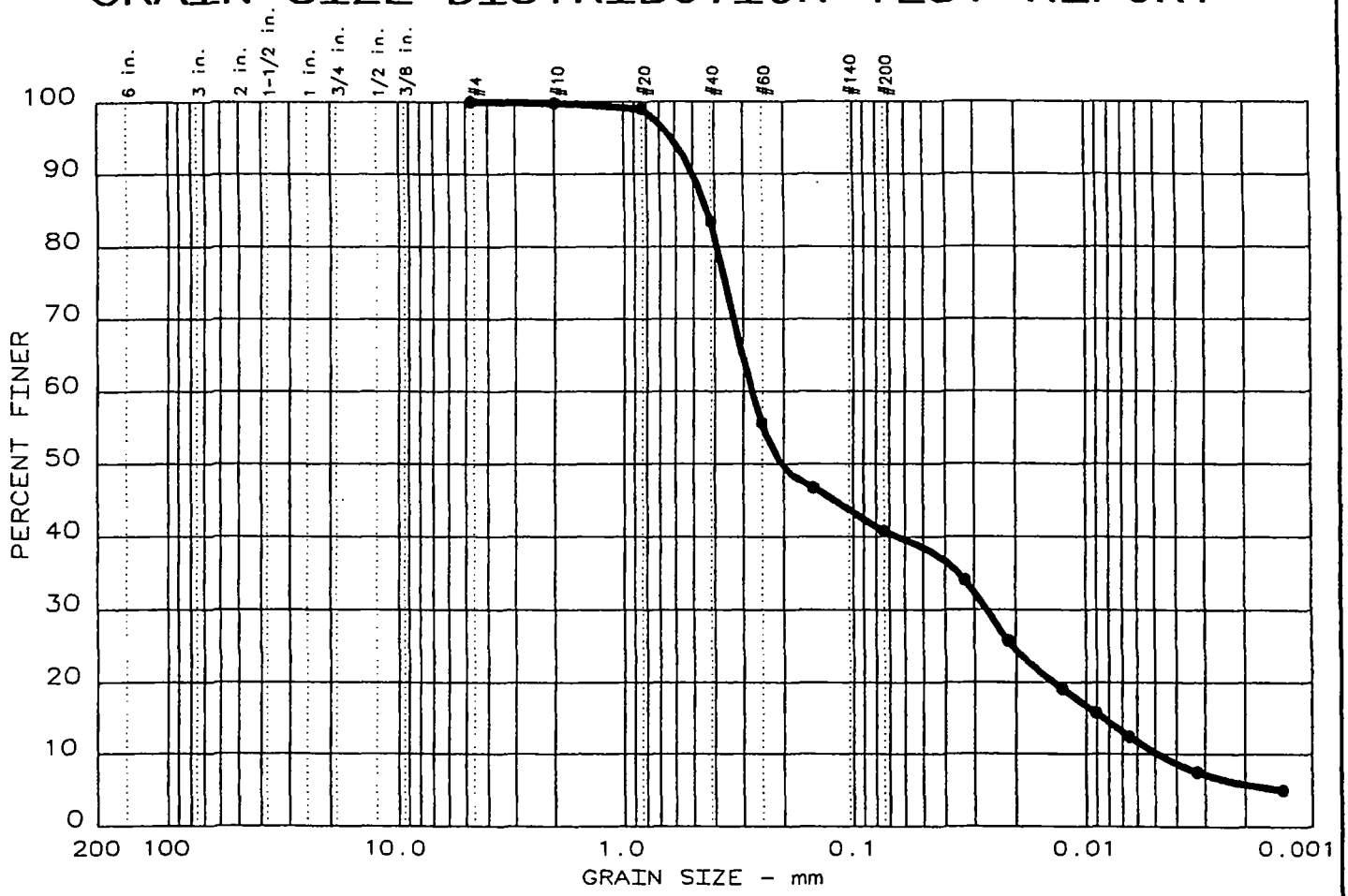
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	59.2	30.6	10.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.44	0.27	0.20	0.027	0.0084	0.0048	0.53	56.9

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	Slightly clayey, very silty SAND	SM	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-30

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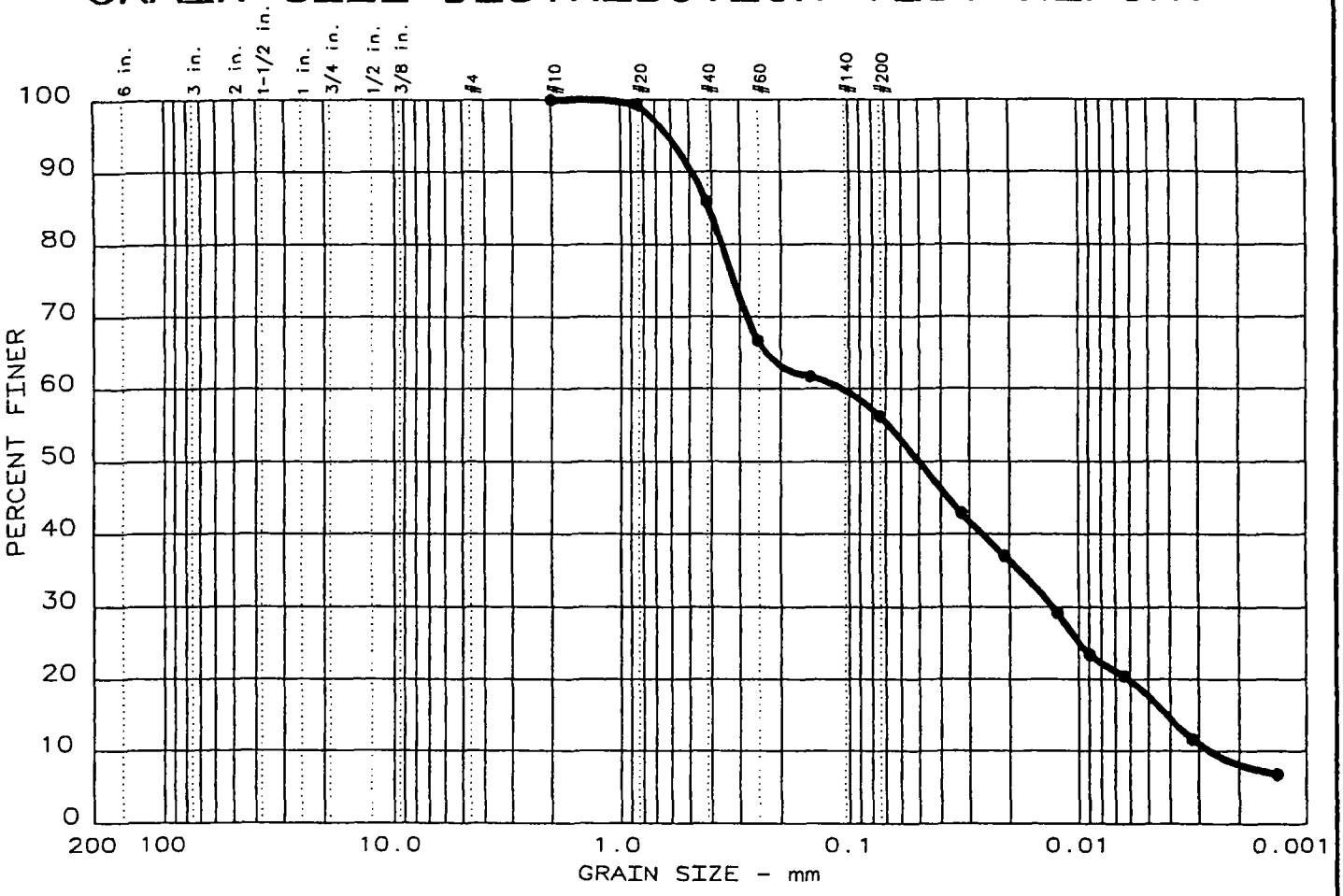
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	43.8	38.6	17.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.41	0.11	0.05	0.013	0.0041	0.0027	0.59	39.8

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	Clayey, very silty SAND	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-32

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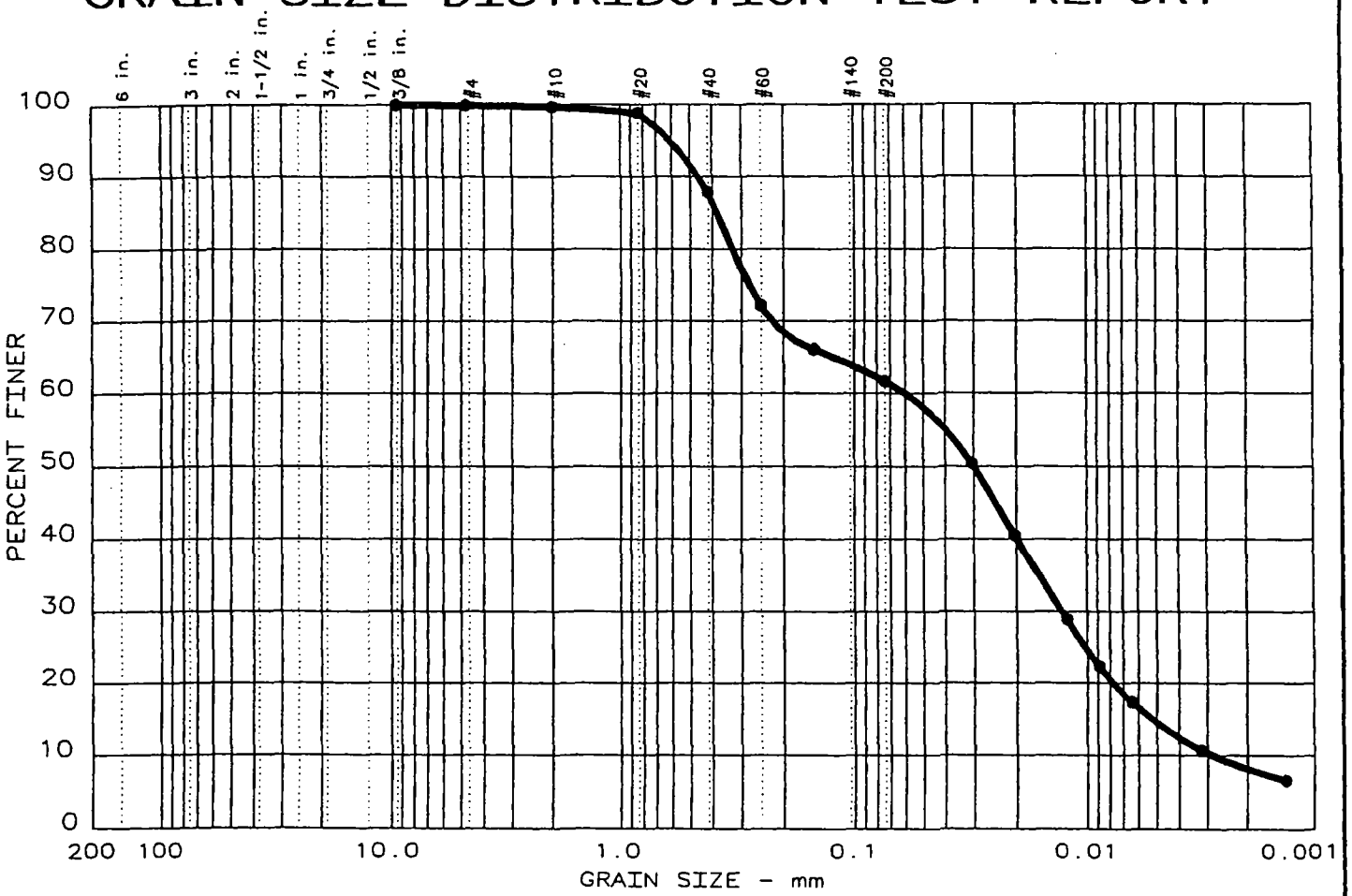
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.1	38.2	47.2	14.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.38		0.03	0.013	0.0052	0.0028	0.98	20.9

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Clayey, very sandy SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-34

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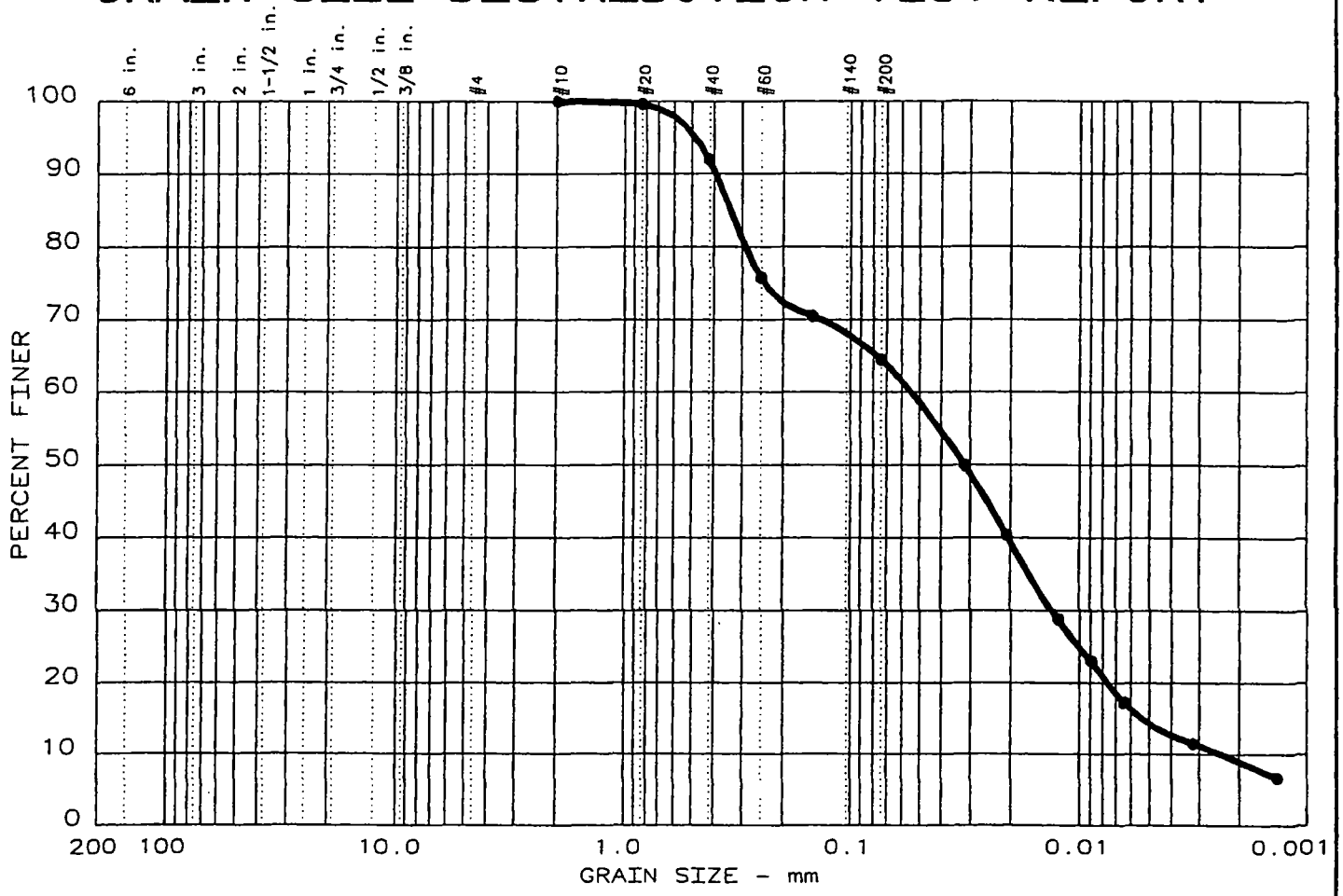
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	35.5	50.2	14.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.34		0.03	0.013	0.0054	0.0024	1.34	22.5

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	Clayey, very sandy SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-35

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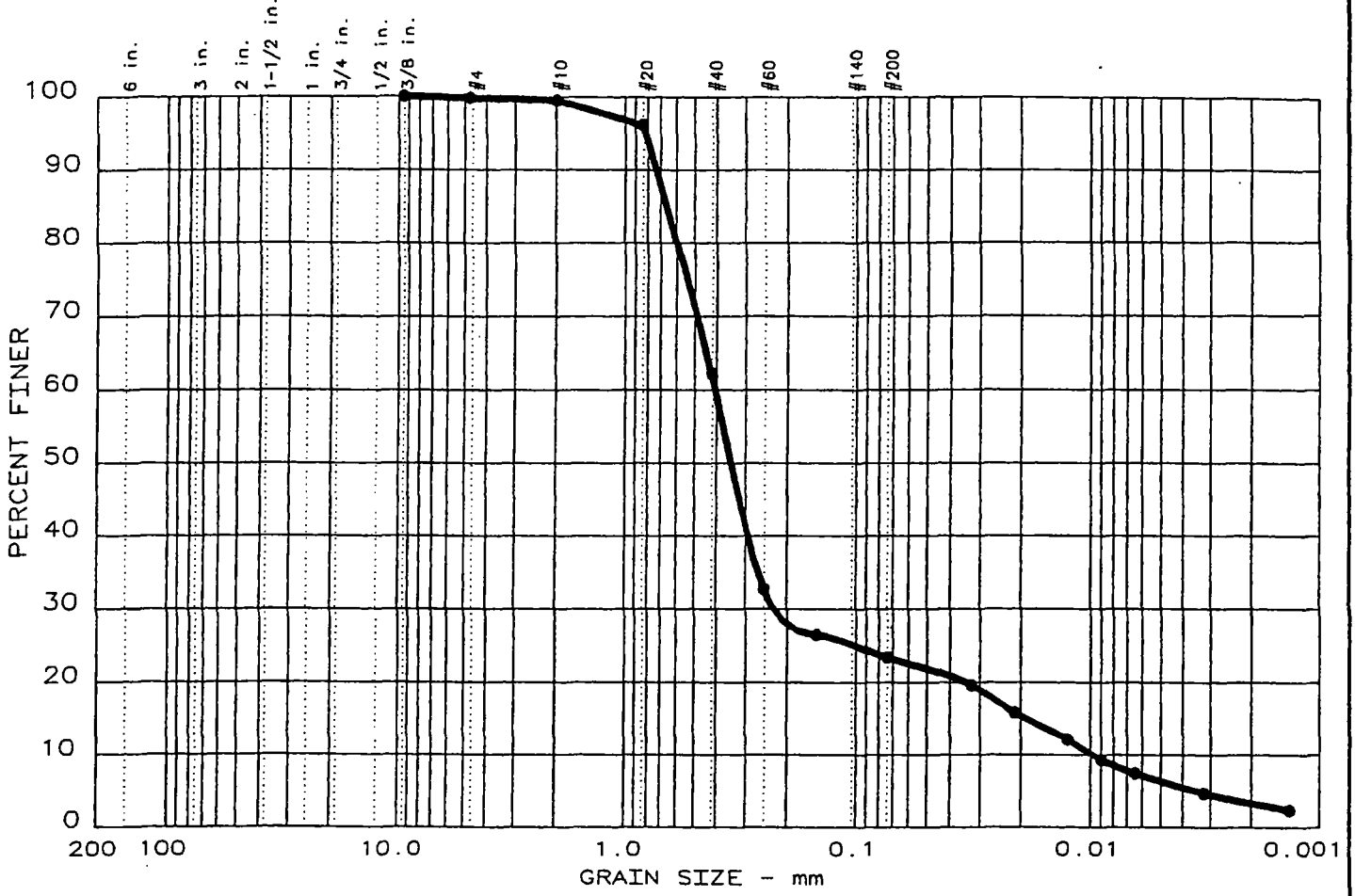
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.2	76.4	17.1	6.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.66	0.41	0.35	0.227	0.0189	0.0098	12.97	41.4

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	Slightly clayey, silty SAND	SM	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-36

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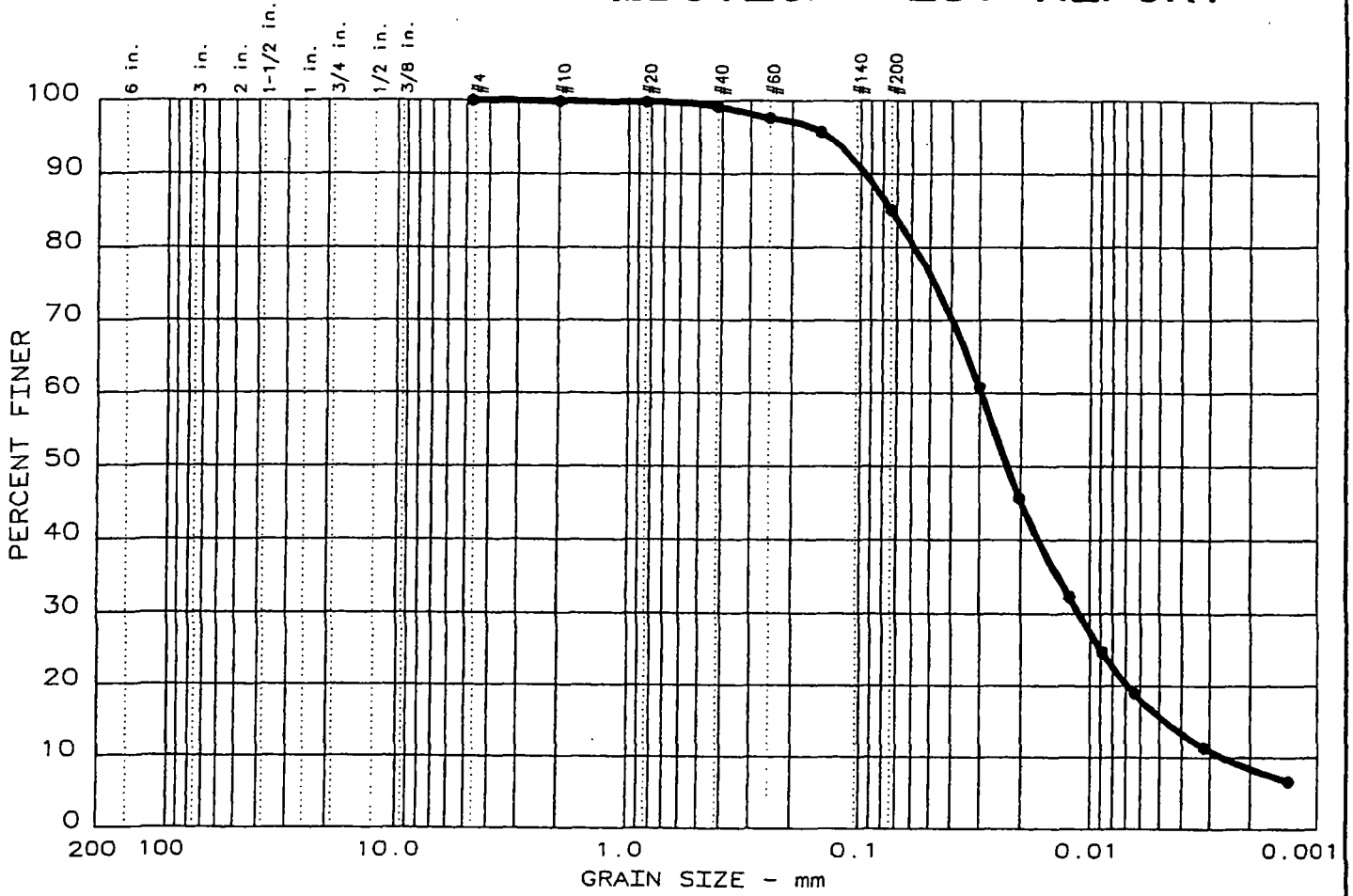
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	14.9	69.4	15.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●					0.02	0.011	0.0047	0.0026	1.58	11.2

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Sandy, clayey SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-39

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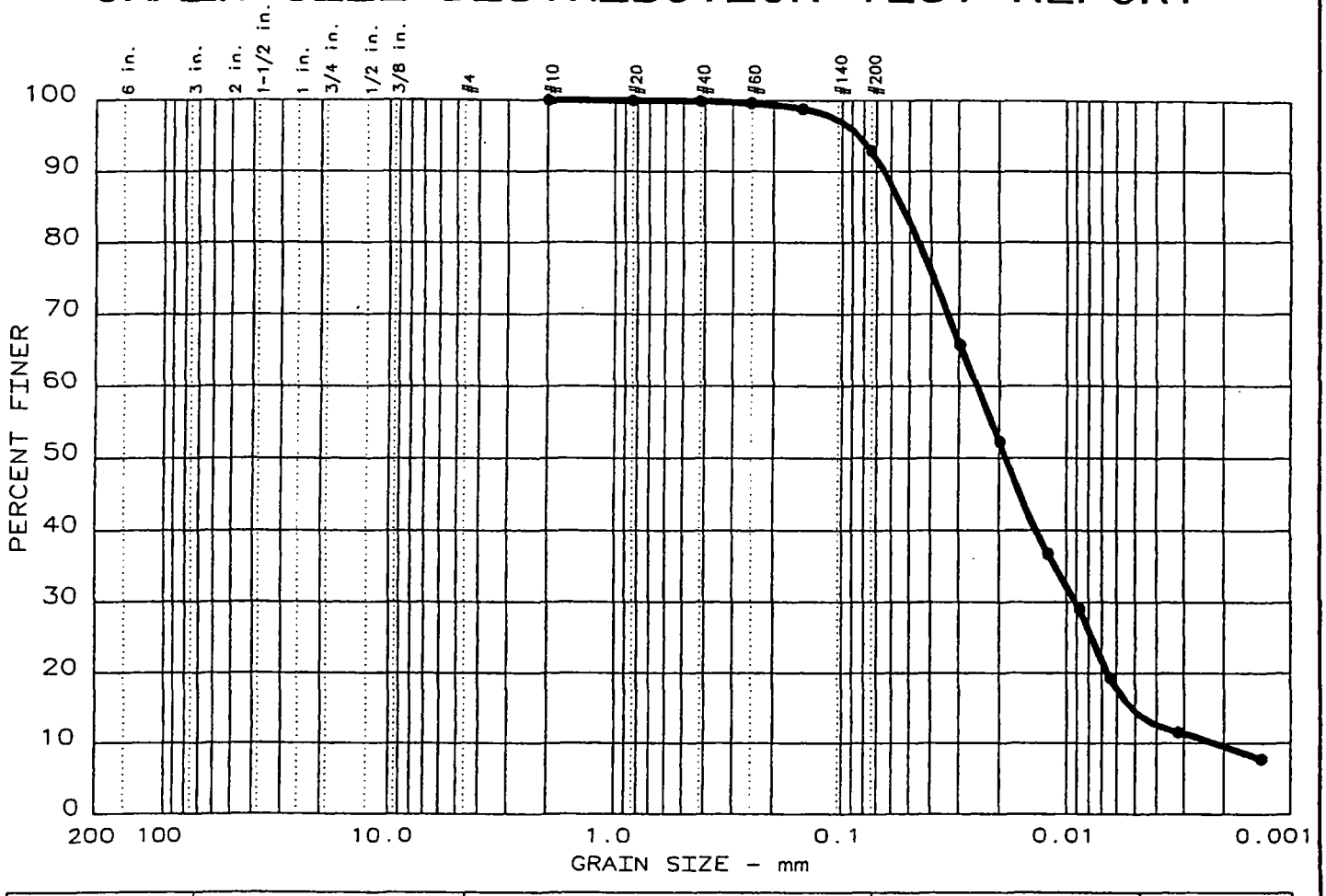
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	7.1	78.3	14.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●					0.02	0.009	0.0051	0.0022	1.51	11.5

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Slightly sandy, clayey SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-42

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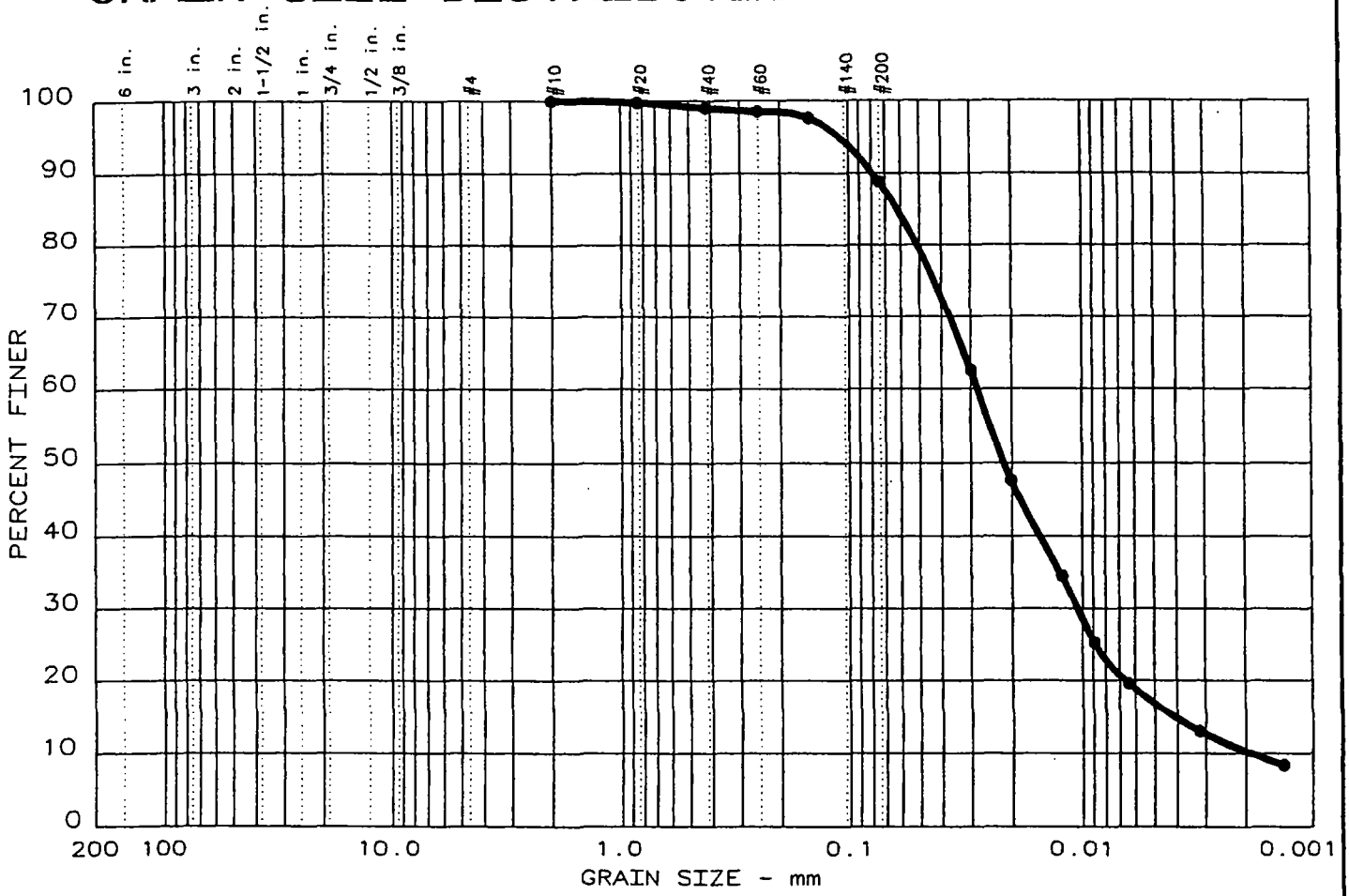
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	11.2	72.0	16.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●					0.02	0.011	0.0040	0.0019	2.08	14.9

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Slightly sandy, clayey SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-S-44

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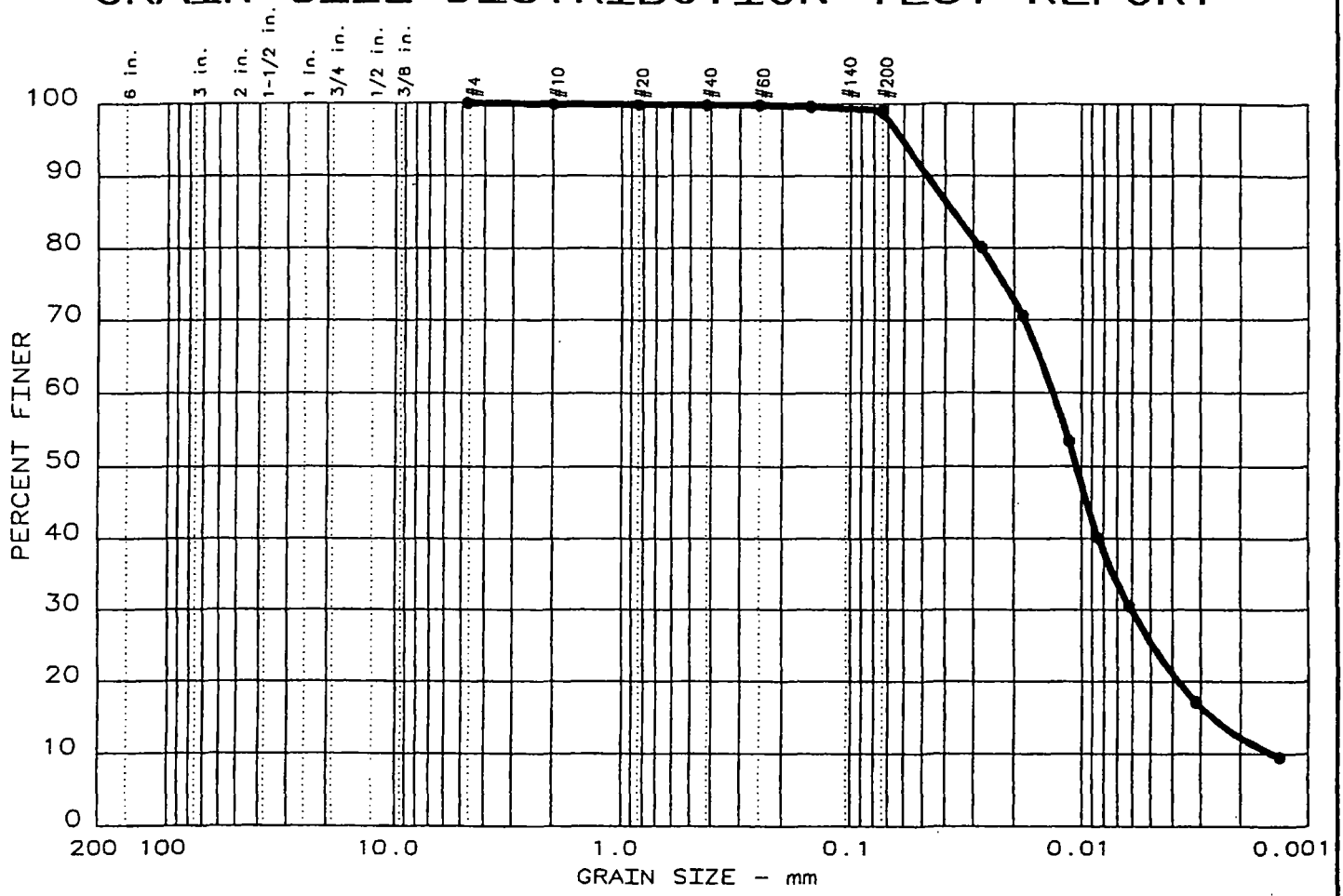
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	0.9	73.6	25.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●					0.01	0.006	0.0027	0.0014	1.88	9.2

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Clayey SILT	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-REF-B

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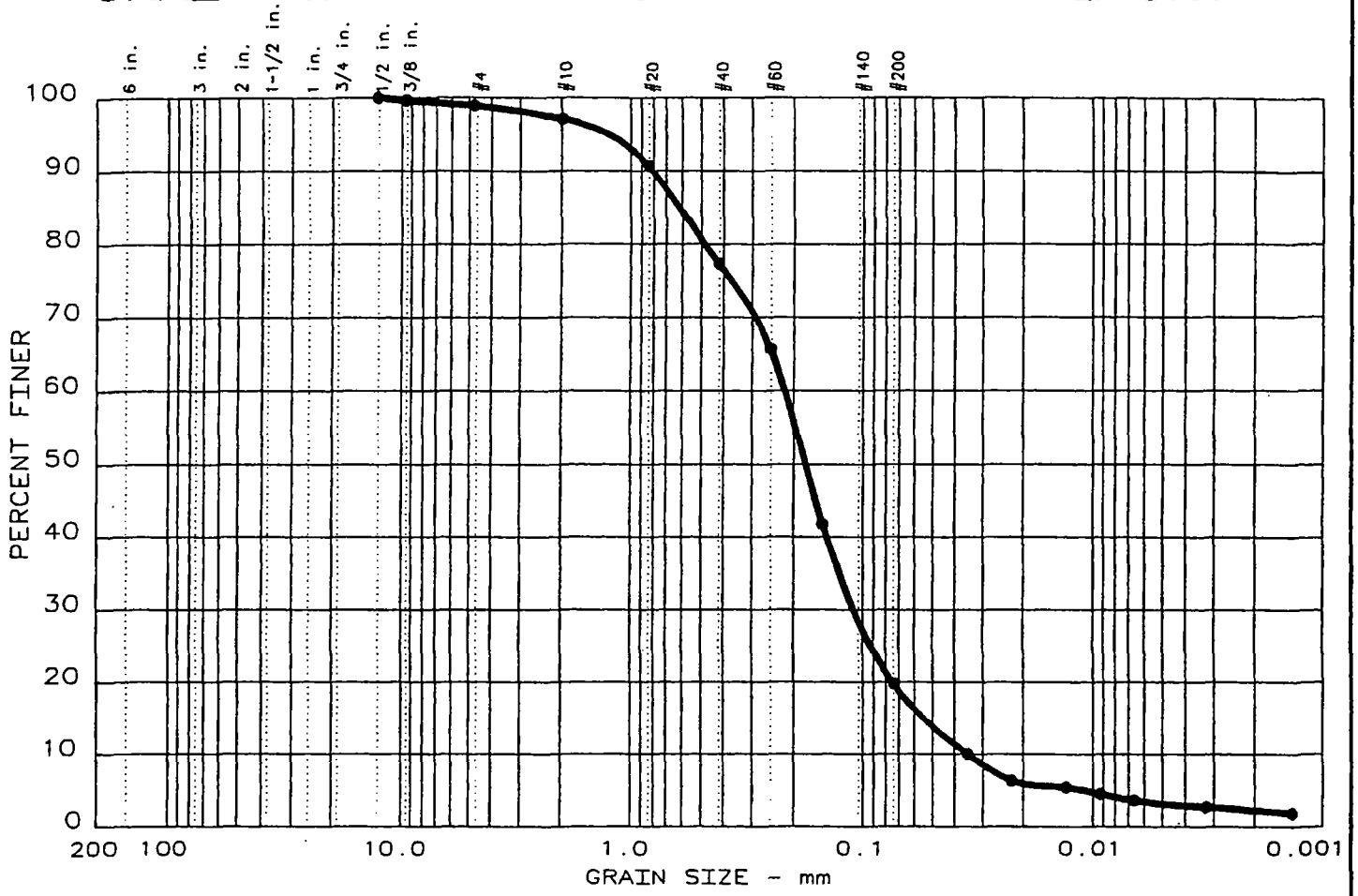
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	1.1	79.1	16.6	3.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.62	0.22	0.18	0.110	0.0545	0.0348	1.60	6.3

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	Silty SAND	SM	

Remarks:

Project: Port of Portland T-4

● Location: HC-REF-C

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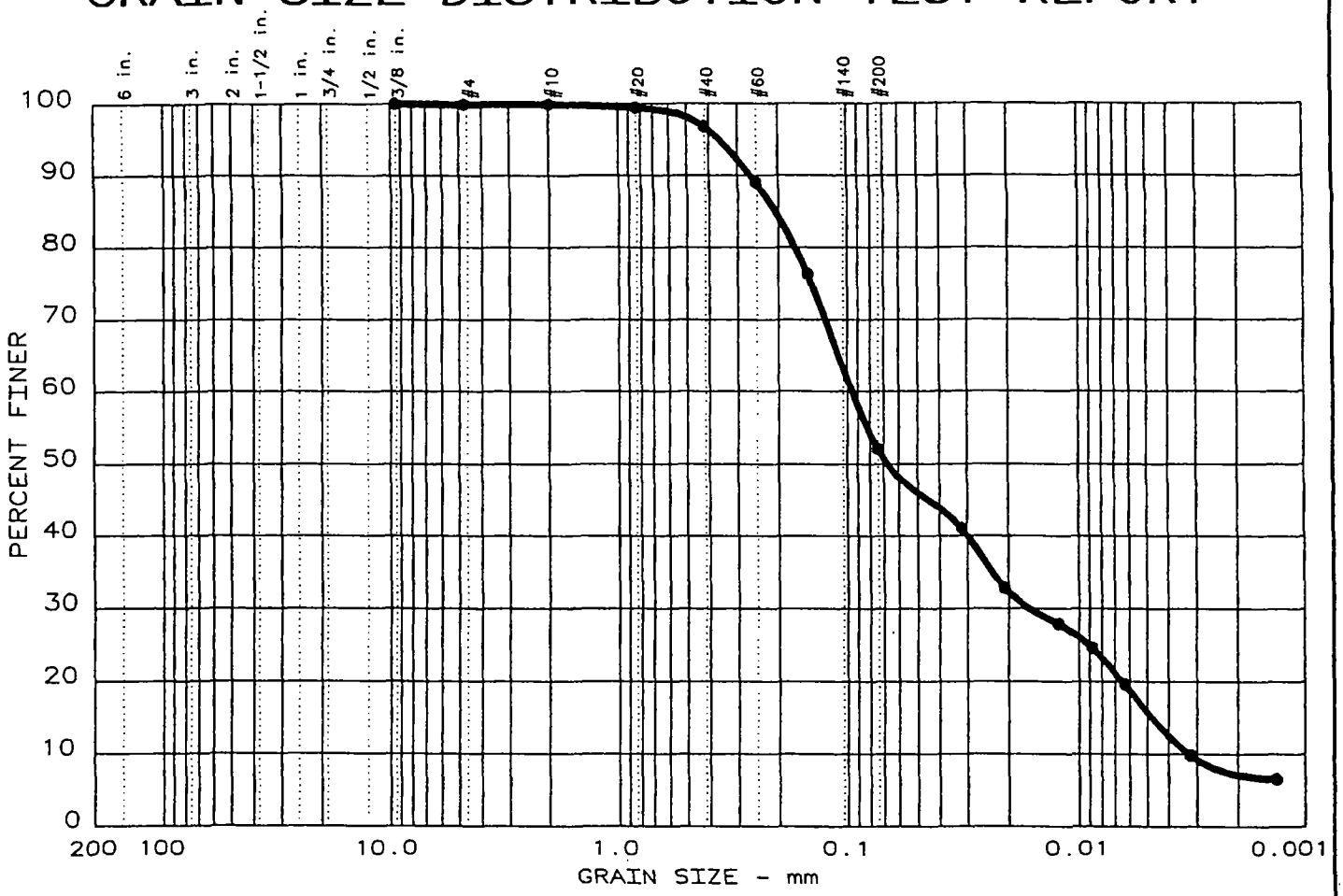
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.1	47.8	36.3	15.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.20	0.10	0.07	0.016	0.0047	0.0032	0.87	29.5

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	Clayey, vey silty SAND	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-VC-7-S2

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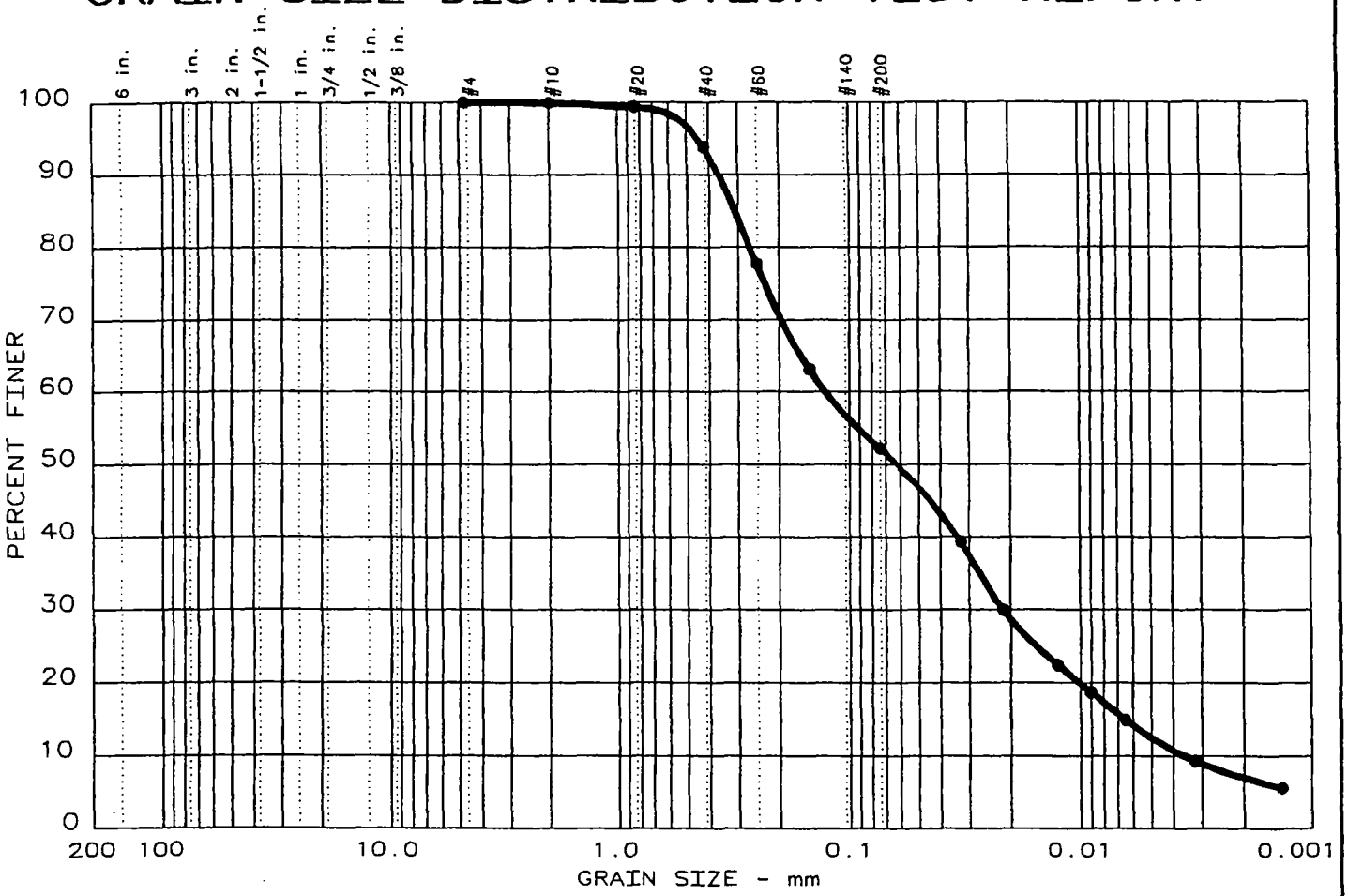
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	47.8	39.7	12.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.31	0.13	0.06	0.021	0.0065	0.0035	1.01	35.9

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	Clayey, very silty SAND	ML	

Remarks:

Project: Port of Portland T-4

● Location: HC-VC-11-S2

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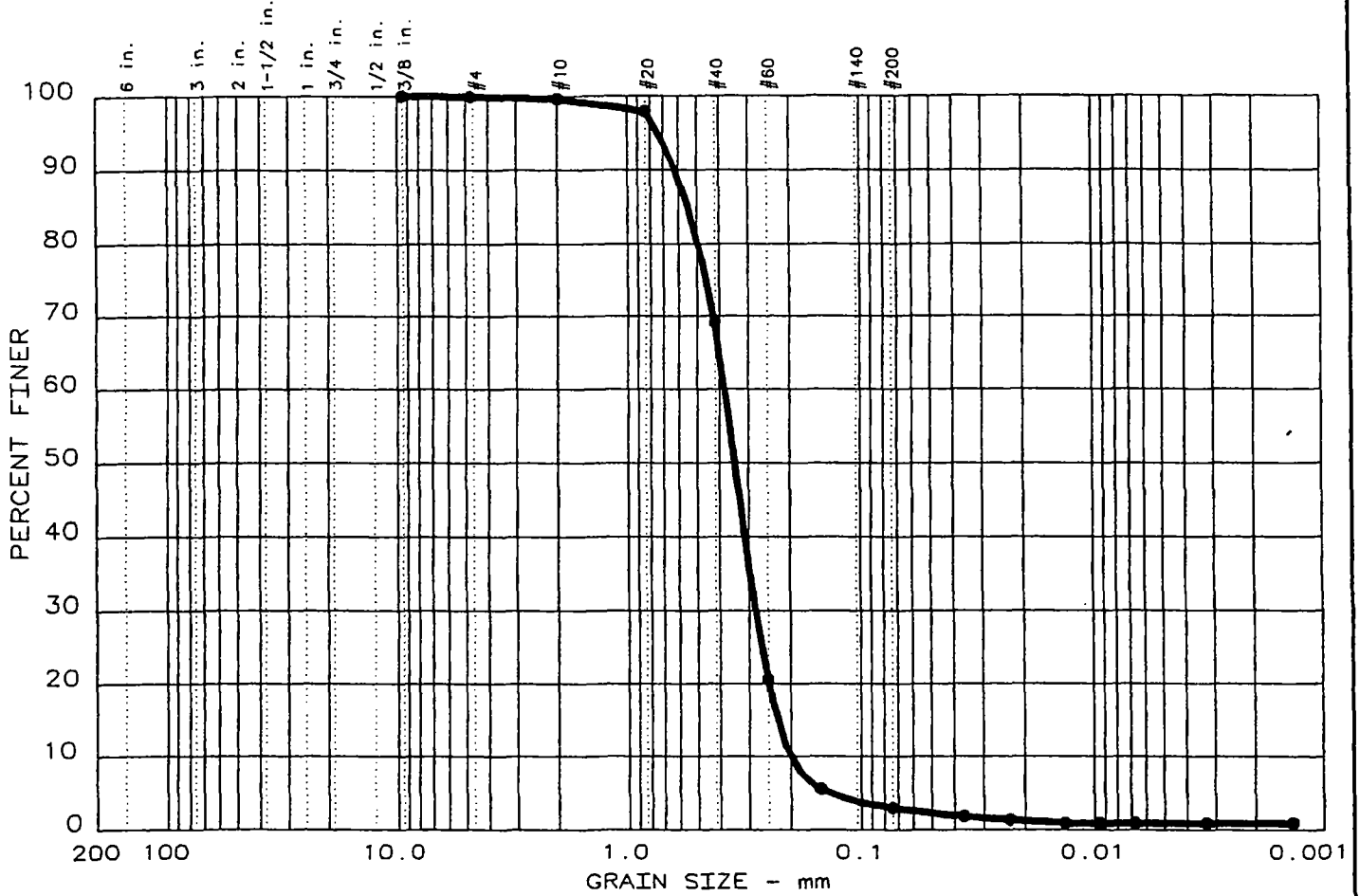
Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.1	96.9	2.1	0.9

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.54	0.38	0.34	0.281	0.2272	0.1995	1.04	1.9

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● SAND	SP	

Remarks:

Project: Port of Portland T-4

● Location: HC-VC-13-S2

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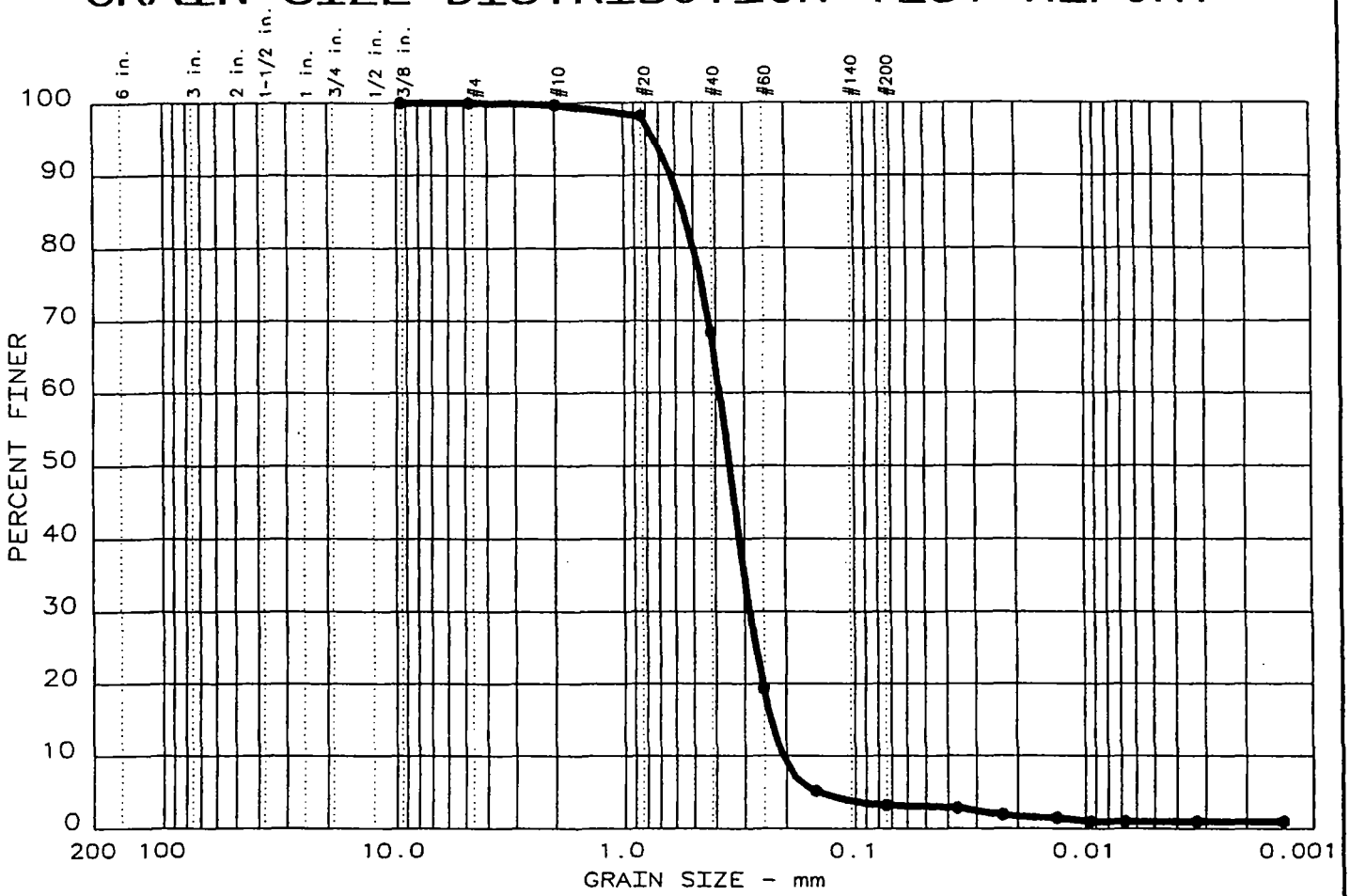
J-5624-06 11/11/98

Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	96.8	2.3	0.9

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.55	0.38	0.35	0.285	0.2328	0.2065	1.02	1.9

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	SAND	SP	

Remarks:

Project: Port of Portland T-4

● Location: HC-VC-18-S2

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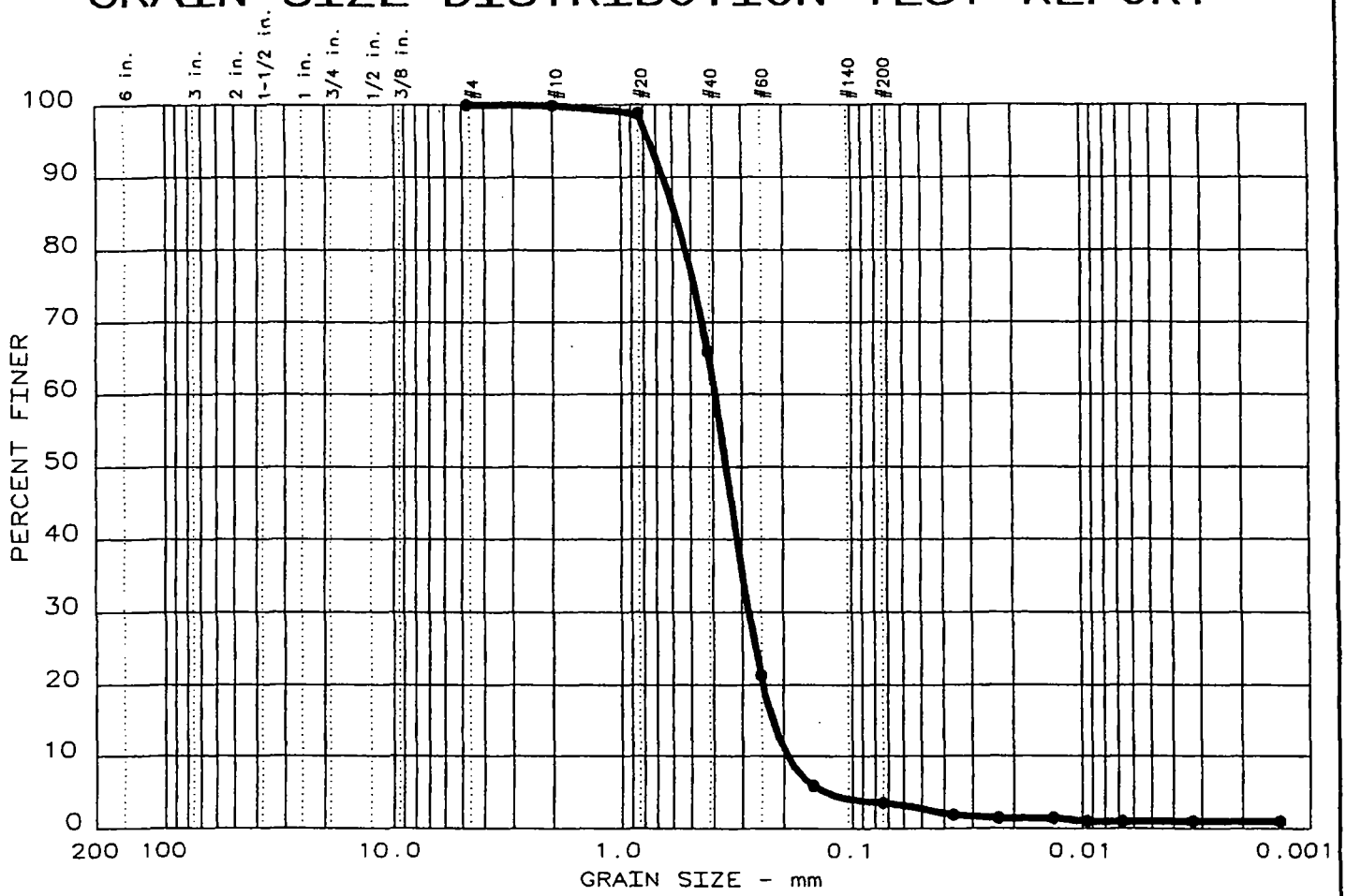
J-5624-06 11/11/98

Figure

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	96.5	2.6	0.9

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.58	0.39	0.35	0.281	0.2223	0.1914	1.05	2.0

	MATERIAL DESCRIPTION	USCS	NAT. MOIST.
●	SAND	SP	

Remarks:

Project: Port of Portland T-4

● Location: HC-VC-32-S2

HARTCROWSER

J-5624-06 11/11/98

Figure

APPENDIX E

APPENDIX E
DATA VALIDATION SUMMARY AND CERTIFICATES OF ANALYSIS SEDIMENT AND WATER SAMPLES

APPENDIX E
DATA VALIDATION SUMMARY AND CERTIFICATES OF ANALYSIS SEDIMENT AND WATER SAMPLES

Summary of Data Validation Effort

This appendix provides the quality assurance review of 64 sediment and eight water samples, including five field duplicates and two rinseate blanks collected in accordance with the Remedial Investigation/Feasibility Study (RI/FS) Work Plan for the Port of Portland (Port) Terminal 4 (T-4).

Chemical analyses were performed by Columbia Analytical Services of Kelso, Washington. The laboratory-submitted data packages were reviewed by Hart Crowser. The following criteria were evaluated in the standard validation process:

- Holding Times;
- Method Blanks;
- Surrogate Recoveries;
- Blank Spike and Laboratory Control Sample (LCS) Recoveries;
- Matrix Spike/Matrix Spike Duplicate(MS/MSD) Recoveries and Relative Percent Differences (RPD);
- Laboratory and Field Duplicate Relative Percent Differences (RPDs); and
- Reported Detection Limits.

Overall Data Quality

The overall data quality objectives (DQOs), as set forth in the Quality Assurance Project Plan (QAPP) have been met, and the data for this site are acceptable for use as qualified. The completeness for the associated data is 99.9 percent. Detailed discussions are presented below.

Quality Assurance Objectives

Precision. Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average values. Precision is generally evaluated using both matrix spike/matrix spike duplicate (MS/MSD) (or lab duplicate) results and field duplicate results. MS/MSD and lab duplicate

results provide information on laboratory (only) precision, while field duplicates provide information on field and lab precision combined.

Analytical precision is measured through MS/MSD samples for organics analyses and for lab duplicate samples for metals and other inorganic analyses. Analytical precision is quantitatively expressed as the relative percent difference (RPD) between the MS/MSD or lab duplicates. Analytical precision measurements were carried out on project-specific sediment samples at a minimum frequency of one in 20 samples. Data qualifiers were assigned to metals results for sediment samples due to low laboratory duplicate RPDs.

Five sets of field duplicates were collected and analyzed for this site. The project-specific precision acceptance criteria for field duplicates is 75 percent for sediment samples. The field duplicate precision for all analyses were generally acceptable. RPDs for polynuclear aromatic hydrocarbons (PAHs) exceeded the criteria of 75 percent for field duplicates HC-S-102/HC-S-24 and HC-VC-104/HC-VC-13-S2. However, no qualifiers were assigned based on RPD results alone.

Accuracy. Accuracy measures the closeness of the measured value to the true value. The accuracy of chemical test results was assessed by analyzing standard reference materials or by "spiking" samples with known standards (surrogates, laboratory control samples, blank spikes, and/or MS) and measuring the percent recovery.

Accuracy measurements for all fractions were carried out in accordance with method requirements for organic and inorganic analyses and at a minimum frequency of one in 20 samples. Recoveries of surrogates, MS/MSDs, and laboratory control samples (LCSs) were generally acceptable. Data qualifiers were assigned to semivolatile and NWTPH-Dx results for sediment samples due to low surrogate recoveries. Sulfide, metals, and NWTPH-Dx results were qualified due to low LCS and/or MS/MSD recoveries.

Completeness. Completeness is defined as the percentage of measurements made which are judged to be valid measurements. The completeness of the data is the ratio of acceptable data points to the total number of data points (expressed as a percent). A target completeness goal for this work was 100 percent. There were 4,148 data points and five data were rejected; therefore, the completeness of the data for this project was 99.9 percent.

Comparability. Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Because of the use of standard techniques for both sample collection and laboratory

analysis, the data collected from same sampling locations and depths should be comparable to both internal and other data generated.

Some Semivolatile Organics Data Rejected

Semivolatile Organic Analyses. Surrogate recoveries in acid fraction were below laboratory control limits in HC-VC-32-S2. Non-detected results in acid fraction were rejected (R).

Other Qualifications of Data

Volatile Organic Analyses. Toluene was detected in rinseate blanks HC-RB-100 and HC-RB-101. Surrogate recoveries of toluene in sediment samples were slightly above laboratory control limits in six samples. No qualifiers were assigned since remaining recoveries were acceptable. The detection limits in several sediment samples were elevated due to low percent solids.

Semivolatile Organic Analyses. Laboratory reextracted and reanalyzed sediment samples outside the holding time due to poor surrogate recoveries on method blanks. Since the samples in the batch showed acceptable surrogate recoveries, it was determined that the blank problem was an isolated occurrence. Thus, the sample results from initial analysis were used. Fluoranthene was analyzed outside the holding time in HC-S-19. The sample result was qualified as estimated (J). Bis(2-ethylhexyl)phthalate was detected in the water method blank. Associated sample results were qualified as not detected (U). Di-n-butylphthalate and diethylphthalate were detected in rinseate blanks. Surrogate recoveries of 2-fluorophenol, phenol, and nitrobenzene were below laboratory control limits in the method blank, HC-S-13, and HC-S-14. The sample results were qualified as estimated (UJ/J). No qualifiers were assigned to sample results where only one recovery was below control limits or where samples were diluted due to high concentrations. LCS recoveries of pentachlorophenol in several samples were below laboratory control limits. No qualifiers were assigned since remaining recoveries were acceptable. MS/MSD recoveries of acenaphthene and pyrene were outside laboratory control limits. No qualifiers were assigned since sample concentrations were greater than four times spike concentrations. The detection limits in several sediment samples were elevated due to matrix interference and/or sample dilution.

NWTPH-Dx Analyses. Surrogate recoveries of terphenyl and chlorohexadecane were outside laboratory control limits in HC-S-08. The sample results were qualified as estimated (UJ/J). These LCS and MS/MSD recoveries were below laboratory control limits. Associated sample results were qualified as estimated (UJ/J). Laboratory duplicate RPD for fluoranthene was above laboratory control

limits. No qualifiers were assigned since remaining RPDs were acceptable. The detection limits in several sediment samples were elevated due to matrix interference.

Pesticide/PCB Analyses. Surrogate recovery of decachlorobiphenyl was outside laboratory control limits in several samples. No qualifiers were assigned since remaining recovery was acceptable. The detection limits in several sediment samples were elevated due to matrix interference.

Metals Analyses. Matrix spike recoveries of antimony, lead, and zinc were outside laboratory control limits. Associated sample results were qualified as estimated (UJ/J). Laboratory duplicate RPDs for cadmium and zinc were above control limits. Associated sample results were qualified as estimated (UJ/J).

Conventional Analyses. Sulfide and total organic carbon (TOC) analysis exceeded the holding times in several samples. Associated sample results were qualified as estimated (J). Both LCS and MS/MSD recoveries for sulfide analysis were below laboratory control limits. Associated sample results were qualified as estimated (J).

APPENDIX F

APPENDIX F
SEDIMENT BIOASSAY DATA QUALITY REVIEW

APPENDIX F
SEDIMENT BIOASSAY DATA QUALITY REVIEW
TERMINAL 4, SLIP 3 SEDIMENT CHARACTERIZATION

Introduction

This appendix summarizes the sediment bioassay data quality review of the amphipod, *Hyalella azteca,* and the midge, *Chironomus tentans,* sediment bioassays conducted by Northwestern Aquatic Sciences (NAS) of Newport, Oregon. These sediment bioassays were conducted as part of the Terminal 4, Slip 3 (Slip 3) Remedial Investigation (RI).

The sediment bioassay tests were conducted in two phases. In Phase I, sediment samples HC-S-26, HC-S-28, HC-S-35, HC-S-36, HC-S-39, and HC-S-42 were tested and the results were compared against reference sediments, HC-Ref-B and HC-Ref-C. In Phase II, sediment samples HC-S-01, HC-S-04, HC-S-05, HC-S-07, HC-S-11, HC-S-16, HC-S-19, HC-S-22, and HC-S-30 were tested and results were compared against reference sediments, HC-Ref-B and HC-Ref-C. The reference sediment selected for comparison with each test sediment was based on grain size characteristics of the sediment. The results of the sediment bioassays were interpreted in accordance with the criteria presented in the "Draft Dredge Material Evaluation Framework; Lower Columbia River Management Area" (LCRMA) (Corps *et al.*, 1998) and in the DEQ-approved work plan (Hart Crowser, 1998a).

This data quality review was conducted to ensure that the results of the sediment bioassays were of sufficient quality for use in this RI.

Sediment Bioassay Data Quality Review

The test sediment samples were collected by Hart Crowser on October 13 through 15, 1998, and were submitted for toxicity testing to NAS Laboratory on October 17, 1998. Reference Sediments B and C were collected by Hart Crowser on October 15, 1998, and were submitted for toxicity testing to NAS Laboratory on October 17, 1998. The Phase I negative control sediment was collected on October 19, 1998, from an area adjacent to the Hwy 101 bridge at Beaver Creek, approximately 8 miles south of Newport, Oregon. The Phase II negative control sediment was collected on December 3, 1998, from the same location as the Phase I negative control.

The following three sediment toxicity tests were used in this study:

- Acute 10-Day Amphipod Survival Test *(Hyalella azteca)*;
- Acute 10-Day Midge Survival Test *(Chironomus tentans)*; and
- Chronic 10-Day Midge Growth Test *(Chironomus tentans)*.

These freshwater sediment toxicity tests were conducted in accordance with available standard protocols (EPA, 1994 and ASTM, 1995) by NAS. Sediment toxicity test results were interpreted against the decision criteria provided in the LCRMA (Corps *et al.*,1998).

The following criteria were evaluated as part of this data quality review:

- Holding times;
- Bioassay performance in negative control and reference sediments;
- Bioassay performance in positive control tests; and
- Bioassay test conditions.

Phase I Amphipod, Hyalella Azteca, 10-day Survival Test

The amphipod bioassay was initiated on October 20, 1998, which was within the 56-day LCRMA holding time limit. The sediments were held in the dark at 4°C during the holding period. Nitrogen was added to sediment sample jars with headspace prior to storage.

The water quality observations of overlying water temperature, pH, and dissolved oxygen were within the protocol-specified ranges. The range of dilution water alkalinity (70 to 80 mg/L as $CaCO_3$) slightly exceeded the specified range of 60 to 70 mg/L. This minor deviation is unlikely to have affected the test results. Sulfides were not detected in the overlying water (detection limit 0.02 mg/L) at either the beginning or end of the test. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 1.0 mg/L.

The reference toxicant test 96-hour 50% Lethal Concentration (96-h LC_{50}) of 17.0 µg/L $CdCl_2$ was within the laboratory's control chart warning limits (2.65 to 22.9 µg/L) obtained by NAS.

The reported mean mortality of 1.2% in the negative control for this bioassay was well within the LCRMA performance standard of 20%. The mean mortality

responses from the Reference Sediment B (3.7%) and Reference Sediment C (1.2%) were well within the LCRMA performance standard of 30%.

Final QA Determination. The Phase I *Hyalella azteca* data are of acceptable quality and fully usable.

Phase I Midge, Chironomus Tentans, 10-Day Survival and Growth Test

The midge bioassay was initiated on October 20, 1998, which was within the 56-day LCRMA holding time limit. The sediments were held in the dark at 4°C during the holding period. Nitrogen was added to sediment sample jars with headspace prior to storage.

The water quality observations of overlying water temperature and pH were within the protocol-specified ranges. Dissolved oxygen dropped slightly below the specified range (40 to 100% saturation) on day 7 in three test chambers. This minor deviation is unlikely to have affected the test results. The range of dilution water alkalinity (70 to 80 mg/L as $CaCO_3$) slightly exceeded the specified range of 60 to 70 mg/L. This minor deviation is unlikely to have affected the test results. Sulfides were not detected in the overlying water (detection limit 0.02 mg/L) at either the beginning or end of the test. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 1.5 mg/L.

The reference toxicant test 96-h LC_{50} of 6.35 g/L KCl was within the laboratory's control chart warning limits (2.54 to 6.82 g/L) obtained by NAS.

The reported mean mortality of 15.0% in the negative control for this bioassay was within the LCRMA performance standard of 30%. The mean mortality responses from the Reference Sediment B (28.7%) and Reference Sediment C (20.0%) were within the LCRMA performance standard of 35%.

The mean growth response in the negative control (1.69 mg), reference sediment B (1.60 mg), and reference sediment C (1.73 mg) were within LCRMA performance criteria of 0.6 mg minimum mean growth per midge.

Final QA Determination. The Phase I *Chironomus tentans* data are of acceptable quality and fully usable.

Phase II Amphipod, Hyalella Azteca, 10-day Survival Test

The amphipod bioassay was initiated on December 8, 1998, which was within the 56-day LCRMA holding time limit. The sediments were held in the dark at

4°C during the holding period. Nitrogen was added to sediment sample jars with headspace prior to storage.

The water quality observations of overlying water temperature, pH, and dissolved oxygen were within the protocol specified ranges. The range of dilution water alkalinity (80 mg/L as $CaCO_3$) slightly exceeded the specified range of 60 to 70 mg/L. This minor deviation is unlikely to have affected the test results. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 0.5 mg/L.

The reference toxicant test 96-h LC_{50} of 15.2 µg/L $CdCl_2$ was within the laboratory's control chart warning limits (2.86 to 23.3 µg/L) obtained by NAS.

The reported mean mortality of 15.0% in the negative control for this bioassay was within the LCRMA performance standard of 20%. The mean mortality responses from the Reference Sediment B (13.7%) and Reference Sediment C (26.2%) were within the LCRMA performance standard of 30%.

Final QA Determination. The Phase II *Hyalella azteca* data are of acceptable quality and fully usable.

Phase II Midge*, Chironomus Tentans, *10-Day Survival and Growth Test

The midge bioassay was initiated on December 20, 1998, which was within the 56-day LCRMA holding time limit. The sediments were held in the dark at 4°C during the holding period. Nitrogen was added to sediment sample jars with headspace prior to storage.

The water quality observations of overlying water temperature, pH, and dissolved oxygen were within the protocol specified ranges. The range of dilution water alkalinity (80 mg/L as $CaCO_3$) slightly exceeded the specified range of 60 to 70 mg/L. This minor deviation is unlikely to have affected the test results. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 0.5 mg/L.

The reference toxicant test 96-h LC_{50} of 3.14 g/L KCl was within the laboratory's control chart warning limits (2.65 to 7.12 g/L) obtained by NAS.

The reported mean mortality of 3.7% in the negative control for this bioassay was well within the LCRMA performance standard of 30%. The mean mortality responses from the Reference Sediment B (12.5%) and Reference Sediment C (21.2%) were within the LCRMA performance standard of 35%.

The mean growth response in the negative control (1.46 mg) and reference sediment B (1.15 mg) and reference sediment C (1.37 mg) were within LCRMA performance criteria of 0.6 mg minimum mean growth per midge.

Final QA Determination. The Phase II *Chironomus tentans* data are of acceptable quality and fully usable.

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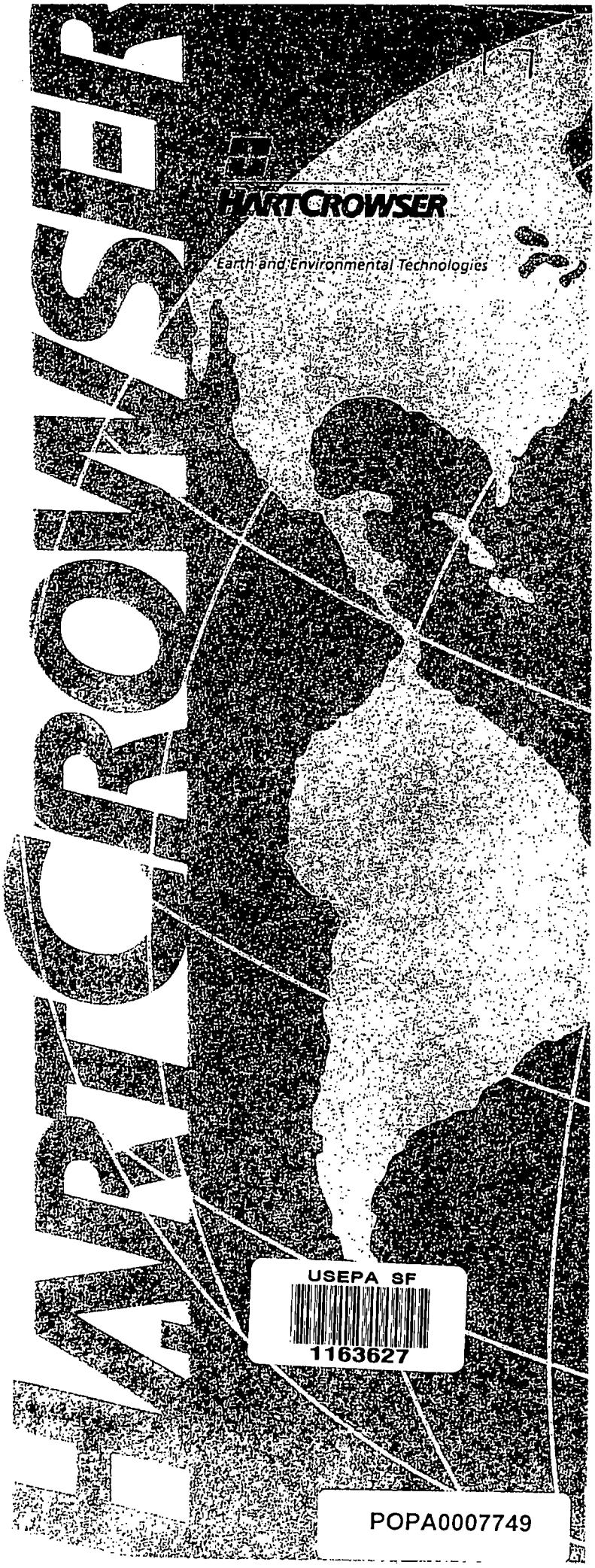
Summary of Sediment Data Findings
Terminal 4, Slip 3 Sediments
Port of Portland
Portland, Oregon

Volume II
Appendices G and H

Prepared for
Port of Portland

Port Project No. 23640
Port Task No. 310

April 18, 2000
J-5624-10



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APPENDIX G
ANALYTICAL LABORATORY REPORTS
ANALYTICAL CHEMISTRY LAB CERTIFICATIONS

Appendix G

RECEIVED

JUN 2 7 2003

Environmental Cleanup Office

Columbia Analytical Services INC.
An Employee-Owned Company

HART CROWSER INC.

JAN 2 8 1999

Portland Office

December 16, 1998

Service Request No: K9807115

Howard Cumberland
Hart Crowser, Inc.
Five Centerpointe Drive, Suite 240
Lake Oswego, OR 97035

Re: Port of Portland Terminal 4/5624

Dear Howard:

Enclosed are the results of the sample(s) submitted to our laboratory on October 15, 1998. For your reference, these analyses have been assigned our service request number K9807115.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 243.

Respectfully submitted,

Columbia Analytical Services, Inc.

Richard Craven
Project Chemist

RAC/td

317 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 360/ 577-7222 • Fax 360/636-1068

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
J	Estimated concentration. The value is less than the method reporting limit, but greater than the method detection limit.
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Hart Crowser, Inc.	**Service Request No.:**	K9807115
Project:	Port of Portland Terminal 4	**Date Received:**	15-October-98
Sample Matrix:	Sediment		

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier IIA data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), Initial/Continuing Calibration Verification Standards (ICV/CCV), and Initial/Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

The following difficulties were experienced during analysis of this batch:

General Chemistry: There were no QC failures observed.

Metals: Due to matrix interference with the ICP-MS internal standard the samples required dilution prior to analysis. The detection and reporting limits are elevated accordingly.

The percent differences for cadmium and zinc in the sediment duplicates are elevated because the sample matrix was not homogenous.

Due to a defect in the EPA digestion method, which can be multiplied by matrix interferences, the antimony spike was outside control limits. The laboratory control spike indicated that the analysis was in control and no corrective action was taken.

Due to elevated concentrations of lead and zinc in the spiked sample, recoveries were not calculated. The background would have made the recoveries unreliable and not applicable for method performance evaluation.

Semivolatile Petroleum Hydrocarbons: The percent difference for fluoranthene in the duplicates was elevated. This compound was used as an indicator compound only, and no corrective action was taken.

The spike recoveries for diesel were elevated, probably due to matrix interference from pencil pitch. No corrective action was taken.

Pesticides: Analysis for the pesticides was requested after the hold times had expired.

Approved by _____ **Date** 11/08/99

POPA0007754

The samples required dilution due to matrix interferences. This reduced surrogates and matrix spikes below the reporting limit.

Volatile Organics: The reporting and detection limits are elevated due to low percent solids in the samples.

Semivolatile Organics: The method blank surrogates were outside control limits in the initial sample extraction batch. The samples were reextracted to demonstrate that detected analytes were native to the samples, and not laboratory contamination. The reanalysis was completed after hold times had expired. Both data sets are provided.

There are target analytes in sample HC-5-16 that are flagged as estimates. In the initial analysis they were above the instrument calibration range. When the samples were reanalyzed diluted they were below the instrument calibration range.

Several samples had severe matrix interferences impacting the quantitation of selected target analytes, surrogates and spike compounds. The affected compounds are flagged.

Detection limits for several target analytes are elevated due to low percent solids, matrix interferences, and high target analyte concentrations requiring dilutions.

Approved by Richard A Cramer **Date** 1/28/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Solids

Prep Method:	NONE	Units:	Percent
Analysis Method:	160.3M	Basis:	WET
Test Notes:			

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
HC-S-10	K9807115-001	10/20/98	30.1	
HC-S-11	K9807115-002	10/20/98	36.9	
HC-S-12	K9807115-003	10/20/98	35.5	
HC-S-13	K9807115-004	10/20/98	41.0	
HC-S-14	K9807115-005	10/20/98	72.4	
HC-S-15	K9807115-006	10/20/98	71.5	
HC-S-16	K9807115-007	10/20/98	43.3	
HC-S-17	K9807115-008	10/20/98	45.1	
HC-S-22	K9807115-009	10/20/98	44.1	
HC-S-23	K9807115-010	10/20/98	36.8	
HC-S-24	K9807115-011	10/20/98	50.0	
HC-S-102	K9807115-012	10/20/98	61.6	
HC-S-25	K9807115-013	10/20/98	50.7	
HC-S-26	K9807115-014	10/20/98	60.5	
HC-S-27	K9807115-015	10/20/98	40.5	
HC-S-28	K9807115-016	10/20/98	42.2	
HC-S-29	K9807115-017	10/20/98	44.8	
HC-S-35	K9807115-018	10/20/98	46.9	
HC-S-37	K9807115-019	10/20/98	42.0	
HC-S-32	K9807115-020	10/20/98	46.4	
HC-S-33	K9807115-021	10/20/98	46.3	

Approved By: _____ Date: 1/27/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Solids, Total Volatile

Prep Method:	NONE	Units:	PERCENT
Analysis Method:	160.4M	Basis:	DRY
Test Notes:			

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
HC-S-11	K9807115-002	10/20/98	8.41	
HC-S-13	K9807115-004	10/20/98	7.15	
HC-S-14	K9807115-005	10/20/98	1.76	
HC-S-16	K9807115-007	10/20/98	7.75	
HC-S-22	K9807115-009	10/20/98	6.34	
HC-S-24	K9807115-011	10/20/98	6.30	
HC-S-102	K9807115-012	10/20/98	4.78	
HC-S-25	K9807115-013	10/20/98	7.21	
HC-S-26	K9807115-014	10/20/98	3.63	
HC-S-28	K9807115-016	10/20/98	7.89	
HC-S-35	K9807115-018	10/20/98	6.34	
HC-S-37	K9807115-019	10/20/98	6.62	
HC-S-32	K9807115-020	10/20/98	6.11	

Approved By: _____ Date: 1/27/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Sulfide, Total

Prep Method: NONE
Analysis Method: PSEP
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
HC-S-11	K9807115-002	1.4	0.5	1	NA	11/10/98	65.5	
HC-S-13	K9807115-004	1.4	0.5	1	NA	11/10/98	102	
HC-S-14	K9807115-005	1.4	0.5	1	NA	11/10/98	34.9	
HC-S-16	K9807115-007	1.4	0.5	1	NA	11/10/98	96.3	
HC-S-22	K9807115-009	1.4	0.5	1	NA	11/10/98	17.5	
HC-S-24	K9807115-011	1.4	0.5	1	NA	11/10/98	181	
HC-S-102	K9807115-012	1.4	0.5	1	NA	11/10/98	130	
HC-S-25	K9807115-013	1.4	0.5	1	NA	11/10/98	1830	
HC-S-26	K9807115-014	1.4	0.5	1	NA	11/10/98	7.8	
HC-S-28	K9807115-016	1.4	0.5	1	NA	11/10/98	65.8	
HC-S-35	K9807115-018	1.4	0.5	1	NA	11/10/98	10.8	
HC-S-37	K9807115-019	1.4	0.5	1	NA	11/10/98	8.6	
HC-S-32	K9807115-020	1.4	0.5	1	NA	11/10/98	9.6	
Method Blank	K9807115-MB	1.4	0.5	1	NA	11/10/98	ND	

Approved By: _____ Date: 11/18/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Ammonia as Nitrogen

Prep Method:	NONE	Units:	mg/Kg (ppm)
Analysis Method:	350.1M	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
HC-S-11	K9807115-002	1.9	0.2	1	NA	10/22/98	99.2	
HC-S-13	K9807115-004	1.9	0.2	1	NA	10/22/98	85.9	
HC-S-14	K9807115-005	1.9	0.2	1	NA	10/22/98	29.9	
HC-S-16	K9807115-007	1.9	0.2	1	NA	10/22/98	74.7	
HC-S-22	K9807115-009	1.9	0.2	1	NA	10/22/98	76.9	
HC-S-24	K9807115-011	1.9	0.2	1	NA	10/22/98	84.2	
HC-S-102	K9807115-012	1.9	0.2	1	NA	10/22/98	70.5	
HC-S-25	K9807115-013	1.9	0.2	1	NA	10/22/98	189	
HC-S-26	K9807115-014	1.9	0.2	1	NA	10/22/98	39.1	
HC-S-28	K9807115-016	1.9	0.2	1	NA	10/22/98	110	
HC-S-35	K9807115-018	1.9	0.2	1	NA	10/22/98	68.2	
HC-S-37	K9807115-019	1.9	0.2	1	NA	10/22/98	82.7	
HC-S-32	K9807115-020	1.9	0.2	1	NA	10/22/98	87.2	
Method Blank	K9807115-MB	1.9	0.2	1	NA	10/22/98	ND	

* Analysis was performed on a 2M KCl extract.

M Modified for analysis of soil.

Approved By: _____ Date: 11/19/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Carbon, Total Organic

Prep Method:	NONE	Units:	PERCENT
Analysis Method:	ASTM D4129-82M	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
HC-S-11	K9807115-002	0.05	0.006	1	NA	10/22/98	2.71	
HC-S-13	K9807115-004	0.05	0.006	1	NA	10/22/98	1.85	
HC-S-14	K9807115-005	0.05	0.006	1	NA	10/22/98	0.42	
HC-S-16	K9807115-007	0.05	0.006	1	NA	10/22/98	2.50	
HC-S-22	K9807115-009	0.05	0.006	1	NA	10/22/98	1.89	
HC-S-24	K9807115-011	0.05	0.006	1	NA	10/22/98	1.67	
HC-S-102	K9807115-012	0.05	0.006	1	NA	10/22/98	1.98	
HC-S-25	K9807115-013	0.05	0.006	1	NA	10/22/98	2.48	
HC-S-26	K9807115-014	0.05	0.006	1	NA	10/22/98	0.78	
HC-S-28	K9807115-016	0.05	0.006	1	NA	10/22/98	2.35	
HC-S-35	K9807115-018	0.05	0.006	1	NA	10/22/98	1.59	
HC-S-37	K9807115-019	0.05	0.006	1	NA	10/22/98	1.68	
HC-S-32	K9807115-020	0.05	0.006	1	NA	10/22/98	1.43	
Method Blank	K9807115-MB	0.05	0.006	1	NA	10/22/98	ND	

M Modified

Approved By: _____ Date: 11/18/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Metals

Sample Name:	HC-S-11	Units:	mg/Kg (ppm)
Lab Code:	K9807115-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.6	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	9	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1.9	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	31.2	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	70.4	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	357	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.13	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	27	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.7	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	397	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Metals

Sample Name:	HC-S-13	Units:	mg/Kg (ppm)
Lab Code:	K9807115-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	5	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	2	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	24.6	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	45.3	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	289	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.06	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	21	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.4	
Zinc	EPA 3050B	200.8	2	100	10/28/98	11/4/98	798	

Approved By: _____ Date: 11/5/98

1S44mc/031695

07115ICP.EA1 - Sample (2) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Metals

Sample Name:	HC-S-14	Units:	mg/Kg (ppm)
Lab Code:	K9807115-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	3	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.5	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	35.3	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	15.3	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	174	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	ND	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	12	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.6	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	109	

Approved By: _____ Date: 11/5/98

1S44mc/031695

071151CP.EA1 - Sample (3) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98

Total Metals

Sample Name: HC-S-16
Lab Code: K9807115-007
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.4	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	6	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1.3	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	29.4	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	52.2	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	210	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.25	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	27	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.1	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	306	

Approved By: _____ Date: 11/5/98

1S44mc/031695
071151CP.EA1 - Sample (4) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Metals

Sample Name:	HC-S-22	Units:	mg/Kg (ppm)
Lab Code:	K9807115-009	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	5	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	23.1	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	44.1	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	125	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.09	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	23	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.3	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	225	

Approved By: _____ Date: 11/5/98

1S44mc/031695
071151CP.EA1 - Sample (5) 11/4/98

POPA0007765

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Metals

Sample Name:	HC-S-24	Units:	mg/Kg (ppm)
Lab Code:	K9807115-011	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.3	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	5	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1.5	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	23	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	41.4	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	118	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	36	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.3	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	279	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Metals

Sample Name:	HC-S-102	Units:	mg/Kg (ppm)
Lab Code:	K9807115-012	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.1	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	5	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1.2	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	18.7	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	35.9	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	101	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	30	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	216	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98

Total Metals

Sample Name: HC-S-25
Lab Code: K9807115-013
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.8	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	12	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	6.6	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	30.1	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	84.4	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	644	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.34	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	56	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	1330	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Metals

Sample Name:	HC-S-26	Units:	mg/Kg (ppm)
Lab Code:	K9807115-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	2.5	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	14.3	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	26	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	68.4	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.04	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	22	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.1	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	435	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Metals

Sample Name:	HC-S-28	Units:	mg/Kg (ppm)
Lab Code:	K9807115-016	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	5	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.9	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	28.4	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	50.4	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	87.6	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.1	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	25	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.3	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	220	

Approved By: _____ Date: 11/5/98

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1S44mc/031695

07115ICP.EA1 - Sample (10) 11/4/98

POPA0007770

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Metals

Sample Name:	HC-S-35	Units:	mg/Kg (ppm)
Lab Code:	K9807115-018	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.1	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.4	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	23.3	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	35.5	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	39	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	21	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	122	

Approved By: _____ Date: 11/5/98

00020

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98

Total Metals

Sample Name: HC-S-37
Lab Code: K9807115-019
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.3	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	24.4	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	37	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	28.3	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	22	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	116	

Approved By: _____ Date: 11/5/98

00021

1S44mc/031695
07115ICP.EA1 - Sample (12) 11/4/98

POPA0007772

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Total Metals

Sample Name:	HC-S-32	Units:	mg/Kg (ppm)
Lab Code:	K9807115-020	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.1	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.5	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	21.8	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	34.6	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	51.6	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.07	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	22	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	146	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Total Metals

Sample Name:	Method Blank	Units:	mg/Kg (ppm)
Lab Code:	K9807115-MB	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	0.5	5	10/28/98	11/4/98	ND	
Cadmium	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Chromium	EPA 3050B	200.8	0.06	5	10/28/98	11/4/98	ND	
Copper	EPA 3050B	200.8	0.1	5	10/28/98	11/4/98	ND	
Lead	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	ND	
Nickel	EPA 3050B	200.8	0.2	5	10/28/98	11/4/98	ND	
Silver	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Zinc	EPA 3050B	200.8	0.5	5	10/28/98	11/4/98	ND	

Approved By: _____ Date: 11/5/98

00023

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980711
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-10	Units:	mg/Kg (ppm)
Lab Code:	K9807115-001	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	960	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	7.4	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-11	Units:	mg/Kg (ppm)
Lab Code:	K9807115-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	750	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	6.6	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-12	Units:	mg/Kg (ppm)
Lab Code:	K9807115-003	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	360	E
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1500	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.8	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.5	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	14	

E Estimated concentration. The result is probably high biased due to the presence of Pencil Pitch in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-13	Units:	mg/Kg (ppm)
Lab Code:	K9807115-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/1/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/1/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/1/98	600	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	4.1	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980711
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-14	Units:	mg/Kg (ppm)
Lab Code:	K9807115-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	310	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	7.2	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/17/98

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-15	Units:	mg/Kg (ppm)
Lab Code:	K9807115-006	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	350	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	5.8	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980711
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-16	Units:	mg/Kg (ppm)
Lab Code:	K9807115-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	410	E
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1700	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.7	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.6	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	26	

E Estimated concentration. The result is probably high biased due to the presence of Pencil Pitch in the sample.

Approved By: _____ Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-17	Units:	mg/Kg (ppm)
Lab Code:	K9807115-008	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1100	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	9.3	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980711-
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-22	Units:	mg/Kg (ppm)
Lab Code:	K9807115-009	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1100	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	7.4	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

00032

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-23	Units:	mg/Kg (ppm)
Lab Code:	K9807115-010	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1700	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.5	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	14	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980711
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-24	Units:	mg/Kg (ppm)
Lab Code:	K9807115-011	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/3/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/3/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/3/98	4500	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	0.5	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	100	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-102	Units:	mg/Kg (ppm)
Lab Code:	K9807115-012	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/3/98	ND	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/3/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/3/98	2100	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	33	

Approved By: _____ Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980711
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-25	Units:	mg/Kg (ppm)
Lab Code:	K9807115-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	960	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	1100	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<300	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	7.0	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	6.1	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	4.1	

E Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.
B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

00036

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-26	Units:	mg/Kg (ppm)
Lab Code:	K9807115-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	560	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	5.0	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

07115PHC_JW3 - 2 11/12/98

POPA0007788

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980711
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-27	Units:	mg/Kg (ppm)
Lab Code:	K9807115-015	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1400	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	8.1	

B The MRL is elevated because of matrix interferences.
E The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-28	Units:	mg/Kg (ppm)
Lab Code:	K9807115-016	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1100	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.5	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	6.1	

B	The MRL is elevated because of matrix interferences.
E	The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K98071
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-29	Units:	mg/Kg (ppm)
Lab Code:	K9807115-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	910	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	3.8	

B The MRL is elevated because of matrix interferences.

E The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-35	Units:	mg/Kg (ppm)
Lab Code:	K9807115-018	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	580	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	2.3	

B	The MRL is elevated because of matrix interferences.
E	The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980711
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-37	Units:	mg/Kg (ppm)
Lab Code:	K9807115-019	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	340	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	1.5	

B The MRL is elevated because of matrix interferences.
E Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-32	Units:	mg/Kg (ppm)
Lab Code:	K9807115-020	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	860	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	2.8	

B	The MRL is elevated because of matrix interferences.
E	The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-33	Units:	mg/Kg (ppm)
Lab Code:	K9807115-021	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	230	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	400	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<200	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	2.3	

E Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.
B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	Method Blank	Units:	mg/Kg (ppm)
Lab Code:	K981024-MB	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/1/98	ND	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/1/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/1/98	ND	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	ND	

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980711:
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	Method Blank	Units:	mg/Kg (ppm)
Lab Code:	K981024-MB2	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/1/98	ND	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/1/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/1/98	ND	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	ND	

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Organochlorine Pesticides

Sample Name:	HC-S-16	Units:	ug/Kg (ppb)
Lab Code:	K9807115-007	Basis:	Dry
Test Notes:	D,H		

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
alpha-BHC	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
beta-BHC	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
gamma-BHC (Lindane)	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
delta-BHC	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Heptachlor	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Aldrin	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Heptachlor Epoxide	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
gamma-Chlordane	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endosulfan I	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
alpha-Chlordane	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Dieldrin	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
4,4'-DDE	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	5	J
Endrin	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Endosulfan II	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
4,4'-DDD	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	8	J
Endrin Aldehyde	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endosulfan Sulfate	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
4,4'-DDT	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	26	
Endrin Ketone	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Methoxychlor	EPA 3550A	8081A	40	1	10	12/9/98	12/24/98	ND	
Toxaphene	EPA 3550A	8081A	300	5	10	12/9/98	12/24/98	ND	

D The MRL is elevated because of matrix interferences and because the sample required diluting.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: Linda Neuneker Date: 1-7-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Organochlorine Pesticides

Sample Name:	HC-S-28	Units:	ug/Kg (ppb)
Lab Code:	K9807115-016	Basis:	Dry
Test Notes:	D,H		

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
alpha-BHC	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
beta-BHC	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
gamma-BHC (Lindane)	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
delta-BHC	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Heptachlor	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Aldrin	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Heptachlor Epoxide	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
gamma-Chlordane	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endosulfan I	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
alpha-Chlordane	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Dieldrin	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
4,4'-DDE	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	5	J
Endrin	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Endosulfan II	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
4,4'-DDD	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	8	J
Endrin Aldehyde	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endosulfan Sulfate	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
4,4'-DDT	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	10	J
Endrin Ketone	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Methoxychlor	EPA 3550A	8081A	40	1	10	12/9/98	12/24/98	ND	
Toxaphene	EPA 3550A	8081A	300	5	10	12/9/98	12/24/98	ND	

D	The MRL is elevated because of matrix interferences and because the sample required diluting.
H	The analysis was performed past the recommended hold time; see case narrative.

Approved By: Wanda Mennekes Date: 1-7-99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Organochlorine Pesticides

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9804237-4	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
alpha-BHC	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
beta-BHC	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
gamma-BHC (Lindane)	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
delta-BHC	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
Heptachlor	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Aldrin	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Heptachlor Epoxide	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
gamma-Chlordane	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Endosulfan I	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
alpha-Chlordane	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
Dieldrin	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
4,4'-DDE	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
Endrin	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
Endosulfan II	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
4,4'-DDD	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Endrin Aldehyde	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Endosulfan Sulfate	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
4,4'-DDT	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Endrin Ketone	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
Methoxychlor	EPA 3550A	8081A	4	1	1	12/9/98	12/24/98	ND	
Toxaphene	EPA 3550A	8081A	30	5	1	12/9/98	12/24/98	ND	

Approved By: Linda Neuneker Date: 1-7-99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-11	Units:	ug/Kg (ppb)
Lab Code:	K9807115-002	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	25	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	25	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	25	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	25	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	25	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	25	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	25	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	25	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	25	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	25	1	10/28/98	10/28/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-13	Units:	ug/Kg (ppb)
Lab Code:	K9807115-004	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Sara L. Christens Date: 11/6/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-14	Units:	ug/Kg (ppb)
Lab Code:	K9807115-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	

Approved By: Dana L. Christensen Date: 11/6/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-16	Units:	ug/Kg (ppb)
Lab Code:	K9807115-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-22	Units:	ug/Kg (ppb)
Lab Code:	K9807115-009	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

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Approved By: Tara L. Christensen Date: 11/6/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-24	Units:	ug/Kg (ppb)
Lab Code:	K9807115-011	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-102	Units:	ug/Kg (ppb)
Lab Code:	K9807115-012	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	

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Approved By: Sara L Christensen Date: 11/6/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-25	Units:	ug/Kg (ppb)
Lab Code:	K9807115-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-26	Units:	ug/Kg (ppb)
Lab Code:	K9807115-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	

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Approved By: David Christensen Date: 11/6/98

IS44/121597a

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-28	Units:	ug/Kg (ppb)
Lab Code:	K9807115-016	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Paul Anderson Date: 11/7/98

IS44/121597a

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-35	Units:	ug/Kg (ppb)
Lab Code:	K9807115-018	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: David A Christensen Date: 11/6/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-37	Units:	ug/Kg (ppb)
Lab Code:	K9807115-019	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-32	Units:	ug/Kg (ppb)
Lab Code:	K9807115-020	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/28/98	10/28/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Lisa L. Christens Date: 11/6/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803709-1	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Toluene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803720-1	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Toluene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/28/98	10/28/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-11	Units:	ug/Kg (ppb)
Lab Code:	K9807115-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	250	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	200	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	940	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	200	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	590	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	5700	
Anthracene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	1700	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	21000	
Pyrene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	22000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	36	
Benz(a)anthracene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	11000	
Chrysene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	11000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	450	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	10000	
Benzo(k)fluoranthene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	8400	
Benzo(a)pyrene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	13000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	14000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	2200	
Benzo(g,h,i)perylene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	8900	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Holmes Date: JAN 19 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
ımple Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-13	Units:	ug/Kg (ppb)
Lab Code:	K9807115-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	140	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	140	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	270	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	250	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	2100	
ıthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	600	
.-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	9600	
Pyrene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	11000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	4600	
Chrysene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	4500	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	360	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	4100	
Benzo(k)fluoranthene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	3400	
Benzo(a)pyrene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	5500	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	7100	
Dibenz(a,h)anthracene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	870	
Benzo(g,h,i)perylene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	3900	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C C Heeringa Date: JAN 19 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-14	Units:	ug/Kg (ppb)
Lab Code:	K9807115-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	220	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	350	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	54	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	33	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	250	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	2700	
Anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	590	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	13000	
Pyrene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	17000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	4800	
Chrysene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	4500	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	51	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	3200	
Benzo(k)fluoranthene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	3300	
Benzo(a)pyrene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	5400	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	500	25	10/23/98	12/1/98	6600	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	570	
Benzo(g,h,i)perylene	EPA 3550A	SIM	500	25	10/23/98	12/2/98	4000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C L Haines Date: JAN 19 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-16	Units:	ug/Kg (ppb)
Lab Code:	K9807115-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	450	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	480	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	630	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	160	
Fluorene	EPA 3550A	SIM	500	50	10/23/98	12/2/98	620	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	4900	
Anthracene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	1900	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	21000	
Pyrene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	25000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	47	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	9000	
Chrysene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	8900	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	420	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	7600	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	7000	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	11000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	13000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	1700	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	10/23/98	12/2/98	7600	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

JAN 19 1999

Approved By: C L Haines Date: _____

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-22	Units:	ug/Kg (ppb)
Lab Code:	K9807115-009	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	110	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	310	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	75	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	230	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1900	
Anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	560	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	7200	
Pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	7500	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	24	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	4000	
Chrysene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	3800	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	310	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	3700	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	3300	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	4900	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	6000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	800	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	3300	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 19 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-24	Units:	ug/Kg (ppb)
Lab Code:	K9807115-011	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	2200	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	3600	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	410	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	170	
Fluorene	EPA 3550A	SIM	1000	100	10/23/98	12/2/98	1200	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	15000	
ıthracene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	6600	
i-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	10000	500	10/23/98	12/2/98	84000	
Pyrene	EPA 3550A	SIM	10000	500	10/23/98	12/2/98	110000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	37000	
Chrysene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	38000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	23000	
Benzo(k)fluoranthene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	24000	
Benzo(a)pyrene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	39000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	41000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	4700	
Benzo(g,h,i)perylene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	27000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 19 1999

00070

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-102	Units:	ug/Kg (ppb)
Lab Code:	K9807115-012	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	500	100	10/23/98	12/2/98	980	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	2000	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	420	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	160	
Fluorene	EPA 3550A	SIM	1000	100	10/23/98	12/2/98	1200	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	47	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	9900	
Anthracene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	4600	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	40000	
Pyrene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	50000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	14000	
Chrysene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	14000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	300	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	8800	
Benzo(k)fluoranthene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	11000	
Benzo(a)pyrene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	17000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	21000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	2100	
Benzo(g,h,i)perylene	EPA 3550A	SIM	2000	100	10/23/98	12/2/98	13000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: _____ Date: JAN 19 1999

00071

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-25	Units:	ug/Kg (ppb)
Lab Code:	K9807115-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	140	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	100	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	210	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	48	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	230	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	25	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1100	
Anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	270	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	3100	
Pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	3700	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1300	
Chrysene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1500	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	300	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	880	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	600	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1400	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1800	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	170	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 19 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-26	Units:	ug/Kg (ppb)
Lab Code:	K9807115-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	100	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	140	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	73	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	30	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	100	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1000	
Anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	350	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	5500	
Pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	6800	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	2300	
Chrysene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	2200	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	110	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1600	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1800	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	2700	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	3400	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	350	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1900	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 19 1999

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
ample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-28	Units:	ug/Kg (ppb)
Lab Code:	K9807115-016	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	100	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	120	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	260	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	62	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	200	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	1700	
ıthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	510	
i-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	6500	
Pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	7000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	3200	
Chrysene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	3200	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	370	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	2900	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	2700	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	4000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	5100	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	630	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/23/98	12/2/98	2800	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 19 1999

00074

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-35	Units:	ug/Kg (ppb)
Lab Code:	K9807115-018	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	40	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	30	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	120	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	31	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	85	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	200	10	10/23/98	12/2/98	730	
Anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	220	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	SIM	200	10	10/23/98	12/2/98	2700	
Pyrene	EPA 3550A	SIM	200	10	10/23/98	12/2/98	2700	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	200	10	10/23/98	12/2/98	1500	
Chrysene	EPA 3550A	SIM	200	10	10/23/98	12/2/98	1500	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	260	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	200	10	10/23/98	12/2/98	1500	
Benzo(k)fluoranthene	EPA 3550A	SIM	200	10	10/23/98	12/2/98	1300	
Benzo(a)pyrene	EPA 3550A	SIM	200	10	10/23/98	12/2/98	1800	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	200	10	10/23/98	12/2/98	2300	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	280	
Benzo(g,h,i)perylene	EPA 3550A	SIM	200	10	10/23/98	12/2/98	1200	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 19 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-37	Units:	ug/Kg (ppb)
Lab Code:	K9807115-019	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	27	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	20	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	88	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	30	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	75	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	580	
Anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	140	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1500	
Pyrene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1300	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benz(a)anthracene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	800	
Chrysene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	900	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	290	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1000	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	510	
Benzo(a)pyrene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1100	
Indeno(1,2,3-cd)pyrene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	900	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	170	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	610	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Kleine Date: JAN 19 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-32	Units:	ug/Kg (ppb)
Lab Code:	K9807115-020	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	12/1/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	36	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	12/1/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	35	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	120	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	12/1/98	29	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	82	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	12/1/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	12/1/98	ND	
Phenanthrene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	900	
Anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	210	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Fluoranthene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	2000	
Pyrene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1700	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benz(a)anthracene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1100	
Chrysene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1200	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	250	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	12/1/98	ND	
Benzo(b)fluoranthene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1400	
Benzo(k)fluoranthene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1100	
Benzo(a)pyrene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1600	
Indeno(1,2,3-cd)pyrene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1300	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/23/98	12/1/98	290	
Benzo(g,h,i)perylene	EPA 3550A	8270C	300	1	10/23/98	12/2/98	1200	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 19 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803649-4	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/23/98	11/30/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/23/98	11/30/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/23/98	11/30/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/23/98	11/30/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/23/98	11/30/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/23/98	11/30/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Anthracene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Pyrene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Chrysene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/23/98	11/30/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Helms Date: JAN 19 1999

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-11	Units:	ug/Kg (ppb)
Lab Code:	K9807115-002RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	260	
Benzoic Acid	EPA 3550A	SIM	100	1	12/10/98	1/8/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	210	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	740	
Dibenzofuran	EPA 3550A	SIM	20	1	12/10/98	1/8/99	190	
Fluorene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	530	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/10/98	1/8/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/10/98	1/8/99	ND	
Phenanthrene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	11000	
ıthracene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	2600	
ı-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
luoranthene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	36000	
Pyrene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	37000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	32	
Benz(a)anthracene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	19000	
Chrysene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	20000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	690	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	19000	
Benzo(k)fluoranthene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	19000	
Benzo(a)pyrene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	27000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	22000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	100	12/10/98	1/13/99	1800	
Benzo(g,h,i)perylene	EPA 3550A	SIM	2000	100	12/10/98	1/13/99	11000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C C Haines Date: JAN 21 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-13	Units:	ug/Kg (ppb)
Lab Code:	K9807115-004RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	210	
Benzoic Acid	EPA 3550A	SIM	100	1	12/10/98	1/8/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	300	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	270	
Dibenzofuran	EPA 3550A	SIM	20	1	12/10/98	1/8/99	82	
Fluorene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	280	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/10/98	1/8/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/10/98	1/8/99	ND	
Phenanthrene	EPA 3550A	SIM	500	100	12/10/98	1/14/99	3600	
Anthracene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	700	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Fluoranthene	EPA 3550A	SIM	2000	100	12/10/98	1/14/99	16000	
Pyrene	EPA 3550A	SIM	2000	100	12/10/98	1/14/99	19000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	2000	100	12/10/98	1/14/99	7300	
Chrysene	EPA 3550A	SIM	2000	100	12/10/98	1/14/99	8200	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	380	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	2000	100	12/10/98	1/14/99	6000	
Benzo(k)fluoranthene	EPA 3550A	SIM	2000	100	12/10/98	1/14/99	6600	
Benzo(a)pyrene	EPA 3550A	SIM	2000	100	12/10/98	1/14/99	9800	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	2000	100	12/10/98	1/14/99	7900	
Dibenz(a,h)anthracene	EPA 3550A	SIM	500	100	12/10/98	1/14/99	500	
Benzo(g,h,i)perylene	EPA 3550A	SIM	2000	100	12/10/98	1/14/99	4200	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C C Hewes Date: JAN 21 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-14	Units:	ug/Kg (ppb)
Lab Code:	K9807115-005RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	140	
Benzoic Acid	EPA 3550A	SIM	100	1	12/10/98	1/8/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	200	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	26	
Dibenzofuran	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Fluorene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	96	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/10/98	1/8/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/10/98	1/8/99	ND	
Phenanthrene	EPA 3550A	SIM	500	50	12/10/98	1/14/99	2700	
Anthracene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	330	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	12000	
Pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	15000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	3900	
Chrysene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	4200	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	32	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	2500	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	3300	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	5200	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	4500	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	310	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	2600	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C L Beames Date: JAN 21 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-16	Units:	ug/Kg (ppb)
Lab Code:	K9807115-007RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	630	
Benzoic Acid	EPA 3550A	SIM	100	1	12/10/98	1/8/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	750	E
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	640	
Dibenzofuran	EPA 3550A	SIM	20	1	12/10/98	1/8/99	230	
Fluorene	EPA 3550A	SIM	1000	200	12/10/98	1/14/99	1100	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/10/98	1/8/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/10/98	1/8/99	ND	
Phenanthrene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	12000	
Anthracene	EPA 3550A	SIM	1000	200	12/10/98	1/14/99	3100	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	36000	
Pyrene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	42000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	30	
Benz(a)anthracene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	13000	
Chrysene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	15000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	570	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	9900	
Benzo(k)fluoranthene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	12000	
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	19000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	15000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	1800	E
Benzo(g,h,i)perylene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	8300	

*	3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.
E	Estimated concentration; see case narrative.
H	The analysis was performed past the recommended hold time; see case narrative.

Approved By: C L Beine Date: JAN 21 1999

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-22	Units:	ug/Kg (ppb)
Lab Code:	K9807115-009RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	110	
Benzoic Acid	EPA 3550A	SIM	100	1	12/10/98	1/8/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	100	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	290	
Dibenzofuran	EPA 3550A	SIM	20	1	12/10/98	1/8/99	79	
Fluorene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	220	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/10/98	1/8/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/10/98	1/8/99	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	3900	
Anthracene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	480	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	12000	
Pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	13000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	7000	
Chrysene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	7400	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	380	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	6700	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	6900	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	10000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	8600	
Dibenz(a,h)anthracene	EPA 3550A	SIM	500	50	12/10/98	1/14/99	680	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	12/10/98	1/14/99	4200	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 21 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-24	Units:	ug/Kg (ppb)
Lab Code:	K9807115-011RE	Basis:	Dry
Test Notes:	D, H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	12/10/98	1/13/99	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	12/10/98	1/13/99	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	12/10/98	1/13/99	ND	
Naphthalene	EPA 3550A	SIM	500	50	12/10/98	1/13/99	850	
Benzoic Acid	EPA 3550A	SIM	5000	50	12/10/98	1/13/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Acenaphthylene	EPA 3550A	SIM	500	50	12/10/98	1/13/99	850	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Dibenzofuran	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Fluorene	EPA 3550A	SIM	500	50	12/10/98	1/13/99	610	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	12/10/98	1/13/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	12/10/98	1/13/99	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	6800	
Anthracene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	2200	
Di-n-butyl Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	44000	
Pyrene	EPA 3550A	SIM	4000	200	12/10/98	1/14/99	55000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	15000	
Chrysene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	16000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	11000	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	12000	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	21000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	19000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	1000	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	10000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 21 1999

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-102	Units:	ug/Kg (ppb)
Lab Code:	K9807115-012RE	Basis:	Dry
Test Notes:	D, H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	12/10/98	1/13/99	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	12/10/98	1/13/99	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	12/10/98	1/13/99	ND	
Naphthalene	EPA 3550A	SIM	500	50	12/10/98	1/13/99	660	
Benzoic Acid	EPA 3550A	SIM	5000	50	12/10/98	1/13/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Acenaphthylene	EPA 3550A	SIM	500	50	12/10/98	1/13/99	650	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Dibenzofuran	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Fluorene	EPA 3550A	SIM	500	50	12/10/98	1/13/99	520	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	12/10/98	1/13/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	12/10/98	1/13/99	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	5300	
Anthracene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	2000	
Di-n-butyl Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	30000	
Pyrene	EPA 3550A	SIM	2000	100	12/10/98	1/14/99	36000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	12000	
Chrysene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	13000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	9400	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	9900	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	17000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	16000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	500	50	12/10/98	1/13/99	770	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	8600	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 21 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-25	Units:	ug/Kg (ppb)
Lab Code:	K9807115-013RE	Basis:	Dry
Test Notes:	D, H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	120	20	12/10/98	1/14/99	ND	
2-Methylphenol	EPA 3550A	SIM	120	20	12/10/98	1/14/99	ND	
4-Methylphenol	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	120	20	12/10/98	1/14/99	ND	
Naphthalene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	200	
Benzoic Acid	EPA 3550A	SIM	2000	20	12/10/98	1/14/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Acenaphthylene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	130	
Dimethyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Acenaphthene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	200	
Dibenzofuran	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Fluorene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	260	
Diethyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	240	20	12/10/98	1/14/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Pentachlorophenol	EPA 3550A	SIM	1200	20	12/10/98	1/14/99	ND	
Phenanthrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	1800	
Anthracene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	440	
Di-n-butyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Fluoranthene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	5600	
Pyrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	6700	
Butyl Benzyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	2100	
Chrysene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	2400	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	1500	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	1700	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	2700	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	2800	
Dibenz(a,h)anthracene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	170	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	1500	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 21 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-26	Units:	ug/Kg (ppb)
Lab Code:	K9807115-014RE	Basis:	Dry
Test Notes:	D, H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	120	20	12/10/98	1/14/99	ND	
2-Methylphenol	EPA 3550A	SIM	120	20	12/10/98	1/14/99	ND	
4-Methylphenol	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	120	20	12/10/98	1/14/99	ND	
Naphthalene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	140	
Benzoic Acid	EPA 3550A	SIM	2000	20	12/10/98	1/14/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Acenaphthylene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	150	
Dimethyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Acenaphthene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Dibenzofuran	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Fluorene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	130	
Diethyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	240	20	12/10/98	1/14/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Pentachlorophenol	EPA 3550A	SIM	1200	20	12/10/98	1/14/99	ND	
Phenanthrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	1600	
Anthracene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	460	
Di-n-butyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Fluoranthene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	7200	
Pyrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	8700	
Butyl Benzyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	3300	
Chrysene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	3300	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	2800	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	2600	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	4400	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	4300	
Dibenz(a,h)anthracene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	290	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	2100	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 21 1999

07115SVM.EE8 - 14RE 1/21/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-28	Units:	ug/Kg (ppb)
Lab Code:	K9807115-016RE	Basis:	Dry
Test Notes:	D, H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	120	20	12/10/98	1/14/99	ND	
2-Methylphenol	EPA 3550A	SIM	120	20	12/10/98	1/14/99	ND	
4-Methylphenol	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	120	20	12/10/98	1/14/99	ND	
Naphthalene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	150	
Benzoic Acid	EPA 3550A	SIM	2000	20	12/10/98	1/14/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Acenaphthylene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	120	
Dimethyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Acenaphthene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	290	
Dibenzofuran	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Fluorene	EPA 3550A	SIM	120	20	12/10/98	1/14/99	220	
Diethyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	240	20	12/10/98	1/14/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Pentachlorophenol	EPA 3550A	SIM	1200	20	12/10/98	1/14/99	ND	
Phenanthrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	2300	
Anthracene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	570	
Di-n-butyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Fluoranthene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	8300	
Pyrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	8900	
Butyl Benzyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	4400	
Chrysene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	4300	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	400	20	12/10/98	1/14/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	4500	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	3400	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	5800	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	6300	
Dibenz(a,h)anthracene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	540	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	12/10/98	1/14/99	2900	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

H The analysis was performed past the recommended hold time; see case narrative.

JAN 21 1999

Approved By: C Haines Date: _____

07115SVM.EP8 - 16RE 1/21/99

POPA0007839

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-35	Units:	ug/Kg (ppb)
Lab Code:	K9807115-018RE	Basis:	Dry
Test Notes:	D, H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	30	5	12/10/98	1/14/99	ND	
2-Methylphenol	EPA 3550A	SIM	30	5	12/10/98	1/14/99	ND	
4-Methylphenol	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	30	5	12/10/98	1/14/99	ND	
Naphthalene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
Benzoic Acid	EPA 3550A	SIM	500	5	12/10/98	1/14/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
Acenaphthylene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
Acenaphthene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	120	
Dibenzofuran	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
Fluorene	EPA 3550A	SIM	50	5	12/10/98	1/14/99	90	
Diethyl Phthalate	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	60	5	12/10/98	1/14/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
Pentachlorophenol	EPA 3550A	SIM	300	5	12/10/98	1/14/99	ND	
Phenanthrene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	930	
Anthracene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	270	
Di-n-butyl Phthalate	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
Fluoranthene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	2900	
Pyrene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	2800	
Butyl Benzyl Phthalate	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	1800	
Chrysene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	1700	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	100	5	12/10/98	1/14/99	280	
Di-n-octyl Phthalate	EPA 3550A	SIM	100	5	12/10/98	1/14/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	2100	
Benzo(k)fluoranthene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	1400	
Benzo(a)pyrene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	2300	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	2700	
Dibenz(a,h)anthracene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	290	
Benzo(g,h,i)perylene	EPA 3550A	SIM	100	5	12/10/98	1/14/99	1100	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C(Haines Date: JAN 21 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-37	Units:	ug/Kg (ppb)
Lab Code:	K9807115-019RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/10/98	1/15/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/10/98	1/15/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/10/98	1/15/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/10/98	1/15/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/10/98	1/15/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	29	
Benzoic Acid	EPA 3550A	SIM	100	1	12/10/98	1/15/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/15/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	82	
Dibenzofuran	EPA 3550A	SIM	20	1	12/10/98	1/15/99	27	
Fluorene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	63	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/15/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/10/98	1/15/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/10/98	1/15/99	ND	
Phenanthrene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	550	
nthracene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	120	
i-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/15/99	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	1400	
Pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	1400	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/15/99	22	
Benz(a)anthracene	EPA 3550A	SIM	500	50	12/10/98	1/13/99	770	
Chrysene	EPA 3550A	SIM	500	50	12/10/98	1/13/99	980	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/15/99	290	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/15/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	500	50	12/10/98	1/13/99	740	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	650	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	1100	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	12/10/98	1/13/99	1100	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	140	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	12/10/98	1/15/99	520	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C C Hayes Date: JAN 21 1999

00090

POPA0007841

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-32	Units:	ug/Kg (ppb)
Lab Code:	K9807115-020RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	33	
Benzoic Acid	EPA 3550A	SIM	100	1	12/10/98	1/8/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	100	
Dibenzofuran	EPA 3550A	SIM	20	1	12/10/98	1/8/99	33	
Fluorene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	81	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/10/98	1/8/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/10/98	1/8/99	ND	
Phenanthrene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	720	
Anthracene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	170	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Fluoranthene	EPA 3550A	SIM	200	10	12/10/98	1/15/99	3900	
Pyrene	EPA 3550A	SIM	200	10	12/10/98	1/15/99	3700	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	200	10	12/10/98	1/15/99	2300	
Chrysene	EPA 3550A	SIM	200	10	12/10/98	1/15/99	2200	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	330	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	200	10	12/10/98	1/15/99	2500	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	960	
Benzo(a)pyrene	EPA 3550A	SIM	200	10	12/10/98	1/15/99	3000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	200	10	12/10/98	1/15/99	3600	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	210	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	710	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

JAN 21 1999

Approved By: C Heines Date: _____

00091

07115SVM.EE9 - 20RE 1/21/99

POPA0007842

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9804259-4	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/10/98	1/8/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	12/10/98	1/8/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Fluorene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/10/98	1/8/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/10/98	1/8/99	ND	
Phenanthrene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Anthracene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Fluoranthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Pyrene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Chrysene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	12/10/98	1/8/99	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: _____ Date: JAN 21 1999

APPENDIX A

LABOTATORY

QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Duplicate Summary
Solids, Total Volatile

Prep Method:	NONE	Units:	PERCENT
Analysis Method:	160.4M	Basis:	WET
Test Notes:			

Sample Name	Lab Code	Date Analyzed	Sample Result	Triplicate Sample Result	Average	Relative Percent Difference	Result Notes
HC-S-11	K9807115-002DUP	10/20/98	8.41	8.45	8.43	<1	

Approved By: _____ Date: 1/27/99

00094

Total Solids/060595
07115ICP.AB1 - TVS DUP 12/17/98

POPA0007845

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ent: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98

Duplicate Summary
Total Solids

Prep Method: NONE
Analysis Method: 160.3M
Test Notes:

Units: PERCENT
Basis: WET

Sample Name	Lab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
HC-S-10	K9807115-001DUP	10/20/98	30.1	29.8	30.0	<1	

Approved By: _____ Date: 1/27/99

00095

Total Solids/060595
07115ICP.AB1 - TS DUP 12/17/98

POPA0007846

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: NA
Date Analyzed: 11/10/98

Duplicate Summary
Sulfide, Total

Sample Name: HC-S-11
Lab Code: K9807115-002DUP
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Sulfide, Total	NONE	PSEP	1.4	65.5	60.1	62.8	9	

Approved By: _____ Date: 11/19/98

DUP/020597p
07115WET.LJ1 - DUP 11/18/98

POPA0007847

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ent:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	11/10/98

Laboratory Control Sample Summary
Sulfide, Total

Sample Name:	Lab Control Sample	Units:	mg/Kg (ppm)
Lab Code:	K9807115-LCS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	NONE	PSEP	0.70	0.51	73	60-130	

Approved By: _____ Date: 11/18/98

LCS/020597p
07115WET.LJ1 - LCS 11/18/98

POPA0007848

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	NA
		Date Analyzed:	11/10/98

Matrix Spike Summary
Sulfide, Total

Sample Name:	HC-S-11	Units:	mg/Kg (ppm)
Lab Code:	K9807115-002MS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	NONE	PSEP	1.4	462	65.5	364	65	60-130	

Approved By: _____ Date: 11/18/98

00098

MS/020597p
07115WET.LJ1 - MS 11/18/98

POPA0007849

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807115
Date Collected: NA
Date Received: NA
Date Analyzed: 11/13/98

Sulfide, Total
PSEP
Units: mg/Kg (ppm)
Dry Weight Basis

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	0.49	0.50	102
CCV 2 Result	0.49	0.50	102
CCV 3 Result	0.49	0.49	100
CCV 4 Result	0.49	0.49	100
CCV 5 Result	0.49	0.49	100

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 4 Result	0.05	ND
CCB 5 Result	0.05	ND

Approved By: _____ Date: 11/15/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: NA
Date Analyzed: 10/22/98

Duplicate Summary
Ammonia as Nitrogen

Sample Name: HC-S-11
Lab Code: K9807115-002DUP
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Ammonia as Nitrogen	NONE	350.1M	1.9	99.2	98.3	98.8	< 1	

Approved By: _____ Date: 11/19/98

DUP/020597p
07115WET.LJ2 - DUP 11/19/98

00100

POPA0007851

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	10/22/98

Laboratory Control Sample Summary
Ammonia as Nitrogen

Sample Name:	Lab Control Sample	Units:	mg/Kg (ppm)
Lab Code:	K9807115-LCS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Ammonia as Nitrogen	NONE	350.1M	4.04	4.12	102	85-115	

Approved By: _____ Date: 10/15/98

00101

LCS/020597p
07115WET.LJ2 - LCS 11/19/98

POPA0007852

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	NA
		Date Analyzed:	10/22/98

Matrix Spike Summary
Ammonia as Nitrogen

Sample Name:	HC-S-11	Units:	mg/Kg (ppm)
Lab Code:	K9807115-002MS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Ammonia as Nitrogen	NONE	350.1M	1.9	893	99.2	1020	103	75-125	

Approved By: _____ Date: 11/19/98

MS/020597p
07115WET.LJ2 - MS 11/19/98

POPA0007853

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807115
Date Collected: NA
Date Received: NA
Date Analyzed: 10/22,27/98

Ammonia as Nitrogen
EPA Method 350.1M
Units: mg/Kg (ppm)
Dry Weight Basis

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	2.00	2.06	103
CCV 2 Result	2.00	1.99	100
CCV 3 Result	2.00	2.03	101
CCV 4 Result	2.00	2.00	100
CCV 5 Result	2.00	2.06	103
CCV 6 Result	2.00	2.06	103

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 4 Result	0.05	ND
CCB 5 Result	0.05	ND
CCB 6 Result	0.05	ND

Approved By: _____ Date: 11/9/98

00103

COMBOQCD/042695

Q-CCV.XLT

POPA0007854

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: NA
Date Analyzed: 10/22/98

Duplicate Summary
Carbon, Total Organic

Sample Name: HC-S-11
Lab Code: K9807115-002DUP
Test Notes:

Units: PERCENT
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Carbon, Total Organic	NONE	ASTM D4129-82M	0.05	2.71	2.62	2.66	3	

M Modified

Approved By: _____ Date: 11/18/98

00104

DUP/020597p
07115WET.LJ3 - DUP 11/18/98

POPA0007855

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	Service Request:	K9807115
Project:	Port of Portland Terminal 4/5624	Date Collected:	NA
LCS Matrix:	Sediment	Date Received:	NA
		Date Extracted:	NA
		Date Analyzed:	10/22/98

Laboratory Control Sample Summary
Carbon, Total Organic

Sample Name:	Lab Control Sample	Units:	PERCENT
Lab Code:	K9807115-LCS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Carbon, Total Organic	NONE	ASTM D4129-82M	0.62	0.66	106	85-115	

M Modified

Approved By: _____ Date: 11/18/98

LCS/020597p
07115WET.LJ3 - LCS 11/18/98

POPA0007856

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	NA
		Date Analyzed:	10/22/98

Matrix Spike Summary
Carbon, Total Organic

Sample Name:	HC-S-11	Units:	PERCENT
Lab Code:	K9807115-002MS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Carbon, Total Organic	NONE	ASTM D4129-82M	0.05	10.9	2.71	13.8	102	75-125	

M Modified

Approved By: _____ Date: 11/18/98

MS/020597p
07115WET.LJ3 - MS 11/18/98

00106

POPA0007857

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807115
Date Collected: NA
Date Received: NA
Date Analyzed: 10/22/98

Carbon, Total Organic
ASTM D4129-82M
Units: PERCENT
Dry Weight Basis

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	20.0	19.5	98
CCV 2 Result	20.0	19.9	100
CCV 3 Result	20.0	19.4	97

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND

Approved By: _____ Date: 11/13/98

00107

COMBOQCD/042695

Q-CCV.XLT

POPA0007858

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 10/28/98
Date Analyzed: 11/4/98

Duplicate Summary
Total Metals

Sample Name: HC-S-13
Lab Code: K9807115-004
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Antimony	EPA 3050B	200.8	0.1	0.2	0.4	0.3	67	
Arsenic	EPA 3050B	200.8	2	5	5	5	<1	
Cadmium	EPA 3050B	200.8	0.1	2.0	1.3	1.6	44	A
Chromium	EPA 3050B	200.8	0.3	24.6	25.4	25.0	3	
Copper	EPA 3050B	200.8	0.5	45.3	42.2	43.8	7	
Lead	EPA 3050B	200.8	0.1	288	244	266	16	
Mercury	7471A	7471A	0.02	0.06	0.08	0.07	28	
Nickel	EPA 3050B	200.8	1	21	21	21	<1	
Silver	EPA 3050B	200.8	0.1	0.4	0.6	0.5	40	
Zinc	EPA 3050B	200.8	2	798	297	548	91	A

A Outside aceptance limits; see case narrative.

Approved By: _____ Date: 11/5/98

DUP/031695

07115ICP.EA1 - DUP 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	10/28/98
		Date Analyzed:	11/4/98

Matrix Spike Summary
Total Metals

Sample Name:	HC-S-13	Units:	mg/Kg (ppm)
Lab Code:	K9807115-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Antimony	EPA 3050B	200.8	0.1	100	0.2	17.6	17	30-120	A
Arsenic	EPA 3050B	200.8	2	40	5	42	92	60-130	
Cadmium	EPA 3050B	200.8	0.1	10	2.0	10.0	80	60-130	
Chromium	EPA 3050B	200.8	0.3	40	24.6	61.6	92	60-130	
Copper	EPA 3050B	200.8	0.5	50	45.3	91.8	93	60-130	
Lead	EPA 3050B	200.8	0.1	100	288	338	NA	60-130	
Mercury	7471A	7471A	0.02	1	0.06	1.15	109	60-130	
Nickel	EPA 3050B	200.8	1	100	21	111	90	60-130	
Silver	EPA 3050B	200.8	0.1	10	0.4	7.2	68	60-130	
Zinc	EPA 3050B	200.8	2	100	798	380	NA	60-130	

A	Outside acceptance limits; see case narrative.
NA	Not Applicable; see case narrative.

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Soil	**Date Received:**	NA
		Date Extracted:	10/28/98
		Date Analyzed:	11/4/98

Laboratory Control Sample Summary
Total Metals

Sample Name:	Laboratory Control Sample	Units:	mg/Kg (ppm)
Lab Code:	K9807115-LCS	Basis:	Dry
Test Notes:			

Source: Environmental Resource Associates #238

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Antimony	EPA 3050B	200.8	59.6	49.5	83	20-180	
Arsenic	EPA 3050B	200.8	82.4	63.9	78	62-138	
Cadmium	EPA 3050B	200.8	94.3	61.8	66	55-144	
Chromium	EPA 3050B	200.8	97.8	68.5	70	69-131	
Copper	EPA 3050B	200.8	81.3	57.5	71	62-138	
Lead	EPA 3050B	200.8	190	142	75	60-140	
Mercury	7471A	7471A	1.34	1.16	87	49-151	
Nickel	EPA 3050B	200.8	164	111	68	67-133	
Silver	EPA 3050B	200.8	113	104	92	65-134	
Zinc	EPA 3050B	200.8	131	73.2	56	56-144	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807115
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/4/98

Initial Calibration Verification (ICV) Summary
Metals
Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Antimony	200.8	50.0	50.8	102
Arsenic	200.8	50.0	51.2	102
Cadmium	200.8	25.0	25.9	104
Chromium	200.8	20.0	20.6	103
Copper	200.8	25.0	25.6	102
Lead	200.8	50.0	52.2	104
Mercury	7471A	5.0	5.32	106
Nickel	200.8	50.0	50.9	102
Silver	200.8	25.0	25.2	101
Zinc	200.8	50.0	52.0	104

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807115
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/4/98

Initial Calibration Verification (ICV) Summary
Metals
Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Antimony	200.8	50.0	49.8	100
Arsenic	200.8	50.0	51.0	102
Cadmium	200.8	25.0	25.5	102
Chromium	200.8	20.0	20.2	101
Copper	200.8	25.0	25.7	103
Lead	200.8	50.0	51.4	103
Mercury	7471A	5.0	-	-
Nickel	200.8	50.0	51.1	102
Silver	200.8	25.0	25.1	100
Zinc	200.8	50.0	50.9	102

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807115
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Verification (CCV) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery	CCV3 Result	Percent Recovery
Antimony	200.8	25.0	25.1	100	25.2	101	23.9	96
Arsenic	200.8	25.0	25.1	100	25.4	102	26.3	105
Cadmium	200.8	25.0	25.2	101	25.3	101	24.0	96
Chromium	200.8	25.0	25.3	101	25.4	102	25.0	100
Copper	200.8	25.0	25.0	100	26.0	104	26.2	105
Lead	200.8	25.0	25.6	102	25.4	102	26.1	104
Mercury	7471A	5.0	5.05	101	4.99	100	4.92	98
Nickel	200.8	25.0	25.3	101	25.4	102	25.2	101
Silver	200.8	25.0	25.0	100	25.2	101	24.0	96
Zinc	200.8	25.0	25.3	101	26.0	104	26.7	107

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807115
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Verification (CCV) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV4 Result	Percent Recovery	CCV5 Result	Percent Recovery	CCV6 Result	Percent Recovery
Antimony	200.8	25.0	25.0	100	24.9	100	24.3	97
Arsenic	200.8	25.0	25.0	100	25.0	100	25.1	100
Cadmium	200.8	25.0	24.8	99	24.8	99	24.8	99
Chromium	200.8	25.0	25.0	100	24.6	98	25.0	100
Copper	200.8	25.0	24.8	99	25.3	101	25.3	101
Lead	200.8	25.0	25.1	100	25.2	101	25.5	102
Mercury	7471A	5.0	4.87	97	5.05	101	5.05	101
Nickel	200.8	25.0	25.1	100	25.5	102	25.2	101
Silver	200.8	25.0	25.0	100	25.0	100	24.8	99
Zinc	200.8	25.0	25.0	100	25.3	101	25.3	101

Approved By: _____ Date: 11/5/98

CCV 7-9/042795
071151CP.EAJ - CCV 4-6 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807115
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Blank (CCB) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Antimony	200.8	0.02	ND	ND	ND	ND
Arsenic	200.8	0.5	ND	ND	ND	ND
Cadmium	200.8	0.02	ND	ND	ND	ND
Chromium	200.8	0.06	ND	ND	ND	ND
Copper	200.8	0.1	ND	ND	ND	ND
Lead	200.8	0.02	ND	ND	ND	ND
Mercury	7471A	0.001	ND	ND	ND	ND
Nickel	200.8	0.2	ND	ND	ND	ND
Silver	200.8	0.02	0.02	0.02	0.02	0.02
Zinc	200.8	0.5	ND	ND	ND	ND

Approved By: _____ Date: 11/5/98

CCB4SMRL/102194

00115

071151CP.EA1 - CCB 11/4/98

POPA0007866

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807115
Date Analyzed: 11/3/98

Continuing Calibration Blank (CCB) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB5 Result	CCB6 Result
Antimony	200.8	0.02	ND	ND
Arsenic	200.8	0.5	ND	ND
Cadmium	200.8	0.02	0.02	ND
Chromium	200.8	0.06	ND	ND
Copper	200.8	0.1	ND	ND
Lead	200.8	0.02	ND	0.19
Mercury	7471A	0.001	ND	ND
Nickel	200.8	0.2	ND	ND
Silver	200.8	0.02	ND	ND
Zinc	200.8	0.5	ND	ND

Approved By: _____ Date: 11/5/98

CCB4SMRL/102194

07115ICP.EA1 - CCB (2) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 10/24/98
Date Analyzed: 11/1-3/98

Surrogate Recovery Summary
Northwest TPH-Dx

Prep Method: EPA 3550B
Analysis Method: NWTPH-Dx

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery o-Terphenyl	Percent Recovery Chlorohexadecane
HC-S-10	K9807115-001		73	75
HC-S-11	K9807115-002		63	65
HC-S-12	K9807115-003		79	85
HC-S-13	K9807115-004		57	59
HC-S-14	K9807115-005		61	64
HC-S-15	K9807115-006		74	78
HC-S-16	K9807115-007		75	84
HC-S-17	K9807115-008		72	77
HC-S-22	K9807115-009		73	78
HC-S-23	K9807115-010		88	95
HC-S-24	K9807115-011		87	116
HC-S-102	K9807115-012		89	101
HC-S-25	K9807115-013		95	100
HC-S-26	K9807115-014		93	96
HC-S-27	K9807115-015		93	99
HC-S-28	K9807115-016		77	80
HC-S-29	K9807115-017		67	71
HC-S-35	K9807115-018		77	80
HC-S-37	K9807115-019		84	87
HC-S-32	K9807115-020		86	90
HC-S-33	K9807115-021		69	71
HC-S-33	K9807115-021Dup		84	88
HC-S-33	K9807115-021MS		73	75
HC-S-16	K9807115-007Dup		70	77
HC-S-26	K9807115-014MS		80	83
	CAS Acceptance Limits:		50-150	50-150

Approved By: _____ Date: 11/12/98

SUR2/061197p
07115PHCJW1 - SUR 11/12/98

POPA0007868

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 10/24/98
Date Analyzed: 11/1-3/98

Surrogate Recovery Summary
Northwest TPH-Dx

Prep Method: EPA 3550B
Analysis Method: NWTPH-Dx

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery o-Terphenyl	Percent Recovery Chlorohexadecane
Method Blank	K981024-MB		57	58
Method Blank	K981024-MB2		67	69
Lab Control Sample	K981024-LCS		86	85
Lab Control Sample	K981024-LCS2		83	84
Lab Control Sample	K981024-LCS3		95	95
CAS Acceptance Limits:			50-150	50-150

Approved By: _____ Date: 11/12/98

SUR2/061197p
07115PHCJW2 - SUR 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 10/24/98
Date Analyzed: 11/1-2/98

Duplicate Summary
Northwest TPH-Dx

Sample Name: HC-S-33
Lab Code: K9807115-021Dup
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	230	300	260	26	
Lube Oil	EPA 3550B	NWTPH-Dx	100	400	510	460	24	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	<200	<200	<200	<1	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1.2	1.5	1.4	21	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1.0	1.1	1.0	10	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	2.3	2.8	2.6	18	

Approved By: _____ Date: 11/12/98

07115PHCJW1 - DUP 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 10/24/98
Date Analyzed: 11/2-3/98

Duplicate Summary
Northwest TPH-Dx

Sample Name: HC-S-16
Lab Code: K9807115-007Dup
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	410	350	380	16	
Lube Oil	EPA 3550B	NWTPH-Dx	100	ND	ND	ND	<1	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1700	1500	1600	12	
Pristane	EPA 3550B	NWTPH-Dx	0.5	0.7	1.0	0.8	35	
Phytane	EPA 3550B	NWTPH-Dx	0.5	0.6	0.5	0.6	18	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	26	15	20	54	A

A Outside acceptance limits; see case narrative.

Approved By: _____ Date: 11/2/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 10/24/98
Date Analyzed: 11/2/98

Matrix Spike Summary
Northwest TPH-Dx

Sample Name: HC-S-33
Lab Code: K9807115-021MS
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	210	230	370	67	50-150	
Lube Oil	EPA 3550B	NWTPH-Dx	100	210	400	530	62	50-150	

Approved By: _____ Date: 11/12/98

MS/020597p
07115PHC.JW1 - MS 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	10/24/98
		Date Analyzed:	11/2/98

Matrix Spike Summary
Northwest TPH-Dx

Sample Name:	HC-S-26	Units:	mg/Kg (ppm)
Lab Code:	K9807115-014MS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	160	<100	250	156	50-150	A
Lube Oil	EPA 3550B	NWTPH-Dx	100	160	ND	NA	NC	50-150	

A Outside acceptance limits; see case narrative.

Approved By: _____ Date: 11/12/98

MS/020597p
07115PHC_JW1 - MS (2) 11/12/98

POPA0007873

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
LCS Matrix: Sediment

Service Request: K9807115
Date Collected: NA
Date Received: NA
Date Extracted: 10/24/98
Date Analyzed: 11/1/98

Laboratory Control Sample Summary
Northwest TPH-Dx

Sample Name: Lab Control Sample
Lab Code: K981024-LCS
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	100	80	80	50-150	
Lube Oil	EPA 3550B	NWTPH-Dx	100	87	87	50-150	

Approved By: _____ Date: 11/12/98

00123

LCS/020597p
07115PHC.JW1 - LCS 11/12/98

POPA0007874

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/24/98
		Date Analyzed:	11/1/98

Laboratory Control Sample Summary
Northwest TPH-Dx

Sample Name:	Lab Control Sample	Units:	mg/Kg (ppm)
Lab Code:	K981024-LCS2	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Pencil Pitch	EPA 3550B	NWTPH-Dx	53	46	87	50-150	

Approved By: _____ Date: 11/12/98

00124

LCS/020597p
07115PHC_JW1 - LCS (2) 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
LCS Matrix: Sediment

Service Request: K9807115
Date Collected: NA
Date Received: NA
Date Extracted: 10/24/98
Date Analyzed: 11/1/98

Laboratory Control Sample Summary
Northwest TPH-Dx

Sample Name: Lab Control Sample
Lab Code: K981024-LCS3
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	100	94	94	50-150	
Pencil Pitch	EPA 3550B	NWTPH-Dx	53	48	91	50-150	

Approved By: _____ Date: 11/12/98

LCS/020597p
07115PHC.JW2 - LCS 11/12/98

POPA0007876

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 12/9/98
Date Analyzed: 12/24/98

Surrogate Recovery Summary
Organochlorine Pesticides

Prep Method: EPA 3550A
Analysis Method: 8081A

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			Tetrachloro-m-xylene	Decachlorobiphenyl
HC-S-16	K9807115-007		52	NA
HC-S-28	K9807115-016		61	NA
Batch QC	K9807169-001		75	NA
Batch QC	K9807169-001MS		72	65
Batch QC	K9807169-001DMS		71	95
Lab Control Sample	KWG9804237-3		82	95
Method Blank	KWG9804237-4		86	104

CAS Acceptance Limits: 20-107 20-142

NA Not Applicable; see case narrative.

Approved By: Wanda Neuneker Date: 1-7-99

SUR2/111397p
071115SVG.BJ1 - SUR2 1/7/99

00126
Page No.:

POPA0007877

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

t: Hart Crowser, Inc.
roject: Port of Portland Terminal 4/5624
ample Matrix: Sediment

Service Request: K9807115
Date Collected: NA
Date Received: NA
Date Extracted: 12/9/98
Date Analyzed: 12/24/98

Matrix Spike/Duplicate Matrix Spike Summary
Organochlorine Pesticides

Sample Name: Batch QC
Lab Code: K9807169-001MS, K9807169-001DMS
Test Notes:

Units: ug/Kg (ppb)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
gamma-BHC (Lindane)	EPA 3550A	8081A	20	13	13	ND	9	10	69	77	20-141	11	
Heptachlor	EPA 3550A	8081A	20	13	13	ND	10	10	77	77	20-108	<1	
Aldrin	EPA 3550A	8081A	20	13	13	ND	10	10	77	77	20-181	<1	
Dieldrin	EPA 3550A	8081A	20	13	13	ND	10	10	77	77	20-183	<1	
Endrin	EPA 3550A	8081A	20	13	13	ND	10	10	77	77	20-164	<1	
DDT	EPA 3550A	8081A	20	13	13	ND	10	10	77	77	20-185	<1	

Approved By: Wanda Neuneker Date: 1-7-99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	12/9/98
		Date Analyzed:	12/24/98

Laboratory Control Sample Summary
Organochlorine Pesticides

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9804237-3	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
gamma-BHC (Lindane)	EPA 3550A	8081A	13	12	92	21-123	
Heptachlor	EPA 3550A	8081A	13	11	85	31-112	
Aldrin	EPA 3550A	8081A	13	11	85	26-127	
Dieldrin	EPA 3550A	8081A	13	14	108	18-161	
Endrin	EPA 3550A	8081A	13	10	77	32-135	
4,4'-DDT	EPA 3550A	8081A	13	15	115	30-146	

Approved By: Wanda Neuneker Date: 1-7-99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807115
Calibration Date: 11/14/98
Date Analyzed: 12/24/98

Continuing Calibration Verification (CCV) Summary
Organochlorine Pesticides
EPA Method 8081A
Units: ng/mL (ppb)

Analyte	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery
alpha-BHC	50	50	100	52	104
beta-BHC	50	48	96	51	102
gamma-BHC (Lindane)	50	52	104	53	106
delta-BHC	50	48	96	51	102
Heptachlor	50	54	108	55	110
Aldrin	50	51	102	52	104
Heptachlor Epoxide	50	52	104	53	106
gamma-Chlordane	50	53	106	51	102
Endosulfan I	50	55	110	48	96
alpha-Chlordane	50	56	112	52	104
Dieldrin	50	51	102	51	102
4,4'-DDE	50	51	102	52	104
Endrin	50	55	110	60	120
Endosulfan II	50	50	100	50	100
4,4'-DDD	50	51	102	51	102
Endrin Aldehyde	50	51	102	50	100
Endosulfan Sulfate	50	53	106	45	90
4,4'-DDT	50	57	114	56	112
Endrin Ketone	50	55	110	53	106
Methoxychlor	50	57	114	57	114
Toxaphene	1000	1070	107	966	97

Approved By: Wanda Neuneker Date: 1-7-99

CCV 1-4/102194

00129

07115SVG.BJ1 - CCV 1-4 1/7/99

POPA0007880

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807115
Calibration Date: 11/14/98
Date Analyzed: 12/24/98

Continuing Calibration Blank (CCB) Summary
Organochlorine Pesticides
EPA Method 8081A
Units: ng/mL (ppb)

Analyte	MRL	CCB1 Result	CCB2 Result
alpha-BHC	5	ND	ND
beta-BHC	5	ND	ND
gamma-BHC (Lindane)	5	ND	ND
delta-BHC	5	ND	ND
Heptachlor	5	ND	ND
Aldrin	5	ND	ND
Heptachlor Epoxide	5	ND	ND
gamma-Chlordane	5	ND	ND
Endosulfan I	5	ND	ND
alpha-Chlordane	5	ND	ND
Dieldrin	5	ND	ND
4,4'-DDE	5	ND	ND
Endrin	5	ND	ND
Endosulfan II	5	ND	ND
4,4'-DDD	5	ND	ND
Endrin Aldehyde	5	ND	ND
Endosulfan Sulfate	5	ND	ND
4,4'-DDT	5	ND	ND
Endrin Ketone	5	ND	ND
Methoxychlor	5	ND	ND
Toxaphene	250	ND	

Approved By: Linda Neuneker Date: 1-7-99

I&CCBMRL/120594

07115SVG.BJ1 - CCBMRL 1/7/99

00130

POPA0007881

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

nt: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 10/27 - 10/28/98
Date Analyzed: 10/27 - 10/28/98

Surrogate Recovery Summary
Volatile Organic Compounds by GC/MS

Prep Method: EPA 5035
Analysis Method: 8260B

Units: PERCENT
Basis: Dry

Sample Name	Lab Code	Test Notes	Percent Recovery Dibromofluoromethane	Toluene-d8	4-Bromofluorobenzene
HC-S-11	K9807115-002		90	91	86
HC-S-13	K9807115-004		102	108	95
HC-S-14	K9807115-005		95	101	97
HC-S-16	K9807115-007		95	100	97
HC-S-22	K9807115-009		93	102	99
HC-S-32	K9807115-020		90	96	96
HC-S-24	K9807115-011		97	104	98
HC-S-102	K9807115-012		102	102	95
HC-S-25	K9807115-013		100	99	95
HC-S-26	K9807115-014		99	102	92
HC-S-28	K9807115-016		91	96	80
HC-S-35	K9807115-018		92	99	79
HC-S-37	K9807115-019		91	102	86
Method Blank	KWG9803709-1		88	96	93
Method Blank	KWG9803720-1		92	101	99
Lab Control Sample	KWG9803709-2		101	94	101
HC-S-14	K9807115-005MS		92	93	93
HC-S-14	K9807115-005DMS		92	94	93
CAS Acceptance Limits:			75-132	85-109	49-131

Approved By: Lisa L. Clusters Date: 11/6/98

SUR3QC.XLT_SUR/01071998a
07115VOA.MB4 - SUR 11/6/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	10/28/98
		Date Analyzed:	10/28/98

Matrix Spike Summary
Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-14	Units:	ug/Kg (ppb)
Lab Code:	K9807115-005MS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	EPA 5035	8260B	5	70	ND	62	89	57-121	
Trichloroethene (TCE)	EPA 5035	8260B	5	70	ND	59	84	45-127	
Toluene	EPA 5035	8260B	5	70	ND	55	79	34-134	
1,2-Dichlorobenzene	EPA 5035	8260B	5	70	ND	57	81	34-131	

Approved By: Sara L. Christens Date: 11/6/98

SUR3QC.XLT_MS/01071998a
07115VOA_MB4 - MS 11/6/98

00132

POPA0007883

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

[redacted]nt:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	10/28/98
		Date Analyzed:	10/28/98

Matrix Spike/Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-14		Units:	ug/Kg (ppb)
Lab Code:	K9807115-005MS	K9807115-005DMS	Basis:	Dry
Test Notes:				

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Benzene	EPA 5035	8260B	5	70	69	ND	62	60	89	87	57-121	2	
Trichloroethene (TCE)	EPA 5035	8260B	5	70	69	ND	59	56	84	81	45-127	4	
Toluene	EPA 5035	8260B	5	70	69	ND	55	52	79	75	34-134	5	
1,2-Dichlorobenzene	EPA 5035	8260B	5	70	69	ND	57	55	81	80	34-131	1	

Approved By: Mark Christens Date: 11/6/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/27/98
		Date Analyzed:	10/27/98

Laboratory Control Sample Summary
Volatile Organic Compounds by GC/MS

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9803709-2	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	EPA 5035	8260B	50	54	108	78-116	
Trichloroethene (TCE)	EPA 5035	8260B	50	58	116	79-119	
Toluene	EPA 5035	8260B	50	48	96	77-118	
1,2-Dichlorobenzene	EPA 5035	8260B	50	52	104	79-120	

Approved By: Brad Christensen Date: 11/6/98

00134

SUR3QC.XLT_LCS/01071998a
07115VOA_MB4 - LCS 11/6/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 10/23/98
Date Analyzed: 12/1/98

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method: EPA 3550A
Analysis Method: SIM

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
HC-S-11	K9807115-002		33	49	46	45	71	80
HC-S-13	K9807115-004		29 A	40	39	35	64	76
HC-S-14	K9807115-005		27 A	29 A	37	40	68	76
HC-S-16	K9807115-007		39	53	55	46	69	93
HC-S-22	K9807115-009		41	47	60	46	67	74
HC-S-24	K9807115-011		41	56	61	50	61	42
HC-S-102	K9807115-012		42	52	54	46	60	103
HC-S-25	K9807115-013		38	47	50	50	63	79
HC-S-26	K9807115-014		34	41	47	36	58	71
[illegible]-S-28	K9807115-016		42	52	58	46	68	82
[illegible]-S-35	K9807115-018		35	39	45	37	61	76
[illegible]C-S-37	K9807115-019		32	42	41	39	69	82
HC-S-32	K9807115-020		35	39	44	42	75	81
CAS Acceptance Limits:			31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d6
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14

Approved By: _____ Date: 1/27/99

00135

SUR6/052595

07115SVM.EE1 - sur 1/21/99

POPA0007886

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 10/23/98
Date Analyzed: 11/30/98

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method: EPA 3550A
Analysis Method: SIM

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
HC-S-14	K9807115-005MS		39	45	47	49	82	84
HC-S-14	K9807115-005DMS		29 A	31 A	36	34	69	73
Lab Control Sample	KWG9803649-3		43	61	67	62	31	69
Method Blank	KWG9803649-4		7 A	23 A	7 A	36	28	76
CAS Acceptance Limits:			31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d6
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14

Approved By: _____ Date: 1/22/99

SUR6/052595

07115SVM.EE4 - sur 1/21/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	10/23/98
		Date Analyzed:	11/30/98

Matrix Spike Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-14	Units:	
Lab Code:	K9807115-005MS,	Basis:	
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Advisory Limits	Result Notes
Phenol	EPA 3550A	SIM	20	220	ND	100	45	20-99	
Acenaphthene	EPA 3550A	SIM	20	220	54	190	62	26-104	
Pentachlorophenol	EPA 3550A	SIM	60	220	ND	96	44	10-145	
Pyrene	EPA 3550A	SIM	20	220	17000	NA	NR	18-144	

Approved By: C Haines Date: JAN 19 1999

MS/052595

07115SVM.EE1 - MS 1/19/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	10/23/98
		Date Analyzed:	11/30/98

Matrix Spike/Duplicate Matrix Spike Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-14	Units:	ug/Kg (ppb)
Lab Code:	K9807115-005MS, K9807115-005DMS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Advisory Limits	Relative Percent Difference	Result Notes
Phenol	EPA 3550A	SIM	20	220	180	ND	100	55	45	31	20-99	37	
Acenaphthene	EPA 3550A	SIM	20	220	180	54	190	110	62	31	26-104	67	
Pentachlorophenol	EPA 3550A	SIM	60	220	180	ND	96	79	44	44	10-145	<1	
Pyrene	EPA 3550A	SIM	20	220	180	17000	NA	NA	NR	NR	18-144	NR	

Approved By: C C Hawes Date: JAN 19 1999

DMS 75

00138

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/23/98
		Date Analyzed:	11/30/98

Laboratory Control Sample Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9803649-3	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Advisory Limits	Result Notes
Phenol	EPA 3550A	SIM	240	140	58	21-110	
Acenaphthene	EPA 3550A	SIM	240	150	62	29-109	
Pentachlorophenol	EPA 3550A	SIM	240	15	6	10-120	A
Pyrene	EPA 3550A	SIM	240	170	71	39-149	

A Outside acceptance limits; see case narrative.

Approved By: C Heines Date: JAN 19 1999

00139

LCS/52595

07115SVM.EE1 - lcs 1/19/99

POPA0007890

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 12/10/98
Date Analyzed: 1/8-15/99

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method: EPA 3550A
Analysis Method: SIM

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
HC-S-11	K9807115-002RE		41	50	56	49	62	148 A
HC-S-13	K9807115-004RE		40	45	52	50	65	123
HC-S-14	K9807115-005RE		45	43	54	53	74	105
HC-S-16	K9807115-007RE		41	47	60	59	75	182 A
HC-S-22	K9807115-009RE		35	36 A	46	69	69	123
HC-S-24	K9807115-011RE		NA	NA	NA	NA	NA	NA
HC-S-102	K9807115-012RE		NA	NA	NA	NA	NA	NA
HC-S-25	K9807115-013RE		35	41	39	57	59	90
HC-S-26	K9807115-014RE		42	46	45	48	47	89
[illegible]-S-28	K9807115-016RE		34	50	46	52	49	89
[illegible]-S-35	K9807115-018RE		44	55	55	51	61	94
HC-S-37	K9807115-019RE		44	59	60	53	73	97
HC-S-32	K9807115-020RE		33	39	39	40	63	79
CAS Acceptance Limits:			31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d6
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14

NA	Not Applicable; see case narrative.
A	Outside acceptance limits; see case narrative.

Approved By: [signature] Date: 1/27/99

SUR6/052595

071158VM.EE6 - sur 1/21/99

00140

POPA0007891

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98
Date Extracted: 12/10/98
Date Analyzed: 1/8/99

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method: EPA 3550A
Analysis Method: SIM

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
IC-S-32	K9807115-020MS		29 A	39	39	45	69	85
IC-S-32	K9807115-020DMS		29 A	36 A	35	37	56	73
Lab Control Sample	KWG9804259-3		51	57	58	59	59	75
Method Blank	KWG9804259-4		48	53	57	60	47	104
CAS Acceptance Limits:			31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d6
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14

A	Outside acceptance limits; see case narrative.

Approved By: _____ Date: 1/27/99

SUR6/052595

07115SVM.EE7 - sur 1/21/99

POPA0007892

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	12/10/98
		Date Analyzed:	1/8-15/99

Matrix Spike Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-32	Units:	
Lab Code:	K9807115-020MS	Basis:	
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Advisory Limits	Result Notes
Phenol	EPA 3550A	SIM	20	340	ND	140	41	20-99	
Acenaphthene	EPA 3550A	SIM	20	340	100	290	56	26-104	
Pentachlorophenol	EPA 3550A	SIM	60	340	ND	230	68	10-145	
Pyrene	EPA 3550A	SIM	200	340	3700	3900	59	18-144	

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: _____ Date: JAN 21 1999

MS/052595
07115SVM.EE6 - MS 1/21/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	Service Request:	K9807115
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/14/98
Sample Matrix:	Sediment	Date Received:	10/15/98
		Date Extracted:	12/10/98
		Date Analyzed:	1/8/99

Matrix Spike/Duplicate Matrix Spike Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-32	Units:	ug/Kg (ppb)
Lab Code:	K9807115-020MS, K9807115-020DMS	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Advisory Limits	Relative Percent Difference	Result Notes
Phenol	EPA 3550A	SIM	20	340	340	ND	140	130	41	38	20-99	7	
Acenaphthene	EPA 3550A	SIM	20	340	340	100	290	240	56	41	26-104	19	
Pentachlorophenol	EPA 3550A	SIM	60	340	340	ND	230	250	68	74	10-145	8	
Pyrene	EPA 3550A	SIM	200	340	340	3700	NA	NA	NC	NC	18-144	NC	

Not Applicable; see case narrative.
The analysis was performed past the recommended hold time; see case narrative.

Approved By: C A Haines Date: JAN 21 1999

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	12/10/98
		Date Analyzed:	1/8/99

Laboratory Control Sample Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9804259-3	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Advisory Limits	Result Notes
Phenol	EPA 3550A	SIM	250	150	60	21-110	
Acenaphthene	EPA 3550A	SIM	250	150	60	29-109	
Pentachlorophenol	EPA 3550A	SIM	250	180	72	10-120	
Pyrene	EPA 3550A	SIM	250	180	72	39-149	

Approved By: C Haines Date: JAN 21 1999

00144

LCS/52595

07115SVM.EE6 - lcs 1/21/99

APPENDIX B

CHAIN OF CUSTODY

INFORMATION

POPA0007896

Analytical Services INC.
An Employee-Owned Company

CHAIN OF CUSTODY
Sediment and Tissue Chemistry

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222 • FAX (360) 636-1068

PAGE 1 OF 3 COC

PROJECT NAME: TERMINAL 4 RI/FS
PROJECT NUMBER: 5624-06
PROJECT MANAGER: H. Cumberland
COMPANY/ADDRESS: HC - Portland
PHONE #: FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	☒ Total Volatile Solids ☐ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☒ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☒ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☒ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1	NWTPH - DX	NWTPHCID	Aromatics/Aliphatics PAH/Homocyclic	Archive Extra		REMARKS
HC-S-10	10/14	0915	1	SED	2															X		X			
HC-S-11		0925	2		7	X	X	X		X		X			X			X		X		X	X		
HC-S-12		0940	3		2															X		X			
HC-S-13		10:15	4		7	X	X	X		X		X			X			X		X		X	X		
HC-S-14		10:35	5		7	X	X	X		X		X			X			X		X		X	X		
HC-S-15		11:40	6		2															X		X			
HC-S-16		12:45	7			X	X	X		X		X			X			X		X		X	X		
HC-S-17		1300	8																	X		X			
~~[illegible]~~		~~[illegible]~~																		~~X~~		X			
~~[illegible]~~																									

00146

POPA0007897

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
X III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
X V. EDD Excel

INVOICE INFORMATION
P.O. #
Bill To:

TURNAROUND REQUIREMENTS
___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results
Requested Report Date

Circle which metals are to be analyzed:
SMS Metals: As Cd Cr Cu Pb Hg Ag Zn Ni Sb
CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:
NWTPH = Pencil Pitch Fingerprintline

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
Signature: [signature] Date/Time: 10/14/98 1245	Signature: [signature] Date/Time: 10/14/98 1745	Signature: [signature] Date/Time: 10/15/98 800	Signature: Date/Time:
Printed Name: John [illegible] Firm: KC	Printed Name: Firm: CAS	Printed Name: [illegible] Firm: CAS	Printed Name: Firm:

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PAGE 3 OF 3 COC

SR#:

POPA0007898

PROJECT NAME: TERMINAL 4 RI/FS
PROJECT NUMBER: 5624-06
PROJECT MANAGER: M. Cumberland
COMPANY/ADDRESS: HC - Portland
PHONE #: FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	Total Volatile Solids / Total Solids / Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide / Total (9030M) / Water Soluble	AVS / SEM	Ammonia / Total (350.1m) / Pore water	Pesticides (8081)	PCBs (8082) Aroclors / Congeners	Semivolatiles (GC/MS SIM) PAHs / Phthalates / Phenols / PSEP	Organotin - Sediment Mono / Di / Tri / Tetra	Organotin - Pore water Mono / Di / Tri / Tetra	Volatiles (8260)	TRPH 8015/418.1	NWTPH-DX	NWTPH-HCID	ARCHIVE: (Analysis) Sediment Layer	REMARKS
HC-S-22	10/14/98	1315	9	SED	7	X	X	X		X		X			X				X		X		X	X	
HC-S-23	10/14/98	1330	10		2																X		X		
HC-S-24	10/14/98	1345	11		7	X	X	X		X		X			X				X		X		X	X	
HC-S-102		1400	12		7	X	X	X		X		X			X				X		X		X	X	
HC-S-25		1410	13		7	X	X	X		X		X			X				X		X		X	X	
HC-S-26		14:45	14		7	X	X	X		X		X			X				X		X		X	X	
HC-S-27		15:20	15		2																X		X		
HC-S-28		15:30	16		7	X	X	X		X		X			X				X		X		X	X	
HC-S-29		15:45	17		2																X		X		
HC-S-35		16:25	8		7	X	X	X		X		X			X				X		X		X	X	

00147

REPORT REQUIREMENTS

- ___ I. Routine Report: Method Blank, Surrogate, as required
- ___ II. Report Dup., MS, MSD as required
- X III. Data Validation Report (includes all raw data)
- ___ IV. CLP Deliverable Report
- X V. EDD EXCEL

INVOICE INFORMATION

P.O. #
Bill To:

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results
Requested Report Date

Circle which metals are to be analyzed:

SMS Metals: (As) (Cd) (Cr) (Cu) (Pb) (Hg) (Ag) (Zn) (Ni) (Sb)
CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:

NWTPH = Diesel / Pitch Fingerprint

RELINQUISHED BY:

Signature: Date/Time: 10/14/98 1734
Printed Name: Firm: HC

RELINQUISHED BY:

Signature: Date/Time: 10/14/98 1745
Printed Name: Firm:

RELINQUISHED BY:

Signature: Date/Time: 10/15/98 800
Printed Name: Firm: CAS

RELINQUISHED BY:

Signature: Date/Time:
Printed Name: Firm:

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An Employee-Owned Company
1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222 • FAX (360) 636-1068

Sediment and Tissue Chemistry

PROJECT NAME: Terminal 4 RE/FS
PROJECT NUMBER: 5624-06
PROJECT MANAGER: H. Cumberland
COMPANY/ADDRESS: HC - Portland
PHONE #:
FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	☒ Total Volatile Solids ☐ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☒ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☒ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☒ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1	NWTPH-DX	NWTPH HCID	Aromatic / Aliphatic PAH / Homologs	Archive		REMARKS
HC-S-31	10/14/98	1645	19	SED	7		X	X		X		X			X			X			X		X		
HC-S-32	10/14/98	1700	20		7		X	X		X		X			X			X		X		X	X		
HC-S-33		1720	21		2															X		X			
~~HC-S-36~~		~~17:30~~			~~7~~	~~X~~	~~X~~	~~X~~		~~X~~		~~X~~			~~X~~			~~X~~			~~X~~		~~X~~		

00148

POPA0007899

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
X III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
X V. EDD Excel

INVOICE INFORMATION

P.O. #
Bill To:

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

SMS Metals: As Cd Cr Cu Pb Hg Ag Zn Ni Sb
CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:

NWTPH-DX = Pencil Pitch Fingerprint

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
Signature: [signature] Date/Time: 10/14/98 1545	Signature: [signature] Date/Time: 10/14/98	Signature: [signature] Date/Time: 10/15/98 1752 1000	Signature: Date/Time:
Printed Name: John Firm: HC	Printed Name: Firm: CAS	Printed Name: [signature] Firm: CAS	Printed Name: Firm:

~~67100~~ 1/27/99

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client HART CROWSER Work Order K98 07115

Cooler received on 10/14/98 and opened on 10/15/98 by AP

1. Were custody seals on outside of cooler? YES (NO)
   If yes, how many and where? —
2. Were seals intact and signature & date correct? ~~YES NO~~
3. COC # —

Temperature of cooler(s) upon receipt:	6.4	6.9	7.9	4.4	12.2
Temperature Blank:	6.0	NP	8.1	7.1	5.0

4. Were custody papers properly filled out (ink, signed, etc.)? (YES) NO
5. Type of packing material present BAGS
6. Did all bottles arrive in good condition (unbroken)? (YES) NO
7. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? (YES) NO
8. Did all bottle labels and tags agree with custody papers? (YES) NO
9. *Were the correct types of bottles used for the tests indicated?* (YES) NO
10. Were all of the preserved bottles received at the lab with the appropriate pH? ~~YES NO~~
11. Were VOA vials checked for absence of air bubbles, and if present, noted below? ~~YES NO~~
12. Did the bottles originate from CAS/K or a branch laboratory? _____ (YES) NO

Explain any discrepancies _____

Samples that required preservation or received outside of temperature range at the lab(circle)

Sample ID	Reagent	Volume	Lot Number	Initials
HC-S-10				
HC-S-11				
HC-S-12				
HC-S-13				
HC-S-24		OUT OF TEMP		
HC-S-25				

HC-S-37
HC-S-33
HC-S-35
HC-S-32

00149

POPA0007900

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client HART CROWSER Work Order K98 07115

Cooler received on 10/14/98 and opened on 10/15/98 by AP

1. Were custody seals on outside of cooler? YES (NO)
   If yes, how many and where? ____
2. Were seals intact and signature & date correct? ~~YES NO~~
3. COC # ____
   Temperature of cooler(s) upon receipt: 0.3
   Temperature Blank: N/P
4. Were custody papers properly filled out (ink, signed, etc.)? (YES) NO
5. Type of packing material present BAGS
6. Did all bottles arrive in good condition (unbroken)? (YES) NO
7. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? (YES) NO
8. Did all bottle labels and tags agree with custody papers? ~~YES~~ NO
9. *Were the correct types of bottles used for the tests indicated?* ~~YES~~ *NO*
10. Were all of the preserved bottles received at the lab with the appropriate pH? ~~YES NO~~
11. Were VOA vials checked for absence of air bubbles, and if present, noted below? ~~YES NO~~
12. Did the bottles originate from CAS/K or a branch laboratory? ____ (YES) NO

Explain any discrepancies ____

Samples that required preservation or received outside of temperature range at the lab(circle)

Sample ID	Reagent	Volume	Lot Number	Initials
HC-S-14				
HC-S-15	OUT OF TEMP			
HC-S-16				

00150

POPA0007901

HART CROWSER INC.
FEB 0 2 1999
Portland Office

Columbia Analytical Services INC.
An Employee-Owned Company

December 16, 1998

Service Request No: K9807169

Howard Cumberland
Hart Crowser, Inc.
Five Centerpointe Drive, Suite 240
Lake Oswego, OR 97035

Re: Port of Portland Terminal 4/5624-06

Dear Howard:

Enclosed are the results of the sample(s) submitted to our laboratory on October 16, 1998. For your reference, these analyses have been assigned our service request number K9807169.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 243.

Respectfully submitted,

Columbia Analytical Services, Inc.

Richard Craven
Project Chemist

RAC/td

POPA0007902

317 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 360/ 577-7222 • Fax 360/636-1068

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
J	Estimated concentration. The value is less than the method reporting limit, but greater than the method detection limit.
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Hart Crowser Inc.	**Service Request No.:**	K9807169
Project:	Port of Portland Terminal 4	**Date Received:**	16-October-98
Sample Matrix:	Sediment and Water		

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier IIA data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), Initial/Continuing Calibration Verification Standards (ICV/CCV), and Initial/Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

The following difficulties were experienced during analysis of this batch:

General Chemistry: The initial duplicates and spikes for sulfide failed to met control limits. The sample duplicates and matrix spikes were reanalyzed and met all criteria. Both data sets are provided. The reanlysis of the QC was completed after hold times had expired.

Metals: Due to matrix interference with the ICP-MS the samples required dilution prior to analysis. The reporting limits are elevated accordingly.

Due to a method defect in the EPA digestion method, that can be multiplied by matrix interference, the sediment spike recovery for antimony was outside control limits. The laboratory control spike indicated that the analysis was in control and no corrective action was taken.

Due to the elevated concentrations of zinc in the sample, the matrix spike recovery was not calculated. The recovery would have been unreliable and not applicable for method performance.

Semivolatile Petroleum Hydrocarbons: Due to an apparent spiking error in the laboratory, the laboratory control spike and matrix spike in the sediment were outside control limits. All other QC was within control, and no corrective action was taken.

Pesticides: The analysis of the sediment samples for pesticides was requested after hold times had expired.

Due to matrix interference the samples required dilution prior to analysis. The reporting limits are elevated accordingly.

Approved by Richard A Pera **Date** 2/11/99

Due to required dilutions, and matrix interference the decachlorobiphenyl surrogate was below detection limits in sample HC-S-36, and not applicable for method performance evaluation.

Volatile Organics: The reporting and detection limits for the sediments are elevated due to low percent solids.

There were samples with the toluene surrogate above control limits. No target analytes were detected and, and no corrective action was taken.

The matrix spike pairs were completed after hold times had expired. All target analytes were within control limits, and the delay would have no impact on the sample results.

Semivolatile Organics: For the SIM-TCL analysis, some acid surrogate recoveries in the method blank associated with the sediment samples were outside control limits low. The impact on sample data is as follows: 1) Where the field sample results had acceptable surrogate recoveries and no positive results for associated acid target compounds, the results are reported. In this case, the sample data is not affected. The majority of field samples had no positive results reported. 2) Where associated field samples had acid surrogate recoveries outside the control limits, the samples were reextracted after the sample holding time had expired. These results are evaluated to determine whether the surrogate failure negatively impacted the original sample results. Both sets of data are reported. 3) Where field sample results had acceptable surrogate recoveries and positive results for associated acid target compounds, the results are flagged as estimated values since the low acid surrogate recoveries in the blank may indicate a low-bias in the sample preparation process. In most cases, these results would be flagged as estimates regardless, since the values are less than the MRL. It is very uncommon for acid compounds (such as phenols and chlorinated phenols) to be introduced into the analysis during preparation and analysis. Introduction of contaminants into the process is typically limited to phthalates and non-target compounds.

The recovery of pentachlorophenol was outside control limits in the laboratory control spike. All target analytes were within control limits in the matrix spike pair, and no corrective action was taken.

Due to high background levels of pyrene and acenaphthene the spike recoveries were not calculated. The results would have been unreliable and not applicable for method performance evaluation.

The recovery of the terphenyl surrogate in sample HC-S-19, and the spikes prepared on that sample, is outside control limits due to matrix interference.

Approved by _____ **Date** 2/11/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Solids

Prep Method:	NONE	Units:	Percent
Analysis Method:	160.3M	Basis:	WET
Test Notes:			

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
HC-S-36	K9807169-001	10/21/98	68.9	
HC-S-34	K9807169-002	10/21/98	57.3	
HC-S-40	K9807169-003	10/21/98	42.6	
HC-S-39	K9807169-004	10/21/98	43.9	
HC-S-38	K9807169-005	10/21/98	44.3	
HC-S-44	K9807169-006	10/21/98	44.1	
HC-S-43	K9807169-007	10/21/98	39.2	
HC-S-42	K9807169-008	10/21/98	43.2	
HC-S-41	K9807169-009	10/21/98	48.4	
[illegible]-REF-B	K9807169-010	10/21/98	34.8	
[illegible]-REF-C	K9807169-011	10/21/98	72.0	
HC-S-18	K9807169-012	10/21/98	47.0	
HC-S-19	K9807169-013	10/21/98	78.0	
HC-S-20	K9807169-014	10/21/98	42.2	
HC-S-21	K9807169-015	10/21/98	41.3	
HC-S-31	K9807169-016	10/21/98	48.0	
HC-S-30	K9807169-017	10/21/98	52.8	

Approved By: JC Date: 10/23/98

Total Solids/042095

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

...ient:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Solids, Total Volatile

Prep Method:	NONE	Units:	PERCENT
Analysis Method:	160.4M	Basis:	DRY
Test Notes:			

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
HC-S-36	K9807169-001	10/21/98	2.30	
HC-S-34	K9807169-002	10/21/98	5.24	
HC-S-40	K9807169-003	10/21/98	6.37	
HC-S-39	K9807169-004	10/21/98	6.09	
HC-S-38	K9807169-005	10/21/98	6.70	
HC-S-44	K9807169-006	10/21/98	5.97	
HC-S-43	K9807169-007	10/21/98	6.35	
HC-S-42	K9807169-008	10/21/98	6.28	
HC-S-41	K9807169-009	10/21/98	5.95	
...-REF-B	K9807169-010	10/21/98	6.37	
...C-REF-C	K9807169-011	10/21/98	1.38	
HC-S-19	K9807169-013	10/21/98	3.44	
HC-S-20	K9807169-014	10/21/98	7.34	
HC-S-30	K9807169-017	10/21/98	4.19	

Approved By: JC Date: 10/23/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-S-36 Basis: Dry
Lab Code: K9807169-001
Test Notes:

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	12.2	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	13.4	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	0.69	

Approved By: _____ Date: 2/1/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-S-34 Basis: Dry
Lab Code: K9807169-002
Test Notes:

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	142	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	704	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	2.12	

Approved By: _____ Date: 2/11/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-S-40 Basis: Dry
Lab Code: K9807169-003
Test Notes:

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	85.0	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	1.6	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	1.74	

Approved By: _____ Date: 2/11/99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-S-39
Lab Code: K9807169-004
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	96.8	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	6.2	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	1.87	

Approved By: _____ Date: 2/11/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

[redacted]t:	Hart Crowser, Inc.	**Service Request:**	K9807169
'roject:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-S-38 Basis: Dry
Lab Code: K9807169-005
Test Notes:

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	80.6	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	7.3	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	1.63	

Approved By: _____ Date: 2/11/99

1SZ2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-S-44
Lab Code: K9807169-006
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	99.9	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	2.1	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	2.11	

Approved By: _____ Date: 2/1/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

t:	Hart Crowser, Inc.	**Service Request:**	K9807169
roject:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
ample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-S-43 Basis: Dry

ab Code: K9807169-007

est Notes:

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
mmonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	85.8	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	2.4	
arbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	2.26	

Approved By: _____ Date: 2/1/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-S-42
Lab Code: K9807169-008
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	84.8	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	3.3	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	1.93	

Approved By: _____ Date: 2/1/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

[redacted]:	Hart Crowser, Inc.	**Service Request:**	K9807169
oject:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
ample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

ample Name:	HC-S-41	Basis:	Dry
lb Code:	K9807169-009		
est Notes:			

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
mmonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	90.2	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	8.8	
arbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	1.91	

Approved By: _____ Date: 2/11/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-REF-B
Lab Code: K9807169-010
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	82.9	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	3.8	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	2.30	

Approved By: _____ Date: 2/11/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

t:	Hart Crowser, Inc.	**Service Request:**	K9807169
roject:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
ample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-REF-C
Lab Code: K9807169-011
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
mmonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	6.0	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	ND	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	0.38	

Approved By: _____ Date: 2/1/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-S-19
Lab Code: K9807169-013
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	44.8	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	9.2	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	1.24	

Approved By: _____ Date: 2/1/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

oject:	Hart Crowser, Inc.	**Service Request:**	K9807169
ample Matrix:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

ample Name:	HC-S-20	Basis:	Dry
b Code:	K9807169-014		
st Notes:			

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
nmonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	86.8	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	11.1	
rbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	2.54	

Approved By: _____ Date: 2/1/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Inorganic Parameters

Sample Name: HC-S-30 Basis: Dry
Lab Code: K9807169-017
Test Notes:

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	67.0	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	12.6	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	1.28	

Approved By: _____ Date: 2/11/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

[redacted]:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Inorganic Parameters

Sample Name: Method Blank
Lab Code: K9807169-MB1
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	10/23/98	ND	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/22/98	ND	
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.006	1	NA	10/28/98	ND	

Approved By: _____ Date: 2/11/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ent:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Inorganic Parameters

Sample Name: Method Blank
Lab Code: K9807169-MB2
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	10/23/98	ND	

Approved By: _____ Date: 11/24/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

nt:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Inorganic Parameters

Sample Name:	Method Blank	Basis:	Dry
Lab Code:	K9807169-MB3		
Test Notes:			

Analyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	0.7	1	NA	11/14/98	ND	

Approved By: _____ Date: 11/24/98

SZ2/020597p

07169WET.LJ1 - mb (3) 11/24/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-S-36	Units:	mg/Kg (ppm)
Lab Code:	K9807169-001	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.2	20	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	3	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	15.2	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	20.9	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	15.2	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	0.05	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	17	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.1	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	82	

Approved By: _____ Date: 11/5/98

1S44mc/031695
07169ICP.EA1 - Sample 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-S-34	Units:	mg/Kg (ppm)
Lab Code:	K9807169-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.2	20	10/28/98	11/4/98	0.2	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	5	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1.1	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	23.4	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	37.1	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	153	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	0.2	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	24	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.4	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	376	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-S-39	Units:	mg/Kg (ppm)
Lab Code:	K9807169-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.2	20	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	26.4	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	38	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	30.1	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	22	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	104	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-S-38	Units:	mg/Kg (ppm)
Lab Code:	K9807169-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.2	20	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.3	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	28.3	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	37.7	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	49.9	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	0.06	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	24	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	126	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-S-42	Units:	mg/Kg (ppm)
Lab Code:	K9807169-008	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.2	20	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.3	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	27.3	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	40.7	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	36	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	0.07	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	22	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	124	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-S-41	Units:	mg/Kg (ppm)
Lab Code:	K9807169-009	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.2	20	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.3	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	25.5	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	37.2	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	30.3	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	0.11	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	23	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	133	

Approved By: _____ Date: 11/5/98

POPA0007930

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-REF-B	Units:	mg/Kg (ppm)
Lab Code:	K9807169-010	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.2	20	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	9	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.9	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	25.4	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	36.8	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	23.5	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	0.12	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	21	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.2	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	142	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-REF-C	Units:	mg/Kg (ppm)
Lab Code:	K9807169-011	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.2	20	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	3	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.3	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	10.1	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	10.7	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	7.3	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	0.06	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	10	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	ND	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	84	

Approved By: _____ Date: 11/5/98

1S44mc/031695

071691CP.EA1 - Sample (8) 11/5/98

POPA0007932

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-S-19	Units:	mg/Kg (ppm)
Lab Code:	K9807169-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.2	20	10/28/98	11/4/98	4.4	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	11	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	5.6	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	18.3	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	62.9	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1160	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	0.07	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	16	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1.9	
Zinc	EPA 3050B	200.8	2	100	10/28/98	11/4/98	1020	

Approved By: _____ Date: 11/5/98

1S44mc/031695

07169ICP.EA1 - Sample (9) 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-S-30	Units:	mg/Kg (ppm)
Lab Code:	K9807169-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.2	20	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.6	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	21.1	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	62	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	80.7	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	0.06	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	22	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	0.3	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	167	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Total Metals

Sample Name:	Method Blank	Units:	mg/Kg (ppm)
Lab Code:	K9807169-MB	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.4	5	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	0.5	5	10/28/98	11/4/98	ND	
Cadmium	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Chromium	EPA 3050B	200.8	0.06	5	10/28/98	11/4/98	ND	
Copper	EPA 3050B	200.8	0.1	5	10/28/98	11/4/98	ND	
Lead	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Mercury	7471A	7471A	0.02	1	10/29/98	10/30/98	ND	
Nickel	EPA 3050B	200.8	0.2	5	10/28/98	11/4/98	ND	
Silver	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Zinc	EPA 3050B	200.8	0.5	5	10/28/98	11/4/98	ND	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-WS-01-M	Units:	ug/L (ppb)
Lab Code:	K9807169-018	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.05	
Arsenic	CLFAA	200.8	0.5	1	10/28/98	11/4/98	0.6	
Cadmium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Chromium	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.5	
Copper	CLFAA	200.8	0.1	1	10/28/98	11/4/98	2.0	
Lead	CLFAA	200.8	0.02	1	10/28/98	11/4/98	2.85	
Mercury	7471A	7471A	0.5	1	10/29/98	10/30/98	ND	
Nickel	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.7	
Silver	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Thallium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.03	
Zinc	CLFAA	200.8	0.5	1	10/28/98	11/4/98	5.2	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-WS-01-B	Units:	ug/L (ppb)
Lab Code:	K9807169-019	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.09	
Arsenic	CLFAA	200.8	0.5	1	10/28/98	11/4/98	0.6	
Cadmium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.02	
Chromium	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.4	
Copper	CLFAA	200.8	0.1	1	10/28/98	11/4/98	1.7	
Lead	CLFAA	200.8	0.02	1	10/28/98	11/4/98	2.68	
Mercury	7471A	7471A	0.5	1	10/29/98	10/30/98	ND	
Nickel	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.7	
Silver	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Thallium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.02	
Zinc	CLFAA	200.8	0.5	1	10/28/98	11/4/98	5.0	

Approved By: _____ Date: 11/5/98

Sample/042895
071691CP.EA2 - Sample (2) 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-WS-02-M	Units:	ug/L (ppb)
Lab Code:	K9807169-020	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.05	
Arsenic	CLFAA	200.8	0.5	1	10/28/98	11/4/98	0.6	
Cadmium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.02	
Chromium	CLFAA	200.8	0.2	1	10/28/98	11/4/98	ND	
Copper	CLFAA	200.8	0.1	1	10/28/98	11/4/98	2.7	
Lead	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.61	
Mercury	7471A	7471A	0.5	1	10/29/98	10/30/98	ND	
Nickel	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.5	
Silver	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.04	
Thallium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Zinc	CLFAA	200.8	0.5	1	10/28/98	11/4/98	3.2	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-WS-02-B	Units:	ug/L (ppb)
Lab Code:	K9807169-021	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.04	
Arsenic	CLFAA	200.8	0.5	1	10/28/98	11/4/98	0.6	
Cadmium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Chromium	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.2	
Copper	CLFAA	200.8	0.1	1	10/28/98	11/4/98	1.4	
Lead	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.71	
Mercury	7471A	7471A	0.5	1	10/29/98	10/30/98	ND	
Nickel	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.6	
Silver	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Thallium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.02	
Zinc	CLFAA	200.8	0.5	1	10/28/98	11/4/98	3.2	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-WS-03-M	Units:	ug/L (ppb)
Lab Code:	K9807169-022	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.04	
Arsenic	CLFAA	200.8	0.5	1	10/28/98	11/4/98	0.6	
Cadmium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Chromium	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.3	
Copper	CLFAA	200.8	0.1	1	10/28/98	11/4/98	1.6	
Lead	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.87	
Mercury	7471A	7471A	0.5	1	10/29/98	10/30/98	ND	
Nickel	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.6	
Silver	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Thallium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Zinc	CLFAA	200.8	0.5	1	10/28/98	11/4/98	4.4	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-WS-03-B	Units:	ug/L (ppb)
Lab Code:	K9807169-023	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.05	
Arsenic	CLFAA	200.8	0.5	1	10/28/98	11/4/98	0.6	
Cadmium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Chromium	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.3	
Copper	CLFAA	200.8	0.1	1	10/28/98	11/4/98	1.9	
Lead	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.76	
Mercury	7471A	7471A	0.5	1	10/29/98	10/30/98	ND	
Nickel	CLFAA	200.8	0.2	1	10/28/98	11/4/98	0.6	
Silver	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Thallium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Zinc	CLFAA	200.8	0.5	1	10/28/98	11/4/98	3.6	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-RB-100	Units:	ug/L (ppb)
Lab Code:	K9807169-024	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Arsenic	CLFAA	200.8	0.5	1	10/28/98	11/4/98	ND	
Cadmium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Chromium	CLFAA	200.8	0.2	1	10/28/98	11/4/98	ND	
Copper	CLFAA	200.8	0.1	1	10/28/98	11/4/98	1.5	
Lead	CLFAA	200.8	0.02	1	10/28/98	11/4/98	0.02	
Mercury	7471A	7471A	0.5	1	10/29/98	10/30/98	ND	
Nickel	CLFAA	200.8	0.2	1	10/28/98	11/4/98	ND	
Silver	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Thallium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Zinc	CLFAA	200.8	0.5	1	10/28/98	11/4/98	0.5	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Total Metals

Sample Name:	HC-RB-101	Units:	ug/L (ppb)
Lab Code:	K9807169-025	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Arsenic	CLFAA	200.8	0.5	1	10/28/98	11/4/98	ND	
Cadmium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Chromium	CLFAA	200.8	0.2	1	10/28/98	11/4/98	ND	
Copper	CLFAA	200.8	0.1	1	10/28/98	11/4/98	1.0	
Lead	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Mercury	7471A	7471A	0.5	1	10/29/98	10/30/98	ND	
Nickel	CLFAA	200.8	0.2	1	10/28/98	11/4/98	ND	
Silver	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Thallium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Zinc	CLFAA	200.8	0.5	1	10/28/98	11/4/98	0.8	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Total Metals

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	K9807169-MB	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Arsenic	CLFAA	200.8	0.5	1	10/28/98	11/4/98	ND	
Cadmium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Chromium	CLFAA	200.8	0.2	1	10/28/98	11/4/98	ND	
Copper	CLFAA	200.8	0.1	1	10/28/98	11/4/98	ND	
Lead	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Mercury	7471A	7471A	0.5	1	10/29/98	10/30/98	ND	
Nickel	CLFAA	200.8	0.2	1	10/28/98	11/4/98	ND	
Silver	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Thallium	CLFAA	200.8	0.02	1	10/28/98	11/4/98	ND	
Zinc	CLFAA	200.8	0.5	1	10/28/98	11/4/98	ND	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-36	Units:	mg/Kg (ppm)
Lab Code:	K9807169-001	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/3/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/3/98	160	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/3/98	<100	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/3/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/3/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/3/98	0.5	

B	The MRL is elevated because of matrix interferences.
E	Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-34	Units:	mg/Kg (ppm)
Lab Code:	K9807169-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	480	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	650	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<200	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	2.6	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	2.4	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	1.7	

B The MRL is elevated because of matrix interferences.

E Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-40	Units:	mg/Kg (ppm)
Lab Code:	K9807169-003	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	770	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	4.4	

B	The MRL is elevated because of matrix interferences.
E	The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

ISZ2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-39	Units:	mg/Kg (ppm)
Lab Code:	K9807169-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	1200	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	9.8	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-38	Units:	mg/Kg (ppm)
Lab Code:	K9807169-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	2100	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	26	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-44	Units:	mg/Kg (ppm)
Lab Code:	K9807169-006	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	390	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	1.6	

B	The MRL is elevated because of matrix interferences.
E	Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980716[illegible]
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-43	Units:	mg/Kg (ppm)
Lab Code:	K9807169-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	720	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	3.2	

B The MRL is elevated because of matrix interferences.
E The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-42	Units:	mg/Kg (ppm)
Lab Code:	K9807169-008	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	1800	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	15	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-41	Units:	mg/Kg (ppm)
Lab Code:	K9807169-009	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	2400	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	23	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-18	Units:	mg/Kg (ppm)
Lab Code:	K9807169-012	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	2600	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	26	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1SZ2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-19	Units:	mg/Kg (ppm)
Lab Code:	K9807169-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	ND	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	14000	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	<1	B
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	180	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1SZ2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-20	Units:	mg/Kg (ppm)
Lab Code:	K9807169-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	3700	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	0.5	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	36	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-21	Units:	mg/Kg (ppm)
Lab Code:	K9807169-015	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	1800	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	10	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-31	Units:	mg/Kg (ppm)
Lab Code:	K9807169-016	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	310	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	1.1	

B	The MRL is elevated because of matrix interferences.
E	Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-30	Units:	mg/Kg (ppm)
Lab Code:	K9807169-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	880	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	6.5	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	Method Blank	Units:	mg/Kg (ppm)
Lab Code:	K981028-MB	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/3/98	ND	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/3/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/3/98	ND	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/3/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/3/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/3/98	ND	

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ent:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Organochlorine Pesticides

Sample Name:	HC-S-36	Units:	ug/Kg (ppb)
Lab Code:	K9807169-001	Basis:	Dry
Test Notes:	D,H		

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
alpha-BHC	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
beta-BHC	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
gamma-BHC (Lindane)	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
delta-BHC	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Heptachlor	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Aldrin	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
tachlor Epoxide	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
ma-Chlordane	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endosulfan I	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
alpha-Chlordane	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Dieldrin	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
4,4'-DDE	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	2	J
Endrin	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Endosulfan II	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
4,4'-DDD	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	3	J
Endrin Aldehyde	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endosulfan Sulfate	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
4,4'-DDT	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endrin Ketone	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Methoxychlor	EPA 3550A	8081A	40	1	10	12/9/98	12/24/98	ND	
Toxaphene	EPA 3550A	8081A	300	5	10	12/9/98	12/24/98	ND	

D The MRL is elevated because of matrix interferences and because the sample required diluting.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: Wenda Neuneker Date: 1-7-99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807169
Project:	Port of Portland Terminal 4/5624-06	Date Collected:	10/15/98
Sample Matrix:	Sediment	Date Received:	10/16/98

Organochlorine Pesticides

Sample Name:	HC-S-39	Units:	ug/Kg (ppb)
Lab Code:	K9807169-004	Basis:	Dry
Test Notes:	D,H		

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
alpha-BHC	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
beta-BHC	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
gamma-BHC (Lindane)	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
delta-BHC	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Heptachlor	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Aldrin	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
ptachlor Epoxide	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
nma-Chlordane	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endosulfan I	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
alpha-Chlordane	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Dieldrin	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
4,4'-DDE	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	3	J
Endrin	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Endosulfan II	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
4,4'-DDD	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	1	J
Endrin Aldehyde	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endosulfan Sulfate	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
4,4'-DDT	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	3	J
Endrin Ketone	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Methoxychlor	EPA 3550A	8081A	40	1	10	12/9/98	12/24/98	ND	
Toxaphene	EPA 3550A	8081A	300	5	10	12/9/98	12/24/98	ND	

D The MRL is elevated because of matrix interferences and because the sample required diluting.
H The analysis was performed past the recommended hold time; see case narrative.

Approved By: Linda Neuneker Date: 1-7-99

1SZ2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Organochlorine Pesticides

Sample Name:	HC-S-43	Units:	ug/Kg (ppb)
Lab Code:	K9807169-007	Basis:	Dry
Test Notes:	D,H		

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
alpha-BHC	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
beta-BHC	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
gamma-BHC (Lindane)	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
delta-BHC	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Heptachlor	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Aldrin	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
ptachlor Epoxide	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
gamma-Chlordane	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endosulfan I	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
alpha-Chlordane	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Dieldrin	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
4,4'-DDE	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Endrin	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Endosulfan II	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
4,4'-DDD	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	8	J
Endrin Aldehyde	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	ND	
Endosulfan Sulfate	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
4,4'-DDT	EPA 3550A	8081A	20	0.2	10	12/9/98	12/24/98	10	J
Endrin Ketone	EPA 3550A	8081A	20	0.4	10	12/9/98	12/24/98	ND	
Methoxychlor	EPA 3550A	8081A	40	1	10	12/9/98	12/24/98	ND	
Toxaphene	EPA 3550A	8081A	300	5	10	12/9/98	12/24/98	ND	

D The MRL is elevated because of matrix interferences and because the sample required diluting.
H The analysis was performed past the recommended hold time; see case narrative.

Approved By: Wenda Neuneker Date: 1-7-99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Organochlorine Pesticides

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9804237-4	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
alpha-BHC	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
beta-BHC	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
gamma-BHC (Lindane)	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
delta-BHC	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
Heptachlor	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Aldrin	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
tachlor Epoxide	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
nma-Chlordane	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Endosulfan I	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
alpha-Chlordane	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
Dieldrin	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
4,4'-DDE	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
Endrin	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
Endosulfan II	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
4,4'-DDD	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Endrin Aldehyde	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Endosulfan Sulfate	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
4,4'-DDT	EPA 3550A	8081A	2	0.2	1	12/9/98	12/24/98	ND	
Endrin Ketone	EPA 3550A	8081A	2	0.4	1	12/9/98	12/24/98	ND	
Methoxychlor	EPA 3550A	8081A	4	1	1	12/9/98	12/24/98	ND	
Toxaphene	EPA 3550A	8081A	30	5	1	12/9/98	12/24/98	ND	

Approved By: Yonda Meunier Date: 1-7-99

1SZ2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-36	Units:	ug/Kg (ppb)
Lab Code:	K9807169-001	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	

POPA0007965

Approved By: Brad Christensen Date: 11/12/98

00064

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-34	Units:	ug/Kg (ppb)
Lab Code:	K9807169-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	

POPA0007966

Approved By: Lisa L. Christensen Date: 11/12/98

00065

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-40	Units:	ug/Kg (ppb)
Lab Code:	K9807169-003	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-39	Units:	ug/Kg (ppb)
Lab Code:	K9807169-004	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

POPA0007968

Approved By: Cara L. Christensen Date: 11/12/98

00067

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-38	Units:	ug/Kg (ppb)
Lab Code:	K9807169-005	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	

POPA0007969

Approved By: Brad. Christensen Date: 11/12/98

1S44/121597a

07169VOA.MB1 - 1029F028 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-44	Units:	ug/Kg (ppb)
Lab Code:	K9807169-006	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Sara A. Christensen Date: 11/12/98

1S44/121597a

07169VOA.MB1 - 1029F029 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-43	Units:	ug/Kg (ppb)
Lab Code:	K9807169-007	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

POPA0007971

Approved By: Lisa L Christensen Date: 11/12/98

00070

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-42	Units:	ug/Kg (ppb)
Lab Code:	K9807169-008	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

POPA0007972

Approved By: Lisa L. Christens Date: 11/12/98

00071

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-41	Units:	ug/Kg (ppb)
Lab Code:	K9807169-009	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

POPA0007973

Approved By: Brad. Christens Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-REF-B	Units:	ug/Kg (ppb)
Lab Code:	K9807169-010	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	25	1	10/29/98	10/29/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Lisa L. Christens Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-REF-C	Units:	ug/Kg (ppb)
Lab Code:	K9807169-011	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	

Approved By: Brad L. Clawson Date: 11/17/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-19	Units:	ug/Kg (ppb)
Lab Code:	K9807169-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	

POPA0007976

Approved By: Cara L. Christens Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-20	Units:	ug/Kg (ppb)
Lab Code:	K9807169-014	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	10	1	10/29/98	10/29/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

POPA0007977

Approved By: Brad D. Christensen Date: 11/12/98

00076

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-30	Units:	ug/Kg (ppb)
Lab Code:	K9807169-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803744-1	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	5	1	10/29/98	10/29/98	ND	

POPA0007979

Approved By: Sara L. Christens Date: 11/12/98

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1S44/121597a

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803767-1	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	5	1	10/30/98	10/30/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	5	1	10/30/98	10/30/98	ND	
Toluene	EPA 5030B	8260B	5	1	10/30/98	10/30/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	5	1	10/30/98	10/30/98	ND	
Ethylbenzene	EPA 5030B	8260B	5	1	10/30/98	10/30/98	ND	
m- & p-Xylenes	EPA 5030B	8260B	5	1	10/30/98	10/30/98	ND	
o-Xylene	EPA 5030B	8260B	5	1	10/30/98	10/30/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	5	1	10/30/98	10/30/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	5	1	10/30/98	10/30/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	5	1	10/30/98	10/30/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-WS-01-M	Units:	ug/L (ppb)
Lab Code:	K9807169-018	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-WS-01-B	Units:	ug/L (ppb)
Lab Code:	K9807169-019	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	

POPA0007982

Approved By: Jana L. Christensen Date: 11/12/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-WS-02-M	Units:	ug/L (ppb)
Lab Code:	K9807169-020	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	

Approved By: Tara L. Christensen Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-WS-02-B	Units:	ug/L (ppb)
Lab Code:	K9807169-021	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	

Approved By: Sarah Anderson Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-WS-03-M	Units:	ug/L (ppb)
Lab Code:	K9807169-022	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	

Approved By: Brad Andersen Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name: HC-WS-03-B
Lab Code: K9807169-023
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	

Approved By: Sara L. Christens Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-RB-100	Units:	ug/L (ppb)
Lab Code:	K9807169-024	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	0.9	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	

Approved By: Brad Christensen Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-RB-101	Units:	ug/L (ppb)
Lab Code:	K9807169-025	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	0.8	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	

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Approved By: Sara L. Christensen Date: 11/12/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	KWG9803732-1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	KWG9803752-3	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/29/98	10/29/98	ND	

Approved By: Ana L. Christens Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	KWG9803770-1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5030B	8260B	0.5	1	10/30/98	10/30/98	ND	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	1	10/30/98	10/30/98	ND	
Toluene	EPA 5030B	8260B	0.5	1	10/30/98	10/30/98	ND	
Tetrachloroethene (PCE)	EPA 5030B	8260B	0.5	1	10/30/98	10/30/98	ND	
Ethylbenzene	EPA 5030B	8260B	0.5	1	10/30/98	10/30/98	ND	
m,p-Xylenes	EPA 5030B	8260B	0.5	1	10/30/98	10/30/98	ND	
o-Xylene	EPA 5030B	8260B	0.5	1	10/30/98	10/30/98	ND	
1,3-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/30/98	10/30/98	ND	
1,4-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/30/98	10/30/98	ND	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	1	10/30/98	10/30/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-36	Units:	ug/Kg (ppb)
Lab Code:	K9807169-001	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	33	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	23	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/5/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	150	
Anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	27	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	310	
Pyrene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	380	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	170	
Chrysene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	170	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	50	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	150	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	98	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	180	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	340	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	50	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	220	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C C Kleine Date: JAN 28 1999

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-34	Units:	ug/Kg (ppb)
Lab Code:	K9807169-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	100	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	50	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	200	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/5/98	23	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	53	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/5/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	540	
Anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	100	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Fluoranthene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	2300	
Pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	2800	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	690	
Chrysene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	730	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	80	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	540	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	340	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	490	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1300	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	110	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	610	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-40	Units:	ug/Kg (ppb)
Lab Code:	K9807169-003	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	23	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	130	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/5/98	43	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/5/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1000	
Anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	170	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Fluoranthene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	3000	
Pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	2500	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1300	
Chrysene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1700	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	350	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1500	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	690	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1700	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	2600	
Dibenz(a,h)anthracene	EPA 3550A	SIM	200	1	10/27/98	12/5/98	290	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1300	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

07169SVM.EDS - 3 1/27/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-39	Units:	ug/Kg (ppb)
Lab Code:	K9807169-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	49	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	520	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/5/98	160	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	390	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/5/98	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	4700	
Anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	600	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	13000	
Pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	10000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	6200	
Chrysene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	7000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	290	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	6500	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	5500	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	6700	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	10000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	1700	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	5400	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-38	Units:	ug/Kg (ppb)
Lab Code:	K9807169-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	55	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	17	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	51	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	9	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	540	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	4000	
Dibenzofuran	EPA 3550A	SIM	500	50	10/27/98	12/6/98	860	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/5/98	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	23000	
Anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	4100	
[illegible]n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
[illegible]oranthene	EPA 3550A	SIM	10000	500	10/27/98	12/6/98	58000	
Pyrene	EPA 3550A	SIM	10000	500	10/27/98	12/6/98	46000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	29000	
Chrysene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	31000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	310	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	34000	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	21000	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	31000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	10000	500	10/27/98	12/6/98	53000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	7200	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	23000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: CC Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-44	Units:	ug/Kg (ppb)
Lab Code:	K9807169-006	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	39	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	150	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/5/98	91	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	180	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/5/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	970	
Anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	170	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Fluoranthene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1800	
Pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1500	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	640	
Chrysene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	610	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	270	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	670	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	380	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	670	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1400	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	140	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	520	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: _____ Date: JAN 28 1999

071169SVM.EP7 - 6/17/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-43	Units:	ug/Kg (ppb)
Lab Code:	K9807169-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	60	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	42	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/5/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	430	
Anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	99	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Fluoranthene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1700	
Pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1500	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	20	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	830	
Chrysene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1100	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	550	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	40	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	820	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	510	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1100	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1700	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	170	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	580	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

07169SVM.EE7 - 7/12/99

POPA0007998

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-42	Units:	ug/Kg (ppb)
Lab Code:	K9807169-008	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	92	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	23	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthene	EPA 3550A	SIM	500	50	10/27/98	12/6/98	920	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/5/98	170	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	420	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/5/98	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	5300	
Anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	1500	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	17000	
Pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	16000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	37	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	11000	
Chrysene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	11000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	500	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	100	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	11000	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	8900	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	14000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	18000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	2600	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	11000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-41	Units:	ug/Kg (ppb)
Lab Code:	K9807169-009	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/5/98	24	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/5/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	160	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	1600	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/5/98	270	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	650	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/5/98	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	7800	
Anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	2000	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	24000	
Pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	22000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	110	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	15000	
Chrysene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	16000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	220	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/5/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	15000	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	12000	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	20000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	25000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	3900	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	16000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-REF-B	Units:	ug/Kg (ppb)
Lab Code:	K9807169-010	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/6/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/6/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/6/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Anthracene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	63	
Pyrene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	68	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	35	
Chrysene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	35	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	62	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	37	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	22	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	43	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	110	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	57	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

07169SVM.EE7 - 10/27/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-REF-C	Units:	ug/Kg (ppb)
Lab Code:	K9807169-011	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/6/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/6/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/6/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Anthracene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	23	
Pyrene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	27	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Chrysene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	43	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	23	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

07169SVM.EP8 - 11/27/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-19	Units:	ug/Kg (ppb)
Lab Code:	K9807169-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/6/98	110	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	51	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/6/98	130	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	31	
Naphthalene	EPA 3550A	SIM	1000	100	10/27/98	12/6/98	1400	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/6/98	110	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	71	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Acenaphthene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	6100	
Dibenzofuran	EPA 3550A	SIM	500	100	10/27/98	12/6/98	660	
Fluorene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	2500	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/6/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/6/98	ND	
Phenanthrene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	26000	
Anthracene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	5900	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/27/98	12/17/98	70000	H
Pyrene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	68000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	44000	
Chrysene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	46000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	360	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	44000	
Benzo(k)fluoranthene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	35000	
Benzo(a)pyrene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	55000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	60000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	11000	
Benzo(g,h,i)perylene	EPA 3550A	SIM	2000	100	10/27/98	12/6/98	38000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-20	Units:	ug/Kg (ppb)
Lab Code:	K9807169-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/6/98	24	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	7	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	370	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/6/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	160	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	1500	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/6/98	260	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	700	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/6/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/6/98	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	7900	
Anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	2000	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	43	
Fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	26000	
Pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	25000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	56	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	14000	
Chrysene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	14000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	430	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	13000	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	11000	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	18000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	21000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	3100	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	10/27/98	12/6/98	13000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-30	Units:	ug/Kg (ppb)
Lab Code:	K9807169-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/6/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	64	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/6/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	44	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	260	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/6/98	52	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	160	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/6/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/6/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	1600	
Anthracene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	370	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Fluoranthene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	5200	
Pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	5000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	2700	
Chrysene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	3000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	300	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/6/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	2400	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	2400	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	3300	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	4600	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/6/98	540	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/27/98	12/6/98	2500	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

07169SVM.EB8 - 17 1/27/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-WS-01-M	Units:	ug/L (ppb)
Lab Code:	K9807169-018	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Benzyl Alcohol	EPA 3520B	SIM	1	1	10/19/98	11/27/98	ND	
2-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
4-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	*
2,4-Dimethylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Naphthalene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzoic Acid	EPA 3520B	SIM	5	1	10/19/98	11/27/98	ND	
Hexachlorobutadiene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dimethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenzofuran	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Fluorene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Diethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
N-Nitrosodiphenylamine	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Hexachlorobenzene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pentachlorophenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Phenanthrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Di-n-butyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Butyl Benzyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benz(a)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.1	
Chrysene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.1	
Bis(2-ethylhexyl) Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.4	E
Di-n-octyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(b)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Benzo(k)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.1	
Benzo(a)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Indeno(1,2,3-cd)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.3	
Dibenz(a,h)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(g,h,i)perylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.1	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

E Estimated concentration; see case narrative.

Approved By: C Haines Date: JAN 28 1999

07169SVM.EP1 - 18-1/27/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
ample Matrix:	Water	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name: HC-WS-01-B
Lab Code: K9807169-019
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Benzyl Alcohol	EPA 3520B	SIM	1	1	10/19/98	11/27/98	ND	
2-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
4-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	*
2,4-Dimethylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Naphthalene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzoic Acid	EPA 3520B	SIM	5	1	10/19/98	11/27/98	ND	
Hexachlorobutadiene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dimethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenzofuran	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Fluorene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Diethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
N-Nitrosodiphenylamine	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Hexachlorobenzene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pentachlorophenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Phenanthrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
nthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
i-n-butyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.1	
Pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.1	
Butyl Benzyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benz(a)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Chrysene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	E
Di-n-octyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(b)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(k)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(a)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Dibenz(a,h)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(g,h,i)perylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.
E Estimated concentration; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-WS-02-M	Units:	ug/L (ppb)
Lab Code:	K9807169-020	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Benzyl Alcohol	EPA 3520B	SIM	1	1	10/19/98	11/27/98	ND	
2-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
4-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	*
2,4-Dimethylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Naphthalene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzoic Acid	EPA 3520B	SIM	5	1	10/19/98	11/27/98	ND	
Hexachlorobutadiene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dimethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenzofuran	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Fluorene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Diethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.1	
N-Nitrosodiphenylamine	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Hexachlorobenzene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pentachlorophenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Phenanthrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Di-n-butyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Butyl Benzyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benz(a)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Chrysene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	E
Di-n-octyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(b)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(k)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(a)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenz(a,h)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(g,h,i)perylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

E Estimated concentration; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-WS-02-B	Units:	ug/L (ppb)
Lab Code:	K9807169-021	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Benzyl Alcohol	EPA 3520B	SIM	1	1	10/19/98	11/27/98	ND	
2-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
4-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	*
2,4-Dimethylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Naphthalene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzoic Acid	EPA 3520B	SIM	5	1	10/19/98	11/27/98	ND	
Hexachlorobutadiene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dimethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenzofuran	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Fluorene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Diethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.1	
N-Nitrosodiphenylamine	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Hexachlorobenzene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pentachlorophenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Phenanthrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
thracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
-n-butyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Butyl Benzyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benz(a)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Chrysene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.3	E
Di-n-octyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(b)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(k)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(a)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenz(a,h)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(g,h,i)perylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

E Estimated concentration; see case narrative.

Approved By: _____ Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-WS-03-M	Units:	ug/L (ppb)
Lab Code:	K9807169-022	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Benzyl Alcohol	EPA 3520B	SIM	1	1	10/19/98	11/27/98	ND	
2-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
4-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	*
2,4-Dimethylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Naphthalene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzoic Acid	EPA 3520B	SIM	5	1	10/19/98	11/27/98	ND	
Hexachlorobutadiene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dimethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenzofuran	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Fluorene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Diethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
N-Nitrosodiphenylamine	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Hexachlorobenzene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pentachlorophenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Phenanthrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Di-n-butyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Butyl Benzyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benz(a)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Chrysene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.7	E
Di-n-octyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(b)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(k)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(a)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenz(a,h)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(g,h,i)perylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

E Estimated concentration; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-WS-03-B	Units:	ug/L (ppb)
Lab Code:	K9807169-023	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Benzyl Alcohol	EPA 3520B	SIM	1	1	10/19/98	11/27/98	ND	
2-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
4-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	*
2,4-Dimethylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Naphthalene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzoic Acid	EPA 3520B	SIM	5	1	10/19/98	11/27/98	ND	
Hexachlorobutadiene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dimethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenzofuran	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Fluorene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Diethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
N-Nitrosodiphenylamine	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Hexachlorobenzene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pentachlorophenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Phenanthrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Di-n-butyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.1	
Fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Butyl Benzyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benz(a)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Chrysene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	E
Di-n-octyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(b)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(k)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(a)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenz(a,h)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(g,h,i)perylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

E Estimated concentration; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-RB-100	Units:	ug/L (ppb)
Lab Code:	K9807169-024	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Benzyl Alcohol	EPA 3520B	SIM	1	1	10/19/98	11/27/98	ND	
2-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
4-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	*
2,4-Dimethylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Naphthalene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzoic Acid	EPA 3520B	SIM	5	1	10/19/98	11/27/98	ND	
Hexachlorobutadiene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dimethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenzofuran	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Fluorene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Diethyl Phthalate	EPA 3520B	SIM	1	10	10/19/98	11/27/98	13	
N-Nitrosodiphenylamine	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Hexachlorobenzene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pentachlorophenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Phenanthrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Di-n-butyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.2	
Fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Butyl Benzyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benz(a)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Chrysene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	0.6	E
Di-n-octyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(b)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(k)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(a)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenz(a,h)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(g,h,i)perylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

E Estimated concentration; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-RB-101	Units:	ug/L (ppb)
Lab Code:	K9807169-025	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Benzyl Alcohol	EPA 3520B	SIM	1	1	10/19/98	11/27/98	ND	
2-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
4-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	*
2,4-Dimethylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Naphthalene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzoic Acid	EPA 3520B	SIM	5	1	10/19/98	11/27/98	ND	
Hexachlorobutadiene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dimethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Acenaphthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenzofuran	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Fluorene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Diethyl Phthalate	EPA 3520B	SIM	1	10	10/19/98	11/27/98	10	
N-Nitrosodiphenylamine	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Hexachlorobenzene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pentachlorophenol	EPA 3520B	SIM	0.5	1	10/19/98	11/27/98	ND	
Phenanthrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Di-n-butyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Butyl Benzyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benz(a)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Chrysene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3520B	SIM	1	10	10/19/98	11/27/98	5	E
Di-n-octyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(b)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(k)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(a)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Dibenz(a,h)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	
Benzo(g,h,i)perylene	EPA 3520B	SIM	0.1	1	10/19/98	11/27/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

E Estimated concentration; see case narrative.

Approved By: C Hans Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803700-4	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/27/98	12/4/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/27/98	12/4/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/27/98	12/4/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/27/98	12/4/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/27/98	12/4/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/27/98	12/4/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Anthracene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Pyrene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Chrysene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/27/98	12/4/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	KWG9803582-5	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3520B	SIM	0.5	1	10/19/98	11/13/98	ND	
Benzyl Alcohol	EPA 3520B	SIM	1	1	10/19/98	11/13/98	ND	
2-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/13/98	ND	
4-Methylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/13/98	ND	*
2,4-Dimethylphenol	EPA 3520B	SIM	0.5	1	10/19/98	11/13/98	ND	
Naphthalene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Benzoic Acid	EPA 3520B	SIM	5	1	10/19/98	11/13/98	ND	
Hexachlorobutadiene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Acenaphthylene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Dimethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Acenaphthene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Dibenzofuran	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Fluorene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Diethyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
N-Nitrosodiphenylamine	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Hexachlorobenzene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Pentachlorophenol	EPA 3520B	SIM	0.5	1	10/19/98	11/13/98	ND	
Phenanthrene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Di-n-butyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Butyl Benzyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Benz(a)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Chrysene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	2.1	
Di-n-octyl Phthalate	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Benzo(b)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Benzo(k)fluoranthene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Benzo(a)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Dibenz(a,h)anthracene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	
Benzo(g,h,i)perylene	EPA 3520B	SIM	0.1	1	10/19/98	11/13/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-36	Units:	ug/Kg (ppb)
Lab Code:	K9807169-001RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/12/98	1/28/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/12/98	1/28/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/12/98	1/28/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/12/98	1/28/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/12/98	1/28/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	48	
Benzoic Acid	EPA 3550A	SIM	100	1	12/12/98	1/28/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/28/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	53	
Dibenzofuran	EPA 3550A	SIM	20	1	12/12/98	1/28/99	21	
Fluorene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	37	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/28/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/12/98	1/28/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/12/98	1/28/99	ND	
Phenanthrene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	290	
Anthracene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	45	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/28/99	ND	
Fluoranthene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	480	
Pyrene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	550	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/28/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	220	
Chrysene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	210	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/28/99	120	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/28/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	190	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	130	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	230	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	270	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	26	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	12/12/98	1/28/99	120	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C L Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-34	Units:	ug/Kg (ppb)
Lab Code:	K9807169-002RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	60	10	12/12/98	1/28/99	ND	
2-Methylphenol	EPA 3550A	SIM	60	10	12/12/98	1/28/99	ND	
4-Methylphenol	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	60	10	12/12/98	1/28/99	ND	
Naphthalene	EPA 3550A	SIM	100	10	12/12/98	1/28/99	130	
Benzoic Acid	EPA 3550A	SIM	1000	10	12/12/98	1/28/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Acenaphthylene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Acenaphthene	EPA 3550A	SIM	100	10	12/12/98	1/28/99	130	
Dibenzofuran	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Fluorene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Diethyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	120	10	12/12/98	1/28/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Pentachlorophenol	EPA 3550A	SIM	600	10	12/12/98	1/28/99	ND	
Phenanthrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	440	
Anthracene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Fluoranthene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	1600	
Pyrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	1900	
Butyl Benzyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	750	
Chrysene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	820	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	100	10	12/12/98	1/28/99	110	
Di-n-octyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	730	
Benzo(k)fluoranthene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	480	
Benzo(a)pyrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	940	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	1200	
Dibenz(a,h)anthracene	EPA 3550A	SIM	100	10	12/12/98	1/28/99	100	
Benzo(g,h,i)perylene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	550	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-40	Units:	ug/Kg (ppb)
Lab Code:	K9807169-003RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	60	10	12/12/98	1/28/99	ND	
2-Methylphenol	EPA 3550A	SIM	60	10	12/12/98	1/28/99	ND	
4-Methylphenol	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	60	10	12/12/98	1/28/99	ND	
Naphthalene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benzoic Acid	EPA 3550A	SIM	1000	10	12/12/98	1/28/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Acenaphthylene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Acenaphthene	EPA 3550A	SIM	100	10	12/12/98	1/28/99	160	
Dibenzofuran	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Fluorene	EPA 3550A	SIM	100	10	12/12/98	1/28/99	120	
Diethyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	120	10	12/12/98	1/28/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Pentachlorophenol	EPA 3550A	SIM	600	10	12/12/98	1/28/99	ND	
Phenanthrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	1200	
Anthracene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	230	
Di-n-butyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Fluoranthene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	3300	
Pyrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	2600	
Butyl Benzyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	1700	
Chrysene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	1800	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	330	
Di-n-octyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	2300	
Benzo(k)fluoranthene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	1300	
Benzo(a)pyrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	2000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	2600	
Dibenz(a,h)anthracene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	310	
Benzo(g,h,i)perylene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	960	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-39	Units:	ug/Kg (ppb)
Lab Code:	K9807169-004RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	120	20	12/12/98	1/28/99	ND	
2-Methylphenol	EPA 3550A	SIM	120	20	12/12/98	1/28/99	ND	
4-Methylphenol	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	120	20	12/12/98	1/28/99	ND	
Naphthalene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
Benzoic Acid	EPA 3550A	SIM	2000	20	12/12/98	1/28/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
Acenaphthylene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
Acenaphthene	EPA 3550A	SIM	200	20	12/12/98	1/28/99	360	
Dibenzofuran	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
Fluorene	EPA 3550A	SIM	200	20	12/12/98	1/28/99	260	
Diethyl Phthalate	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	240	20	12/12/98	1/28/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
Pentachlorophenol	EPA 3550A	SIM	1200	20	12/12/98	1/28/99	ND	
Phenanthrene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	2500	
Anthracene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	460	
Di-n-butyl Phthalate	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
Fluoranthene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	6000	
Pyrene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	4600	
Butyl Benzyl Phthalate	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	3400	
Chrysene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	3700	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	200	20	12/12/98	1/28/99	250	
Di-n-octyl Phthalate	EPA 3550A	SIM	400	20	12/12/98	1/28/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	4600	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	2500	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	4100	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	5000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	630	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	12/12/98	1/28/99	1800	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-38	Units:	ug/Kg (ppb)
Lab Code:	K9807169-005RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	12/12/98	1/28/99	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	12/12/98	1/28/99	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	12/12/98	1/28/99	ND	
Naphthalene	EPA 3550A	SIM	500	50	12/12/98	1/28/99	680	
Benzoic Acid	EPA 3550A	SIM	5000	50	12/12/98	1/28/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	
Acenaphthylene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	3500	
Dibenzofuran	EPA 3550A	SIM	500	50	12/12/98	1/28/99	900	
Fluorene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	2200	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	12/12/98	1/28/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	12/12/98	1/28/99	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	20000	
Anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	3700	
Di-n-butyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	45000	E
Pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	35000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	26000	
Chrysene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	26000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	36000	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	19000	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	31000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	38000	E
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	4900	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	12/12/98	1/28/99	13000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

E Estimated concentration; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-44	Units:	ug/Kg (ppb)
Lab Code:	K9807169-006RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
Naphthalene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzoic Acid	EPA 3550A	SIM	5000	50	12/12/98	1/15/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Acenaphthylene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Dibenzofuran	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Fluorene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	12/12/98	1/15/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	12/12/98	1/15/99	ND	
Phenanthrene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	820	
Anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1700	
Pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1400	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	660	
Chrysene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	670	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	710	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzo(a)pyrene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	690	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	900	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-43	Units:	ug/Kg (ppb)
Lab Code:	K9807169-007RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
Naphthalene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzoic Acid	EPA 3550A	SIM	5000	50	12/12/98	1/15/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Acenaphthylene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Dibenzofuran	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Fluorene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	12/12/98	1/15/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	12/12/98	1/15/99	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1200	
Pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1100	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	670	
Chrysene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	690	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	820	
Benzo(k)fluoranthene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	520	
Benzo(a)pyrene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	790	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1100	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-42	Units:	ug/Kg (ppb)
Lab Code:	K9807169-008RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
Naphthalene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzoic Acid	EPA 3550A	SIM	5000	50	12/12/98	1/15/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Acenaphthylene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Acenaphthene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	710	
Dibenzofuran	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Fluorene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	12/12/98	1/15/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	12/12/98	1/15/99	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	4600	
Anthracene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	960	
Di-n-butyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	15000	
Pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	13000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	9100	
Chrysene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	9000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	11000	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	8200	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	13000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	14000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1400	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	5600	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-41	Units:	ug/Kg (ppb)
Lab Code:	K9807169-009RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
Naphthalene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzoic Acid	EPA 3550A	SIM	5000	50	12/12/98	1/15/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Acenaphthylene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1500	
Dibenzofuran	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Fluorene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	670	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	12/12/98	1/15/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	12/12/98	1/15/99	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	8200	
Anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	2000	
Di-n-butyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	25000	
Pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	22000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	17000	
Chrysene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	16000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	20000	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	14000	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	23000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	28000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	2900	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	11000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C C Hermes Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-REF-B	Units:	ug/Kg (ppb)
Lab Code:	K9807169-010RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	12/12/98	1/15/99	ND	
Naphthalene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzoic Acid	EPA 3550A	SIM	5000	50	12/12/98	1/15/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Acenaphthylene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Dibenzofuran	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Fluorene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	12/12/98	1/15/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	12/12/98	1/15/99	ND	
Phenanthrene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	560	
Anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1700	
Pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1500	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1100	
Chrysene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1100	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1200	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1000	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1500	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	1800	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	12/12/98	1/15/99	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	500	50	12/12/98	1/15/99	740	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-REF-C	Units:	ug/Kg (ppb)
Lab Code:	K9807169-011RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/14/98	1/13/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/14/98	1/13/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/14/98	1/13/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	12/14/98	1/13/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Fluorene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/14/98	1/13/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/14/98	1/13/99	ND	
Phenanthrene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Anthracene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Fluoranthene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	23	
Pyrene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	24	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Chrysene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 28 1999

07169SVM.AY3 - 11RE 1/28/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-19	Units:	ug/Kg (ppb)
Lab Code:	K9807169-013RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	600	100	12/12/98	1/28/99	ND	
2-Methylphenol	EPA 3550A	SIM	600	100	12/12/98	1/28/99	ND	
4-Methylphenol	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	600	100	12/12/98	1/28/99	ND	
Naphthalene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	3400	
Benzoic Acid	EPA 3550A	SIM	10000	100	12/12/98	1/28/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	
Acenaphthylene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	
Acenaphthene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	16000	
Dibenzofuran	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	2400	
Fluorene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	6700	
Diethyl Phthalate	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	1200	100	12/12/98	1/28/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	
Pentachlorophenol	EPA 3550A	SIM	6000	100	12/12/98	1/28/99	ND	
Phenanthrene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	56000	
Anthracene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	17000	
Di-n-butyl Phthalate	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	12/12/98	1/28/99	170000	E
Pyrene	EPA 3550A	SIM	4000	200	12/12/98	1/28/99	150000	E
Butyl Benzyl Phthalate	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	4000	200	12/12/98	1/28/99	130000	
Chrysene	EPA 3550A	SIM	4000	200	12/12/98	1/28/99	110000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	4000	200	12/12/98	1/28/99	160000	E
Benzo(b)fluoranthene	EPA 3550A	SIM	4000	200	12/12/98	1/28/99	92000	
Benzo(k)fluoranthene	EPA 3550A	SIM	4000	200	12/12/98	1/28/99	160000	E
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	12/12/98	1/28/99	190000	E
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	20000	
Benzo(g,h,i)perylene	EPA 3550A	SIM	2000	100	12/12/98	1/28/99	54000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.
E Estimated concentration; see case narrative.
H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-20	Units:	ug/Kg (ppb)
Lab Code:	K9807169-014RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	600	100	12/14/98	1/15/99	ND	
2-Methylphenol	EPA 3550A	SIM	600	100	12/14/98	1/15/99	ND	
4-Methylphenol	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	600	100	12/14/98	1/15/99	ND	
Naphthalene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Benzoic Acid	EPA 3550A	SIM	10000	100	12/14/98	1/15/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Acenaphthylene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Acenaphthene	EPA 3550A	SIM	1000	100	12/14/98	1/15/99	1900	
Dibenzofuran	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Fluorene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Diethyl Phthalate	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	1200	100	12/14/98	1/15/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Pentachlorophenol	EPA 3550A	SIM	6000	100	12/14/98	1/15/99	ND	
Phenanthrene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	8800	
Anthracene	EPA 3550A	SIM	1000	100	12/14/98	1/15/99	2000	
Di-n-butyl Phthalate	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Fluoranthene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	28000	
Pyrene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	25000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	17000	
Chrysene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	17000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	22000	
Benzo(k)fluoranthene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	16000	
Benzo(a)pyrene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	26000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	29000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	2800	
Benzo(g,h,i)perylene	EPA 3550A	SIM	2000	100	12/14/98	1/15/99	12000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-30	Units:	ug/Kg (ppb)
Lab Code:	K9807169-017RE	Basis:	Dry
Test Notes:	H		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	60	10	12/12/98	1/28/99	ND	
2-Methylphenol	EPA 3550A	SIM	60	10	12/12/98	1/28/99	ND	
4-Methylphenol	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	60	10	12/12/98	1/28/99	ND	
Naphthalene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benzoic Acid	EPA 3550A	SIM	1000	10	12/12/98	1/28/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Acenaphthylene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Acenaphthene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	290	
Dibenzofuran	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Fluorene	EPA 3550A	SIM	100	10	12/12/98	1/28/99	160	
Diethyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	120	10	12/12/98	1/28/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Pentachlorophenol	EPA 3550A	SIM	600	10	12/12/98	1/28/99	ND	
Phenanthrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	1600	
Anthracene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	380	
Di-n-butyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Fluoranthene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	4200	
Pyrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	4000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	2700	
Chrysene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	2500	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	330	
Di-n-octyl Phthalate	EPA 3550A	SIM	200	10	12/12/98	1/28/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	3100	
Benzo(k)fluoranthene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	1900	
Benzo(a)pyrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	3500	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	4100	
Dibenz(a,h)anthracene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	490	
Benzo(g,h,i)perylene	EPA 3550A	SIM	200	10	12/12/98	1/28/99	1500	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: C C Harris Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9804280-4	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/12/98	1/19/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/12/98	1/19/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/12/98	1/19/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	12/12/98	1/19/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Fluorene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/12/98	1/19/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/12/98	1/19/99	ND	
Phenanthrene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Anthracene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Fluoranthene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Pyrene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Chrysene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	12/12/98	1/19/99	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9804290-2	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	12/14/98	1/13/99	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	12/14/98	1/13/99	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	12/14/98	1/13/99	ND	
Naphthalene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	12/14/98	1/13/99	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Acenaphthene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Fluorene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	12/14/98	1/13/99	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	12/14/98	1/13/99	ND	
Phenanthrene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Anthracene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Fluoranthene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Pyrene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Chrysene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	12/14/98	1/13/99	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: C Vennes Date: JAN 28 1999

07169SVM.AT3 - MB 1/28/99

APPENDIX A

LABOTATORY

QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ent:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Duplicate Summary
Total Solids

Prep Method: NONE
Analysis Method: 160.3M
Test Notes:

Units: PERCENT
Basis: WET

Sample Name	Lab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
HC-S-18	K9807169-012DUP	10/21/98	47.0	47.5	47.3	<1	

Approved By: JC Date: 10/23/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ent: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
Sample Matrix: Sediment

Service Request: K9807169
Date Collected: 10/15/98
Date Received: 10/16/98

Duplicate Summary
Solids, Total Volatile

Prep Method: NONE
Analysis Method: 160.4M
Test Notes:

Units: PERCENT
Basis: WET

Sample Name	Lab Code	Date Analyzed	Sample Result	Triplicate Sample Result	Average	Relative Percent Difference	Result Notes
HC-S-36	K9807169-001DUP	10/21/98	2.30	2.66	2.48	15	

Approved By: JC Date: 10/23/98

Total Solids/060595
07169ICP.AB1 - TVS DUP 10/23/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	NA
		Date Analyzed:	10/23,28/98

Duplicate Summary
Inorganic Parameters

Sample Name: HC-S-36 Basis: Dry
Lab Code: K9807169-001DUP
Test Notes:

Analyte	Units	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	12.2	12.3	12.2	< 1	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	5.1	13.8	9.4	93	A
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	0.69	0.68	0.68	1	

A Outside acceptance limits; see case narrative.

Approved By: _____ Date: 2/1/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

[redacted]t:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	NA
		Date Analyzed:	10/23,28/98

Matrix Spike Summary
Inorganic Parameters

Sample Name: HC-S-36 Basis: Dry
Lab Code: K9807169-001MS
Test Notes:

Analyte	Units	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	474	12.2	520	107	75-125	
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	327	5.1	122	36	60-130	A
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.05	3.90	0.69	4.29	92	75-125	

A Outside acceptance limits; see case narrative.

Approved By: _____ Date: 11/24/98

MS/072898p
07169WET.LJ1 - MS 11/24/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

.nt:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	NA
		Date Analyzed:	10/23/98

Matrix Spike/Duplicate Matrix Spike Summary
Inorganic Parameters

Sample Name: HC-S-36 Basis: Dry
Lab Code: K9807169-001MS, K9807169-001DMS
Test Notes:

				Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent	
Analyte	**Units**	**Analysis Method**	**MRL**	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**	**Result Notes**
Sulfide, Total	mg/Kg (ppm	PSEP	0.7	327	332	5.1	122	210	36	62	60-130	53	

Approved By: _____ Date: 11/24/98

DMS/072898_07169WET.LJ1 - DMS 11/24/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

nt:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	NA
		Date Analyzed:	11/14/98

Duplicate Summary
Inorganic Parameters

Sample Name: HC-S-36
Lab Code: K9807169-001DUPR
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	7.1	7.3	7.2	3	

Approved By: _____ Date: 11/24/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ent:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	NA
		Date Analyzed:	11/14/98

Matrix Spike Summary
Inorganic Parameters

Sample Name: HC-S-36
Lab Code: K9807169-001MSR
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	mg/Kg (ppm)	PSEP	0.7	398	7.1	366	90	60-130	

Approved By: _____ Date: 11/24/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

...ent:	Hart Crowser, Inc.	**Service Request:**	K9807169
...oject:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	NA
		Date Analyzed:	11/14/98

Matrix Spike/Duplicate Matrix Spike Summary
Inorganic Parameters

Sample Name: HC-S-36 Basis: Dry
Lab Code: K9807169-001MSR K9807169-001DMSR
Test Notes:

Analyte	Units	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Sulfide, Total	mg/Kg (ppm	PSEP	0.7	366	277	7.1	366	277	90	98	60-130	9	

Approved By: _____ Date: 11/24/98

DMS/072898D07169WET.LJ1 - DMS2 11/24/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

nt:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	10/22-28/98

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name: Lab Control Sample
Lab Code: K9807169-LCS
Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes	CLP Qual.
Carbon, Total Organic	PERCENT	ASTM D4129-82M	0.62	0.62	100	85-115		

Approved By: _____ Date: 2/11/99

LCS/072898p
07169WET.LJ1 - LCS (2) 12/18/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

nt:	Hart Crowser, Inc.	**Service Request:**	K9807169
ject:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	10/22-28/98

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name: Lab Control Sample
Lab Code: K9807169-LCS
Test Notes:

Basis: NA

Analyte	Units	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Ammonia as Nitrogen	mg/L (ppm)	350.1M	4.04	4.02	100	85-115	
Sulfide, Total	mg/L (ppm)	PSEP	0.89	0.92	103	60-130	

Approved By: _____ Date: 11/24/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	10/23/98

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name:	Lab Control Sample	Basis:	NA
Lab Code:	K9807169-LCS		
Test Notes:			

Analyte	Units	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	mg/L (ppm)	PSEP	0.93	1.89	203	60-130	A

A Outside acceptance limits; see case narrative.

Approved By: _____ Date: 11/24/98

LCS/072898p
07169WET.LJ1 - LCS2 11/24/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

t:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	11/14/98

Laboratory Control Sample Summary
Inorganic Parameters

Sample Name: Lab Control Sample
Lab Code: K9807169-LCS
Test Notes:

Basis: NA

Analyte	Units	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	mg/L (ppm)	PSEP	0.96	0.83	86	60-130	

Approved By: _____ Date: 11/24/98

LCS/072898p
07169WET.LJ1 - LCS3 11/24/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06

Service Request: K9807169
Date Collected: NA
Date Received: NA
Date Analyzed: 10/23/98

Ammonia as Nitrogen
EPA Method 350.1
Units: mg/L (ppm)

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	2.00	2.06	103
CCV 2 Result	2.00	1.99	100
CCV 3 Result	2.00	2.05	102
CCV 4 Result	2.00	2.04	102
CCV 5 Result	2.00	2.07	102

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 4 Result	0.05	ND
CCB 5 Result	0.05	ND

Approved By: _____ Date: 11/24/98

COMBOQCD/042695

Q-CCV.XLT

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06

Service Request: K9807169
Date Collected: NA
Date Received: NA
Date Analyzed: 10/22-11/14/98

Sulfide, Total
PSEP
Units: mg/L (ppm)

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	0.44	0.45	102
CCV 2 Result	0.44	0.44	100
CCV 3 Result	0.44	0.44	100
CCV 1 Result	0.46	0.45	98
CCV 2 Result	0.46	0.45	98
CCV 3 Result	0.46	0.45	98
CCV 4 Result	0.46	0.45	98

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 4 Result	0.05	ND

Approved By: _____ Date: 11/24/98

COMBOQCD/042695

Q-CCV.XLT

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06

Service Request: K9807169
Date Collected: NA
Date Received: NA
Date Analyzed: 10/28/98

Carbon, Total Organic
ASTM D4129-82M
Units: mg/Kg (ppm)
Dry Weight Basis

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	20.0	19.6	98
CCV 2 Result	20.0	19.0	95
CCV 3 Result	20.0	18.9	95

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND

Approved By: _____ Date: 11/24/98

COMBOQCD/042695

Q-CCV.XLT

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
Sample Matrix: Sediment

Service Request: K9807169
Date Collected: 10/15/98
Date Received: 10/16/98
Date Extracted: 10/28/98
Date Analyzed: 11/4/98

Duplicate Summary
Total Metals

Sample Name: HC-S-34
Lab Code: K9807169-002
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Antimony	EPA 3050B	200.8	0.2	0.2	0.3	0.2	50	
Arsenic	EPA 3050B	200.8	2	5	5	5	<1	
Cadmium	EPA 3050B	200.8	0.1	1.1	1	1	10	
Chromium	EPA 3050B	200.8	0.3	23.4	23.1	23.2	1	
Copper	EPA 3050B	200.8	0.5	37.1	39.5	38.3	6	
Lead	EPA 3050B	200.8	0.1	153	199	176	26	
Mercury	7471A	7471A	0.02	0.20	0.23	0.2	15	
Nickel	EPA 3050B	200.8	1	24	25	24	4	
Silver	EPA 3050B	200.8	0.1	0.4	0.4	0.4	<1	
Zinc	EPA 3050B	200.8	2	376	286	331	27	

Approved By: _____ Date: 11/5/98

DUP/031695

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	10/28/98
		Date Analyzed:	11/4/98

Matrix Spike Summary
Total Metals

Sample Name:	HC-S-34	Units:	mg/Kg (ppm)
Lab Code:	K9807169-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Antimony	EPA 3050B	200.8	0.2	100	0.2	19.2	19	30-120	A
Arsenic	EPA 3050B	200.8	2	40	5	35	75	60-130	
Cadmium	EPA 3050B	200.8	0.1	10	1.1	9.2	81	60-130	
Chromium	EPA 3050B	200.8	0.3	40	23.4	57.3	85	60-130	
Copper	EPA 3050B	200.8	0.5	50	37.1	78.9	84	60-130	
Lead	EPA 3050B	200.8	0.1	100	153	260	107	60-130	
Mercury	7471A	7471A	0.02	0.6	0.2	0.86	110	60-130	
Nickel	EPA 3050B	200.8	1	100	24	102	78	60-130	
Silver	EPA 3050B	200.8	0.1	10	0.4	7.4	70	60-130	
Zinc	EPA 3050B	200.8	2	100	376	374	NA	60-130	

A	Outside acceptance limits; see case narrative
NA	Not Applicable; see case narrative.

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
LCS Matrix: Soil

Service Request: K9807169
Date Collected: NA
Date Received: NA
Date Extracted: 10/28/98
Date Analyzed: 11/4/98

Laboratory Control Sample Summary
Total Metals

Sample Name: Laboratory Control Sample
Lab Code: K9807169-LCS
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Source: Environmental Resource Associates #238

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Antimony	EPA 3050A	200.8	59.6	58.6	98	20-180	
Arsenic	EPA 3050A	200.8	82.4	65.1	79	62-138	
Cadmium	EPA 3050A	200.8	94.3	64.1	68	55-144	
Chromium	EPA 3050A	200.8	97.8	71.2	73	69-131	
Copper	EPA 3050A	200.8	81.3	58.9	72	62-138	
Lead	EPA 3050A	200.8	190	144	76	60-140	
Mercury	7471A	7471A	1.34	1.16	87	49-151	
Nickel	EPA 3050A	200.8	164	112	68	67-133	
Silver	EPA 3050A	200.8	113	107	95	65-134	
Zinc	EPA 3050A	200.8	131	74.6	57	56-144	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
Sample Matrix: Water

Service Request: K9807169
Date Collected: 10/15/98
Date Received: 10/16/98
Date Extracted: 10/28/98
Date Analyzed: 11/4/98

Duplicate Summary
Total Metals

Sample Name: HC-WS-01-M
Lab Code: K9807169-018
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Antimony	CLFAA	200.8	0.02	0.05	0.05	0.05	<1	
Arsenic	CLFAA	200.8	0.5	0.6	0.6	0.6	<1	
Cadmium	CLFAA	200.8	0.02	ND	ND	ND	-	
Chromium	CLFAA	200.8	0.2	0.5	0.4	0.4	25	
Copper	CLFAA	200.8	0.1	2	1.8	1.9	11	
Lead	CLFAA	200.8	0.02	2.85	2.93	2.89	3	
Mercury	7471A	7471A	0.5	ND	ND	ND	-	
Nickel	CLFAA	200.8	0.2	0.7	0.7	0.7	<1	
Silver	CLFAA	200.8	0.02	ND	ND	ND	-	
Thallium	CLFAA	200.8	0.02	0.03	0.02	0.02	50	
Zinc	CLFAA	200.8	0.5	5.2	5.2	5.2	<1	

Approved By: _____ Date: 11/5/98

DUP/031695

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
Sample Matrix: Water

Service Request: K9807169
Date Collected: 10/15/98
Date Received: 10/16/98
Date Extracted: 10/28/98
Date Analyzed: 11/4/98

Matrix Spike Summary
Total Metals

Sample Name: HC-WS-01-M
Lab Code: K9807169-018
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Antimony	CLFAA	200.8	0.02	20	0.05	20.7	103	75-125	
Arsenic	CLFAA	200.8	0.5	20	0.6	21.7	106	75-125	
Cadmium	CLFAA	200.8	0.02	20	ND	21	105	75-125	
Chromium	CLFAA	200.8	0.2	20	0.5	20.9	102	75-125	
Copper	CLFAA	200.8	0.1	20	2	22.1	100	75-125	
Lead	CLFAA	200.8	0.02	20	2.85	24.1	106	75-125	
Mercury	7471A	7471A	0.5	1	ND	0.9	90	60-130	
Nickel	CLFAA	200.8	0.2	20	0.7	21.1	102	75-125	
Silver	CLFAA	200.8	0.02	20	ND	20.1	100	75-125	
Thallium	CLFAA	200.8	0.02	20	0.03	21.4	107	75-125	
Zinc	CLFAA	200.8	0.5	20	5.2	26.1	104	75-125	

Approved By: _____ Date: 11/5/98

MS/031695
07169ICP.EA2 - Spike 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	10/28/98
		Date Analyzed:	11/4/98

Laboratory Control Sample Summary
Total Metals

Sample Name:	Laboratory Control Sample	Units:	ug/L (ppb)
Lab Code:	K9807169-LCS	Basis:	NA
Test Notes:			

Source: Inorganic Ventures

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Antimony	CLFAA	200.8	20	20.8	104	85-115	
Arsenic	CLFAA	200.8	20	21.2	106	85-115	
Cadmium	CLFAA	200.8	20	21.0	105	85-115	
Chromium	CLFAA	200.8	20	20.7	104	85-115	
Copper	CLFAA	200.8	20	20.6	103	85-115	
Lead	CLFAA	200.8	20	21.2	106	85-115	
Mercury	7471A	7471A	5.0	4.85	97	85-115	
Nickel	CLFAA	200.8	20	20.5	103	85-115	
Silver	CLFAA	200.8	20	20.5	103	85-115	
Thallium	CLFAA	200.8	20	21.2	106	85-115	
Zinc	CLFAA	200.8	20	20.9	105	85-115	

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807169
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Initial Calibration Verification (ICV) Summary
Metals
Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Antimony	200.8	50.0	50.0	100
Arsenic	200.8	50.0	51.3	103
Cadmium	200.8	25.0	25.8	103
Chromium	200.8	20.0	20.6	103
Copper	200.8	25.0	25.8	103
Lead	200.8	50.0	51.6	103
Mercury	7471A	5.0	5.21	104
Nickel	200.8	50.0	50.0	100
Silver	200.8	25.0	25.2	101
Thallium	200.8	50.0	50.7	101
Zinc	200.8	50.0	50.8	102

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807169
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Initial Calibration Verification (ICV) Summary
Metals
Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Antimony	200.8	50.0	50.6	101
Arsenic	200.8	50.0	53.0	106
Cadmium	200.8	25.0	26.4	106
Chromium	200.8	20.0	21.0	105
Copper	200.8	25.0	26.0	104
Lead	200.8	50.0	52.5	105
Mercury	7471A	5.0	5.06	101
Nickel	200.8	50.0	51.4	103
Silver	200.8	25.0	25.3	101
Thallium	200.8	50.0	53.3	107
Zinc	200.8	50.0	52.0	104

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ient: Hart Crowser, Inc.
roject: Port of Portland Terminal 4/5624

Service Request: K9807169
Date Analyzed: 11/3/98

Continuing Calibration Verification (CCV) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery	CCV3 Result	Percent Recovery
Antimony	200.8	25.0	24.8	99	25.2	101	24.7	99
Arsenic	200.8	25.0	25.0	100	24.8	99	24.8	99
Cadmium	200.8	25.0	24.8	99	25.2	101	24.8	99
Chromium	200.8	25.0	25.1	100	24.9	100	25.1	100
Copper	200.8	25.0	24.9	100	25.0	100	24.5	98
Lead	200.8	25.0	25.0	100	25.5	102	25.1	100
Mercury	7471A	5.0	5.06	101	5.08	102	5.23	105
Nickel	200.8	25.0	25.0	100	25.2	101	24.7	99
Silver	200.8	25.0	24.8	99	25.1	100	24.9	100
allium	200.8	25.0	25.2	101	26.1	104	25.0	100
nc	200.8	25.0	25.2	101	25.1	100	24.9	100

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807169
Date Analyzed: 11/3/98

Continuing Calibration Verification (CCV) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV4 Result	Percent Recovery	CCV5 Result	Percent Recovery	CCV6 Result	Percent Recovery
Antimony	200.8	25.0	24.4	98	24.7	99	24.9	100
Arsenic	200.8	25.0	25.1	100	24.7	99	25.1	100
Cadmium	200.8	25.0	24.6	98	24.8	99	24.9	100
Chromium	200.8	25.0	24.9	100	25.2	101	25.0	100
Copper	200.8	25.0	24.7	99	24.9	100	24.9	100
Lead	200.8	25.0	25.5	102	25.4	102	24.9	100
Mercury	7471A	5.0	5.05	101	5.01	100	5.09	102
Nickel	200.8	25.0	24.8	99	24.9	100	24.9	100
Silver	200.8	25.0	24.7	99	24.7	99	25.1	100
Thallium	200.8	25.0	25.4	102	25.3	101	25.1	100
Zinc	200.8	25.0	25.1	100	25.3	101	25.1	100

Approved By: _____ Date: 11/5/98

CCV 1-3/042795
07169ICP.EA1 - CCV 1-3 (2) 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807169
Date Analyzed: 11/3/98

Continuing Calibration Verification (CCV) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV7 Result	Percent Recovery	CCV8 Result	Percent Recovery
Antimony	200.8	25.0	24.6	98	24.7	99
Arsenic	200.8	25.0	25.6	102	26.3	105
Cadmium	200.8	25.0	24.2	97	24.4	98
Chromium	200.8	25.0	24.0	96	24.8	99
Copper	200.8	25.0	24.4	98	24.5	98
Lead	200.8	25.0	25.1	100	25.1	100
Mercury	7471A	5.0	-	-	-	-
Nickel	200.8	25.0	24.3	97	24.1	96
Silver	200.8	25.0	24.2	97	24.2	97
Thallium	200.8	25.0	25.1	100	25.3	101
Zinc	200.8	25.0	25.2	101	25.7	103

Approved By: _____ Date: 11/5/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807169
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Blank (CCB) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Antimony	200.8	0.02	ND	ND	ND	ND
Arsenic	200.8	0.5	ND	ND	ND	ND
Cadmium	200.8	0.02	ND	ND	ND	ND
Chromium	200.8	0.06	ND	ND	ND	ND
Copper	200.8	0.1	ND	ND	ND	ND
Lead	200.8	0.02	ND	ND	ND	ND
Mercury	7471A	0.001	ND	ND	ND	ND
Nickel	200.8	0.2	ND	ND	ND	ND
Silver	200.8	0.02	ND	ND	ND	ND
Thallium	200.8	0.02	ND	ND	ND	ND
Zinc	200.8	0.5	ND	ND	ND	ND

Approved By: _____ Date: 11/5/98

CCB4SMRL/102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807169
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Blank (CCB) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB5 Result	CCB6 Result	CCB7 Result	CCB8 Result
Antimony	200.8	0.02	ND	ND	ND	ND
Arsenic	200.8	0.5	ND	ND	ND	ND
Cadmium	200.8	0.02	ND	ND	ND	ND
Chromium	200.8	0.06	ND	ND	ND	ND
Copper	200.8	0.1	ND	ND	ND	ND
Lead	200.8	0.02	ND	ND	ND	ND
Mercury	7471A	0.001	ND	ND	-	-
Nickel	200.8	0.2	ND	ND	ND	ND
Silver	200.8	0.02	ND	ND	ND	ND
Thallium	200.8	0.02	ND	ND	ND	ND
Zinc	200.8	0.5	ND	ND	ND	ND

Approved By: _____ Date: 11/5/98

CCB4SMRL/102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
Sample Matrix: Sediment

Service Request: K9807169
Date Collected: 10/15/98
Date Received: 10/16/98
Date Extracted: 10/28/98
Date Analyzed: 11/3-4/989

Surrogate Recovery Summary
Northwest TPH-Dx

Prep Method: EPA 3550B
Analysis Method: NWTPH-Dx

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery o-Terphenyl	Percent Recovery Chlorohexadecane
HC-S-36	K9807169-001		94	93
HC-S-34	K9807169-002		92	96
HC-S-40	K9807169-003		67	69
HC-S-39	K9807169-004		90	92
HC-S-38	K9807169-005		85	87
HC-S-44	K9807169-006		88	92
HC-S-43	K9807169-007		84	87
HC-S-42	K9807169-008		86	88
HC-S-41	K9807169-009		84	85
HC-S-18	K9807169-012		86	89
HC-S-19	K9807169-013		83	118
HC-S-20	K9807169-014		82	89
HC-S-21	K9807169-015		82	87
HC-S-31	K9807169-016		85	88
HC-S-30	K9807169-017		82	84
HC-S-36	K9807169-001Dup		89	90
HC-S-36	K9807169-001MS		83	75
Method Blank	K981028-MB		90	91
Lab Control Sample	K981028-LCS		95	94
Lab Control Sample	K981028-LCS2		91	92
Lab Control Sample	K981028-LCS3		93	89
CAS Acceptance Limits:			50-150	50-150

Approved By: _____ Date: 11/12/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
Sample Matrix: Sediment

Service Request: K9807169
Date Collected: 10/15/98
Date Received: 10/16/98
Date Extracted: 10/28/98
Date Analyzed: 11/3-4/98

Duplicate Summary
Northwest TPH-Dx

Sample Name: HC-S-36
Lab Code: K9807169-001Dup
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	<100	<100	<100	<1	
Lube Oil	EPA 3550B	NWTPH-Dx	100	160	160	160	<1	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	<100	<100	<100	<1	
Pristane	EPA 3550B	NWTPH-Dx	0.5	ND	0.6	NC	NC	
Phytane	EPA 3550B	NWTPH-Dx	0.5	ND	ND	ND	<1	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	0.5	0.5	0.5	<1	

Approved By: _____ Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	10/28/98
		Date Analyzed:	11/3-4/98

Matrix Spike Summary
Northwest TPH-Dx

Sample Name:	HC-S-36	Units:	mg/Kg (ppm)
Lab Code:	K9807169-001MS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1400	<100	510	36	50-150	A
Lube Oil	EPA 3550B	NWTPH-Dx	100	1400	160	570	29	50-150	A

A Outside acceptance limits; see case narrative.

Approved By: _____ Date: 11/12/98

MS/020597p
07169PHC_JW1 - MS 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/28/98
		Date Analyzed:	11/3/98

Laboratory Control Sample Summary
Northwest TPH-Dx

Sample Name:	Lab Control Sample	Units:	mg/Kg (ppm)
Lab Code:	K981028-LCS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	1000	320	32	50-150	A
Lube Oil	EPA 3550B	NWTPH-Dx	1000	320	32	50-150	A

A Outside acceptance limits; see case narrative.

Approved By: _____ Date: 11/12/98

LCS/020597p
07169PHC.JW1 - LCS 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
LCS Matrix: Sediment

Service Request: K9807169
Date Collected: NA
Date Received: NA
Date Extracted: 10/28/98
Date Analyzed: 11/3/98

Laboratory Control Sample Summary
Northwest TPH-Dx

Sample Name: Lab Control Sample
Lab Code: K981028-LCS2
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Pencil Pitch	EPA 3550B	NWTPH-Dx	260	220	85	50-150	

Approved By: _____ Date: 11/12/98

LCS/020597p
07169PHC.JW1 - LCS (Z) 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
LCS Matrix: Sediment

Service Request: K9807169
Date Collected: NA
Date Received: NA
Date Extracted: 10/28/98
Date Analyzed: 11/3/98

Laboratory Control Sample Summary
Northwest TPH-Dx

Sample Name: Lab Control Sample
Lab Code: K981028-LCS3
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	1000	980	98	50-150	
Pencil Pitch	EPA 3550B	NWTPH-Dx	260	270	104	50-150	

Approved By: _____ Date: 11/12/98

LCS/020597p
07169PHC.JW1 - LCS (3) 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	12/9/98
		Date Analyzed:	12/24/98

Surrogate Recovery Summary
Organochlorine Pesticides

Prep Method:	EPA 3550A		Units:	PERCENT
Analysis Method:	8081A		Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			Tetrachloro-m-xylene	Decachlorobiphenyl
HC-S-36	K9807169-001		75	NA
HC-S-39	K9807169-004		63	74
HC-S-43	K9807169-007		63	65
HC-S-36	K9807169-001MS		72	65
HC-S-36	K9807169-001DMS		71	95
Lab Control Sample	KWG9804237-3		82	95
Method Blank	KWG9804237-4		86	104

CAS Acceptance Limits:	20-107	20-142

NA Not Applicable; see case narrative.

Approved By: Wanda Neuneker Date: 1-7-99

SUR2/111397p
07169SVG.BJ1 - SUR2 1/7/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

[redacted]:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	12/9/98
		Date Analyzed:	12/24/98

Matrix Spike/Duplicate Matrix Spike Summary
Organochlorine Pesticides

Sample Name: HC-S-36
Lab Code: K9807169-001MS, K9807169-001DMS
Test Notes:

Units: ug/Kg (ppb)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
gamma-BHC (Lindane)	EPA 3550A	8081A	20	13	13	ND	9	10	69	77	20-141	11	
Heptachlor	EPA 3550A	8081A	20	13	13	ND	10	10	77	77	20-108	<1	
Aldrin	EPA 3550A	8081A	20	13	13	ND	10	10	77	77	20-181	<1	
Dieldrin	EPA 3550A	8081A	20	13	13	ND	10	10	77	77	20-183	<1	
Endrin	EPA 3550A	8081A	20	13	13	ND	10	10	77	77	20-164	<1	
[redacted]DT	EPA 3550A	8081A	20	13	13	ND	10	10	77	77	20-185	<1	

Approved By: Linda Neuneker Date: 1-7-99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	12/9/98
		Date Analyzed:	12/24/98

Laboratory Control Sample Summary
Organochlorine Pesticides

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9804237-3	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
gamma-BHC (Lindane)	EPA 3550A	8081A	13	12	92	21-123	
Heptachlor	EPA 3550A	8081A	13	11	85	31-112	
Aldrin	EPA 3550A	8081A	13	11	85	26-127	
Dieldrin	EPA 3550A	8081A	13	14	108	18-161	
Endrin	EPA 3550A	8081A	13	10	77	32-135	
4,4'-DDT	EPA 3550A	8081A	13	15	115	30-146	

Approved By: Wanda Neuenkes Date: 1-7-99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06

Service Request: K9807169
Calibration Date: 11/14/98
Date Analyzed: 12/24/98

Continuing Calibration Verification (CCV) Summary
Organochlorine Pesticides
EPA Method 8081A
Units: ng/mL (ppb)

Analyte	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery
alpha-BHC	50	50	100	52	104
beta-BHC	50	48	96	51	102
gamma-BHC (Lindane)	50	52	104	53	106
delta-BHC	50	48	96	51	102
Heptachlor	50	54	108	55	110
Aldrin	50	51	102	52	104
Heptachlor Epoxide	50	52	104	53	106
gamma-Chlordane	50	53	106	51	102
Endosulfan I	50	55	110	48	96
alpha-Chlordane	50	56	112	52	104
Dieldrin	50	51	102	51	102
4,4'-DDE	50	51	102	52	104
Endrin	50	55	110	60	120
Endosulfan II	50	50	100	50	100
4,4'-DDD	50	51	102	51	102
Endrin Aldehyde	50	51	102	50	100
Endosulfan Sulfate	50	53	106	45	90
4,4'-DDT	50	57	114	56	112
Endrin Ketone	50	55	110	53	106
Methoxychlor	50	57	114	57	114
Toxaphene	1000	1070	107	966	97

Approved By: Wanda Neuneker Date: 1-7-99

CCV 1-4/102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06

Service Request: K9807169
Calibration Date: 11/14/98
Date Analyzed: 12/24/98

Continuing Calibration Blank (CCB) Summary
Organochlorine Pesticides
EPA Method 8081A
Units: ng/mL (ppb)

Analyte	MRL	CCB1 Result	CCB2 Result
alpha-BHC	5	ND	ND
beta-BHC	5	ND	ND
gamma-BHC (Lindane)	5	ND	ND
delta-BHC	5	ND	ND
Heptachlor	5	ND	ND
Aldrin	5	ND	ND
Heptachlor Epoxide	5	ND	ND
gamma-Chlordane	5	ND	ND
Endosulfan I	5	ND	ND
alpha-Chlordane	5	ND	ND
Dieldrin	5	ND	ND
4,4'-DDE	5	ND	ND
Endrin	5	ND	ND
Endosulfan II	5	ND	ND
4,4'-DDD	5	ND	ND
Endrin Aldehyde	5	ND	ND
Endosulfan Sulfate	5	ND	ND
4,4'-DDT	5	ND	ND
Endrin Ketone	5	ND	ND
Methoxychlor	5	ND	ND
Toxaphene	250	ND	

Approved By: Linda Neuneker Date: 1-7-99

L:\CCBMRL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
Sample Matrix: Sediment

Service Request: K9807169
Date Collected: 10/15/98
Date Received: 10/16/98
Date Extracted: 10/29-30/98
Date Analyzed: 10/29 - 10/31/98

Surrogate Recovery Summary
Volatile Organic Compounds by GC/MS

Prep Method: EPA 5030B
Analysis Method: 8260B

Units: PERCENT
Basis: Dry

Sample Name	Lab Code	Test Notes	Percent Recovery Dibromofluoromethane	Toluene-d8	4-Bromofluorobenzene
HC-S-36	K9807169-001		88	106	89
HC-S-34	K9807169-002		89	108	98
HC-S-40	K9807169-003		87	112 A	96
HC-S-39	K9807169-004		87	111 A	89
HC-S-38	K9807169-005		87	106	85
HC-S-44	K9807169-006		83	109	93
HC-S-43	K9807169-007		82	109	91
HC-S-42	K9807169-008		83	104	90
HC-S-41	K9807169-009		85	110 A	93
[illegible]EF-B	K9807169-010		84	102	92
[illegible]EF-C	K9807169-011		89	113 A	103
HC-S-19	K9807169-013		87	110 A	92
HC-S-20	K9807169-014		82	106	96
HC-S-30	K9807169-017		89	113 A	101
Method Blank	KWG9803744-1		86	108	98
Method Blank	KWG9803767-1		99	109	108
Lab Control Sample	KWG9803744-2		93	103	100
HC-S-38	K9807169-005MS		98	96	89
HC-S-38	K9807169-005DMS		94	98	90
CAS Acceptance Limits:			75-132	85-109	49-131

A Outside acceptance limits; see case narrative.

Approved By: Sara L. Anderson Date: 11/12/98

SUR3QC.XLT_SUR/01071998a
07169VOA.MB4 - SUR 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

C .:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	10/31/98
		Date Analyzed:	10/31/98

Matrix Spike/Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-38		Units:	ug/Kg (ppb)
Lab Code:	K9807169-005MS	K9807169-005DMS	Basis:	Dry
Test Notes:	FH			

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Percent Recovery MS	Percent Recovery DMS	Result MS	Result DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Benzene	EPA 5030B	8260B	10	110	110	ND	110	99	100	90	57-121	11	
Trichloroethene (TCE)	EPA 5030B	8260B	10	110	110	ND	110	99	100	90	45-127	11	
Toluene	EPA 5030B	8260B	10	110	110	ND	110	97	100	88	34-134	13	
1,2-Dichlorobenzene	EPA 5030B	8260B	10	110	110	ND	95	73	86	66	34-131	26	

F The MRL is elevated because of the low percent solids in the sample as received.
H The analysis was performed past the recommended hold time; see case narrative.

Approved By: Rina L. Christens Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/29/98
		Date Analyzed:	10/29/98

Laboratory Control Sample Summary
Volatile Organic Compounds by GC/MS

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9803744-2	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	EPA 5030B	8260B	50	49	98	78-116	
Trichloroethene (TCE)	EPA 5030B	8260B	50	49	98	79-119	
Toluene	EPA 5030B	8260B	50	50	100	77-118	
1,2-Dichlorobenzene	EPA 5030B	8260B	50	47	94	79-120	

POPA0008074

Approved By: Sara L. Christens Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

C t:	Hart Crowser, Inc.	Service Request:	K9807169
Project:	Port of Portland Terminal 4/5624-06	Date Collected:	10/15/98
Sample Matrix:	Water	Date Received:	10/16/98
		Date Extracted:	10/31/98
		Date Analyzed:	10/30-10/31/1998

Matrix Spike/Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS

Sample Name:	HC-RB-101		Units:	ug/L (ppb)
Lab Code:	K9807169-025MS	K9807169-025DMS	Basis:	NA
Test Notes:				

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Resu Notes
Benzene	EPA 5030B	8260B	0.5	10	10	ND	10	9.9	100	99	65-138	1	
Trichloroethene (TCE)	EPA 5030B	8260B	0.5	10	10	ND	11	8.7	110	87	58-146	13	
Toluene	EPA 5030B	8260B	0.5	10	10	0.8	11	9.7	102	88	68-135	15	
1,2-Dichlorobenzene	EPA 5030B	8260B	0.5	10	10	ND	9.7	8.6	97	86	71-121	12	

Approved By: Sara L Christensen Date: 11/12/98

SUR3QC.XLT DMS/01071998a
07169VOA.MB7 - DMS 11/12/98

POPA0008075

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	10/29/98
		Date Analyzed:	10/29/98

Laboratory Control Sample Summary
Volatile Organic Compounds by GC/MS

Sample Name:	Lab Control Sample	Units:	ug/L (ppb)
Lab Code:	KWG9803732-2	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	EPA 5030B	8260B	10	9.2	92	77-114	
Trichloroethene (TCE)	EPA 5030B	8260B	10	9.4	94	69-124	
Toluene	EPA 5030B	8260B	10	9.4	94	75-118	
1,2-Dichlorobenzene	EPA 5030B	8260B	10	8.3	83	80-108	

POPA0008076

Approved By: Jared L. Christensen Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624-06
Sample Matrix: Water

Service Request: K9807169
Date Collected: 10/15/98
Date Received: 10/16/98
Date Extracted: 10/29 - 10/31/98
Date Analyzed: 10/29 - 10/31/98

Surrogate Recovery Summary
Volatile Organic Compounds by GC/MS

Prep Method: EPA 5030B
Analysis Method: 8260B

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery		
			Dibromofluoromethane	Toluene-d8	4-Bromofluorobenze
HC-WS-01-M	K9807169-018		100	100	87
HC-WS-01-B	K9807169-019		99	98	86
HC-WS-02-M	K9807169-020		100	99	90
HC-WS-02-B	K9807169-021		101	98	88
HC-WS-03-M	K9807169-022		100	99	85
HC-WS-03-B	K9807169-023		101	99	83
HC-RB-100	K9807169-024		100	98	92
HC-RB-101	K9807169-025		101	95	92
Method Blank	KWG9803732-1		98	99	91
Method Blank	KWG9803752-3		100	96	94
Method Blank	KWG9803770-1		105	99	88
Lab Control Sample	KWG9803732-2		94	102	98
Matrix Spike	K9807169-025MS		103	101	99
Duplicate Matrix Spike	K9807169-025DMS		110	95	99
CAS Acceptance Limits:			89-111	89-111	79-126

POPA0008077

Approved By: Dana L. Christensen Date: 11/12/98

SUR3QC.XLT_SUR/01071998a
07169VOA_MB7 - SUR 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

[redacted]t:	Hart Crowser, Inc.	**Service Request:**	K9807169
[redacted]ject:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	10/27/98
		Date Analyzed:	12/5-6/98

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method:	EPA 3550A	Units:	PERCENT
Analysis Method:	SIM	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
HC-S-36	K9807169-001		44	51	53	46	58	73
HC-S-34	K9807169-002		47	56	58	51	65	78
HC-S-40	K9807169-003		51	61	61	53	75	87
HC-S-39	K9807169-004		40	47	43	40	66	79
HC-S-38	K9807169-005		48	61	65	53	63	96
HC-S-44	K9807169-006		43	53	51	45	67	78
HC-S-43	K9807169-007		34	48	49	40	64	77
HC-S-42	K9807169-008		52	62	67	54	69	93
HC-S-41	K9807169-009		45	58	66	50	58	79
HC-REF-B	K9807169-010		43	50	55	43	68	85
HC-REF-C	K9807169-011		46	43	72	48	69	90
[redacted]-19	K9807169-013		52	68	73	53	56	192 A
HC-S-20	K9807169-014		40	50	55	43	60	89
HC-S-30	K9807169-017		44	58	62	42	70	83
CAS Acceptance Limits:			31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d5
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14
A	Outside acceptance limits; see case narrative.

Approved By: CC Haines Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

C t:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	10/27/98
		Date Analyzed:	12/4-5/98

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method: EPA 3550A
Analysis Method: SIM

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
HC-S-19	K9807169-013MS		50	40	72	52	60	NA
HC-S-19	K9807169-013DMS		46	52	61	50	63	NA
Lab Control Sample	KWG9803700-3		27 A	45	58	67	12	79
Method Blank	KWG9803700-4		3 A	24 A	61	77	2 A	85
CAS Acceptance Limits:			31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d5
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14

A	Outside acceptance limits; see case narrative.
NA	Not Applicable; see case narrative.

Approved By: CC Haines Date: JAN 28 1999

SUR6/052595

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ıt:	Hart Crowser, Inc.	**Service Request:**	K9807169
oject:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Water	**Date Received:**	10/16/98
		Date Extracted:	10/19/98
		Date Analyzed:	11/13-27/98

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method: EPA 3520B
Analysis Method: SIM

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
HC-WS-01-M	K9807169-018		58	45	57	53	109	87
HC-WS-01-B	K9807169-019		57	48	56	50	96	83
HC-WS-02-M	K9807169-020		56	47	56	50	92	87
HC-WS-02-B	K9807169-021		58	48	53	51	101	90
HC-WS-03-M	K9807169-022		63	50	59	49	94	95
HC-WS-03-B	K9807169-023		50	39	49	48	82	75
HC-RB-100	K9807169-024		63	50	57	63	91	99
HC-RB-101	K9807169-025		52	43	49	50	86	81
Lab Control Sample	KWG9803582-3		64	72	69	70	79	92
Lab Control Sample	KWG9803582-4		21	39	36	48	66	73
ɔd Blank	KWG9803582-5		50	57	62	67	47	115
CAS Acceptance Limits:			12-123	13-121	25-117	26-97	10-134	22-141

2FPHL	2-Fluorophenol
PHLD6	Phenol-d5
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14

Approved By: C Hewes Date: JAN 28 1999

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Cl	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	10/27/98
		Date Analyzed:	12/5/98

Matrix Spike/Duplicate Matrix Spike Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-19	Units:	ug/Kg (ppb)
Lab Code:	K9807169-013MS, K9807169-013DMS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Advisory Limits	Relative Percent Difference	Result Notes
Phenol	EPA 3550A	SIM	20	250	230	110	280	200	68	39	20-99	54	
Acenaphthene	EPA 3550A	SIM	20	250	230	6100	NA	NA	NC	NC	26-104	NC	
Pentachlorophenol	EPA 3550A	SIM	61	250	230	ND	99	92	40	40	10-145	<1	
Pyrene	EPA 3550A	SIM	20	250	230	68000	NA	NA	NC	NC	18-144	NC	

NA Not Applicable; see case narrative.

Approved By: C C Haines Date: JAN 28 1999

DMS/[illegible]95

POPA0008081

07169SVM.EE5 - DMS 1/27/99

00180

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/27/98
		Date Analyzed:	12/4/98

Laboratory Control Sample Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9803700-3	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Advisory Limits	Result Notes
Phenol	EPA 3550A	SIM	250	111	44	21-110	
Acenaphthene	EPA 3550A	SIM	250	161	64	29-109	
Pentachlorophenol	EPA 3550A	SIM	250	6	2	10-120	A
Pyrene	EPA 3550A	SIM	250	199	80	39-149	

A Outside acceptance limits; see case narrative.

Approved By: CC Haines Date: JAN 28 1999

LCS/52595 07169SVM.EE5 - lcs 1/27/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	10/19/98
		Date Analyzed:	11/13/98

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary
Polynuclear Aromatic Hydrocarbons

Sample Name:	Lab Control Sample	Units:	ug/L (ppb)
Lab Code:	KWG9803582-3, KWG9803582-4	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value LCS	True Value DLCS	Result LCS	Result DLCS	Percent Recovery LCS	Percent Recovery DLCS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Phenol	EPA 3520B	SIM	2.5	2.5	1.9	1.0	76	40	38-110	47	
Acenaphthene	EPA 3520B	SIM	2.5	2.5	1.6	1.1	64	44	28-111	37	
Pentachlorophenol	EPA 3520B	SIM	2.5	2.5	1.2	1.2	48	48	23-117	<1	
Pyrene	EPA 3520B	SIM	2.5	2.5	2.3	1.7	92	68	32-152	30	

Approved By: CC Haines Date: JAN 28 1999

DLCS/080797p
07169SVM.EE1 - DLCS 1/28/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

.t:	Hart Crowser, Inc.	**Service Request:**	K9807169
ject:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	12/12/98
		Date Analyzed:	1/13-19/99

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method:	EPA 3550A	Units:	PERCENT
Analysis Method:	SIM	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
HC-S-36	K9807169-001RE		50	61	60	54	81	95
HC-S-34	K9807169-002RE		61	67	60	60	65	86
HC-S-40	K9807169-003RE		50	57	49	53	64	97
HC-S-39	K9807169-004RE		50	54	44	48	54	80
HC-S-38	K9807169-005RE		NA	NA	NA	NA	NA	NA
HC-S-44	K9807169-006RE		NA	NA	NA	NA	NA	NA
HC-S-43	K9807169-007RE		NA	NA	NA	NA	NA	NA
HC-S-42	K9807169-008RE		NA	NA	NA	NA	NA	NA
HC-S-41	K9807169-009RE		NA	NA	NA	NA	NA	NA
HC-REF-B	K9807169-010RE		NA	NA	NA	NA	NA	NA
[illegible] 19	K9807169-013RE		NA	NA	NA	NA	NA	NA
[illegible]-30	K9807169-017RE		64	65	50	59	65	92
Lab Control Sample	KWG9804280-3		60	72	74	63	68	82
Method Blank	KWG9804280-4		40	49	55	48	34	77
CAS Acceptance Limits:			31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d5
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14
NA	Not Applicable; see case narrative.

Approved By: C C Hames Date: JAN 28 1999

TUR6/052595

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	12/14/98
		Date Analyzed:	1/13-15/99

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method:	EPA 3550A	Units:	PERCENT
Analysis Method:	SIM	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
HC-REF-C	K9807169-011RE		56	63	64	59	75	101
HC-S-20	K9807169-014RE		NA	NA	NA	NA	NA	NA
Lab Control Sample	KWG9804290-1		58	70	72	68	64	87
Method Blank	KWG9804290-2		51	57	67	61	50	81
CAS Acceptance Limits:			31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d5
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14
NA	Not Applicable; see case narrative.

Approved By: C Haines Date: JAN 28 1999

SUR6/052595 07169SVM.AY3 - sur 1/28/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	12/12/98
		Date Analyzed:	1/13/99

Laboratory Control Sample Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9804280-3	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Advisory Limits	Result Notes
Phenol	EPA 3550A	SIM	240	190	79	21-110	
Acenaphthene	EPA 3550A	SIM	240	170	71	29-109	
Pentachlorophenol	EPA 3550A	SIM	240	180	75	10-120	
Pyrene	EPA 3550A	SIM	240	230	96	39-149	

Approved By: C Haines Date: JAN 28 1999

LCS/52595

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	12/14/98
		Date Analyzed:	1/13/99

Laboratory Control Sample Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9804290-1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Advisory Limits	Result Notes
Phenol	EPA 3550A	SIM	250	190	76	21-110	
Acenaphthene	EPA 3550A	SIM	250	180	72	29-109	
Pentachlorophenol	EPA 3550A	SIM	250	190	76	10-120	
Pyrene	EPA 3550A	SIM	250	250	100	39-149	

Approved By: C Haines Date: JAN 28 1999

APPENDIX B

CHAIN OF CUSTODY

INFORMATION

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client HART CROWSER Work Order K98 0719

Cooler received on 10/16/98 and opened on 10/16/98 by AP

1. Were custody seals on outside of cooler? YES (NO)
   If yes, how many and where? —
2. Were seals intact and signature & date correct? ~~YES NO~~
3. COC #

Temperature of cooler(s) upon receipt:	6.3	9.9	8.0	7.5	7.3	7.
Temperature Blank:	N/P	N/P	N/P	N/P	N/P	N

4. Were custody papers properly filled out (ink, signed, etc.)? (YES) NO
5. Type of packing material present NONE
6. Did all bottles arrive in good condition (unbroken)? (YES) NO
7. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? (YES) NO
8. Did all bottle labels and tags agree with custody papers? (YES) NO
9. *Were the correct types of bottles used for the tests indicated?* (YES) NO
10. Were all of the preserved bottles received at the lab with the appropriate pH? ~~YES NO~~
11. Were VOA vials checked for absence of air bubbles, and if present, noted below? ~~YES NO~~
12. Did the bottles originate from CAS/K or a branch laboratory? YES (NO)

Explain any discrepancies H2O Bottles labeled HC-SW not HC-WS. Rec'd VOA's for RB-100 & 101 not marked on COC. Rec'd Trip Blank not on COC

Samples that required preservation or received outside of temperature range at the lab(circle)

Sample ID	Reagent	Volume	Lot Number	Initials

POPA0008089

00188

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client HART CROWSER Work Order K98_____

Cooler received on 10/16/98 and opened on 10/16/98 by AP

1. Were custody seals on outside of cooler? YES ~~NO~~
   If yes, how many and where?_____
2. Were seals intact and signature & date correct? ~~YES NO~~
3. COC #

Temperature of cooler(s) upon receipt:	8.4	7.5			
Temperature Blank:	N/P	N/P			

4. Were custody papers properly filled out (ink, signed, etc.)? YES NO
5. Type of packing material present BUBBLE WRAP
6. Did all bottles arrive in good condition (unbroken)? YES NO
7. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? YES NO
8. Did all bottle labels and tags agree with custody papers? YES NO
9. *Were the correct types of bottles used for the tests indicated?* YES NO
10. Were all of the preserved bottles received at the lab with the appropriate pH? YES NO
11. Were VOA vials checked for absence of air bubbles, and if present, noted below? YES NO
12. Did the bottles originate from CAS/K or a branch laboratory? _____ YES NO

Explain any discrepancies_____

Samples that required preservation or received outside of temperature range at the lab(circle)

Sample ID	Reagent	Volume	Lot Number	Initials

POPA0008090

00189

Analytical Services INC.
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CHAIN OF CUSTODY
Sediment and Tissue Chemistry

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SH#: _____ PAGE _____ OF _____ COC # _____

001190

POPA0008091

PROJECT NAME: 5624-06
PROJECT NUMBER: TERMINAL 4 RI/FS
PROJECT MANAGER: H. CUMBERLAND
COMPANY/ADDRESS: HC - PORTLAND
PHONE # / FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	Total Volatile Solids ☐ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☒ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☒ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☒ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1	NWTPH-DX	NWTPH HCID	Aliph / Arom / BTEX / Naphs	Archive	REMARKS
HC-S-36	10/15/98	900	1	SED	7	/	/	/		/		/			/				/			/		/	
HC-S-34		0915	2		7	/	/	/		/		/			/				/		/		/	/	
HC-S-40		0925	3		7		/	/		/		/			/				/			/		/	
HC-S-39		0940	4		7	/	/	/		/		/			/				/			/		/	
HC-S-38		10:10	5		5	/	/	/		/		/			/				/			/		/	
HC-S-44		10:35	6		7		/	/		/		/			/				/			/		/	
HC-S-43		10:45	7		7		/	/		/		/			/				/			/		/	
HC-S-42		11:10	8		7	/	/	/		/		/			/				/			/			
HC-S-41		11:30	9		7	/	/	/		/		/			/				/			/		/	
HC-REF-B		1400	10		7	/	/	/		/		/			/				/			/		/	

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
X III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
Δ V. EDD EXCEL

INVOICE INFORMATION

P.O. # _____
Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results
Requested Report Date: _____

Circle which metals are to be analyzed:

SMS Metals: (As) (Cd) (Cr) (Cu) (Pb) (Hg) (Ag) (Zn) (Ni) (Sb)
CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:

NW TPH ~~DX~~ = Pencil Pitch Identification

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
Signature: [signature]	Signature: [signature]	Signature:	Signature:
Date/Time: 10/16/98	Date/Time: 10/16/98 9:00	Date/Time:	Date/Time:
Printed Name: [illegible]	Printed Name: [illegible]	Printed Name:	Printed Name:
Firm: HC 950	Firm: CAS	Firm:	Firm:

Columbia Analytical Services INC.
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CHAIN OF CUSTODY

Sediment and Tissue Chemistry

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SR#: _____

PAGE _____ OF _____ COC # _____

POPA0008092

00191

PROJECT NAME: 5624-06

PROJECT NUMBER: Terminal 4 RZ/FS

PROJECT MANAGER: H. Cumberland

COMPANY/ADDRESS: HC-Portland

PHONE #: _____ FAX #: _____

SAMPLER'S SIGNATURE: _____

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	☒ Total Volatile Solids ☐ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☒ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☒ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☒ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1	NWTPH-DX	NWTPH-HCZD	Mlp/Arco/PAH/Homo	Archive		REMARKS
HC-REF-C	10/15/98	1500	11	SED	7	X	X	X		X		X			X			X					X		
HC-S-18		1630	12		7															X		X			
HC-S-19		1640	13		7	X	X	X		X		X			X			X		X		X	X		
HC-S-20		1650	14		7		X	X		X		X			X			X		X		X	X		
HC-S-21		1700	15		2															X		X			
HC-S-31		1720	16		2															X		X	~~X~~		
HC-S-30		1710	17		7	X	X	X		X		X			X			X		X		X	X		

REPORT REQUIREMENTS

- ___ I. Routine Report: Method Blank, Surrogate, as required
- ___ II. Report Dup., MS, MSD as required
- X III. Data Validation Report (includes all raw data)
- ___ IV. CLP Deliverable Report
- X V. EDD

EXCEL

INVOICE INFORMATION

P.O. # _____

Bill To: _____

TURNAROUND REQUIREMENTS

- ___ 24 hr. ___ 48 hr.
- ___ 5 Day
- X Standard (10-15 working days)
- ___ Provide FAX Results

Requested Report Date: _____

Circle which metals are to be analyzed:

SMS Metals: As Cd Cr Cu Pb Hg Ag Zn Sb N.

CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:

NWTPH-DX = Pencil Pitch Fingerprinting

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
Signature: [signature] Date/Time: 10/16/98 9:50	Signature: [signature] Date/Time: 10/16/98 9:50	Signature: Date/Time:	Signature: Date/Time:
Printed Name: Tiburcio HC	Printed Name: [signature] Firm: CAS	Printed Name: Firm:	Printed Name: Firm:

Analytical Services INC.
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Sediment and Tissue Chemistry

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SR#: _____ PAGE _____ OF _____ COC #: _____

POPA0008093 00192

PROJECT NAME: 5624-06
PROJECT NUMBER: Terminal 4 RI/FS
PROJECT MANAGER: H. Cumberland
COMPANY/ADDRESS: HC-Portland
PHONE #: _____ FAX #: _____
SAMPLER'S SIGNATURE: _____

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	☐ Total Volatile Solids ☐ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☐ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☐ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☒ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1	SVOC *					REMARKS
HC-WS-01-M	10/15/98	1815	18	H_2O		X								X				X						BHs
HC-WS-01-B	↑	1825	19	↓		X								X				X						labeled
HC-WS-02-M		1835	20			X								X				X						HC-SW-[illegible]
HC-WS-02-B		1845	21			X								X				X						
HC-WS-03-M		1855	22			X								X				X						
HC-WS-03 B		1905	23			X								X				X						
HC-RB-100		1600	24			X								X										Recd VOA's
HC-RB-101		1610	25			X								X										"

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
X III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
X V. EDD Excel

INVOICE INFORMATION

P.O. # _____
Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results

Requested Report Date: _____

Circle which metals are to be analyzed:

SMS Metals: (As) (Cd) (Cr) (Cu) (Pb) (Hg) (Ag) (Zn) (N) (Sb) (Thallium)
CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
Signature: [signature] Date/Time: 10/16/98	Signature: [signature] Date/Time: 10/16/98 9:57	Signature: _____ Date/Time: _____	Signature: _____ Date/Time: _____
Printed Name: JOHN WILSON Firm: HC	Printed Name: [illegible] Firm: [illegible]	Printed Name: _____ Firm: _____	Printed Name: _____ Firm: _____

Columbia Analytical Services INC.
An Employee-Owned Company

HART CROWSER INC.
JAN 2 8 1999
Portland Office

December 17, 1998

Service Request No: K9807097

Howard Cumberland
Hart Crowser, Inc.
Five Centerpointe Drive, Suite 240
Lake Oswego, OR 97035

Re: Port of Portland Terminal 4 5624

Dear Howard:

Enclosed are the results of the sample(s) submitted to our laboratory on October 14, 1998. For your reference, these analyses have been assigned our service request number K9807097.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 243.

Respectfully submitted,

Columbia Analytical Services, Inc.

Richard Craven
Project Chemist

RAC/td

POPA0008094

317 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 360/ 577-7222 • Fax 360/636-1068

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
J	Estimated concentration. The value is less than the method reporting limit, but greater than the method detection limit.
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Hart Crowser Inc.	**Service Request No.:**	K9807097
Project:	Port of Portland Terminal 4	**Date Received:**	14-October-98
Sample Matrix:	Sediment		

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier IIA data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), Initial/Continuing Calibration Verification Standards (ICV/CCV), and Initial/Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times have been met for analyses in this sample delivery group.

The following difficulties were experienced during analysis of this batch:

General Chemistry: The recovery of the sulfide spike in the matrix spike pair was outside control limits. Since both spikes were low this indicates the failure to be due to matrix interference. The laboratory control spike was within control limits indicating the analysis was in control. Some of the samples were reanalyzed to confirm results from the first analysis. Both data sets are provided. The reanalysis of sample HC-SO-1 was not completed until after hold times had expired.

Metals: Due to a method defect in the EPA digestion method, which can be multiplied by matrix interferences, the spike recovery for antimony was outside control limits. The laboratory control spike indicated that the analysis was in control and no corrective action was taken.

Due to high concentrations of zinc and lead in the spiked samples, the recoveries of those elements were not calculated. The elevated background would make recoveries unreliable and not applicable for method performance evaluation.

Due to the nonhomogenous nature of the sediment samples the percent difference for the duplicate samples is elevated above control limits.

Semivolatile Petroleum Hydrocarbons: Recoveries of diesel in the matrix spike pair are outside control limits due to interference from elevated concentrations of other target compounds.

The surrogate recovery is sample HC-S-08 was outside control limits. This sample was also selected for spiking, and the results of the spike indicated that the initial sample results were accurate for screening purposes.

POPA0008096

Approved by Richard A Crow **Date** 12/16/98

Indicator compounds were used to assess the accuracy of the diesel and pencil pitch quantitations. When the response of those compounds indicated a significant bias in the quantitation of the target mixture, the results were flagged as an estimate.

Volatile Organics: The recovery of dichlorobenzene was outside control limits in the laboratory control spike. The matrix spike recoveries were acceptable, and this target analyte was not detected in any samples so no corrective action was taken.

The reporting and detection limits in several of the samples are elevated due to low percent solids in the samples. The affected samples are flagged with an "F".

Semivolatile Organics: Several of the samples required dilutions due to matrix interference, and high levels of target analytes. This resulted in the surrogates being diluted below detection limits. The affected surrogates are flagged as not applicable for method performance evaluation.

Due to high concentrations of target analytes in the matrix spike of sample HC-S-03, the spikes were unusable for method performance evaluation. The laboratory control spike with that batch of samples indicated that the analysis was in control, and no corrective action was taken.

3,3-dichlorobenzidene was above control limits in the CCV. This target analyte was not detected in any of the samples and no corrective action was taken.

Surrogate recoveries in the method blank "KWG9803614", and samples HC-VC-22-S2, and HC-VC-32-S2 were below control limits. The samples were reextracted to confirm the results of the initial analysis.

Approved by Richard A Cramer Date 12/16/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ient:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12-10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Solids

Prep Method:	NONE	Units:	Percent
Analysis Method:	160.3M	Basis:	WET
Test Notes:			

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
HC-VC-18-S1	K9807097-001	10/15/98	68.6	
HC-VC-18-S2	K9807097-002	10/15/98	78.3	
HC-VC-7-S1	K9807097-004	10/15/98	51.3	
HC-VC-7-S2	K9807097-005	10/15/98	61.7	
HC-VC-13-S1	K9807097-007	10/15/98	75.9	
HC-VC-13-S2	K9807097-008	10/15/98	75.7	
HC-VC-103	K9807097-010	10/15/98	77.1	
HC-VC-104	K9807097-011	10/15/98	74.7	
HC-VC-105	K9807097-012	10/15/98	49.0	
-VC-11-S1	K9807097-013	10/15/98	49.0	
C-VC-11-S2	K9807097-014	10/15/98	59.2	
HC-VC-22-S1	K9807097-016	10/15/98	79.7	
HC-VC-22-S2	K9807097-017	10/15/98	77.8	
HC-VC-27-S1	K9807097-019	10/15/98	55.5	
HC-VC-27-S2	K9807097-020	10/15/98	63.7	
HC-VC-32-S1	K9807097-022	10/15/98	57.4	
HC-VC-32-S2	K9807097-023	10/15/98	81.4	
HC-VC-39-S1	K9807097-025	10/15/98	49.1	
HC-VC-39-S2	K9807097-026	10/15/98	52.2	
HC-VC-42-S1	K9807097-028	10/15/98	49.5	
HC-VC-42-S2	K9807097-029	10/15/98	53.3	
HC-S-01	K9807097-031	10/15/98	38.9	
HC-S-02	K9807097-032	10/15/98	54.1	
HC-S-03	K9807097-033	10/15/98	55.0	
HC-S-04	K9807097-034	10/15/98	40.7	
HC-S-05	K9807097-035	10/15/98	47.3	
HC-S-06	K9807097-036	10/15/98	35.1	

Approved By: _____ Date: 1/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

...ient:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Solids

Prep Method:	NONE	Units:	Percent
Analysis Method:	160.3M	Basis:	WET
Test Notes:			

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
HC-S-07	K9807097-037	10/15/98	36.3	
HC-S-08	K9807097-038	10/15/98	35.0	
HC-S-09	K9807097-039	10/15/98	35.1	
HC-S-101	K9807097-040	10/15/98	34.2	

Approved By: _____ Date: 1/26/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807097
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/12-10/13/98
Sample Matrix:	Sediment	Date Received:	10/14/98

Solids, Total Volatile

Prep Method:	NONE	Units:	PERCENT
Analysis Method:	160.4M	Basis:	DRY
Test Notes:			

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
HC-VC-18-S1	K9807097-001	10/15/98	4.04	
HC-VC-18-S2	K9807097-002	10/15/98	2.14	
HC-VC-7-S1	K9807097-004	10/15/98	7.93	
HC-VC-7-S2	K9807097-005	10/15/98	5.62	
HC-VC-13-S1	K9807097-007	10/15/98	1.82	
HC-VC-13-S2	K9807097-008	10/15/98	1.77	
HC-VC-103	K9807097-010	10/15/98	1.93	
HC-VC-104	K9807097-011	10/15/98	3.19	
HC-VC-105	K9807097-012	10/15/98	7.67	
[illegible]-VC-11-S1	K9807097-013	10/15/98	10.5	
[illegible]C-VC-11-S2	K9807097-014	10/15/98	6.13	
HC-VC-22-S1	K9807097-016	10/15/98	2.70	
HC-VC-22-S2	K9807097-017	10/15/98	1.73	
HC-VC-27-S1	K9807097-019	10/15/98	7.35	
HC-VC-27-S2	K9807097-020	10/15/98	5.02	
HC-VC-32-S1	K9807097-022	10/15/98	7.41	
HC-VC-32-S2	K9807097-023	10/15/98	1.80	
HC-VC-39-S1	K9807097-025	10/15/98	7.87	
HC-VC-39-S2	K9807097-026	10/15/98	7.95	
HC-VC-42-S1	K9807097-028	10/15/98	7.65	
HC-VC-42-S2	K9807097-029	10/15/98	8.70	
HC-S-01	K9807097-031	10/15/98	9.28	
HC-S-02	K9807097-032	10/15/98	12.9	
HC-S-03	K9807097-033	10/15/98	5.65	
HC-S-04	K9807097-034	10/15/98	7.97	
HC-S-05	K9807097-035	10/15/98	7.15	
HC-S-06	K9807097-036	10/15/98	8.89	

Approved By: _____ Date: 1/26/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

.ient:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12-10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Solids, Total Volatile

Prep Method:	NONE	Units:	PERCENT
Analysis Method:	160.4M	Basis:	DRY
Test Notes:			

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
HC-S-07	K9807097-037	10/15/98	8.81	
HC-S-08	K9807097-038	10/15/98	9.00	
HC-S-09	K9807097-039	10/15/98	8.91	
HC-S-101	K9807097-040	10/15/98	8.96	

Approved By: _____ Date: 1/26/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Sulfide, Total

Prep Method:	NONE	Units:	mg/Kg (ppm)
Analysis Method:	PSEP	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
HC-VC-18-S1	K9807097-001	1.5	1.5	1	NA	10/18/98	31.4	
HC-VC-18-S2	K9807097-002	1.5	1.5	1	NA	10/18/98	2.0	
HC-VC-7-S1	K9807097-004	1.5	1.5	1	NA	10/18/98	161	
HC-VC-7-S2	K9807097-005	1.5	1.5	1	NA	10/18/98	796	
HC-VC-13-S1	K9807097-007	1.5	1.5	1	NA	10/18/98	21.0	
HC-VC-13-S2	K9807097-008	1.5	1.5	1	NA	10/18/98	9.4	
HC-VC-103	K9807097-010	1.5	1.5	1	NA	10/19/98	21.7	
HC-VC-11-S1	K9807097-013	1.5	1.5	1	NA	10/19/98	276	
HC-VC-11-S2	K9807097-014	1.5	1.5	1	NA	10/19/98	228	
HC-VC-22-S1	K9807097-016	1.5	1.5	1	NA	10/19/98	6.6	
HC-VC-22-S2	K9807097-017	1.5	1.5	1	NA	10/19/98	2.0	
HC-VC-27-S1	K9807097-019	1.5	1.5	1	NA	10/19/98	33.5	
HC-VC-27-S2	K9807097-020	1.5	1.5	1	NA	10/19/98	50.2	
HC-S-01	K9807097-031	1.5	1.5	1	NA	10/27/98	249	H
HC-S-02	K9807097-032	1.5	1.5	1	NA	10/19/98	127	
HC-S-03	K9807097-033	1.5	1.5	1	NA	10/19/98	90.3	
HC-S-04	K9807097-034	1.5	1.5	1	NA	10/19/98	6.6	
HC-S-05	K9807097-035	1.5	1.5	1	NA	10/19/98	590	
HC-S-07	K9807097-037	1.5	1.5	1	NA	10/20/98	92.4	
HC-S-08	K9807097-038	1.5	1.5	1	NA	10/20/98	49.7	
HC-S-09	K9807097-039	1.5	1.5	1	NA	10/20/98	44.9	
HC-S-101	K9807097-040	1.5	1.5	1	NA	10/20/98	40.6	
Method Blank	K9807097-MB	1.5	1.5	1	NA	10/18/98	ND	
Method Blank	K9807097-MB	1.5	1.5	1	NA	10/19/98	ND	
Method Blank	K9807097-MB	1.5	1.5	1	NA	10/20/98	ND	

H The analysis was performed past the recommended hold time; see case narrative.

Approved By: _____ Date: 11/30/98

1A/020597p

07097WET.LJ1 - Sample 11/20/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Sulfide, Total

Prep Method:	NONE	Units:	mg/Kg (ppm)
Analysis Method:	PSEP	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
HC-VC-103	K9807097-010R	1.5	1.5	1	NA	11/7/98	16.0	
HC-VC-11-S1	K9807097-013R	1.5	1.5	1	NA	10/27/98	751	
HC-VC-27-S1	K9807097-019R	1.5	1.5	1	NA	10/27/98	109	
HC-VC-27-S2	K9807097-020R	1.5	1.5	1	NA	10/27/98	62.4	
HC-S-01	K9807097-031R	1.5	1.5	1	NA	10/27/98	249	
HC-S-02	K9807097-032R	1.5	1.5	1	NA	10/27/98	153	
HC-S-04	K9807097-034R	1.5	1.5	1	NA	11/7/98	26.4	
Method Blank	K9807097-MB	1.5	1.5	1	NA	10/27/98	ND	
Method Blank	K9807097-MB	1.5	1.5	1	NA	11/7/98	ND	

Approved By: _____ Date: 11/30/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Ammonia as Nitrogen

Prep Method: NONE
Analysis Method: 350.1M
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
HC-VC-18-S1	K9807097-001	2.0	0.04	1	NA	10/22/98	75.7	
HC-VC-18-S2	K9807097-002	2.0	0.04	1	NA	10/22/98	45.2	
HC-VC-7-S1	K9807097-004	2.0	0.04	1	NA	10/22/98	301	
HC-VC-7-S2	K9807097-005	2.0	0.04	1	NA	10/22/98	239	
HC-VC-13-S1	K9807097-007	2.0	0.04	1	NA	10/22/98	22.9	
HC-VC-13-S2	K9807097-008	2.0	0.04	1	NA	10/22/98	16.9	
HC-VC-105	K9807097-012	2.0	0.04	1	NA	10/22/98	216	
HC-VC-11-S1	K9807097-013	2.0	0.04	1	NA	10/22/98	201	
HC-VC-11-S2	K9807097-014	2.0	0.04	1	NA	10/22/98	159	
HC-VC-22-S1	K9807097-016	2.0	0.04	1	NA	10/22/98	19.2	
HC-VC-22-S2	K9807097-017	2.0	0.04	1	NA	10/22/98	15.7	
HC-VC-27-S1	K9807097-019	2.0	0.04	1	NA	10/22/98	185	
HC-VC-27-S2	K9807097-020	2.0	0.04	1	NA	10/22/98	150	
HC-VC-32-S1	K9807097-022	2.0	0.04	1	NA	10/22/98	107	
HC-VC-32-S2	K9807097-023	2.0	0.04	1	NA	10/22/98	1.4	
HC-VC-39-S1	K9807097-025	2.0	0.04	1	NA	10/22/98	194	
HC-VC-39-S2	K9807097-026	2.0	0.04	1	NA	10/22/98	327	
HC-VC-42-S1	K9807097-028	2.0	0.04	1	NA	10/22/98	120	
HC-VC-42-S2	K9807097-029	2.0	0.04	1	NA	10/22/98	216	
Method Blank	K9807097-MB	2.0	0.04	1	NA	10/22/98	ND	

* Analysis was performed on a 2M KCl extract.
M Modified for analysis of soil.

Approved By: _____ Date: 11/30/98

1A/020597p

07097WET.LJ2 - Sample 11/30/98

POPA0008104

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Ammonia as Nitrogen

Prep Method:	NONE	Units:	mg/Kg (ppm)
Analysis Method:	350.1M	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
HC-S-01	K9807097-031	0.2	0.2	1	NA	10/22/98	224	
HC-S-02	K9807097-032	0.2	0.2	1	NA	10/22/98	107	
HC-S-03	K9807097-033	0.2	0.2	1	NA	10/22/98	70.1	
HC-S-04	K9807097-034	0.2	0.2	1	NA	10/22/98	112	
HC-S-05	K9807097-035	0.2	0.2	1	NA	10/22/98	114	
HC-S-07	K9807097-037	0.2	0.2	1	NA	10/22/98	121	
HC-S-08	K9807097-038	0.2	0.2	1	NA	10/22/98	118	
HC-S-09	K9807097-039	0.2	0.2	1	NA	10/22/98	114	
HC-S-101	K9807097-040	0.2	0.2	1	NA	10/22/98	116	

* Analysis was performed on a 2M KCl extract.

M Modified for analysis of soil.

Approved By: _____ Date: 11/30/98

1A/020597p

07097WET.LJ3 - Sample 11/30/98

POPA0008105

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Carbon, Total Organic

Prep Method:	NONE	Units:	PERCENT
Analysis Method:	ASTM D4129-82M	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
HC-VC-18-S1	K9807097-001	0.05	0.006	1	NA	10/20/98	0.91	
HC-VC-18-S2	K9807097-002	0.05	0.006	1	NA	10/20/98	0.29	
HC-VC-7-S1	K9807097-004	0.05	0.006	1	NA	10/20/98	2.36	
HC-VC-7-S2	K9807097-005	0.05	0.006	1	NA	10/20/98	1.38	
HC-VC-13-S1	K9807097-007	0.05	0.006	1	NA	10/20/98	0.08	
HC-VC-13-S2	K9807097-008	0.05	0.006	1	NA	10/20/98	0.09	
HC-VC-105	K9807097-012	0.05	0.006	1	NA	10/20/98	2.05	
HC-VC-11-S1	K9807097-013	0.05	0.006	1	NA	10/20/98	2.09	
HC-VC-11-S2	K9807097-014	0.05	0.006	1	NA	10/20/98	1.69	
HC-VC-22-S1	K9807097-016	0.05	0.006	1	NA	10/20/98	0.71	
HC-VC-22-S2	K9807097-017	0.05	0.006	1	NA	10/20/98	0.03	J
HC-VC-27-S1	K9807097-019	0.05	0.006	1	NA	10/20/98	1.67	
HC-VC-27-S2	K9807097-020	0.05	0.006	1	NA	10/20/98	1.67	
HC-VC-32-S1	K9807097-022	0.05	0.006	1	NA	10/20/98	1.98	
HC-VC-32-S2	K9807097-023	0.05	0.006	1	NA	10/21/98	0.04	J
HC-VC-39-S1	K9807097-025	0.05	0.006	1	NA	10/21/98	1.91	
HC-VC-39-S2	K9807097-026	0.05	0.006	1	NA	10/21/98	2.39	
HC-VC-42-S1	K9807097-028	0.05	0.006	1	NA	10/21/98	2.11	
HC-VC-42-S2	K9807097-029	0.05	0.006	1	NA	10/21/98	2.95	
Method Blank	K9807097-MB	0.05	0.006	1	NA	10/20/98	ND	

M Modified

Approved By: _____ Date: 11/30/98

1A/020597p

07097WET.LJ4 - Sample 11/30/98

00013

POPA0008106

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807097
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/13/98
Sample Matrix:	Sediment	Date Received:	10/14/98

Carbon, Total Organic

Prep Method:	NONE	Units:	PERCENT
Analysis Method:	ASTM D4129-82M	Basis:	Dry
Test Notes:			

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
HC-S-01	K9807097-031	0.05	0.006	1	NA	10/21/98	3.69	
HC-S-02	K9807097-032	0.05	0.006	1	NA	10/21/98	2.42	
HC-S-03	K9807097-033	0.05	0.006	1	NA	12/4/98	2.38	
HC-S-04	K9807097-034	0.05	0.006	1	NA	12/2/98	2.74	
HC-S-05	K9807097-035	0.05	0.006	1	NA	12/2/98	3.00	
HC-S-07	K9807097-037	0.05	0.006	1	NA	12/2/98	2.61	
HC-S-08	K9807097-038	0.05	0.006	1	NA	12/2/98	2.38	
HC-S-09	K9807097-039	0.05	0.006	1	NA	12/2/98	2.41	
HC-S-101	K9807097-040	0.05	0.006	1	NA	12/2/98	2.35	
Method Blank	K9807097-MB	0.05	0.006	1	NA	10/21/98	0.02	J
Method Blank	K9807097-MB	0.05	0.006	1	NA	12/2/98	ND	

M Modified

Approved By: _____ Date: 12/8/98

1A/020597p

07097WET.LJ5 - Sample 12/8/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-7-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.6	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	8	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	2.4	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	27.3	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	62.8	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	361	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.15	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	26	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.9	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	469	

Approved By: _____ Date: 11/4/98

1S44mc/031695

070971CP.EA1 - Sample 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-7-S2	Units:	mg/Kg (ppm)
Lab Code:	K9807097-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	1.4	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	15	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	3.3	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	23.2	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	83.2	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	576	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.18	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	25	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	1.4	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	650	

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-13-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	2	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	9	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	13.3	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	25.8	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.03	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	15	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	61	

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-13-S2	Units:	mg/Kg (ppm)
Lab Code:	K9807097-008	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	2	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	10.7	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	15.2	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	23.9	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	ND	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	17	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	65	

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-105	Units:	mg/Kg (ppm)
Lab Code:	K9807097-012	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.4	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	6	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	1.1	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	25.6	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	52.4	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	190	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	24	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.5	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	267	

Approved By: _____ Date: 11/4/98

1S44mc/031695

07097ICP.EA1 - Sample (5) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-11-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.3	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	7	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	1.2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	25.3	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	52.1	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	169	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.09	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	24	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.6	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	273	

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1S44mc/031695

070971CP.EA1 - Sample (6) 11/4/98

POPA0008113

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-11-S2	Units:	mg/Kg (ppm)
Lab Code:	K9807097-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	1.1	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	12	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	3.2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	22.6	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	78.3	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	527	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.12	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	24	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	1.2	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	656	

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07097ICP.EA1 - Sample (7) 11/4/98

POPA0008114

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-22-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-016	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	2	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.1	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	11.8	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	17.6	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	12.1	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.02	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	17	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	55	

Approved By: _____ Date: 11/6/98

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07097ICP.EA1 - Sample (8) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-22-S2	Units:	mg/Kg (ppm)
Lab Code:	K9807097-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	2	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	9.6	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	13.4	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	3	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	ND	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	16	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	37	

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1S44mc/031695

070971CP.EA1 - Sample (9) 11/4/98

POPA0008116

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-27-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-019	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.3	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	5	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.8	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	22.1	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	47.8	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	116	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	22	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.4	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	193	

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-27-S2	Units:	mg/Kg (ppm)
Lab Code:	K9807097-020	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.2	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	5	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	1.1	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	18.5	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	43	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	144	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	22	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.4	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	245	

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07097ICP.EA1 - Sample (11) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-39-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-025	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	3	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	23.8	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	38.4	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	19.3	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	22	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.4	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	89	

Approved By: _____ Date: 11/4/98

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07097ICP.EA1 - Sample (12) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-39-S2	Units:	mg/Kg (ppm)
Lab Code:	K9807097-026	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	27.4	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	44.4	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	27.6	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	24	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.4	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	109	

Approved By: _____ Date: 11/4/98

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07097ICP.EA1 - Sample (13) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-42-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-028	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	ND	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	4	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	25.5	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	40.4	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	23.9	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.07	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	23	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.2	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	100	

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-VC-42-S2	Units:	mg/Kg (ppm)
Lab Code:	K9807097-029	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.2	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	5	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.7	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	29.4	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	54.6	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	79.1	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.13	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	23	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.4	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	207	

Approved By: _____ Date: 11/4/98

1S44mc/031695

07097ICP.EA1 - Sample (15) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-S-02	Units:	mg/Kg (ppm)
Lab Code:	K9807097-032	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	2	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	14	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	4.2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	23.7	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	90.1	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	837	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.14	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	22	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	2	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	855	

Approved By: _____ Date: 11/4/98

1S44mc/031695

070971CP.EA1 - Sample (16) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-S-04	Units:	mg/Kg (ppm)
Lab Code:	K9807097-034	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.4	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	6	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	2.6	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	29.2	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	57.3	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	294	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.13	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	25	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.8	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	450	

Approved By: _____ Date: 11/4/98

1S44mc/031695

070971CP.EA1 - Sample (17) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-S-05	Units:	mg/Kg (ppm)
Lab Code:	K9807097-035	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.8	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	6	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	2.2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	23.6	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	44.6	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	272	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.08	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	21	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.8	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	385	

Approved By: _____ Date: 11/4/98

1S44mc/031695

070971CP.EA1 - Sample (16) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-S-07	Units:	mg/Kg (ppm)
Lab Code:	K9807097-037	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.3	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	7	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	31.9	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	64	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	322	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.16	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	27	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.8	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	399	

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-S-09	Units:	mg/Kg (ppm)
Lab Code:	K9807097-039	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	0.7	
Arsenic	EPA 3050B	200.8	2	20	10/27/98	11/3/98	9	
Cadmium	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	3.2	
Chromium	EPA 3050B	200.8	0.3	20	10/27/98	11/3/98	30	
Copper	EPA 3050B	200.8	0.5	20	10/27/98	11/3/98	68.1	
Lead	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	626	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.13	
Nickel	EPA 3050B	200.8	1	20	10/27/98	11/3/98	25	
Silver	EPA 3050B	200.8	0.1	20	10/27/98	11/3/98	1.3	
Zinc	EPA 3050B	200.8	2	20	10/27/98	11/3/98	563	

Approved By: _____ Date: 11/4/98

1S44mc/031695

070971CP_EA1 - Sample (20) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Total Metals

Sample Name:	HC-S-101	Units:	mg/Kg (ppm)
Lab Code:	K9807097-040	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1.4	
Arsenic	EPA 3050B	200.8	2	20	10/28/98	11/4/98	9	
Cadmium	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	3.1	
Chromium	EPA 3050B	200.8	0.3	20	10/28/98	11/4/98	29.2	
Copper	EPA 3050B	200.8	0.5	20	10/28/98	11/4/98	68.8	
Lead	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	640	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	0.17	
Nickel	EPA 3050B	200.8	1	20	10/28/98	11/4/98	23	
Silver	EPA 3050B	200.8	0.1	20	10/28/98	11/4/98	1.5	
Zinc	EPA 3050B	200.8	2	20	10/28/98	11/4/98	584	

Approved By: _____ Date: 11/4/98

1S44inc/031695

070971CP.EA1 - Sample (21) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Total Metals

Sample Name:	Method Blank	Units:	mg/Kg (ppm)
Lab Code:	K9807097-MB1	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.02	5	10/27/98	11/3/98	ND	
Arsenic	EPA 3050B	200.8	0.5	5	10/27/98	11/3/98	ND	
Cadmium	EPA 3050B	200.8	0.02	5	10/27/98	11/3/98	ND	
Chromium	EPA 3050B	200.8	0.06	5	10/27/98	11/3/98	ND	
Copper	EPA 3050B	200.8	0.1	5	10/27/98	11/3/98	ND	
Lead	EPA 3050B	200.8	0.02	5	10/27/98	11/3/98	ND	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	ND	
Nickel	EPA 3050B	200.8	0.2	5	10/27/98	11/3/98	ND	
Silver	EPA 3050B	200.8	0.02	5	10/27/98	11/3/98	ND	
Zinc	EPA 3050B	200.8	0.5	5	10/27/98	11/3/98	ND	

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Total Metals

Sample Name:	Method Blank	Units:	mg/Kg (ppm)
Lab Code:	K9807097-MB2	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Antimony	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Arsenic	EPA 3050B	200.8	0.5	5	10/28/98	11/4/98	ND	
Cadmium	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Chromium	EPA 3050B	200.8	0.06	5	10/28/98	11/4/98	ND	
Copper	EPA 3050B	200.8	0.1	5	10/28/98	11/4/98	ND	
Lead	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Mercury	7471A	7471A	0.02	1	11/2/98	11/2/98	ND	
Nickel	EPA 3050B	200.8	0.2	5	10/28/98	11/4/98	ND	
Silver	EPA 3050B	200.8	0.02	5	10/28/98	11/4/98	ND	
Zinc	EPA 3050B	200.8	0.5	5	10/28/98	11/4/98	ND	

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-VC-13-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	ND	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	102	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	

Approved By: _____ Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-VC-11-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1500	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	11	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-VC-11-S2	Units:	mg/Kg (ppm)
Lab Code:	K9807097-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	2300	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	24	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 10/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-01	Units:	mg/Kg (ppm)
Lab Code:	K9807097-031	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	2100	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	11000	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	5.3	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	5.5	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	120	

Approved By: _____ Date: 11/12/98

1SZ2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980709[illegible]
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-02	Units:	mg/Kg (ppm)
Lab Code:	K9807097-032	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<200	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	5200	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	0.6	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	0.8	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	58	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

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POPA0008135

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-03	Units:	mg/Kg (ppm)
Lab Code:	K9807097-033	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	3600	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	37	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

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POPA0008136

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-04	Units:	mg/Kg (ppm)
Lab Code:	K9807097-034	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	640	E
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	2200	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	1.3	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.9	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	18	

E Estimated concentration. The result is probably high bias due to the presence of Pencil Pitch in the sample.

Approved By: _____ Date: 11/12/98

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-05	Units:	mg/Kg (ppm)
Lab Code:	K9807097-035	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	550	E
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1600	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	1.5	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.9	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	15	

E Estimated concentration. The result is probably high bias due to the presence of Pencil Pitch in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-06	Units:	mg/Kg (ppm)
Lab Code:	K9807097-036	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	440	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1900	E
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	1.0	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	1.0	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	12	

E Estimated concentration. The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 11/12/98

1SZ2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-07	Units:	mg/Kg (ppm)
Lab Code:	K9807097-037	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	400	E
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1800	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.8	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.6	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	15	

E Estimated concentration. The result is probably high bias due to the presence of Pencil Pitch in the sample.

Approved By: _____ Date: 11/12/98

1S22/020597p

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-08	Units:	mg/Kg (ppm)
Lab Code:	K9807097-038	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1900	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.6	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	16	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

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POPA0008141

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-09	Units:	mg/Kg (ppm)
Lab Code:	K9807097-039	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	3000	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.6	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	36	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-101	Units:	mg/Kg (ppm)
Lab Code:	K9807097-040	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1900	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	16	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1S22/020597p

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POPA0008143

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	Method Blank	Units:	mg/Kg (ppm)
Lab Code:	K981023-MB	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/30/98	ND	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/30/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/30/98	ND	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/25/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/25/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/25/98	ND	

Approved By: _____ Date: 11/12/98

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-18-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-001	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Lisa L. Christens Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-18-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Lara L. Christens Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-7-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Paul L. Christens Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-7-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Sara L. Christens Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-13-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Jana L. Chrisdens Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-13-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-008	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Jared Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-103	Units:	ug/Kg (ppb)
Lab Code:	K9807097-010	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Tara L. Christens Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-11-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-013	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	10	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/20/98	10/20/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Lisa L. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-11-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Dana L. Christens Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-22-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-016	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Sara L. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-22-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Sara L. Christensen Date: 11/13/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-27-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-019	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Toluene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	

Approved By: Sarah. Christensen Date: 11/13/98

00063

1S44/121597a

07097VOA.TC2 - 1021F010 11/13/98

POPA0008156

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-27-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-020	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Toluene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	

Approved By: Paul Anderson Date: 11/13/98

1S44/121597a
07097VOA.TC3 - 1021F011 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-32-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-022	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Toluene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	

Approved By: Sara L. Christensen Date: 11/13/98

00065

1S44/121597a

07097VOA.TC3 - 1021F012 11/13/98

POPA0008158

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-32-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-023	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Toluene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	

Approved By: Lara L. Christensen Date: 11/13/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-39-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-025	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Toluene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Lara L. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-39-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-026	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Toluene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	

Approved By: Dana L. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-42-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-028	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Toluene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Sara L. Christens Date: 11/13/98

00069

1S44/121597a

07097VOA.TC3 - 1021F016 11/13/98

POPA0008162

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-VC-42-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-029	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Toluene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	

Approved By: Lara L. Christens Date: 11/13/98

1S44/121597a

07097VOA.TC4 - 1021F017 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-01	Units:	ug/Kg (ppb)
Lab Code:	K9807097-031	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Toluene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/21/98	10/21/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Jarad. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-02	Units:	ug/Kg (ppb)
Lab Code:	K9807097-032	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Toluene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	

Approved By: Brad Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-03	Units:	ug/Kg (ppb)
Lab Code:	K9807097-033	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/22/98	10/22/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/22/98	10/22/98	ND	
Toluene	EPA 5035	8260B	5	1	10/22/98	10/22/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/22/98	10/22/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/22/98	10/22/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/22/98	10/22/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/22/98	10/22/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/22/98	10/22/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/22/98	10/22/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/22/98	10/22/98	ND	

Approved By: Tara L. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-04	Units:	ug/Kg (ppb)
Lab Code:	K9807097-034	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Toluene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Cara L. Christens Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-05	Units:	ug/Kg (ppb)
Lab Code:	K9807097-035	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Toluene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Carol L. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-07	Units:	ug/Kg (ppb)
Lab Code:	K9807097-037	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Toluene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/22/98	10/22/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Lisa L. Christens Date: 11/13/98

00076

IS44/121597a
07097VOA.TC5 - 1021F023 11/13/98

POPA0008169

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-08	Units:	ug/Kg (ppb)
Lab Code:	K9807097-038	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Toluene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Tara L. Christensen Date: 11/13/98

1S44/121597a

07097VOA.TC8 - 1027F015 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-09	Units:	ug/Kg (ppb)
Lab Code:	K9807097-039	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Toluene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Lisa D. Christens Date: 11/13/98

1S44/121597a

07097VOA.TC8 - 1027F016 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Volatile Organic Compounds by GC/MS

Sample Name:	HC-S-101	Units:	ug/Kg (ppb)
Lab Code:	K9807097-040	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Toluene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
Ethylbenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
m- & p-Xylenes	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
o-Xylene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	10	1	10/27/98	10/27/98	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Sara L. Christens Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803606-1	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Toluene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/20/98	10/20/98	ND	

Approved By: Sara L. Christens Date: 11/13/98

00080

1S44/121597a
07097VOA.TC8 - 1020F006 11/13/98

POPA0008173

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803607-1	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Toluene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/21/98	10/21/98	ND	

Approved By: Cara L. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803629-3	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/26/98	10/26/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/26/98	10/26/98	ND	
Toluene	EPA 5035	8260B	5	1	10/26/98	10/26/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/26/98	10/26/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/26/98	10/26/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/26/98	10/26/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/26/98	10/26/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/26/98	10/26/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/26/98	10/26/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/26/98	10/26/98	ND	

Approved By: David Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Volatile Organic Compounds by GC/MS

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803699-1	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Trichloroethene (TCE)	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Toluene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Tetrachloroethene (PCE)	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
Ethylbenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
m- & p-Xylenes	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
o-Xylene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
1,3-Dichlorobenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
1,4-Dichlorobenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	
1,2-Dichlorobenzene	EPA 5035	8260B	5	1	10/27/98	10/27/98	ND	

Approved By: Sara A. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-18-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-001	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	120	20	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	120	20	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	120	20	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	2000	20	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	510	
Dibenzofuran	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	240	20	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	1200	20	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	2200	
Anthracene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	520	
Di-n-butyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	5700	
Pyrene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	5000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	4100	
Chrysene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	4000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	4000	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	3500	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	4800	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	4400	
Dibenz(a,h)anthracene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/21/98	11/25/98	2600	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-18-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-002	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	60	10	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	60	10	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	60	10	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	1000	10	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	120	10	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	600	10	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	820	
Anthracene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	2300	
Pyrene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	1900	
Butyl Benzyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	1600	
Chrysene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	1800	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	1800	
Benzo(k)fluoranthene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	1600	
Benzo(a)pyrene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	1900	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	2200	
Dibenz(a,h)anthracene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	200	10	10/21/98	11/25/98	1300	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-7-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-004	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	1200	200	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	1200	200	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	1200	200	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	20000	200	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	2400	200	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	12000	200	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
)thracene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
i-n-butyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	28000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	24000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	20000	
Chrysene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	20000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	19000	
Benzo(k)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	17000	
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	23000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	25000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	14000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

00086

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
ample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-7-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-005	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	1200	200	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	1200	200	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	1200	200	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	20000	200	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	2400	200	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	12000	200	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	6100	
nthracene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
i-n-butyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	14000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	12000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	9300	
Chrysene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	9800	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	9200	
Benzo(k)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	8800	
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	11000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	12000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	6800	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-13-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/21/98	11/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/21/98	11/5/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/21/98	11/5/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/21/98	11/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/21/98	11/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/21/98	11/5/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	110	
Anthracene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	32	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	450	
Pyrene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	480	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	190	
Chrysene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	190	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	180	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	170	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	240	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	200	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	36	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	120	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: _____ Date: 12/4/98

00088

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-13-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-008	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/21/98	11/5/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/21/98	11/5/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/21/98	11/5/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/21/98	11/5/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/21/98	11/5/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/21/98	11/5/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	87	
Anthracene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	21	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	350	
Pyrene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	320	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	210	
Chrysene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	200	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/5/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	220	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	180	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	250	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	190	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	43	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/21/98	11/5/98	110	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-104	Units:	ug/Kg (ppb)
Lab Code:	K9807097-011	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	30	5	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	30	5	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	30	5	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	500	5	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	60	5	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	300	5	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	280	
Anthracene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	800	
Pyrene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	680	
Butyl Benzyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	480	
Chrysene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	520	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	470	
Benzo(k)fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	410	
Benzo(a)pyrene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	460	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	560	
Dibenz(a,h)anthracene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	100	5	10/21/98	11/25/98	320	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/7/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-11-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-013	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	5000	50	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	4300	
Anthracene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	1000	
Di-n-butyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	10000	
Pyrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	9100	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	7500	
Chrysene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	7300	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	7100	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	6000	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	8200	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	9200	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	5200	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: RW Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-11-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-014	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	1200	200	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	1200	200	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	1200	200	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	20000	200	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	2400	200	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	12000	200	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	8400	
Anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	21000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	18000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	15000	
Chrysene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	14000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	13000	
Benzo(k)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	12000	
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	18000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	18000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	4000	200	10/21/98	11/25/98	9600	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-22-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-016	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	30	
Dibenzofuran	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	150	
Anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	27	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	370	
Pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	340	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	250	
Chrysene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	240	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	36	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	280	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	200	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	280	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	360	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	23	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	220	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: RW Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-22-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Chrysene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-27-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-019	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	5000	50	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	2200	
)thracene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
i-n-butyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	5500	
Pyrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	5000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	3900	
Chrysene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	3800	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	3800	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	3300	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	4300	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	5500	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	3000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-27-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-020	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	300	50	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	300	50	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	300	50	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	5000	50	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	600	50	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	3000	50	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	2400	
nthracene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
⁄i-n-butyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	6200	
Pyrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	5600	
Butyl Benzyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	4400	
Chrysene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	4200	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	3800	
Benzo(k)fluoranthene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	3500	
Benzo(a)pyrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	4800	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	6000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	1000	50	10/21/98	11/25/98	3300	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

00096

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-32-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-022	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	30	5	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	30	5	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	30	5	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	500	5	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Dibenzofuran	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	60	5	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	300	5	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	280	
nthracene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
i-n-butyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	710	
Pyrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	650	
Butyl Benzyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	500	
Chrysene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	470	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	470	
Benzo(k)fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	340	
Benzo(a)pyrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	510	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	690	
Dibenz(a,h)anthracene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	380	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: RW Date: 12/4/98

00097

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-32-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-023	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Anthracene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Pyrene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Chrysene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/21/98	11/26/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: _____ Date: 12/4/98

00098

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-39-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-025	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	30	5	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	30	5	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	30	5	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	500	5	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Dibenzofuran	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	60	5	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	300	5	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	620	
Anthracene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	1300	
Pyrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	1000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	790	
Chrysene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	830	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	960	
Benzo(k)fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	560	
Benzo(a)pyrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	830	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	1100	
Dibenz(a,h)anthracene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	590	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

00099

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-39-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-026	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	30	5	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	30	5	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	30	5	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	500	5	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Dibenzofuran	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	60	5	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	300	5	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	370	
Anthracene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	910	
Pyrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	750	
Butyl Benzyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	530	
Chrysene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	550	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	180	
Di-n-octyl Phthalate	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	600	
Benzo(k)fluoranthene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	350	
Benzo(a)pyrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	540	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	730	
Dibenz(a,h)anthracene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	100	5	10/21/98	11/26/98	370	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

00100

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-42-S1	Units:	ug/Kg (ppb)
Lab Code:	K9807097-028	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	1200	200	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	1200	200	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	1200	200	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	20000	200	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Dibenzofuran	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	2400	200	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	12000	200	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	4500	
Anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	11000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	10000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	9400	
Chrysene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	8900	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	9900	
Benzo(k)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	7200	
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	11000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	15000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	7300	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

00101

POPA0008194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-VC-42-S2	Units:	ug/Kg (ppb)
Lab Code:	K9807097-029	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	1200	200	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	1200	200	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	1200	200	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	20000	200	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Dibenzofuran	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	2400	200	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	12000	200	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	10000	
Anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	27000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	24000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	20000	
Chrysene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	19000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	21000	
Benzo(k)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	15000	
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	24000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	32000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	16000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-01	Units:	ug/Kg (ppb)
Lab Code:	K9807097-031	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6000	1000	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	6000	1000	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6000	1000	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	100000	1000	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Dibenzofuran	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12000	1000	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60000	1000	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	49000	
ıthracene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
.-n-butyl Phthalate	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	120000	
Pyrene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	98000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	77000	
Chrysene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	75000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	83000	
Benzo(k)fluoranthene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	61000	
Benzo(a)pyrene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	86000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	110000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20000	1000	10/21/98	11/26/98	55000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-02	Units:	ug/Kg (ppb)
Lab Code:	K9807097-032	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	3000	500	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	3000	500	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	3000	500	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	50000	500	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	14000	
Dibenzofuran	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	14000	
Diethyl Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	6000	500	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	30000	500	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	74000	
Anthracene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	12000	
Di-n-butyl Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	130000	
Pyrene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	100000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	81000	
Chrysene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	78000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	78000	
Benzo(k)fluoranthene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	63000	
Benzo(a)pyrene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	82000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	92000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	50000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

00104

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-03	Units:	ug/Kg (ppb)
Lab Code:	K9807097-033	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	3000	500	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	3000	500	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	3000	500	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	50000	500	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Dibenzofuran	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	6000	500	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	30000	500	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	16000	
Anthracene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	42000	
Pyrene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	40000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	28000	
Chrysene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	30000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	30000	
Benzo(k)fluoranthene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	26000	
Benzo(a)pyrene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	33000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	40000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	10000	500	10/21/98	11/26/98	22000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 11/4/98

00105

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-04	Units:	ug/Kg (ppb)
Lab Code:	K9807097-034	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	400	
Benzoic Acid	EPA 3550A	SIM	2000	20	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	1100	
Dibenzofuran	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	670	
Diethyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	240	20	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	1200	20	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	6400	
Anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	1700	
Di-n-butyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	21000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	21000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	13000	
Chrysene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	11000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	460	
Di-n-octyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	13000	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	9100	
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	15000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	19000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	1200	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	11000	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-05	Units:	ug/Kg (ppb)
Lab Code:	K9807097-035	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	440	
Benzoic Acid	EPA 3550A	SIM	2000	20	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	460	
Dimethyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	560	
Dibenzofuran	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	570	
Diethyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	240	20	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	1200	20	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	4700	
Anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	1400	
Di-n-butyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	18000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	20000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	8600	
Chrysene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	7800	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	7700	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	5800	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	9600	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	10000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	730	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	7100	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 10/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-06	Units:	ug/Kg (ppb)
Lab Code:	K9807097-036	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	60	10	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	60	10	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	60	10	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	1000	10	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	500	
Dibenzofuran	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	340	
Diethyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	120	10	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	600	10	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	3100	
nthracene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	870	
i-n-butyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	13000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	13000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	7000	
Chrysene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	6300	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	420	
Di-n-octyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	6800	
Benzo(k)fluoranthene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	4500	
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	9100	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	10000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	670	
Benzo(g,h,i)perylene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	5100	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-07	Units:	ug/Kg (ppb)
Lab Code:	K9807097-037	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	2000	20	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	990	
Dibenzofuran	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	730	
Diethyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	240	20	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	1200	20	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	6100	
Anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	1700	
Di-n-butyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	19000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	21000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	12000	
Chrysene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	10000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	540	
Di-n-octyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	12000	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	8100	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	13000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	17000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	1200	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	9400	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-08	Units:	ug/Kg (ppb)
Lab Code:	K9807097-038	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	60	10	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	60	10	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	60	10	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	220	
Benzoic Acid	EPA 3550A	SIM	1000	10	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	810	
Dibenzofuran	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	490	
Diethyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	120	10	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	600	10	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	4300	
Anthracene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	1200	
Di-n-butyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	13000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	14000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	8200	
Chrysene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	8600	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	480	
Di-n-octyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	8100	
Benzo(k)fluoranthene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	5700	
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	11000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	12000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	1100	
Benzo(g,h,i)perylene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	6800	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-09	Units:	ug/Kg (ppb)
Lab Code:	K9807097-039	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	60	10	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	60	10	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	60	10	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	210	
Benzoic Acid	EPA 3550A	SIM	1000	10	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	960	
Dibenzofuran	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	540	
Diethyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	120	10	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	600	10	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	5000	
Anthracene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	1300	
Di-n-butyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	16000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	16000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	11000	
Chrysene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	11000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	370	
Di-n-octyl Phthalate	EPA 3550A	SIM	200	10	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	10000	
Benzo(k)fluoranthene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	6000	
Benzo(a)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	12000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	15000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	200	10	10/21/98	11/26/98	1300	
Benzo(g,h,i)perylene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	8600	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: _____ Date: 12/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	HC-S-101	Units:	ug/Kg (ppb)
Lab Code:	K9807097-040	Basis:	Dry
Test Notes:	D		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
2-Methylphenol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
4-Methylphenol	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	120	20	10/21/98	11/26/98	ND	
Naphthalene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benzoic Acid	EPA 3550A	SIM	2000	20	10/21/98	11/26/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Acenaphthylene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Acenaphthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	1300	
Dibenzofuran	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Fluorene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	710	
Diethyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	240	20	10/21/98	11/26/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Pentachlorophenol	EPA 3550A	SIM	1200	20	10/21/98	11/26/98	ND	
Phenanthrene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	6300	
Anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	1700	
Di-n-butyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Fluoranthene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	18000	
Pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	18000	
Butyl Benzyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	13000	
Chrysene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	11000	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	560	
Di-n-octyl Phthalate	EPA 3550A	SIM	400	20	10/21/98	11/26/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	13000	
Benzo(k)fluoranthene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	8400	
Benzo(a)pyrene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	14000	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	4000	200	10/21/98	11/26/98	18000	
Dibenz(a,h)anthracene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	1600	
Benzo(g,h,i)perylene	EPA 3550A	SIM	400	20	10/21/98	11/26/98	9800	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

D The MRL is elevated because of matrix interferences and because the sample required diluting.

Approved By: KW Date: 12/4/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803614-4	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	29	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Chrysene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: _____ Date: 12/4/98

00113

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA

Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9803615-4	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzyl Alcohol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
2-Methylphenol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
4-Methylphenol	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	*
2,4-Dimethylphenol	EPA 3550A	SIM	6	1	10/21/98	11/25/98	ND	
Naphthalene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzoic Acid	EPA 3550A	SIM	100	1	10/21/98	11/25/98	ND	
Hexachlorobutadiene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Acenaphthylene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Dimethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Acenaphthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Dibenzofuran	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Fluorene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Diethyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
N-Nitrosodiphenylamine	EPA 3550A	SIM	12	1	10/21/98	11/25/98	ND	
Hexachlorobenzene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Pentachlorophenol	EPA 3550A	SIM	60	1	10/21/98	11/25/98	ND	
Phenanthrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Di-n-butyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Butyl Benzyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benz(a)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Chrysene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Di-n-octyl Phthalate	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(b)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(k)fluoranthene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(a)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Dibenz(a,h)anthracene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	
Benzo(g,h,i)perylene	EPA 3550A	SIM	20	1	10/21/98	11/25/98	ND	

* 3- and 4-Methylphenol coelute. Quantitated using 4-Methylphenol.

Approved By: RW Date: 12/4/98

00114

APPENDIX A

LABOTATORY

QC RESULTS

POPA0008208

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ent:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	NA
		Date Analyzed:	11/7/98

Duplicate Summary
Sulfide, Total

Sample Name:	HC-VC-103	Units:	mg/Kg (ppm)
Lab Code:	K9807097-010DUPR	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Sulfide, Total	NONE	PSEP	1.5	16.0	14.1	15.0	13	

Approved By: _____ Date: 11/30/98

DUP/020597p
07097WET.BR1 - DUP 11/20/98

POPA0008209

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	NA
		Date Analyzed:	11/7/98

Matrix Spike Summary
Sulfide, Total

Sample Name:	HC-VC-103	Units:	mg/Kg (ppm)
Lab Code:	K9807097-010MSR	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	NONE	PSEP	1.5	233	16.0	71.9	24	60-130	A
Sulfide, Total	NONE	PSEP	1.5	220	16.0	71.9	28	60-130	A

Approved By: _____ Date: 11/30/98

00117

MS/020597p
07097WET.BR1 - MS 11/20/98

POPA0008210

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ient:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	10/18-20/98

Laboratory Control Sample Summary
Sulfide, Total

Sample Name:	Lab Control Sample	Units:	mg/L (ppm)
Lab Code:	K9807097-LCS	Basis:	
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	NONE	PSEP	0.94	1.08	115	60-130	
Sulfide, Total	NONE	PSEP	0.89	2.15	242	60-130	A
Sulfide, Total	NONE	PSEP	0.87	1.85	213	60-130	A

Approved By: _____ Date: 11/30/98

00118

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Analyzed: 10/18-20/98

Sulfide, Total
PSEP
Units: mg/L (ppm)

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 2 Result	0.47	0.47	100
CCV 3 Result	0.47	0.47	100
CCV 2 Result	0.89	0.88	99
CCV 3 Result	0.89	0.88	99
CCV 4 Result	0.89	0.88	99
CCV 5 Result	0.89	0.88	99
CCV 2 Result	0.87	0.87	100
CCV 3 Result	0.87	0.87	100

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 4 Result	0.05	ND
CCB 5 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND

Approved By: _____ Date: 11/30/98

00119

COMBOQCD/042695

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	10/27,11/7/98

Laboratory Control Sample Summary
Sulfide, Total

Sample Name:	Lab Control Sample	Units:	mg/L (ppm)
Lab Code:	K9807097-LCS	Basis:	
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Sulfide, Total	NONE	PSEP	0.87	0.18	21	60-130	
Sulfide, Total	NONE	PSEP	0.74	0.61	82	60-130	

Approved By: _____ Date: 11/30/98

00120

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Analyzed: 10/27,11/7/98

Sulfide, Total
PSEP
Units: mg/L (ppm)

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	0.43	0.44	102
CCV 2 Result	0.43	0.44	102
CCV 3 Result	0.43	0.44	102
CCV 1 Result	0.37	0.36	95
CCV 2 Result	0.37	0.35	97
CCV 1 Result	0.37	0.36	97
CCV 2 Result	0.37	0.36	97
CCV 3 Result	0.37	0.36	97

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND

Approved By: _____ Date: 11/30/98

00121

COMBOQCD/042695

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

nt: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807097
Date Collected: 10/12/98
Date Received: 10/14/98
Date Extracted: NA
Date Analyzed: 10/22/98

Duplicate Summary
Ammonia as Nitrogen

Sample Name: HC-VC-18-S1
Lab Code: K9807097-001DUP
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Ammonia as Nitrogen	NONE	350.1M	2.0	75.7	76.7	76.2	1	

Approved By: _____ Date: 11/30/98

00122

DUP/020597p
07097WET.LJ2 - DUP 11/30/98

Page No.:

POPA0008215

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ent:	Hart Crowser, Inc.	**Service Request:**	K9807097
oject:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	10/22,27/98

Laboratory Control Sample Summary
Ammonia as Nitrogen

Sample Name:	Lab Control Sample	Units:	mg/Kg (ppm)
Lab Code:	K9807097-LCS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Ammonia as Nitrogen	NONE	350.1M	4.04	3.99	99	85-115	
Ammonia as Nitrogen	NONE	350.1M	4.04	4.02	100	85-115	
Ammonia as Nitrogen	NONE	350.1M	4.04	4.02	100	85-115	
Ammonia as Nitrogen	NONE	350.1M	4.04	4.16	103	85-115	
Ammonia as Nitrogen	NONE	350.1M	4.04	4.01	99	85-115	

Approved By: _____ Date: 11/30/98

00123

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

nt:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	NA
		Date Analyzed:	10/22/98

Matrix Spike Summary
Ammonia as Nitrogen

Sample Name:	HC-VC-18-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-001MS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Ammonia as Nitrogen	NONE	350.1M	2.0	469	75.7	592	110	75-125	

Approved By: _____ Date: 11/30/98

00124

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Analyzed: 10/22/98

Ammonia as Nitrogen
EPA Method 350.1M
Units: mg/Kg (ppm)
Dry Weight Basis

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	2.00	2.01	100
CCV 2 Result	2.00	1.96	98
CCV 3 Result	2.00	1.94	97
CCV 4 Result	2.00	1.99	100
CCV 5 Result	2.00	1.90	95
CCV 6 Result	2.00	1.98	99
CCV 7 Result	2.00	1.93	96
CCV 8 Result	2.00	1.99	100
CCV 9 Result	2.00	2.05	102
CCV 1 Result	2.00	2.01	100
CCV 2 Result	2.00	2.08	104

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 4 Result	0.05	ND
CCB 5 Result	0.05	ND
CCB 6 Result	0.05	ND
CCB 7 Result	0.05	ND
CCB 8 Result	0.05	ND
CCB 9 Result	0.05	ND
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND

Approved By: _____ Date: 11/30/98

00125

COMBOQCD/042695

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Analyzed: 10/27/98

Ammonia as Nitrogen
EPA Method 350.1M
Units: mg/Kg (ppm)
Dry Weight Basis

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	2.00	2.03	102
CCV 2 Result	2.00	2.05	102
CCV 5 Result	2.00	2.06	103
CCV 6 Result	2.00	2.06	103

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 5 Result	0.05	ND
CCB 6 Result	0.05	ND

Approved By: _____ Date: 11/30/98

00126

COMBOQCD/042695

Q-CCV.XLT

POPA0008219

10/6/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	NA
		Date Analyzed:	10/20/98

Duplicate Summary
Carbon, Total Organic

Sample Name:	HC-VC-18-S1	Units:	PERCENT
Lab Code:	K9807097-001DUP	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Carbon, Total Organic	NONE	ASTM D4129-82M	0.05	0.91	0.93	0.92	2	

M Modified

Approved By: _____ Date: 11/30/98

DUP/020597p
07097WET.LJ4 - DUP 11/30/98

00127

POPA0008220

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
LCS Matrix: Sediment

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/20/98

Laboratory Control Sample Summary
Carbon, Total Organic

Sample Name: Lab Control Sample
Lab Code: K9807097-LCS
Test Notes:

Units: PERCENT
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Carbon, Total Organic	NONE	ASTM D4129-82M	0.62	0.66	106	85-115	

M Modified

Approved By: _____ Date: 11/30/98

LCS/020597p
07097WET.LJ4 - LCS 11/30/98

POPA0008221

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

nt:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	NA
		Date Analyzed:	10/20/98

Matrix Spike Summary
Carbon, Total Organic

Sample Name:	HC-VC-18-S1	Units:	PERCENT
Lab Code:	K9807097-001MS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Carbon, Total Organic	NONE	ASTM D4129-82M	0.05	4.70	0.91	5.22	92	75-125	

M Modified

Approved By: _____ Date: 11/30/98

MS/020597p
07097WET.LJ4 - MS 11/30/98

00129

POPA0008222

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Analyzed: 10/20/98

Carbon, Total Organic
ASTM D4129-82M
Units: PERCENT
Dry Weight Basis

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 2 Result	20.0	19.8	99
CCV 3 Result	20.0	19.5	98
CCV 4 Result	20.0	20.5	102

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 4 Result	0.05	ND

Approved By: _____ Date: 11/30/98

COMBOQCD/042695

Q-CCV.XLT

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
LCS Matrix: Sediment

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/21,12/2,4/98

Laboratory Control Sample Summary
Carbon, Total Organic

Sample Name: Lab Control Sample
Lab Code: K9807097-LCS
Test Notes:

Units: PERCENT
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Carbon, Total Organic	NONE	ASTM D4129-82M	0.62	0.62	100	85-115	
Carbon, Total Organic	NONE	ASTM D4129-82M	0.62	0.54	87	85-115	
Carbon, Total Organic	NONE	ASTM D4129-82M	0.62	0.54	87	85-115	

M Modified

Approved By: _____ Date: 12/8/98

LCS/020597p
07097WET.LJ5 - LCS 12/8/98

POPA0008224

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Analyzed: 10/21,12/2,4/98

Carbon, Total Organic
ASTM D4129-82M
Units: PERCENT
Dry Weight Basis

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	20.0	19.3	96
CCV 2 Result	20.0	19.0	95
CCV 3 Result	20.0	19.4	97
CCV 4 Result	20.0	19.4	97
CCV 5 Result	20.0	18.3	92
CCV 1 Result	20.0	19.2	96
CCV 2 Result	20.0	20.3	102

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND
CCB 4 Result	0.05	ND
CCB 5 Result	0.05	ND
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND

Approved By: _____ Date: 12/8/98

COMBOQCD/042695

00132

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807097
Date Collected: 10/12/98
Date Received: 10/14/98
Date Extracted: 10/27/98
Date Analyzed: 11/3/98

Duplicate Summary
Total Metals

Sample Name: HC-VC-7-S1
Lab Code: K9807097-004
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Antimony	EPA 3050B	200.8	0.1	0.6	0.6	0.6	<1	
Arsenic	EPA 3050B	200.8	2	8	8	8	<1	
Cadmium	EPA 3050B	200.8	0.1	2.4	2.4	2.4	<1	
Chromium	EPA 3050B	200.8	0.3	27.3	26.1	26.7	4	
Copper	EPA 3050B	200.8	0.5	62.8	64.7	63.8	3	
Lead	EPA 3050B	200.8	0.1	361	390	376	8	
Mercury	7471A	7471A	0.02	0.15	0.13	0.14	14	
Nickel	EPA 3050B	200.8	1	26	24	25	8	
Silver	EPA 3050B	200.8	0.1	0.9	1	1	10	
Zinc	EPA 3050B	200.8	2	464	470	467	1	

Approved By: _____ Date: 11/4/98

DUP/031695

070971CP.EA1 - DUP 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/27/98
		Date Analyzed:	11/3/98

Matrix Spike Summary
Total Metals

Sample Name:	HC-VC-7-S1	Units:	mg/Kg (ppm)
Lab Code:	K9807097-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Antimony	EPA 3050B	200.8	0.1	100	0.6	20.1	19	30-120	A
Arsenic	EPA 3050B	200.8	2	40	8	41	82	60-130	
Cadmium	EPA 3050B	200.8	0.1	10	2.4	11.3	89	60-130	
Chromium	EPA 3050B	200.8	0.3	40	27.3	63.5	91	60-130	
Copper	EPA 3050B	200.8	0.5	50	62.8	105	84	60-130	
Lead	EPA 3050B	200.8	0.1	100	361	466	105	60-130	
Mercury	7471A	7471A	0.02	0.8	0.15	0.94	99	60-130	
Nickel	EPA 3050B	200.8	1	100	26	115	89	60-130	
Silver	EPA 3050B	200.8	0.1	10	0.9	8.7	78	60-130	
Zinc	EPA 3050B	200.8	2	100	469	518	NA	60-130	

A	Outside acceptance limits; see case narrative.
NA	Not Applicable; see case narrative.

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
LCS Matrix: Soil

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Extracted: 10/27/98
Date Analyzed: 11/3/98

Laboratory Control Sample Summary
Total Metals

Sample Name: Laboratory Control Sample
Lab Code: K9807097-LCS
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Source: Environmental Resource Associates #238

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Antimony	EPA 3050B	200.8	59.6	67.2	113	20-180	
Arsenic	EPA 3050B	200.8	82.4	58.2	71	62-138	
Cadmium	EPA 3050B	200.8	94.3	67.2	71	55-144	
Chromium	EPA 3050B	200.8	97.8	73.0	75	69-131	
Copper	EPA 3050B	200.8	81.3	61.5	76	62-138	
Lead	EPA 3050B	200.8	190	148	78	60-140	
Mercury	7471A	7471A	1.34	1.31	98	49-151	
Nickel	EPA 3050B	200.8	164	119	73	67-133	
Silver	EPA 3050B	200.8	113	144	127	65-134	
Zinc	EPA 3050B	200.8	131	75.8	58	56-144	

Approved By: _____ Date: 11/4/98

LCS/032295
070971CP.EA1 - LCSS 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/28/98
		Date Analyzed:	11/4/98

Duplicate Summary
Total Metals

Sample Name:	Batch QC	Units:	mg/Kg (ppm)
Lab Code:	K9807115-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Antimony	EPA 3050B	200.8	0.1	0.2	0.4	0.3	67	
Arsenic	EPA 3050B	200.8	2	5	5	5	<1	
Cadmium	EPA 3050B	200.8	0.1	2.0	1.3	1.6	44	A
Chromium	EPA 3050B	200.8	0.3	24.6	25.4	25.0	3	
Copper	EPA 3050B	200.8	0.5	45.3	42.2	43.8	7	
Lead	EPA 3050B	200.8	0.1	288	244	266	16	
Mercury	7471A	7471A	0.02	0.06	0.08	0.07	28	
Nickel	EPA 3050B	200.8	1	21	21	21	<1	
Silver	EPA 3050B	200.8	0.1	0.4	0.6	0.5	40	A
Zinc	EPA 3050B	200.8	2	798	297	548	91	A

A Outside aceptance limits; see case narrative.

Approved By: _____ Date: 11/4/98

DUP/031695

07097ICP.EA1 - DUP (2) 11/4/98

00136

POPA0008229

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Extracted: 10/28/98
Date Analyzed: 11/4/98

Matrix Spike Summary
Total Metals

Sample Name: Batch QC
Lab Code: K9807115-004
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Antimony	EPA 3050B	200.8	0.1	100	0.2	17.6	17	30-120	A
Arsenic	EPA 3050B	200.8	2	40	5	42	92	60-130	
Cadmium	EPA 3050B	200.8	0.1	10	2.0	10.0	80	60-130	
Chromium	EPA 3050B	200.8	0.3	40	24.6	61.6	92	60-130	
Copper	EPA 3050B	200.8	0.5	50	45.3	91.8	93	60-130	
Lead	EPA 3050B	200.8	0.1	100	288	338	50	60-130	A
Mercury	7471A	7471A	0.02	1	0.06	1.15	109	60-130	
Nickel	EPA 3050B	200.8	1	100	21	111	90	60-130	
Silver	EPA 3050B	200.8	0.1	10	0.4	7.2	68	60-130	
Zinc	EPA 3050B	200.8	2	100	798	380	NA	60-130	

A Outside acceptance limits; see case narrative.
NA Not Applicable; see case narrative.

Approved By: _____ Date: 11/4/98

MS/031695
070971CP.EA1 - Spike (2) 11/4/98

POPA0008230

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Soil	**Date Received:**	NA
		Date Extracted:	10/28/98
		Date Analyzed:	11/4/98

Laboratory Control Sample Summary
Total Metals

Sample Name:	Laboratory Control Sample	Units:	mg/Kg (ppm)
Lab Code:	K9807097-LCS2	Basis:	Dry
Test Notes:			

Source: Environmental Resource Associates #238

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Control Limits	Result Notes
Antimony	EPA 3050B	200.8	59.6	49.5	83	20-180	
Arsenic	EPA 3050B	200.8	82.4	63.9	78	62-138	
Cadmium	EPA 3050B	200.8	94.3	61.8	66	55-144	
Chromium	EPA 3050B	200.8	97.8	68.5	70	69-131	
Copper	EPA 3050B	200.8	81.3	57.5	71	62-138	
Lead	EPA 3050B	200.8	190	142	75	60-140	
Mercury	7471A	7471A	1.34	1.16	87	49-151	
Nickel	EPA 3050B	200.8	164	111	68	67-133	
Silver	EPA 3050B	200.8	113	104	92	65-134	
Zinc	EPA 3050B	200.8	131	73.2	56	56-144	

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/28/98
		Date Analyzed:	11/4/98

Matrix Spike Summary
Total Metals

Sample Name:	Batch QC	Units:	mg/Kg (ppm)
Lab Code:	K9807115-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Antimony	EPA 3050B	200.8	0.1	100	0.2	17.6	17	30-120	A
Arsenic	EPA 3050B	200.8	2	40	5	42	92	60-130	
Cadmium	EPA 3050B	200.8	0.1	10	2.0	10.0	80	60-130	
Chromium	EPA 3050B	200.8	0.3	40	24.6	61.6	92	60-130	
Copper	EPA 3050B	200.8	0.5	50	45.3	91.8	93	60-130	
Lead	EPA 3050B	200.8	0.1	100	288	338	NA	60-130	
Mercury	7471A	7471A	0.02	1	0.06	1.15	109	60-130	
Nickel	EPA 3050B	200.8	1	100	21	111	90	60-130	
Silver	EPA 3050B	200.8	0.1	10	0.4	7.2	68	60-130	
Zinc	EPA 3050B	200.8	2	100	798	380	NA	60-130	

A	Outside acceptance limits; see case narrative.
NA	Not Applicable; see case narrative.

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807097
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Initial Calibration Verification (ICV) Summary
Metals
Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Antimony	200.8	50.0	51.9	104
Arsenic	200.8	50.0	51.8	104
Cadmium	200.8	25.0	26.2	105
Chromium	200.8	20.0	20.7	104
Copper	200.8	25.0	25.9	104
Lead	200.8	50.0	51.5	103
Mercury	7471A	5.0	5.32	106
Nickel	200.8	50.0	51.4	103
Silver	200.8	25.0	25.7	103
Zinc	200.8	50.0	51.9	104

Approved By: _____ Date: 11/4/98

ICVEPA/102194
070971CP.EA1 - ICV 11/4/98

POPA0008233

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807097
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/4/98

Initial Calibration Verification (ICV) Summary
Metals
Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Antimony	200.8	50.0	50.8	102
Arsenic	200.8	50.0	51.2	102
Cadmium	200.8	25.0	25.9	104
Chromium	200.8	20.0	20.6	103
Copper	200.8	25.0	25.6	102
Lead	200.8	50.0	52.2	104
Mercury	7471A	5.0	-	-
Nickel	200.8	50.0	50.9	102
Silver	200.8	25.0	25.2	101
Zinc	200.8	50.0	52.0	104

Approved By: _____ Date: 11/4/98

ICVEPA/102194
07097ICP.EA1 - ICV (2) 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807097
Date Analyzed: 11/4/98

Initial Calibration Verification (ICV) Summary
Metals
Units: µg/L (ppb)

ICV Source: Inorganic Ventures ICV

Analyte	EPA Method	True Value	Result	Percent Recovery
Antimony	200.8	50.0	49.8	100
Arsenic	200.8	50.0	51.0	102
Cadmium	200.8	25.0	25.5	102
Chromium	200.8	20.0	20.2	101
Copper	200.8	25.0	25.7	103
Lead	200.8	50.0	51.4	103
Mercury	7471A	5.0	-	-
Nickel	200.8	50.0	51.1	102
Silver	200.8	25.0	25.1	100
Zinc	200.8	50.0	50.9	102

Approved By: _____ Date: 11/4/98

00142

ICVEPA/102194
07097ICP.EA1 - ICV (3) 11/4/98

POPA0008235

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807097
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Verification (CCV) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV1 Result	Percent Recovery	CCV2 Result	Percent Recovery	CCV3 Result	Percent Recovery
Antimony	200.8	25.0	25.6	102	25.4	102	25.9	104
Arsenic	200.8	25.0	25.0	100	25.2	101	25.4	102
Cadmium	200.8	25.0	25.3	101	25.0	100	25.9	104
Chromium	200.8	25.0	25.0	100	25.3	101	25.6	102
Copper	200.8	25.0	25.3	101	25.4	102	25.8	103
Lead	200.8	25.0	24.8	99	25.3	101	25.5	102
Mercury	7471A	5.0	5.05	101	4.99	100	4.92	98
Nickel	200.8	25.0	25.3	101	25.2	101	25.8	103
Silver	200.8	25.0	25.0	100	25.1	100	25.1	100
Zinc	200.8	25.0	25.3	101	25.3	101	25.8	103

Approved By: _____ Date: 11/4/98

CCV 1-3/042795
07097ICP.EA1 - CCV 1-3 11/4/98

POPA0008236

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807097
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Verification (CCV) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV4 Result	Percent Recovery	CCV5 Result	Percent Recovery	CCV6 Result	Percent Recovery
Antimony	200.8	25.0	25.6	102	24.7	99	24.6	98
Arsenic	200.8	25.0	25.2	101	25.5	102	25.4	102
Cadmium	200.8	25.0	25.5	102	24.7	99	24.8	99
Chromium	200.8	25.0	25.4	102	25.2	101	25.1	100
Copper	200.8	25.0	25.8	103	25.4	102	25.2	101
Lead	200.8	25.0	25.1	100	27.5	110	26.9	108
Mercury	7471A	5.0	4.87	97	5.05	101	-	-
Nickel	200.8	25.0	25.6	102	25.2	101	25.0	100
Silver	200.8	25.0	25.4	102	25.1	100	24.4	98
Zinc	200.8	25.0	25.6	102	25.6	102	25.4	10

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807097
Date Analyzed: 11/3/98

Continuing Calibration Verification (CCV) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV7 Result	Percent Recovery	CCV8 Result	Percent Recovery	CCV9 Result	Percent Recovery
Antimony	200.8	25.0	24.5	98	25.1	100	25.2	101
Arsenic	200.8	25.0	25.3	101	25.1	100	25.4	102
Cadmium	200.8	25.0	24.5	98	25.2	101	25.3	101
Chromium	200.8	25.0	25.1	100	25.3	101	25.4	102
Copper	200.8	25.0	25.1	100	25.0	100	26.0	104
Lead	200.8	25.0	27.4	110	25.6	102	25.4	102
Mercury	7471A	5.0	-	-	-	-	-	-
Nickel	200.8	25.0	24.8	99	25.3	101	25.4	102
Silver	200.8	25.0	24.8	99	25.0	100	25.2	101
Zinc	200.8	25.0	25.4	102	25.3	101	26.0	104

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807097
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Verification (CCV) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV10 Result	Percent Recovery	CCV11 Result	Percent Recovery	CCV12 Result	Percent Recovery
Antimony	200.8	25.0	23.9	96	25.0	100	24.9	100
Arsenic	200.8	25.0	26.3	105	25.0	100	25.0	100
Cadmium	200.8	25.0	24.0	96	24.8	99	24.8	99
Chromium	200.8	25.0	25.0	100	25.0	100	24.6	98
Copper	200.8	25.0	26.2	105	24.8	99	25.3	101
Lead	200.8	25.0	26.1	104	25.1	100	25.2	101
Mercury	7471A	5.0	-	-	-	-	-	-
Nickel	200.8	25.0	25.2	101	25.1	100	25.5	102
Silver	200.8	25.0	24.0	96	25.0	100	25.0	100
Zinc	200.8	25.0	26.7	107	25.0	100	25.3	101

Approved By: _____ Date: 11/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807097
Date Analyzed: 11/3/98

Continuing Calibration Verification (CCV) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	True Value	CCV13 Result	Percent Recovery
Antimony	200.8	25.0	24.3	97
Arsenic	200.8	25.0	25.1	100
Cadmium	200.8	25.0	24.8	99
Chromium	200.8	25.0	25.0	100
Copper	200.8	25.0	25.3	101
Lead	200.8	25.0	25.5	102
Mercury	7471A	5.0	-	-
Nickel	200.8	25.0	25.2	101
Silver	200.8	25.0	24.8	99
Zinc	200.8	25.0	25.3	101

Approved By: _____ Date: 11/4/98

CCV 7-9/042795
07097ICP.EA1 - CCV 7-9 (3) 11/4/98

POPA0008240

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807097
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Blank (CCB) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB1 Result	CCB2 Result	CCB3 Result	CCB4 Result
Antimony	200.8	0.02	ND	ND	ND	ND
Arsenic	200.8	0.5	ND	ND	ND	ND
Cadmium	200.8	0.02	ND	0.02	ND	0.03
Chromium	200.8	0.06	ND	0.11	ND	0.11
Copper	200.8	0.1	ND	ND	ND	ND
Lead	200.8	0.02	ND	ND	ND	ND
Mercury	7471A	0.001	ND	ND	ND	ND
Nickel	200.8	0.2	ND	ND	ND	ND
Silver	200.8	0.02	ND	ND	ND	ND
Zinc	200.8	0.5	ND	ND	ND	ND

Approved By: _____ Date: 11/4/98

CCB4SMRL/102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807097
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Blank (CCB) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB5 Result	CCB6 Result	CCB7 Result	CCB8 Result
Antimony	200.8	0.02	ND	ND	ND	ND
Arsenic	200.8	0.5	ND	ND	ND	ND
Cadmium	200.8	0.02	ND	ND	ND	ND
Chromium	200.8	0.06	0.13	0.10	0.1	ND
Copper	200.8	0.1	ND	ND	ND	ND
Lead	200.8	0.02	0.21	0.11	0.11	ND
Mercury	7471A	0.001	ND	-	-	-
Nickel	200.8	0.2	ND	ND	ND	ND
Silver	200.8	0.02	ND	ND	ND	0.02
Zinc	200.8	0.5	ND	ND	ND	ND

Approved By: _____ Date: 11/4/98

CCB4SMRL/102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc. **Service Request:** K9807097
Project: Port of Portland Terminal 4/5624 **Date Analyzed:** 11/3/98

Continuing Calibration Blank (CCB) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB9 Result	CCB10 Result	CCB11 Result	CCB12 Result
Antimony	200.8	0.02	ND	ND	ND	ND
Arsenic	200.8	0.5	ND	ND	ND	ND
Cadmium	200.8	0.02	ND	ND	ND	0.02
Chromium	200.8	0.06	ND	ND	0.06	ND
Copper	200.8	0.1	ND	ND	ND	ND
Lead	200.8	0.02	ND	ND	ND	ND
Mercury	7471A	0.001	-	-	-	-
Nickel	200.8	0.2	ND	ND	ND	ND
Silver	200.8	0.02	0.03	0.03	ND	ND
Zinc	200.8	0.5	ND	ND	ND	ND

Approved By: _____ Date: 11/4/98

CCB4SMRL/102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624

Service Request: K9807097
Date Analyzed: 11/3/98

Continuing Calibration Blank (CCB) Summary
Metals
Units: µg/L (ppb)

Analyte	EPA Method	MRL	CCB13 Result
Antimony	200.8	0.02	ND
Arsenic	200.8	0.5	ND
Cadmium	200.8	0.02	ND
Chromium	200.8	0.06	ND
Copper	200.8	0.1	ND
Lead	200.8	0.02	0.19
Mercury	7471A	0.001	-
Nickel	200.8	0.2	ND
Silver	200.8	0.02	ND
Zinc	200.8	0.5	ND

Approved By: _____ Date: 11/4/98

CCB4SMRL/102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/23/98
		Date Analyzed:	10/31/98

Surrogate Recovery Summary
Northwest TPH-Dx

Prep Method:	EPA 3550B	Units:	PERCENT
Analysis Method:	NWTPH-Dx	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery o-Terphenyl	Percent Recovery Chlorohexadecane
HC-VC-13-S1	K9807097-007		76	77
HC-VC-11-S1	K9807097-013		82	85
HC-VC-11-S2	K9807097-014		69	74
HC-S-01	K9807097-031		86	95
HC-S-02	K9807097-032		59	65
HC-S-03	K9807097-033		63	68
HC-S-04	K9807097-034		74	81
HC-S-05	K9807097-035		84	92
HC-S-06	K9807097-036		73	81
HC-S-07	K9807097-037		67	73
HC-S-08	K9807097-038		42 A	47 A
HC-S-09	K9807097-039		59	63
HC-S-101	K9807097-040		79	83
Method Blank	K981023-MB		83	84
HC-S-08	K9807097-038MS		82	87
Lab Control Sample	K981023-LCS		76	74
Lab Control Sample	K981023-LCS2		71	70
Lab Control Sample	K981023-LCS3		97	98
HC-S-01	K9807097-031Dup		92	97
	CAS Acceptance Limits:		50-150	50-150

Approved By: _____ Date: 11/12/98

00152

SUR2/061197p
07097PHC.AG2 - SUR 11/12/98

POPA0008245

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807097
Date Collected: 10/12/98
Date Received: 10/14/98
Date Extracted: 10/23/98
Date Analyzed: 10/31/98

Duplicate Summary
Northwest TPH-Dx

Sample Name: HC-S-01
Lab Code: K9807097-031Dup
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	2100	1600	1800	28	
Lube Oil	EPA 3550B	NWTPH-Dx	100	ND	ND	ND	<1	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	11000	8500	9800	26	
Pristane	EPA 3550B	NWTPH-Dx	0.5	5.3	4.6	5.0	14	
Phytane	EPA 3550B	NWTPH-Dx	0.5	5.5	4.3	4.9	24	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	120	95	110	23	

Approved By: _____ Date: 11/2/98

DUP/020597p
07097PHC.AG2 - DUP 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/23/98
		Date Analyzed:	10/31/98

Matrix Spike Summary
Northwest TPH-Dx

Sample Name:	HC-S-08	Units:	mg/Kg (ppm)
Lab Code:	K9807097-038MS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	270	<100	470	174	50-150	A
Lube Oil	EPA 3550B	NWTPH-Dx	100	270	ND	NA	NC	50-150	

A Outside acceptance limits; see case narrative.

Approved By: _____ Date: 11/12/98

MS/020597p
07097PHC_AG2 - MS 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/23/98
		Date Analyzed:	10/30/98

Laboratory Control Sample Summary
Northwest TPH-Dx

Sample Name:	Lab Control Sample	Units:	mg/Kg (ppm)
Lab Code:	K981023-LCS	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	100	75	75	50-150	
Lube Oil	EPA 3550B	NWTPH-Dx	100	97	97	50-150	

Approved By: _____ Date: 11/12/98

LCS/020597p
07097PHC.AG2 - LCS 11/12/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/23/98
		Date Analyzed:	10/30/98

Laboratory Control Sample Summary
Northwest TPH-Dx

Sample Name:	Lab Control Sample	Units:	mg/Kg (ppm)
Lab Code:	K981023-LCS2	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Pencil Pitch	EPA 3550B	NWTPH-Dx	53	44	83	50-150	

Approved By: _____ Date: 11/12/98

LCS/020597p
07097PHC.AG2 - LCS2 11/12/98

00156

POPA0008249

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
LCS Matrix: Sediment

Service Request: K9807097
Date Collected: NA
Date Received: NA
Date Extracted: 10/23/98
Date Analyzed: 10/30/98

Laboratory Control Sample Summary
Northwest TPH-Dx

Sample Name: Lab Control Sample
Lab Code: K981023-LCS3
Test Notes:

Units: mg/Kg (ppm)
Basis: Dry

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	100	60	60	50-150	
Pencil Pitch	EPA 3550B	NWTPH-Dx	53	37	70	50-150	

Approved By: _____ Date: 11/12/98

LCS/020597p
07097PHC.AG2 - LCS3 11/12/98

00157

POPA0008250

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12 - 10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/20 - 10/27/98
		Date Analyzed:	10/20 - 10/27/98

Surrogate Recovery Summary
Volatile Organic Compounds by GC/MS

Prep Method:	EPA 5035	Units:	PERCENT
Analysis Method:	8260B	Basis:	Dry

Sample Name	Lab Code	Test Notes	Percent Recovery		
			Dibromofluoromethane	Toluene-d8	4-Bromofluorobenzene
HC-VC-18-S1	K9807097-001		104	101	107
HC-VC-18-S2	K9807097-002		97	105	109
HC-VC-7-S1	K9807097-004		101	100	107
HC-VC-7-S2	K9807097-005		101	102	107
HC-VC-13-S1	K9807097-007		94	100	108
HC-VC-13-S2	K9807097-008		99	101	107
HC-VC-103	K9807097-010		96	104	109
HC-VC-11-S1	K9807097-013		98	98	108
HC-VC-11-S2	K9807097-014		102	98	110
HC-VC-22-S1	K9807097-016		100	96	109
HC-VC-22-S2	K9807097-017		100	98	106
HC-VC-27-S1	K9807097-019		102	102	112
HC-VC-27-S2	K9807097-020		102	101	113
HC-VC-32-S1	K9807097-022		104	101	111
HC-VC-32-S2	K9807097-023		101	98	109
HC-VC-39-S1	K9807097-025		98	98	108
HC-VC-39-S2	K9807097-026		100	102	111
HC-VC-42-S1	K9807097-028		102	97	108
HC-VC-42-S2	K9807097-029		101	104	110
HC-S-01	K9807097-031		105	97	110
HC-S-02	K9807097-032		99	101	104
HC-S-03	K9807097-033		99	102	112
HC-S-04	K9807097-034		95	96	108
HC-S-05	K9807097-035		101	98	112
HC-S-07	K9807097-037		96	94	101
	CAS Acceptance Limits:		75-132	85-109	49-131

Approved By: Tara L. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/20 - 10/27/98
		Date Analyzed:	10/20 - 10/27/98

Surrogate Recovery Summary
Volatile Organic Compounds by GC/MS

Prep Method:	EPA 5035	Units:	PERCENT
Analysis Method:	8260B	Basis:	Dry

Sample Name	Lab Code	Test Notes	Percent Recovery		
			Dibromofluoromethane	Toluene-d8	4-Bromofluorobenzene
C-S-08	K9807097-038		93	98	97
C-S-09	K9807097-039		106	103	101
C-S-101	K9807097-040		96	104	97
Method Blank	KWG9803606-1		117	92	109
Method Blank	KWG9803607-1		106	96	112
Method Blank	KWG9803629-3		89	106	98
Method Blank	KWG9803699-1		88	98	100
Matrix Spike	K9807097-038MS		106	92	98
Duplicate Matrix Spike	K9807097-038DMS		99	94	93
ntrol Sample	KWG9803699-2		110	95	112
Spike	K9807097-040MS		110	93	106
Duplicate Matrix Spike	K9807097-040DMS		107	96	101

CAS Acceptance Limits:	75-132	85-109	49-131

Approved By: _____ Date: 11/13/98

00159

SUR3QC.XLT_SUR/01071998a
07097VOA.T10 - SUR 11/13/98

POPA0008252

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/27/98
		Date Analyzed:	10/27/98

Laboratory Control Sample Summary
Volatile Organic Compounds by GC/MS

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9803699-2	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	EPA 5035	8260B	50	53	106	78-116	
Trichloroethene (TCE)	EPA 5035	8260B	50	56	112	79-119	
Toluene	EPA 5035	8260B	50	48	94	77-118	
1,2-Dichlorobenzene	EPA 5035	8260B	50	52	104	79-120	

Approved By: Carla L. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/30/98
		Date Extracted:	10/27/98
		Date Analyzed:	10/27/98

Matrix Spike Summary
Volatile Organic Compounds by GC/MS

Sample Name:	Matrix Spike	Units:	ug/Kg (ppb)
Lab Code:	K9807097-038MS	Basis:	Dry
Test Notes:	F		

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	EPA 5035	8260B	14	140	ND	110	79	57-121	
Trichloroethene (TCE)	EPA 5035	8260B	14	140	ND	110	79	45-127	
Toluene	EPA 5035	8260B	14	140	ND	93	66	34-134	
1,2-Dichlorobenzene	EPA 5035	8260B	14	140	ND	72	51	34-131	

F — The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Carol Christensen Date: 11/13/98

SUR3QC.XLT_MS/01071998a
07097VOA.T10 - MS 11/13/98

POPA0008254

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

C :	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/27/98
		Date Analyzed:	10/27/98

Matrix Spike/Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS

Sample Name:	Duplicate Matrix Spike		Units:	ug/Kg (ppb)
Lab Code:	K9807097-038MS	K9807097-038DMS	Basis:	Dry
Test Notes:	F			

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Percent Recovery MS	Percent Recovery DMS	RPD MS	RPD DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Benzene	EPA 5035	8260B	14	140	140	ND	110	120	79	86	57-121	9	
Trichloroethene (TCE)	EPA 5035	8260B	14	140	140	ND	110	120	79	86	45-127	9	
Toluene	EPA 5035	8260B	14	140	140	ND	93	110	66	79	34-134	17	
1,2-Dichlorobenzene	EPA 5035	8260B	14	140	140	ND	72	90	51	64	34-131	22	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Brad Christens Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/27/98
		Date Analyzed:	10/27/98

Matrix Spike/Duplicate Matrix Spike Summary
Volatile Organic Compounds by GC/MS

Sample Name:	Duplicate Matrix Spike		Units:	ug/Kg (ppb)
Lab Code:	K9807097-040MS	K9807097-040DMS	Basis:	Dry
Test Notes:	F			

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Benzene	EPA 5035	8260B	10	146	148	ND	168	149	115	101	57-121	13	
Trichloroethene (TCE)	EPA 5035	8260B	10	146	148	ND	175	153	120	103	45-127	15	
Toluene	EPA 5035	8260B	10	146	148	ND	143	129	98	87	34-134	12	
1,2-Dichlorobenzene	EPA 5035	8260B	10	146	148	ND	154	97	105	66	34-131	46	

The MRL is elevated because of the low percent solids in the sample as received.

Approved By: Dana L. Christensen Date: 11/13/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12-13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/21/98
		Date Analyzed:	11/4-26/98

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method: EPA 3550A
Analysis Method: SIM

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
HC-VC-18-S1	K9807097-001		46	51	37	53	60	72
HC-VC-18-S2	K9807097-002		53	56	44	61	47	78
HC-VC-7-S1	K9807097-004		NA	NA	NA	NA	NA	NA
HC-VC-7-S2	K9807097-005		NA	NA	NA	NA	NA	NA
HC-VC-13-S1	K9807097-007		66	72	69	58	75	120
HC-VC-13-S2	K9807097-008		76	78	81	58	63	111
HC-VC-104	K9807097-011		36	45	38	47	18	60
HC-VC-11-S1	K9807097-013		NA	NA	NA	NA	NA	NA
HC-VC-11-S2	K9807097-014		NA	NA	NA	NA	NA	NA
HC-VC-22-S1	K9807097-016		55	62	59	64	75	82
HC-VC-22-S2	K9807097-017		19 A	40	51	50	12	78
HC-VC-27-S1	K9807097-019		NA	NA	NA	NA	NA	NA
HC-VC-27-S2	K9807097-020		NA	NA	NA	NA	NA	NA
HC-VC-32-S1	K9807097-022		35	37	31	43	52	61
HC-VC-32-S2	K9807097-023		2 A	12 A	60	57	2 A	84
HC-VC-18-S2	K9807097-002MS		49	51	45	57	42	64
HC-VC-18-S2	K9807097-002DMS		48	53	44	58	34	65
	CAS Acceptance Limits:		31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d5
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14

NA	Not Applicable; see case narrative.
A	Outside acceptance limits; see case narrative.

Approved By: _____ Date: 11/4/98

00164

SUR6/052595

07097SVM.CH7 - sur 12/4/98

POPA0008257

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/21/98
		Date Analyzed:	11/26/98

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method:	EPA 3550A	Units:	PERCENT
Analysis Method:	SIM	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
HC-VC-39-S1	K9807097-025		35	37	34	41	62	68
HC-VC-39-S2	K9807097-026		40	39	40	46	57	68
HC-VC-42-S1	K9807097-028		NA	NA	NA	NA	NA	NA
HC-VC-42-S2	K9807097-029		NA	NA	NA	NA	NA	NA
HC-S-01	K9807097-031		NA	NA	NA	NA	NA	NA
HC-S-02	K9807097-032		NA	NA	NA	NA	NA	NA
HC-S-03	K9807097-033		NA	NA	NA	NA	NA	NA
HC-S-04	K9807097-034		45	42	40	55	46	71
HC-S-05	K9807097-035		43	38	36	48	63	80
HC-S-06	K9807097-036		35	34 X	33	41	56	67
[illegible]07	K9807097-037		43	36 X	40	48	67	81
[illegible]S-08	K9807097-038		45	40	43	52	71	83
HC-S-09	K9807097-039		33	26 X	33	40	46	62
HC-S-101	K9807097-040		46	34 X	36	52	69	87
CAS Acceptance Limits:			31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d5
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14
NA	Not Applicable; see case narrative.
X	See Case Narrative.

Approved By: _____ Date: 12/4/98

SUR6/052595

07097SVM.CH8 - sur 12/3/98

00165

POPA0008258

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

~ ~nt:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/21/98
		Date Analyzed:	11/25/98

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds

Prep Method:	EPA 3550A	Units:	PERCENT
Analysis Method:	SIM	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery 2FPHL	PHLD6	NBZ	2FBPH	246TBPHL	TPH
Lab Control Sample	KWG9803614-3		49	66	68	71	35	85
Lab Control Sample	KWG9803615-3		47	63	65	70	38	81
Method Blank	KWG9803614-4		11 A	38	67	69	2 A	94
Method Blank	KWG9803615-4		27 A	51	68	70	12	98
CAS Acceptance Limits:			31-106	37-104	22-123	15-117	12-116	19-140

2FPHL	2-Fluorophenol
PHLD6	Phenol-d5
NBZ	Nitrobenzene-d5
2FBPH	2-Fluorobiphenyl
246TBPHL	2,4,6-Tribromophenol
TPH	p-Terphenyl-d14

A	Outside acceptance limits; see case narrative.

Approved By: _____ Date: 12/4/98

00166

SUR6/052595

070975VM.CH9 - sur 12/3/98

POPA0008259

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ect: Hart Crowser, Inc.
ample Matrix: Port of Portland Terminal 4/5624
Sediment

Service Request: K9807097
Date Collected: 10/12/98
Date Received: 10/14/98
Date Extracted: 10/21/98
Date Analyzed: 11/25/98

Matrix Spike/Duplicate Matrix Spike Summary
Base Neutral/Acid Semivolatile Organic Compounds

ample Name: HC-VC-18-S2
Lab Code: K9807097-002MS, K9807097-002DMS
est Notes:

Units: ug/Kg (ppb)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Advisory Limits	Relative Percent Difference	Result Notes
henol	EPA 3550A	SIM	200	230	240	ND	130	140	57	58	20-99	2	
cenaphthene	EPA 3550A	SIM	200	230	240	ND	230	190	100	79	26-104	23	
Pentachlorophenol	EPA 3550A	SIM	600	230	240	ND	46	45	20	19	10-145	5	
yrene	EPA 3550A	SIM	200	230	240	1900	NA	NA	NR	NR	18-144	NR	

IA Not Applicable; see case narrative.

pproved By: _____ Date: 12/4/98

00167

POPA0008260

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/21/98
		Date Analyzed:	11/25/98

Laboratory Control Sample Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9803614-3	Basis:	Dry

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Advisory Limits	Result Notes
Phenol	EPA 3550A	SIM	250	160	64	21-110	
Acenaphthene	EPA 3550A	SIM	250	180	72	29-109	
Pentachlorophenol	EPA 3550A	SIM	250	130	52	10-120	
Pyrene	EPA 3550A	SIM	250	220	88	39-149	

Approved By: _____ Date: 12/4/98

LCS/52595

07097SVM.CH7 - lcs 12/3/98

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	NA
LCS Matrix:	Sediment	**Date Received:**	NA
		Date Extracted:	10/21/98
		Date Analyzed:	11/25/98

Laboratory Control Sample Summary
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	KWG9803615-3	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Advisory Limits	Result Notes
Phenol	EPA 3550A	SIM	250	150	60	21-110	
Acenaphthene	EPA 3550A	SIM	250	170	68	29-109	
Pentachlorophenol	EPA 3550A	SIM	250	54	22	10-120	
Pyrene	EPA 3550A	SIM	250	190	76	39-149	

Approved By: LW Date: 12/4/98

LCS/52595

07097SVM.CH8 - lcs 12/3/98

00169

POPA0008262

APPENDIX B

CHAIN OF CUSTODY

INFORMATION

Columbia Analytical Services INC.
An Employee-Owned Company

CHAIN OF CUSTODY

Sediment and Tissue Chemistry

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222 • FAX (360) 636-1068

SR#: K180 [illegible]

PAGE ____ OF ____ COC ____

PROJECT NAME: Port of Portland Terminal-4

PROJECT NUMBER: J-5624

PROJECT MANAGER: Howard Cumberland

COMPANY/ADDRESS: Hart Crowser Portland

PHONE #: | FAX #:

SAMPLER'S SIGNATURE: Robert R Hanford

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	☒ Total Volatile Solids ☐ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☒ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☒ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☒ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1	Archive	PAHs / Homologs / Aromatics / Alphatics				REMARKS
HC-VC-18-S1	10.12.98	15:15	1	SED	RRH	X	X	X		X		X			X			X		X					2-16oz 1-2oz 1-4oz 1-16oz
HC-VC-18-S2		15:15	2		RRH	X	X	X		X		X			X			X		X					" "
HC-VC-18-S3		15:15	3												X					X					2-16oz
HC-VC-7-S1		16:15	4			X	X	X		X		X			X			X		X					3-16oz 1-4oz 1-2oz
HC-VC-7-S2		16:15	5			X	X	X		X		X			X			X		X					" "
HC-VC-7-S3		16:15	6																	X					2-16oz
HC-VC-13-S1		18:15	7			X	X	X		X		X			X			X		X	X				3-16oz 1-8oz 1-4oz 1-2oz
HC-VC-13-S2		18:15	8			X	X	X		X		X			X			X		X					3-16oz 1-4oz 1-2oz
HC-VC-13-S3		18:15	9																	X					2-16oz
HC-VC-103	10.12.98	—	10	Sed						X								X		X	X				1-16oz 1-4oz 1-2oz

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required

___ II. Report Dup., MS, MSD as required

___ III. Data Validation Report (includes all raw data)

___ IV. CLP Deliverable Report

___ V. EDD

INVOICE INFORMATION

P.O. # ____

Bill To: ____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.

___ 5 Day

___ Standard (10-15 working days)

___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

SMS Metals: As Cd Cr Cu Pb Hg Ag Zn Sb

CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
Signature: Robert R Hanford Date/Time: 10/13/98 1724	Signature: [signature] Date/Time: 10/13/98 1725	Signature: [signature] Date/Time: 10/14/98 830	Signature: Date/Time:
Printed Name: Robert R. Hanford Firm: HC		Signature: [signature] Date/Time: 1745	

POPA0008264

0017

Columbia Analytical Services INC
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CHAIN OF CUSTODY
Sediment and Tissue Chemistry

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SR#: 1980 1011

PAGE ____ OF ____ COC #

PROJECT NAME: Port of Portland T-4
PROJECT NUMBER: 5624
PROJECT MANAGER: Howard Cumberland
COMPANY/ADDRESS: Hart Crowser (PTLD)
PHONE #:
FAX #:
SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	☒ Total Volatile Solids ☒ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☒ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☒ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☒ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1	Archive	PAH / Homologs Aromatics / Alkyl				REMARKS
HC-VC-104	10/12/98	—	11	Sed											X										1-16oz
HC-VC-105	10/13/98	—	12	Sed		X	X	X				X													2-16oz
HC-VC-11-S1		10:30	13			X	X	X		X		X			X			X		X	X				3-16oz 1-8oz 1-4oz 1-2oz
HC-VC-11-S2		10:30	14			X	X	X		X		X			X			X		X	X				" "
HC-VC-11-S3		10:30	15																	X					2-16oz
HC-VC-22-S1		11:30	16			X	X	X		X		X			X			X		X	~~X~~ RRH				2-16oz 1-4oz 1-2oz
HC-VC-22-S2		11:30	17			X	X	X		X		X			X			X		X	~~X~~ RRH				" "
HC-VC-22-S3		11:30	18																	X					2-16oz
HC-VC-27-S1		12:15	19																						2-16oz 1-4oz 1-2oz
HC-VC-27-S2		12:15	20			X	X	X		X		X			X			X		X					" "

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION
P.O. #:
Bill To:

TURNAROUND REQUIREMENTS
___ 24 hr. ___ 48 hr.
___ 5 Day
___ Standard (10-15 working days)
___ Provide FAX Results
Requested Report Date

Circle which metals are to be analyzed:
SMS Metals: As Cd Cr Cu Pb Hg Ag Zn Sb
CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:

Analysis not marked for 27-S1 JA

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
[signature] 10/13/98 1724	[signature] 10/13/98 1705	[signature] 10/14/98 830	
Signature Date/Time	Signature Date/Time	Signature Date/Time	Signature Date/Time

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SR#: _____

PAGE _____ OF _____ COC _____

PROJECT NAME: Port of Portland T-4

PROJECT NUMBER: 5624

PROJECT MANAGER: Howard Cumberland

COMPANY/ADDRESS: Hart Crowser Portland

PHONE #: _____ FAX #: _____

SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	☒ Total Volatile Solids ☐ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☒ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☒ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☒ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1	Archive/Hanover/OSS PAH/Hanover/Bromatics/Phthalates					REMARKS
HC-VC-27-S3	10/13/98	12:15	21	SED		RRH	X	X	RRH											X					2-16-oz
HC-VC-32-S1		13 30	22				X	X				X			X			X		X					2-16-oz 14oz 12oz
HC-VC-32-S2		13 30	23				X	X				X			X			X		X					" "
HC-VC-32-S3		13 30	24																	X					
HC-VC-39-S1		14:30	25			X	X	X				X			X			X		X					
HC-VC-39-S2		14:30	26			X	X	X				X			X			X		X					
HC-VC-39-S3		14:50	27																	X					
HC-VC-42-S1		15:15	28			X	X	X				X			X			X		X					
HC-VC-42-S2		15:15	29			X	X	X				X			X			X		X					
HC-VC-42-S3		15:15	30																	X					1 BTL marked S-2 Lid marked S-3

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required

___ II. Report Dup., MS, MSD as required

___ III. Data Validation Report (Includes all raw data)

___ IV. CLP Deliverable Report

___ V. EDD

INVOICE INFORMATION

P.O. # _____

Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.

___ 5 Day

___ Standard (10-15 working days)

___ Provide FAX Results

_____ Requested Report Date

Circle which metals are to be analyzed:

SMS Metals: As Cd Cr Cu Pb Hg Ag Zn SL

CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
[signature] 10/13/98 1724	[signature] 1724 10/13/98	[signature] 10/14/98 830	
Signature / Date/Time	Signature / Date/Time	Signature / Date/Time	Signature / Date/Time
Robert R Hanford HC	CAS	CAS	
Printed Name / Firm			

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SR#: K98070497

PAGE ____ OF ____ COC ____

PROJECT NAME: Terminal 4/PE/FS
PROJECT NUMBER: 5760-06
PROJECT MANAGER: H. Cumberland
COMPANY/ADDRESS: HC - Portland
PHONE #: FAX #:
SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Metals (list below)	☒ Total Volatile Solids ☐ Total Solids ☐ Lipids	TOC (ASTM D4129M)	Grain size - PSEP / ASTM D422	Sulfide ☒ Total (9030M) ☐ Water Soluble	AVS / SEM	Ammonia ☒ Total (350.1m) ☐ Pore water	Pesticides (8081)	PCBs (8082) ☐ Aroclors ☐ Congeners	Semivolatiles (GC/MS SIM) ☐ PAHs ☐ Phthalates ☐ Phenols ☒ PSEP	Organotin - Sediment ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Organotin - Pore water ☐ Mono ☐ Di ☐ Tri ☐ Tetra	Volatiles (8260)	TRPH 8015 / 418.1	NWTPHCED	NWTPH DX	Aromatics/Aliphatics Polyhumanologs	Archive Extra Containers	REMARKS
HC-S-01	10/13	10:35	31	SED	7	~~X~~	X	X		X		X			X			X			X	X		X	
HC-S-02		11:45	32		7	X	X	X		X		X			X			X			X	X		X	
HC-S-03		12:35	33		7		X	X		X		X			X			X			X	X		X	
HC-S-04		13:00	34		7	X	X	X		X		X			X			X			X	X		X	
HC-S-05		14:00	35		7	X	X	X		X		X			X			X			X	X		X	
HC-S-06		15:30	36		2										~~X~~						X	X			
HC-S-07		16:00	37		7	X	X	X		X		X			X			X			X	X		X	
HC-S-08		16:20	38		7		X	X		X		X			X			X			X	X		X	
HC-S-09		16:41	39		7	X	X	X		X		X			X			X			X	X		X	
HC-S-101		16:50	40		7	X	X	X		X		X			X			X			X	X		X	

REPORT REQUIREMENTS

- ___ I. Routine Report: Method Blank, Surrogate, as required
- ___ II. Report Dup., MS, MSD as required
- X III. Data Validation Report (includes all raw data)
- ___ IV. CLP Deliverable Report
- X V. EDD EXCEL

INVOICE INFORMATION

P.O. # ____
Bill To: ____

TURNAROUND REQUIREMENTS

- ___ 24 hr. ___ 48 hr.
- ___ 5 Day
- X Standard (10-15 working days)
- ___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

SMS Metals: As Cd Cr Cu Pb Hg Ag Zn Sb Ni
CA Metals: Ag As Cd Cr Cu Hg Ni Pb Se Zn

SPECIAL INSTRUCTIONS/COMMENTS:
NWTPH DX = PENCIL PITCH Fingerprinting

POPA0008267

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
[signature] 10/13/98 5:27	[signature] 10/17/98 1725	[signature] 10/14/98 830	
Signature / Date/Time	Signature / Date/Time	Signature / Date/Time	Signature / Date/Time

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client HART CROWSER Work Order K98 07097

Cooler received on 10/13/98 and opened on 10/13/98 by AP

1. Were custody seals on outside of cooler? YES (NO)
   If yes, how many and where?_____
2. Were seals intact and signature & date correct? ~~YES NO~~
3. COC #

Temperature of cooler(s) upon receipt:	7.2	7.9	1.4	3.8	5.3
Temperature Blank:	3.0	4.9	N/P	N/P	7.2

4. Were custody papers properly filled out (ink, signed, etc.)? (YES) NO
5. Type of packing material present BAGS
6. Did all bottles arrive in good condition (unbroken)? (YES) NO
7. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? YES (NO)
8. Did all bottle labels and tags agree with custody papers? (YES) NO
9. *Were the correct types of bottles used for the tests indicated?* (YES) NO
10. Were all of the preserved bottles received at the lab with the appropriate pH? ~~YES NO~~
11. Were VOA vials checked for absence of air bubbles, and if present, noted below? ~~YES NO~~
12. Did the bottles originate from CAS/K or a branch laboratory? _____ (YES) NO

Explain any discrepancies ONE BOTTLE LABEL MISSING FROM HC-S-05 — LABELED ON TOP OF JAR. Label for HC-VC-42-52 - Lid marked S-3-

Samples that required preservation or received outside of temperature range at the lab(circle)

Sample ID	Reagent	Volume	~~Lot Number~~	Initials
HC-S-07	OUT OF TEMP			
HC-S-05				

00175

POPA0008268

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client HART CROWSER Work Order K98 07097

Cooler received on 10/13/98 and opened on 10/13/98 by AP

1. Were custody seals on outside of cooler? YES NO
   If yes, how many and where? ———
2. Were seals intact and signature & date correct? ~~YES NO~~
3. COC #

Temperature of cooler(s) upon receipt:	5.5	6.7	1.3	7.8	___
Temperature Blank:	4.5	7.3	5.2	N/P	___

4. Were custody papers properly filled out (ink, signed, etc.)? YES NO
5. Type of packing material present BAGS
6. Did all bottles arrive in good condition (unbroken)? YES NO
7. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? YES NO
8. Did all bottle labels and tags agree with custody papers? YES NO
9. *Were the correct types of bottles used for the tests indicated?* YES NO
10. Were all of the preserved bottles received at the lab with the appropriate pH? ~~YES NO~~
11. Were VOA vials checked for absence of air bubbles, and if present, noted below? ~~YES NO~~
12. Did the bottles originate from CAS/K or a branch laboratory? ——— YES NO

Explain any discrepancies ONE BOTTLE LABEL MISSING FROM HC-S-06 - LABELED ON TOP OF JAR.

Samples that required preservation or received outside of temperature range at the lab(circle)

Sample ID	Reagent	Volume	Lot Number	Initials
HC-S-06	OUT OF TEMP			
HC-S-04				
HC-S-08				
HC-S-09				
HC-S-101				

00176

POPA0008269

CONFIDENTIAL ATTORNEY/CLIENT/WORK PRODUCT

APPENDIX H
ANALYTICAL LABORATORY REPORTS
SEDIMENT BIO LAB REPORT

Appendix H

PORT OF PORTLAND SEDIMENTS, TERMINAL 4 REMEDIATION INVESTIGATION: FRESHWATER SEDIMENT TOXICITY TESTS

Submitted to

Hart Crowser Inc.
Five Center Point Dr., Suite 240
Lake Oswego, OR 97035

Submitted by

Northwestern Aquatic Sciences
P.O. Box 1437
Newport, OR 97365

February 26, 1999

POPA0008272

PORT OF PORTLAND SEDIMENTS, TERMINAL 4 REMEDIATION INVESTIGATION: FRESHWATER SEDIMENT TOXICITY TESTS

Submitted to

Hart Crowser Inc.
Five Center Point Dr., Suite 240
Lake Oswego, OR 97035

Submitted by

Northwestern Aquatic Sciences
P.O. Box 1437
Newport, OR 97365

February 26, 1999

Gerald Irissarri 2-26-99
Project Manager Date

Richard S. Caldwell 2/26/99
Laboratory Director Date

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- Test Water 2
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- Test Procedures and Conditions 2
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- Reference Toxicant Test (summary) 3
- Test Results 3
- Study Approval 3
- Data Tables 4
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- Raw Data ..... Appendix II
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Phase II midge (*Chironomus tentans*) sediment bioassay 592-4 data report ..... Section D
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Study Management 1
Test Material 1
Test Water 2
Test Organisms 2
Test Procedures and Conditions 2
Data Analysis Methods 2
Protocol Deviations 3
Reference Toxicant Test (summary) 3
Test Results 3
Study Approval 4
Data Tables 5
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Raw Data ..... Appendix II
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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY OF SEDIMENT BIOASSAYS

Four sediment bioassay tests were conducted for Hart Crowser, Inc. for the Port of Portland, Terminal 4 Remedial Investigation. Phase I tests (Table 1) were 592-1 and -2, 10-day tests with the amphipod *Hyalella azteca* and the midge *Chironomus tentans*, respectively. Sediments HC-S-26, HC-S-28, HC-S-35, HC-S-36, HC-S-39, and HC-S-42 were tested and the results for each compared against those from the appropriate tested reference sediment, either HC-Ref-B or HC-Ref-C. Following receipt by Hart Crowser of the Tier I chemistry results, Phase II tests (Table 2) with *Hyalella* (592-3) and *Chironomus* (592-4) were conducted, with sediments HC-S-01, HC-S-04, HC-S-05, HC-S-07, HC-S-11, HC-S-16, HC-S-19, HC-S-22, HC-S-24, and HC-S-30. Results from each were again compared against those from the appropriate reference sediment. Information on test, reference, and control sediments is provided in Table 3.

INDIVIDUAL TEST RESULTS

Phase I amphipod, *Hyalella azteca* 10-day survival test (592-1)

Test acceptability

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Sulfides were not detected in the overlying water (detection limit 0.02 mg/L) at either the beginning or end of the test. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 1.0 mg/L. The test met acceptability criterion specified in the protocol with 98.8% mean control survival (80% required). Survival of 96.3% and 98.8% in reference sediments HC-Ref-B (NAS#1857F) and HC-Ref-C (NAS#1858F), respectively, met the 70% survival criterion specified by the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area. The reference toxicant (positive control) result was within the laboratory's control chart limits (17.0 µg/L; control chart mean ± 2 S.D. = 12.8 ± 10.1).

Test results

Survival in the control sediment was not significantly different from that in either reference sediment. Only two significant differences were detected in comparisons of test sediments to their appropriate reference sediments. Survival in sample HC-S-26 (92.5%; NAS #1874F) was significantly less than that in HC-Ref-C (98.8%), and survival in sample HC-S-28 (83.8%; NAS #1875F) was significantly less than that in HC-Ref-B (96.3%).

Phase I midge, *Chironomus tentans*, 10-day survival and growth test (592-2)

Test acceptability

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Sulfides were not detected in the overlying water (detection limits, 0.02 mg/L) either at the beginning or the end of the test. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 1.5 mg/L. The test met acceptability criterion specified in the protocol with 85.0% mean control survival (70% required) and 1.69 mg average control weight (0.6 mg required). Survival of 71.3% and 80.0% in reference sediments HC-Ref-B (NAS#1857F) and HC-Ref-C (NAS#1858F), respectively, met the 65% survival criterion specified by the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area. The reference toxicant (positive control) result was within the laboratory's control chart limits (6.35 g/L; control chart mean ± 2 S.D. = 4.68 ± 2.14).

Test results

Survival in the control sediment was not significantly different from that in either reference sediment. Only one significant difference was detected in comparisons of test sediments to their appropriate reference

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sediments. Survival in sample HC-S-39 (58.8%; NAS #1878F) was significantly less than that in HC-Ref-B (71.3%).

Weights in the control sediment were not significantly different from those in either reference sediment. No test sediments had weights significantly less than that in their appropriate reference sediment.

Phase II amphipod, *Hyalella azteca* 10-day survival test (592-3)

Test acceptability

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 0.5 mg/L. The test met acceptability criterion specified in the protocol with 85.0% mean control survival (80% required). Survival of 86.3% and 73.8% in reference sediments HC-Ref-B (NAS#1857F) and HC-Ref-C (NAS#1858F), respectively, met the 70% survival criterion specified by the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area. The reference toxicant (positive control) result was within the laboratory's control chart limits (15.2 µg/L; control chart mean ± 2 S.D. = 13.1 ± 10.2).

Test results

Survival in the control sediment was not significantly different from that in either reference sediment. Five test sediments showed significantly lower survival than that of their appropriate reference sediments. Survival in samples HC-S-01 (65.0%; NAS #1859F), HC-S-04 (62.5%; NAS #1862F), HC-S-05 (71.2%; NAS #1863F), HC-S-16 (72.5%; NAS #1868F), and HC-S-22 (70.0%, NAS #1872F) was significantly less than that in HC-Ref-B (87.5%).

Phase II midge, *Chironomus tentans*, 10-day survival and growth test (592-4)

Test acceptability

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 0.5 mg/L. The test met acceptability criterion specified in the protocol with 96.3% mean control survival (70% required) and 1.46 mg average control weight (0.6 mg required). Survival of 87.5% and 78.8% in reference sediments HC-Ref-B (NAS#1857F) and HC-Ref-C (NAS#1858F), respectively, met the 65% survival criterion specified by the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area. The reference toxicant (positive control) result was within the laboratory's control chart limits (3.14 g/L; control chart mean ± 2 S.D. = 4.88 ± 2.24).

Test results

Survival in the control sediment was not significantly different from that in either reference sediment. Four test sediments showed significantly lower survival when compared to their appropriate reference sediments. Survival in samples HC-S-01 (52.5%; NAS #1859F), HC-S-04 (70.0%; NAS #1862F), HC-S-05 (68.8%; NAS #1863F), and HC-S-22 (66.2%, NAS #1872F) was significantly less than that in HC-Ref-B (87.5%).

Weights in the control sediment were not significantly different from those in either reference sediment. Eight test sediments had weights significantly less than that in their appropriate reference sediment. Average individual biomass in samples HC-S-01 (0.19 mg), HC-S-04 (0.37 mg), HC-S-05 (0.51 mg), HC-S-07 (0.59 mg; NAS #1864F), HC-S-11 (0.81 mg; NAS #1866F), and HC-S-16 (0.74 mg; NAS #1868F) was significantly less than that in HC-Ref-B (1.15 mg). Average individual biomass in samples HC-S-24 (0.96 mg; NAS #1873F) and HC-S-30 (0.95 mg; NAS #1869F) was significantly less than that in HC-Ref-C (1.37 mg).

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PROJECT DATA SUMMARY

Table 1. Phase I data summary. All comparisons were at the 0.05 level of significance.

Sample Description	Reference Sediment for Comparison	*Hyalella* % Survival (Mean ± SD)	Significant?	P	Midge % Survival (Mean ± SD)	Significant?	P	Average wt/midge (mg) [1] Mean ± SD	Significant?	P
HC-S-26 (NAS#1874F)	HC-Ref-C	92.5 ± 8.9	yes	0.04	72.5 ± 10.4	no	---	2.01 ± 0.70	no	---
HC-S-28 (NAS#1875F)	HC-Ref-B	83.8 ± 10.6	yes	0.01	60.0 ± 16.9	no	---	1.32 ± 0.36	no	---
HC-S-35 (NAS#1876F)	HC-Ref-B	95.0 ± 10.7	no	---	65.0 ± 17.7	no	---	1.71 ± 0.59	no	---
HC-S-36 (NAS#1877F)	HC-Ref-C	96.3 ± 7.4	no	---	73.8 ± 15.1	no	---	1.50 ± 0.27	no	---
HC-S-39 (NAS#1878F)	HC-Ref-B	93.8 ± 9.2	no	---	58.8 ± 13.6	yes	0.03	1.64 ± 0.55	no	---
HC-S-42 (NAS#1879F)	HC-Ref-B	92.5 ± 8.9	no	---	71.3 ± 17.3	no	---	1.46 ± 0.28	no	---
Control (NAS#1884F)	HC-Ref-B and -C	98.8 ± 3.5	no	---	85.0 ± 12.0	no	---	1.69 ± 0.66	no	---
HC-Ref-B (NAS#1857F)	---	96.3 ± 7.4	---	---	71.3 ± 11.3	---	---	1.60 ± 0.35	no	---
HC-Ref-C (NAS#1858F)	---	98.8 ± 3.5	---	---	80.0 ± 15.1	---	---	1.73 ± 0.48	no	---

[1] Pupae were not included in the sample to estimate dry weight (as per EPA/600/R-94/024, p. 55, section 12.3.8.1)

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PROJECT DATA SUMMARY
(continued)

Table 2. Phase II data summary. All comparisons were at the 0.05 level of significance.

Sample Description	Reference Sediment for Comparison	*Hyalella* % Survival (Mean ± SD)	Significant?	P	Midge % Survival (Mean ± SD)	Significant?	P	Average wt/midge (mg) [1] Mean ± SD	Significant?	P
HC-S-01 (NAS#1859F)	HC-Ref-B	65.0 ± 9.3	yes	0.003	52.5 ± 11.6	yes	0.00001	0.19 ± 0.07	yes	0.00002
HC-S-04 (NAS#1862F)	HC-Ref-B	62.5 ± 10.4	yes	0.002	70.0 ± 20.0	yes	0.03	0.37 ± 0.19	yes	0.00001
HC-S-05 (NAS#1863F)	HC-Ref-B	71.3 ± 16.4	yes	0.04	68.8 ± 22.3	yes	0.04	0.51 ± 0.11	yes	0.00002
HC-S-07 (NAS#1864F)	HC-Ref-B	80.0 ± 14.1	no	---	75.0 ± 17.7	no	---	0.59 ± 0.29	yes	0.0003
HC-S-11 (NAS#1866F)	HC-Ref-B	81.3 ± 15.5	no	---	73.8 ± 20.0	no	---	0.81 ± 0.22	yes	0.009
HC-S-16 (NAS#1868F)	HC-Ref-B	72.5 ± 14.9	yes	0.04	82.5 ± 13.9	no	---	0.74 ± 0.19	yes	0.002
HC-S-19 (NAS#1870F)	HC-Ref-C	83.8 ± 16.0	no	---	87.5 ± 12.8	no	---	1.09 ± 0.23	no	---
HC-S-22 (NAS#1872F)	HC-Ref-B	70.0 ± 10.7	yes	0.01	66.3 ± 20.7	yes	0.007	1.02 ± 0.38	no	---
HC-S-24 (NAS#1873F)	HC-Ref-C	66.3 ± 16.9	no	---	70.0 ± 17.7	no	---	0.96 ± 0.22	yes	0.08
HC-S-30 (NAS#1869F)	HC-Ref-C	87.5 ± 8.9	no	---	91.4 ± 9.0	no	---	0.95 ± 0.16	yes	0.01
Control (NAS#2185F)	HC-Ref-B and -C	85.0 ± 13.1	no	---	96.3 ± 5.2	no	---	1.46 ± 0.50	no	---
HC-Ref-B (NAS#1857F)	---	86.3 ± 16.0	---	---	87.5 ± 8.9	---	---	1.15 ± 0.29	---	---
HC-Ref-C (NAS#1858F)	---	73.8 ± 14.1	---	---	78.8 ± 12.5	---	---	1.37 ± 0.43	---	---

[1] Pupae were not included in the sample to estimate dry weight (as per EPA/600/R-94/024, p. 55, section 12.3.8.1)

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TEST, REFERENCE, AND CONTROL SEDIMENT INFORMATION

Test and reference sediments were provided to Northwestern Aquatic Sciences by Hart Crowser personnel and subcontract personnel. The negative control sediment was collected by NAS personnel from an area adjacent to the Highway 101 bridge at Beaver Creek, approximately 8 miles south of Newport, Oregon. The control sediment was sieved through a 1.0 mm screen and rinsed with dilution water before use. Test and reference sediments were placed under nitrogen upon receipt. All sediments were stored at 4°C in the dark until used. Sample identification and collection information is as follows:

Table 3. Test, reference and control sediment information.

Sample description	Hart Crowser Sample Identification	NAS Sample Identification	Collection Date	Receipt Date
Beaver Ck. control	---	1884F	10-19-98	10-19-98
	---	2185F	12-3-98	12-3-98
Test sediment	HC-S-01	1859F	10-13-98	10-17-98
Test sediment	HC-S-04	1862F	10-13-98	10-17-98
Test sediment	HC-S-05	1863F	10-13-98	10-17-98
Test sediment	HC-S-07	1864F	10-13-98	10-17-98
Test sediment	HC-S-11	1866F	10-14-98	10-17-98
Test sediment	HC-S-16	1868F	10-14-98	10-17-98
Test sediment	HC-S-19	1870F	10-15-98	10-17-98
Test sediment	HC-S-22	1872F	10-14-98	10-17-98
Test sediment	HC-S-24	1873F	10-14-98	10-17-98
Test sediment	HC-S-26	1874F	10-14-98	10-17-98
Test sediment	HC-S-28	1875F	10-14-98	10-17-98
Test sediment	HC-S-30	1869F	10-15-98	10-17-98
Test sediment	HC-S-35	1876F	10-14-98	10-17-98
Test sediment	HC-S-36	1877F	10-15-98	10-17-98
Test sediment	HC-S-39	1878F	10-15-98	10-17-98
Test sediment	HC-S-42	1879F	10-15-98	10-17-98
Reference sediment	HC-Ref-B	1857F	10-15-98	10-17-98
Reference sediment	HC-Ref-C	1858F	10-15-98	10-17-98

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SECTION A

Phase I

Amphipod (*Hyalella azteca*) sediment bioassay 592-1 data report

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test No.: 592-1

Title: Toxicity of freshwater sediments using a 10-day amphipod, *Hyalella azteca*, sediment bioassay.

Protocol No.: NAS-XXX-HA4b, April 7, 1998. Based on ASTM 1996 (Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates, E1706-95b), Am. Soc. Test. Mat., Phila., PA, and EPA Method 100.1 (Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates, EPA/600/R-94/024). Testing was also conducted with consideration of the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area (Draft, April 1998).

STUDY MANAGEMENT

Study Sponsor: Hart Crowser, Inc., 5 Center Pointe Dr., Suite 240, Lake Oswego, Oregon 97035

Sponsor's Study Monitor: Dr. Takashi Fuji

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365

Test Location: Newport laboratory

Laboratory's Study Personnel: G.J. Irissarri, B.S., Proj. Man.; G.A. Buhler, B.S., Study Dir.; L.K. Nemeth, B.A., QA Officer; M.S. Redmond, M.S., Aq. Toxicol.; E. Coffey, B.S., Sr. Tech.; S. Bione, B.S., Tech.

Study Schedule:

Test Beginning: 10-20-98, 1400 hrs.

Test Ending: 10-30-98, 1430 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Test Sediments: Unidentified freshwater test sediments. Details are as follows:

NAS Sample No.	1874F	1875F	1876F	1877F
Description	HC-S-26	HC-S-28	HC-S-35	HC-S-36
Collection Date	10-14-98	10-14-98	10-14-98	10-15-98
Receipt Date	10-17-98	10-17-98	10-17-98	10-17-98

NAS Sample No.	1878F	1879F	1857F	1858F
Description	HC-S-39	HC-S-42	HC-Ref-B	HC-Ref-C
Collection Date	10-15-98	10-15-98	10-15-98	10-15-98
Receipt Date	10-17-98	10-17-98	10-17-98	10-17-98

Control Sediment: The negative control sediment was collected on 10-19-98 from an area adjacent to the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR. The control sediment was sieved through a 1.0 mm screen, and rinsed three times with dilution water prior to use.

Storage: All test and reference sediments were placed under nitrogen upon receipt and stored at 4°C in the dark until used.

TEST WATER

Source: Moderately hard synthetic water prepared from Milli-Q® deionized water.

Dates of Preparation: 10-16-98, 10-23-98, 10-27-98

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Water Quality: pH 7.6, 7.6, 7.9; conductivity 280,280, 230 µmhos/cm; hardness 100, 100, 100 mg/L as $CaCO_3$; alkalinity 80, 80, 70 mg/L as $CaCO_3$.
Pretreatment: Aerated ≥24 hr.

TEST ORGANISMS

Species: *Hyalella azteca*, amphipod.
Age/Size: 9-12 days old
Source: Aquatic Biosystems, Fort Collins, Colorado; received 10-16-98.
Acclimation: Temperature, 19.4°C; dissolved oxygen, 8.1 mg/L; pH, 7.2; conductivity, 365 µmhos/cm; hardness, 130 mg/L as $CaCO_3$; and alkalinity, 90 mg/L as $CaCO_3$.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 300 ml high-form glass beakers
Test Volumes: 100 ml sediment layer; 175 ml test water.
Replicates/Treatment: 8
Organisms/Treatment: 80
Water Volume Changes: 2 water volumes per day
Aeration: None.
Feeding: Animals are fed 1.5 ml of YCT suspension per beaker daily.
Effects Criteria: Survival after 10 days. Death is defined as no visible movement or response to tactile stimulation. Missing organisms were considered to be dead.
Water Quality and Other Test Conditions: The temperature, dissolved oxygen, conductivity, pH, hardness, alkalinity, sulfide and ammonia-nitrogen were measured in the overlying water of one replicate test container per treatment on days 0 and 10 of the test. Temperature and dissolved oxygen were measured daily in the overlying water of one replicate test container per treatment. Hardness and alkalinity were measured with titrimetric methods. Sulfide and ammonia-N were measured using Hach test kits based on the methylene blue (EPA Method 376.2) and salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric methods, respectively; samples were not distilled prior to analysis. The photoperiod was 16:8, L:D.

DATA ANALYSIS METHODS

The percent amphipod survival was calculated for each replicate as follows:

percent survival = 100 x (number surviving/initial number tested)

Control and treatment means and standard deviations for percent survival and for water quality data were computed using Microsoft EXCEL v5.0.

Proportional survival values for the test sediments were statistically compared against those for the appropriate reference sediment, as specified by the client, using ToxCalc v5.0.17. An arcsine square root transformation was performed on the proportional data before analysis. Following transformation and determination of normality and homogeneity of variances, one-tailed homoscedastic or heteroscedastic t-tests, or Wilcoxon Two-Sample tests, were conducted at the 0.05 level of significance.

PROTOCOL DEVIATIONS

1. The range of dilution water alkalinity (70-80 mg/L as $CaCO_3$) slightly exceeded the specified range of 60-70. This minor deviation is unlikely to have affected the test results.

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REFERENCE TOXICANT TEST

The reference toxicant test is a standard multi-concentration toxicity test using cadmium as $CdCl_2 \cdot 2½ H_2O$, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-969
Reference Toxicant and Source: Cadmium as $CdCl_2 \cdot 2½ H_2O$, Mallinckrodt Lot #TNZ, 1.0 mg/ml stock prepared 6-23-98.
Test Date: 10-20-98
Dilution Water Used: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Result: 96-hr LC50, 17.0 µg/L. This result is within the laboratory's control chart warning limits (2.65 - 22.9 µg/L).

TEST RESULTS

Water quality data are summarized in Table 1. A detailed tabulation of the water quality results by sample and test day can be found in Appendix II. The means and standard deviations of percent survival of *Hyalella azteca* exposed for 10 days to sediments are summarized in Table 2. Detailed data organized by sample and replicate, and summary statistics for these observations, are given in Appendix II.

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Sulfides were not detected in the overlying water (detection limit 0.02 mg/L) at either the beginning or end of the test. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 1.0 mg/L. The test met acceptability criterion specified in the protocol with 98.8% mean control survival (80% required). Survival of 96.3% and 98.8% in reference sediments HC-Ref-B (NAS#1857F) and HC-Ref-C (NAS#1858F), respectively, met the 70% survival criterion specified by the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area. The reference toxicant (positive control) result was within the laboratory's control chart limits (17.0 µg/L; control chart mean ± 2 S.D. = 12.8 ± 10.1).

Survival in the control sediment was not significantly different from that in either reference sediment. Only two significant differences were detected in comparisons of test sediments to their appropriate reference sediments. Survival in sample HC-S-26 (92.5%; NAS #1874F) was significantly less than that in HC-Ref-C (98.8%), and survival in sample HC-S-28 (83.8%; NAS #1875F) was significantly less than that in HC-Ref-B (96.3%).

STUDY APPROVAL

Project Manager	Date	Study Director	Date
Laboratory Director	Date	Quality Assurance Unit	Date

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Table 1. Summary of water quality conditions during tests of the amphipod, *Hyalella azteca*, exposed to freshwater sediments.

Water Quality Parameter	Mean ± S.D.	Minimum	Maximum	N
Temperature (°C)	22.5 ± 0.3	21.9	23.1	99
Dissolved oxygen (mg/L)	6.5 ± 0.5	4.8	7.4	99
Conductivity (µmhos/cm)	314 ± 46	250	430	27
pH	7.4 ± 0.3	6.6	7.8	18
Hardness (mg/L as $CaCO_3$)	113 ± 17	100	140	18
Alkalinity (mg/L as $CaCO_3$)	87 ± 10	80	100	18
Total sulfide (mg/L)	—	<0.02	<0.02	18
Total ammonia (mg/L)	—	<0.5	1.0	18

Table 2. Survival of amphipods, *Hyalella azteca*, exposed for 10 days to freshwater sediments. All comparisons were conducted at the 0.05 level of significance.

Sample Description	Reference Sediment for Comparison	Percent Survival (Mean ± SD)	Significant?	P
HC-S-26 (NAS#1874F)	HC-Ref-C	92.5 ± 8.9	yes	0.04
HC-S-28 (NAS#1875F)	HC-Ref-B	83.8 ± 10.6	yes	0.01
HC-S-35 (NAS#1876F)	HC-Ref-B	95.0 ± 10.7	no	—
HC-S-36 (NAS#1877F)	HC-Ref-C	96.3 ± 7.4	no	—
HC-S-39 (NAS#1878F)	HC-Ref-B	93.8 ± 9.2	no	—
HC-S-42 (NAS#1879F)	HC-Ref-B	92.5 ± 8.9	no	—
Control (NAS#1884F)	HC-Ref-B and -C	98.8 ± 3.5	no	—
HC-Ref-B (NAS#1857F)	—	96.3 ± 7.4	—	—
HC-Ref-C (NAS#1858F)	—	98.8 ± 3.5	—	—

APPENDIX I

PROTOCOL

TEST PROTOCOL

FRESHWATER AMPHIPOD, *HYALELLA AZTECA*, 10-DAY SEDIMENT TOXICITY TEST

1. INTRODUCTION

1.1 Purpose of Study: The purpose of this study is to characterize the toxicity of freshwater sediments based on survival and, optionally, growth using the amphipod, *Hyalella azteca*.

1.2 Referenced Method: This protocol is based on ASTM Method E 1706-95b (ASTM 1996) and EPA Method 100.1 (EPA/600/R-94/024).

1.3 Summary of Method: A summary of test conditions for the amphipod 10-day sediment toxicity test is tabulated below. The 10-day sediment toxicity test with *Hyalella azteca* is conducted at 23 ± 1°C with a 16L:8D photoperiod at an illuminance of about 50 to 100 footcandles. Test chambers are 300-mL high-form lipless beakers containing 100 mL of sediment and 175 mL of overlying water. Ten 7-14 day old amphipods are used in each replicate. The number of replicates/treatment depends on the objective of the test. Eight replicates are recommended for routine testing. Amphipods in each test chamber are fed 1.5 mL of a YCT food daily. Each chamber receives two volume additions per day of overlying water. Overlying water can be culture water, well water, surface water, site water, or reconstituted water. Test endpoints include survival and/or growth.

1. Test type	whole sediment toxicity test with renewal of overlying water
2. Test duration	10 days
3. Temperature	23 ± 1°C
4. Light quality	daylight flourescent light
5. Illuminance	50-100 footcandles
6. Photoperiod	16L:8D
7. Test chamber size	300-mL high-form lipless beakers, (Pyrex® 1040 or equivalent)
8. Sediment volume	100 mL
9. Overlying water volume	175 mL
10. Renewal overlying water	2 volume additions/day (continuous or intermittent)
11. Age of test organisms	7-14 days old at test initiation
12. Organisms per test chamber	10
13. Replicates per treatment	8 recommended for routine testing (depends on design)
14. Organisms per treatment	80
15. Feeding regime	YCT food, fed 1.5 mL daily/chamber
16. Cleaning	if screens are used, clean as needed
17. Aeration	None, unless DO falls below 40% saturation
18. Overlying (test) water	Culture water, well water, surface water, site water or reconstituted water
19. Water quality	Hardness, alkalinity, conductivity, pH, ammonia-N beginning and end; temperature and dissolved oxygen daily
20. Endpoints	Survival (optional, grwoth by dry weight or length)
21. Test acceptability criteria	Minimum control survival of 80%
22. Sample holding	14 days at 4°C in the dark

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23. Sample volume required	1L (800 mL per sediment)
24. Reference toxicant	Concurrent testing required

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:

_____
_____
_____
_____

2.2 Sponsor's Study Monitor:

_____

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
3814 Yaquina Bay Road, P.O. Box 1437
Newport, OR 97365.

2.4 Test Location: _____

2.5 Laboratory's Personnel to be Assigned to the Study:
Study Director: _____
Quality Assurance Unit: _____
Aquatic Toxicologist: _____
Aquatic Toxicologist: _____

2.6 Proposed Testing Schedule: Tests are to begin within 14 days of sample collection. Reference toxicant test to be run concurrently.

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

3. TEST MATERIAL

The test materials are freshwater sediments. The control, reference, and test sediments are placed in solvent cleaned 1 L glass jars fitted with PTFE-lined screw caps. At the laboratory the samples are stored at 4°C in the dark. The original sealed containers may be stored for up to 14 days prior to testing. If jars are not not full when received or if sediment is removed for testing, headspaces should be filled with nitrogen to retard deterioration. A negative control sediment is collected from a clean site. In addition, a reference sediment, a clean sediment with physical characteristics similar to the test sediments, may be employed as a comparison station.

4. TEST WATER

Test water (overlying water) at NAS is normally moderately hard synthetic water at a hardness of 80-100 mg/L as $CaCO_3$ and alkalinity of 60-70 mg/L as $CaCO_3$. Dilution water is prepared from Milli-Q reagent grade water and reagent grade chemicals. Test water may also be well water, surface water or site water, depending on the study design. Current research is being done by EPA on a new type of reconstituted water that may be used for this test in the future (STM 1996, EPA 1994).

5. TEST ORGANISMS

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5.1 Species: amphipod, *Hyalella azteca*.

5.2 Source: Cultured at NAS. Originally purchased from ESE in Gainesville, FL.

5.3 Age: 7-14 days old at start of test; if using growth endpoint, it may be desirable to reduce the age range.

5.4 Acclimation and Pretest Observation: Cultures are maintained at 23 ± 1°C under a 16:8 L:D photoperiod. Cultured amphipods are fed dried maple leaves with occasional Tetramin® flake or rabbit chow supplements. Acclimation of test organisms to the test water may be desirable, depending on culture water, but it is not required by ASTM. If test organisms are to be acclimated, they could be held for 2 hr in a 50:50 mixture of culture water to overlying water, then for 2 hr in a 25:75 mixture, followed by a transfer into 100 % overlying water for 2 hrs. Mortality during the 48-hr prior to testing should not be excessive.

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers used in the toxicity test are 300-mL high-form lipless glass beakers. Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or by placement in a temperature-controlled room. Aeration is not empolyed unless dissolved oxygen drops below 40% saturation. The test is conducted under an illuminance of 500 to 1000 lx with a 16L:8D photoperiod.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA/600/4-90/027F. New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%, V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compounds (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: The test involves exposure of amphipods to test, control, and reference sediments. The sediments are placed on the bottom of the test containers and are overlain with test water. The test exposure is for 10 days. The renewal of overlying water consists of two volume additions per day, either continuous or intermittent. Each treatment consists of eight replicate test containers, each containing 10 organisms. Test chamber positions are completely randomized. Test organisms are randomly distributed to the test chambers. Blind testing is normally used.

7.2 Setup of Test Containers: Sediments are homogenized and placed in test chambers on the day before addition of test organisms. Sediment (100 ml) is placed into each of eight replicate beakers. After addition of the sediment, 175 ml of test water is gently added to each beaker in a manner to prevent resuspension. The overlying water is replaced twice daily. The test begins when amphipods are introduced to the test chambers. Initial water quality measurements are taken prior to the addition of test organisms.

7.3 Effect Criterion: The acute effect criterion used in the amphipod bioassay is mortality, defined as the lack of movement of body or appendages on response to tactile stimulation. The optional chronic effect criterion is growth which is determined by using dry weight measurements, or alternatively body measurements.

7.4 Test Conditions: No aeration is employed unless dissoved oxygen falls below 40% saturation. The test temperature employed is 23 ± 1°C. A 16:8, L:D photoperiod is used. Illumination is supplied by daylight fluorescent lamps at 50-100 footcandles. The overlying water is replaced twice daily.

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7.5 Beginning the Test: On the day the test begins, amphipods are impartially counted into small containers of test water (10/container). The test is begun by rinsing test organisms into the equilibrated test containers. If the optional growth endpoint is to be used, time-zero weight/length data should be collected.

7.6 Feeding: Amphipods are fed 1.5 mL of YCT daily per test chamber. A feeding may be skipped if there is a build up of excess food. However, all beakers must be treated similarly.

7.7 Test Duration, Type and Frequency of Observations, and Methods:
The duration of the acute toxicity test is 10 days. The type and frequency of observations to be made are summarized as follows:

TYPE OF OBSERVATION	TIMES OF OBSERVATION (ASTM 1996)
BIOLOGICAL DATA	
Survival, growth	Day 10
PHYSICAL AND CHEMICAL DATA	
Hardness, alkalinity, ammonia-N, conductivity, pH, dissolved oxygen, and temperature	Beginning and end of test in overlying water of one replicate beaker from each treatment.
Dissolved oxygen, temperature	Daily in overlying water of one replicate beaker from each treatment.

Dissolved oxygen is measured using a polarographic oxygen probe calibrated according to the manufacturer's recommendations. The pH is measured using a pH probe and a properly calibrated meter with scale divisions of 0.1 pH units. Temperature is measured with a calibrated mercury thermometer or telethermometer. Conductivity is measured with a conductivity meter. Hardness and alkalinity are measured using titrometric methods. Ammonia-nitrogen is measured using the salicylate colerimetric method (Clin. Chim. Acta 14:403, 1996).

Overlying water should be sampled just before water renewal from about 1 to 2 cm above the sediment surface using a pipet. It may be necessay to pool water samples from individual replicates. The pipet should be checked to make sure no organisms are removed during sampling of overlying water.

7.8 Growth Measurement: Growth is measured as average dry weight of animals in a test replicate at the end of the test on day 10 or average total length of preserved animals. Pooled animals from each test replicate are rinsed with deionized water, gently blotted and placed into tared aluminum weigh pans. The pans are dried at 60-90°C to constant weight. The dried amphipods are placed into a dessicator and weighed as soon as possible to the nearest 0.01 mg (desirable to use 0.001 mg). The total weight of the dried amphipods in each pan is divided by the number of amphipods weighed to obtain an average dry weight per surviving amphipod per replicate.

If the length growth endpoint is to be used, either in place of or along with the weight endpoint, amphipods from each replicate are pooled and preserved in vials. Later, the preserved amphipods from one vial are carefully stretched out on a glass microscope slide and quickly measured using a dissecting microscope fitted with a calibrated ocular micrometer. Then, if weight is to be determined, the animals are quickly transferred to tared aluminum foil cups. Fine-tipped forceps are required for these handling operations.

If both measurements are to be used, total length measurements are taken first, then the animals are transferred to tared aluminum foil cups for weighing.

7.9 Criteria of Test Acceptance: The test results are acceptable if the minimum survival of organisms in the control treatment at the end of the test is at least 80%.

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8. DATA ANALYSIS

The endpoints of the toxicity test are survival and growth (optional). Survival is obtained as a direct count of living organisms in each test container at the end of the test. Average amphipod dry weight, also measured at the end of the test, may be used to compare growth between treatment sediments and the control or reference sediment. Ordinarily the following data analysis is performed. Due to special requirements, alternative methods may be used. The means and standard deviations are calculated for each treatment level. Identification of toxic sediments is established by statistical comparison of test endpoints between test and control or reference sediments. Between treatment comparisons may be made using a Student's t-test or Wilcoxon's Two-Sample test, where each treatment is compared to the control or the reference sediment. An arcsine-square root transformation of proportional data, and tests for normality and heterogeneity of variances, are performed prior to statistical comparisons.

9. REPORTING

The final report of the test results must include all of the following standard information at a minimum: name and identification of the test; the investigator and laboratory; date and time of test beginning and end; information on the test material; information on the source and quality of the overlying/test water; detailed information about the test organisms including acclimation conditions; a description of the experimental design and test chambers and other test conditions including feeding, if any, and water quality; definition of the effect criteria and other observations; responses, if any, in the control treatment; tabulation and statistical analysis of measured responses and a summary table of endpoints; a description of the statistical methods used; any unusual information about the test or deviations from procedures; reference toxicant testing information.

10. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change, the date the change took effect and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

11. REFERENCE TOXICANT

The reference toxicant test is a standard multi-concentration toxicity test using a specified chemical toxicant to evaluate the performance of test organisms used in the study. Reference toxicant tests are 96-hour, water only exposures, not 10-day sediment exposures. The reference toxicant test is run concurrently. Performance is evaluated by comparing the results of the reference toxicant test with historical results (e.g., control charts) obtained at the laboratory.

12. REFERENCED GUIDELINES

ASTM. 1996. Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates. ASTM Standard Method No. E 1706-95b. Am. Soc. Test. Mat., Philadelphia, PA.

U.S. EPA. 1994. Section 11, Test Method 100.1, Hyalella azteca 10-d Survival Test for Sediments, pp. 44-50 In: Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-94/024.

Weber, C.I. (Ed.) 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fourth Edition). EPA/600/4-90/027F.

13. APPROVALS

POPA0008293

_____ for _____
Name Date

_____ for Northwestern Aquatic Sciences
Name Date

POPA0008294

APPENDIX II

RAW DATA

NORTHWESTERN AQUATIC SCIENCES

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-1 Client Hart-Crowser Investigator Approved PPI-32 2-12-99 GB

STUDY MANAGEMENT

Client: Hart Crowser Inc., 5 Center Pointe Dr., Suite 240, Lake Osuego, OR 97035

Client's Study Monitor: Dr. Takashi Fuji

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.J. Irissarri / G.A. Buhler GB

QA Officer L.K. Nemeth

1. M.S. Redmond MLR 2. Erin Coffey

3. [illegible] SB 4.

5. 6.

Study Schedule:

Test Beginning: 10-20-98 1400 Test Ending: 10-30-98 1430

TEST MATERIAL

General description (see sample logbook/chain-of-custody for details):

NAS Sample No.:	1874F	1875F	1876F	1877F	1878F
Description:	HC-S-26	HC-S-28	HC-S-35	HC-S-36	HC-S-39
Collection Date:	10-14-98	10-14-98	10-14-98	10-15-98	10-15-98
Receipt Date:	10-17-98	10-17-98	10-17-98	10-17-98	10-17-98
Salinity:	Ø	Ø	Ø	Ø	Ø

NAS Sample No.:	1879F	1857F	1858F	1884F	
Description:	HC-S-42	HC-Ref-B	HC-Ref-C	control	
Collection Date:	10-15-98	10-15-98	10-15-98	10-19-98	
Receipt Date:	10-17-98	10-17-98	10-17-98	10-19-98	
Salinity:	Ø	Ø	Ø	Ø	

NAS Sample No.: all test and reference sediments

Description: were placed under nitrogen upon receipt

Collection Date: MLR

Receipt Date:

NAS Sample No.:

Description:

Collection Date:

Receipt Date:

NAS Sample No.:

Description:

Collection Date:

Receipt Date:

NAS Sample No.:

Description:

Collection Date:

Receipt Date:

4/98

POPA0008296

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-1 Client Hart-Crowser Investigator _____

TEST WATER

Source: Moderately Hard Synthetic water Date of Preparation: ~~10-16-98~~, 10-23-98, 10-27-98

pH 7.6-7.9, 7.9 Cond (umhos/cm) 230, 280, 230 Hard (mg/L) 100, 100, 100 Alk (mg/L) 80, 80, 70

Treatments: Aerated ≥ 24hr

If more than one batch of test water is used, attach water prep benchsheets and mark appropriate batches.

TEST ORGANISMS

Species: Hyalella azteca, amphipod Age: 9-12 days Size: _____

Source: Aquatic Biosystems, Fort Collins, CO

Acclimation Data:

Date	Temp (°C)	DO (mg/L)	pH	Cond umh/cm	Hard (mg/L)	Alk (mg/L)	Comments
10-16-98	16-9	8-6	6.2	400	160	100	Rec'd water Date
10-19-98	22.0	7-6	8-1	330	100	80	
Mean	19.4	8.1	7.2	365	130	90	
S.D.	-	-	-	-	-	-	
(N)	2	2	2	2	2	2	

TEST PROCEDURES AND CONDITIONS

Test chambers: 300 mL high-form lipless glass beakers

Test volumes: 100 mL of test sediment; 175 mL of test water

Replicates/treatment: (8) 8 Organisms/replicate: (10) 10

Test water: Moderately hard synthetic water

Daily test water changes: two volumes/day

Aeration: None, unless DO falls below 40% saturation

Photoperiod: 16:8, L:D

Temperature: 23 ± 1°C

Feeding: fed 1.5 mL of YCT per beaker daily

Beaker placement: Total randomization

Water Quality Measurements:

Daily: temperature and dissolved oxygen; 1 repl./treatment

Beg. & End: Conductivity, hardness, alkalinity, pH, ammonia-nitrogen, temperature & dissolved oxygen; 1 repl./treatment

TEST SCHEDULE SUMMARY

Date	10-21-98	10-22-98	10-23-98	10-24-98	10-25-98	10-26-98	10-27-98	10-28-98	10-29-98	10-30-98
Day	0	1	2	3	4	5	6	7	8	9	10
Feed	X	X	X	X	X	X	X	X	X	X	X
Record WQ	X	X	X	X	X	X	X	X	X	X	X
Initials											

POPA0008297

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-1 Client Hart-Crowser Investigator

SEDIMENT DESCRIPTIONS--SUPPLEMENTAL NOTES

Sample No.	Description
1857F	greenish-gray mud, chironomid larvae present
1874F	greenish-gray sandy mud
1875F	greenish-gray sandy mud
1876F	greenish-gray mud
1877F	gray sandy mud
1878F	gray sandy mud
1879F	chironomids present, greenish-gray mud
1858F	Dark gray sand
Control	Brown silt; sieved through 1.0 mm screen and rinsed with moderately-hard synthetic water 3 times.

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Test No. 592-1 Client Hart - Crowser Investigator

MISCELLANEOUS NOTES

N →

Randomization chart:

1	5	10	15	20	25	30	35	40	45	50
2	4	9	14	19	24	29	34	39	44	49
3	3	8	13	18	23	28	33	38	43	48
4	2	7	12	17	22	27	32	37	42	47
5	1	6	11	16	21	26	31	36	~~41~~ 46	46

Randomization chart:

1	55	60	65	70						
2	54	59	64	69						
3	53	58	63	68						
4	52	57	62	67	72					
5	51	56	61	66	71					

Randomization chart:

1										
2										
3										
4										
5										

Randomization chart:

1										
2										
3										
4										
5										

POPA0008299

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4D

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-1 Client Hart-Crowser Investigator _____

DAILY RECORD SHEET

Day 0 (10/20/98) Initials: BB

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	22.3	6.0	330	6.6	~~50~~ 120	100		Yes	S <.02
14	22.3	6.7	370	6.7	140	100			S <.02
20	22.4	6.9	310	7.0	120	80			S <.02
27	22.5	7.3	430	7.7	120	80			S <.02
39	22.4	5.9	340	7.2	140	100			S <.02
42	22.4	6.4	340	7.5	120	80			S <.02
45	22.4	5.8	340	6.9	140	100			S <.02
63	22.6	6.0	370	7.1	140	100			S <.02
64	22.6	6.5	360	7.5	120	100		✓	S <.02

Day 1 (10/21/98) Initials: BB/BB

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	22.3	6.6	320	7.2				Yes	water d'ed @ 0600 GB
14	22.3	5.7	340	7.1					" 0615 JL
20	22.4	7.0	320	7.4					
27	22.4	7.2	340	7.4					
39	22.4	6.6	330	7.4					
42	22.4	7.0	320	7.6					
45	22.5	6.5	320	7.3					
63	22.7	6.5	330	7.3					
64	22.7	6.8	330	7.5				↓	

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-1 Client Hart-Crowser Investigator

DAILY RECORD SHEET

Day 2 (10/22/98) Initials: GB/EG

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	23.0	6.8						Yes	water renewed 0550 GB
14	22.9	6.8							" " 1600 EG
20	22.9	7.0							
27	22.9	7.2							
39	22.9	6.8							
42	22.9	6.9							
45	22.9	6.8							
63	23.0	7.1							
64	23.1	7.0						↓	

Day 3 (10/23/98 Initials: GB/EG

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	22.4	6.6						Yes	water renewed 0530 GB
14	22.4	6.5							water renewed 1600 EG
20	22.5	6.6							
27	22.5	6.8							
39	22.4	6.5							
42	22.5	6.6							
45	22.5	6.5							
63	22.4	6.6							
64	22.7	6.6						↓	

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HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-1 Client Hart-Crowser Investigator

DAILY RECORD SHEET

Day 4 (10/24/98) Initials: GS/[illegible]

Beaker No.	Temp. (°C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	22-1	6.8						Yes	watersede 0600GAS
14	22-2	6.6							" 1800
20	22-2	6.7							
27	22-3	6.7							
39	22-5	6.8							
42	22-5	6.6							
45	22-6	6.6							
63	22-6	6.7							
64	22-6	6.5							

Day 5 (10/25/98) Initials: GS/[illegible]

Beaker No.	Temp. (°C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	22-8	5.3						Yes	watersede 0600GAS
14	22-8	5.2							" " 1700
20	22-6	4.8							
27	22-7	5.6							
39	22-6	5.8							
42	22-8	5.1							
45	22-8	4.9							
63	22-9	5.9							
64	22-9	5.5							

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NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-1 Client Hart-Crowser Investigator _____

DAILY RECORD SHEET

Day 6 (10/20/98 Initials: GA/

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	22.6	6.8						yes	water side 0550 GA
14	22.6	6.6							" 1650 "
20	22.7	7.0							
27	22.6	7.0							
39	22.6	6.6							
42	22.7	6.8							
45	22.8	6.4							
63	22.6	6.7							
64	22.6	6.9							

Day 7 (10/27/98 Initials: GA/SB

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	22.6	6.0						yes	water side 0550 GA
14	22.6	5.4							
20	22.6	5.8							water changed 1600 SB
27	22.6	5.8							
39	22.7	5.8							
42	22.6	5.6							
45	22.6	5.5							
63	22.9	5.8							
64	22.9	5.7							

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4D

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-1 Client Hart-Crowser Investigator

DAILY RECORD SHEET

Day 8 (10/28/98) Initials: GB/kc

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	22.3	6.8						yes	water added 0600 GB
14	22.3	6.6							water added 1600 kc
20	22.3	6.4							
27	22.3	6.6							
39	22.3	6.6							
42	22.3	6.6							
45	22.3	6.5							
63	22.3	6.8							
64	22.5	6.7							

Day 9 (10/29/98) Initials: GB/kc

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	21.9	6.7						yes	water added 0545 GB
14	21.9	6.4							" " 1630 →
20	21.9	6.6							
27	21.9	6.8							
39	22.0	6.6							
42	21.9	6.8							
45	22.0	6.6							
63	21.9	6.6							
64	21.9	6.6							

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-1 Client Hart-Crowser Investigator _____

DAILY RECORD SHEET

Day 10 (10/30/97) Initials: CH/B

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2	22.5	7.0	240	7.7	100	80			water blank 0.05 S-<.02
14	22.4	7.0	260	7.7	100	80			S-<.02
20	22.4	6.9	250	7.7	100	80			S-<.02
27	22.5	7.4	260	7.8	100	80			S-<.02
39	22.4	6.9	260	7.6	100	80			S-<.02
42	22.5	7.0	250	7.6	100	80			S-<.02
45	22.4	6.6	250	7.5	100	80			S-<.02
63	22.8	7.1	260	7.5	100	80			S-<.02
64	22.8	6.9	260	7.5	100	80			S-<.02

Day ____ (/ /) Initials:

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
2									
14									
20									
27									
39									
42									
45									
63									
64									

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NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-RAHD

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-1 Client Hart - Crowser Investigator _____

DAY 10 TEST TERMINATION SHEET

Beaker No.	Number of survivors	Init.
1	10	
2	9	
3	10	
4	8	
5	9	
6	8	
7	8	
8	9	
9	10	
10	10	
11	8	
12	9	
13	9	
14	7	
15	10	
16	8	
17	8	
18	7	
19	10	
20	10	
21	10	
22	10	
23	10	
24	10	
25	10	
26	9	
27	9	
28	10	
29	10	
30	9	
31	9	
32	9	
33	10	
34	10	
35	10	
36	7	
37	10	
38	9	
39	10	
40	10	
41	10	
42	9	
43	10	
44	10	
45	10	

Beaker No.	Number of survivors	Init.
46	8	
47	10	
48	10	
49	10	
50	10	
51	10	
52	10	
53	10	
54	9	
55	8	
56	10	
57	10	
58	8	
59	10	
60	10	
61	10	
62	10	
63	10	
64	10	
65	10	
66	10	
67	10	
68	10	
69	10	
70	10	
71	9	
72	10	

POPA0008306

Randomization Key

	NAS	CLIENT	
BKR	SMPL	DESCRIP	REPL
64	1874F	HC-S-26	1
26	1874F	HC-S-26	2
62	1874F	HC-S-26	3
6	1874F	HC-S-26	4
67	1874F	HC-S-26	5
24	1874F	HC-S-26	6
38	1874F	HC-S-26	7
17	1874F	HC-S-26	8
14	1875F	HC-S-28	1
50	1875F	HC-S-28	2
71	1875F	HC-S-28	3
30	1875F	HC-S-28	4
7	1875F	HC-S-28	5
58	1875F	HC-S-28	6
54	1875F	HC-S-28	7
18	1875F	HC-S-28	8
63	1876F	HC-S-35	1
15	1876F	HC-S-35	2
12	1876F	HC-S-35	3
3	1876F	HC-S-35	4
35	1876F	HC-S-35	5
53	1876F	HC-S-35	6
36	1876F	HC-S-35	7
37	1876F	HC-S-35	8
42	1877F	HC-S-36	1
33	1877F	HC-S-36	2
34	1877F	HC-S-36	3
51	1877F	HC-S-36	4
46	1877F	HC-S-36	5
68	1877F	HC-S-36	6
43	1877F	HC-S-36	7
70	1877F	HC-S-36	8
45	1878F	HC-S-39	1
11	1878F	HC-S-39	2
22	1878F	HC-S-39	3
47	1878F	HC-S-39	4
23	1878F	HC-S-39	5
31	1878F	HC-S-39	6
21	1878F	HC-S-39	7
13	1878F	HC-S-39	8
2	1879F	HC-S-42	1
4	1879F	HC-S-42	2
10	1879F	HC-S-42	3
16	1879F	HC-S-42	4
8	1879F	HC-S-42	5
1	1879F	HC-S-42	6
72	1879F	HC-S-42	7

Randomization Key

	NAS	CLIENT	
BKR	SMPL	DESCRIP	REPL
28	1879F	HC-S-42	8
* 39	1857F	HC-ref-B	1
52	1857F	HC-ref-B	2
5	1857F	HC-ref-B	3
69	1857F	HC-ref-B	4
40	1857F	HC-ref-B	5
19	1857F	HC-ref-B	6
55	1857F	HC-ref-B	7
49	1857F	HC-ref-B	8
* 20	1858F	HC-ref-C	1
60	1858F	HC-ref-C	2
65	1858F	HC-ref-C	3
29	1858F	HC-ref-C	4
9	1858F	HC-ref-C	5
56	1858F	HC-ref-C	6
44	1858F	HC-ref-C	7
32	1858F	HC-ref-C	8
* 27	control	control	1
57	control	control	2
25	control	control	3
41	control	control	4
61	control	control	5
48	control	control	6
59	control	control	7
66	control	control	8

*water quality replicates

11/4/98

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: Test 592-1 Hart Crowser Hyalella - Day Ø
10/20/98 - Overlying water

	BKR Sample description	BLK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	2		1.0													QC	Std	NH_3-N (mg/L)			
2	14			1.0													Nominal		Measured		
3	20				1.0												10			10.5	
4	27					1.6											3			3.0	
5	39						1.0										1			1.0	
6	42							1.0													
7	45								1.0												
8	63									1.0											
9	64										1.0										
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.0	→							→										
	Measured concentration (mg/L)	<.1	.1	.2	<.1	<.1	.1	<.1	.2	.1	<.1										
	x multiplier	1.0	5.0	→							→										
	Final concentration (mg/L)	<.1	.5	1.0	<.5	<.5	.5	<.5	1.0	.5	<.5										

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

-14-

POPA0008309

11/4/98

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: Test ST92-1 Heat Cruiser Hyalella - Day 10
10/30/98 - overlying water

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	2		1.0																		
2	14			1.0																	
3	20				1.0																
4	27					1.0															
5	39						1.0														
6	42							1.0													
7	45								1.0												
8	63									1.0											
9	64										1.0										
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	Seawater	5.0	4.0	→																	
	Measured concentration (mg/L)	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1										
	x multiplier	1.0	5.0	→																	
	Final concentration (mg/L)	<.1	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5										

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

-15-

POPA0008310

Endpoints Data Entry and Calculations File

Data entry verified against laboratory bench sheets MLL 12-9-98

BKR=beaker number
INIT=initial number
SURV=number survivors
MORT=number dead=INIT-SURV
PSURV=%survival=100(SURV/INIT)
PMORT=%mortality=100(MORT/INIT)

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	SURV	MORT	PSURV	PMORT		SURV	MORT	PSURV	PMORT
1	64	1874F	HC-S-26	1	10	10	0	100.0	0.0					
2	26	1874F	HC-S-26	2	10	9	1	90.0	10.0					
3	62	1874F	HC-S-26	3	10	10	0	100.0	0.0					
4	6	1874F	HC-S-26	4	10	8	2	80.0	20.0					
5	67	1874F	HC-S-26	5	10	10	0	100.0	0.0	Mean	9.3	0.8	92.5	7.5
6	24	1874F	HC-S-26	6	10	10	0	100.0	0.0	SD	0.9	0.9	8.9	8.9
7	38	1874F	HC-S-26	7	10	9	1	90.0	10.0	n	8	8	8	8
8	17	1874F	HC-S-26	8	10	8	2	80.0	20.0					
9	14	1875F	HC-S-28	1	10	7	3	70.0	30.0					
10	50	1875F	HC-S-28	2	10	10	0	100.0	0.0					
11	71	1875F	HC-S-28	3	10	9	1	90.0	10.0					
12	30	1875F	HC-S-28	4	10	9	1	90.0	10.0					
13	7	1875F	HC-S-28	5	10	8	2	80.0	20.0	Mean	8.4	1.6	83.8	16.3
14	58	1875F	HC-S-28	6	10	8	2	80.0	20.0	SD	1.1	1.1	10.6	10.6
15	54	1875F	HC-S-28	7	10	9	1	90.0	10.0	n	8	8	8	8
16	18	1875F	HC-S-28	8	10	7	3	70.0	30.0					
17	63	1876F	HC-S-35	1	10	10	0	100.0	0.0					
18	15	1876F	HC-S-35	2	10	10	0	100.0	0.0					
19	12	1876F	HC-S-35	3	10	9	1	90.0	10.0					
20	3	1876F	HC-S-35	4	10	10	0	100.0	0.0					
21	35	1876F	HC-S-35	5	10	10	0	100.0	0.0	Mean	9.5	0.5	95.0	5.0
22	53	1876F	HC-S-35	6	10	10	0	100.0	0.0	SD	1.1	1.1	10.7	10.7
23	36	1876F	HC-S-35	7	10	7	3	70.0	30.0	n	8	8	8	8
24	37	1876F	HC-S-35	8	10	10	0	100.0	0.0					
25	42	1877F	HC-S-36	1	10	9	1	90.0	10.0					
26	33	1877F	HC-S-36	2	10	10	0	100.0	0.0					
27	34	1877F	HC-S-36	3	10	10	0	100.0	0.0					
28	51	1877F	HC-S-36	4	10	10	0	100.0	0.0					
29	46	1877F	HC-S-36	5	10	8	2	80.0	20.0	Mean	9.6	0.4	96.3	3.8
30	68	1877F	HC-S-36	6	10	10	0	100.0	0.0	SD	0.7	0.7	7.4	7.4
31	43	1877F	HC-S-36	7	10	10	0	100.0	0.0	n	8	8	8	8
32	70	1877F	HC-S-36	8	10	10	0	100.0	0.0					
33	45	1878F	HC-S-39	1	10	10	0	100.0	0.0					
34	11	1878F	HC-S-39	2	10	8	2	80.0	20.0					
35	22	1878F	HC-S-39	3	10	10	0	100.0	0.0					
36	47	1878F	HC-S-39	4	10	10	0	100.0	0.0					
37	23	1878F	HC-S-39	5	10	10	0	100.0	0.0	Mean	9.4	0.6	93.8	6.3
38	31	1878F	HC-S-39	6	10	8	2	80.0	20.0	SD	0.9	0.9	9.2	9.2
39	21	1878F	HC-S-39	7	10	10	0	100.0	0.0	n	8	8	8	8
40	13	1878F	HC-S-39	8	10	9	1	90.0	10.0					
41	2	1879F	HC-S-42	1	10	9	1	90.0	10.0					

	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	SURV	MORT	PSURV	PMORT		SURV	MORT	PSURV	PMORT
42	4	1879F	HC-S-42	2	10	8	2	80.0	20.0					
43	10	1879F	HC-S-42	3	10	10	0	100.0	0.0					
44	16	1879F	HC-S-42	4	10	8	2	80.0	20.0					
45	8	1879F	HC-S-42	5	10	9	1	90.0	10.0	Mean	9.3	0.8	92.5	7.5
46	1	1879F	HC-S-42	6	10	10	0	100.0	0.0	SD	0.9	0.9	8.9	8.9
47	72	1879F	HC-S-42	7	10	10	0	100.0	0.0	n	8	8	8	8
48	28	1879F	HC-S-42	8	10	10	0	100.0	0.0					
49	39	1857F	HC-ref-B	1	10	10	0	100.0	0.0					
50	52	1857F	HC-ref-B	2	10	10	0	100.0	0.0					
51	5	1857F	HC-ref-B	3	10	9	1	90.0	10.0					
52	69	1857F	HC-ref-B	4	10	10	0	100.0	0.0					
53	40	1857F	HC-ref-B	5	10	10	0	100.0	0.0	Mean	9.6	0.4	96.3	3.8
54	19	1857F	HC-ref-B	6	10	10	0	100.0	0.0	SD	0.7	0.7	7.4	7.4
55	55	1857F	HC-ref-B	7	10	8	2	80.0	20.0	n	8	8	8	8
56	49	1857F	HC-ref-B	8	10	10	0	100.0	0.0					
57	20	1858F	HC-ref-C	1	10	10	0	100.0	0.0					
58	60	1858F	HC-ref-C	2	10	10	0	100.0	0.0					
59	65	1858F	HC-ref-C	3	10	10	0	100.0	0.0					
60	29	1858F	HC-ref-C	4	10	10	0	100.0	0.0					
61	9	1858F	HC-ref-C	5	10	10	0	100.0	0.0	Mean	9.9	0.1	98.8	1.3
62	56	1858F	HC-ref-C	6	10	10	0	100.0	0.0	SD	0.4	0.4	3.5	3.5
63	44	1858F	HC-ref-C	7	10	10	0	100.0	0.0	n	8	8	8	8
64	32	1858F	HC-ref-C	8	10	9	1	90.0	10.0					
65	27	1884F	control	1	10	9	1	90.0	10.0					
66	57	1884F	control	2	10	10	0	100.0	0.0					
67	25	1884F	control	3	10	10	0	100.0	0.0					
68	41	1884F	control	4	10	10	0	100.0	0.0					
69	61	1884F	control	5	10	10	0	100.0	0.0	Mean	9.9	0.1	98.8	1.3
70	48	1884F	control	6	10	10	0	100.0	0.0	SD	0.4	0.4	3.5	3.5
71	59	1884F	control	7	10	10	0	100.0	0.0	n	8	8	8	8
72	66	1884F	control	8	10	10	0	100.0	0.0					

Freshwater Sediment 10-day survival

Start Date:	10/20/98 14:00	Test ID: 592-1	Sample ID: NAS#1857F-1858F,1874F-1879F
End Date:	10/30/98 14:30	Lab ID: ORNAS-Northwestern Aquat	Sample Type: SED-Sediment
Sample Date:		Protocol: NASXXXHA4b-Hyalella sedi	Test Species: HA-Hyalella azteca
Comments:			

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	1.0000	1.0000	0.9000	1.0000	1.0000	1.0000	0.8000	1.0000
HC-Ref-C	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9000
HC-S-26	1.0000	0.9000	1.0000	0.8000	1.0000	1.0000	0.9000	0.8000
HC-S-28	0.7000	1.0000	0.9000	0.9000	0.8000	0.8000	0.9000	0.7000
HC-S-35	1.0000	1.0000	0.9000	1.0000	1.0000	1.0000	0.7000	1.0000
HC-S-36	0.9000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
HC-S-39	1.0000	0.8000	1.0000	1.0000	1.0000	0.8000	1.0000	0.9000
HC-S-42	0.9000	0.8000	1.0000	0.8000	0.9000	1.0000	1.0000	1.0000
control	0.9000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					1-Tailed		
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	0.9625	0.9747	1.3535	1.1071	1.4120	8.476	8			
HC-Ref-C	0.9875	1.0000	1.3916	1.2490	1.4120	4.140	8			
*HC-S-26	0.9250	0.9367	1.2951	1.1071	1.4120	10.505	8	1.849	1.761	0.0048
HC-S-28	0.8375	0.8481	1.1695	0.9912	1.4120	12.483	8			
HC-S-35	0.9500	0.9620	1.3390	0.9912	1.4120	11.328	8			
HC-S-36	0.9625	0.9747	1.3535	1.1071	1.4120	8.476	8			
HC-S-39	0.9375	0.9494	1.3154	1.1071	1.4120	10.667	8			
HC-S-42	0.9250	0.9367	1.2951	1.1071	1.4120	10.505	8			
control	0.9875	1.0000	1.3916	1.2490	1.4120	4.140	8			

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.85322	0.844	-0.734	-0.1896
F-Test indicates equal variances ($p = 0.04$)	5.57548	8.88531		
The control means are not significantly different ($p = 0.42$)	0.83954	2.14479		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

Comparison made against HC-Ref-C - MSR 2-10-99

Freshwater Sediment 10-day survival

Start Date:	10/20/98 14:00	Test ID:	592-1	Sample ID:	NAS#1857F-1858F,1874F-1879F
End Date:	10/30/98 14:30	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	SED-Sediment
Sample Date:		Protocol:	NASXXXHA4b-Hyalella sedi	Test Species:	HA-Hyalella azteca

ments:

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	1.0000	1.0000	0.9000	1.0000	1.0000	1.0000	0.8000	1.0000
HC-Ref-C	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9000
HC-S-26	1.0000	0.9000	1.0000	0.8000	1.0000	1.0000	0.9000	0.8000
HC-S-28	0.7000	1.0000	0.9000	0.9000	0.8000	0.8000	0.9000	0.7000
HC-S-35	1.0000	1.0000	0.9000	1.0000	1.0000	1.0000	0.7000	1.0000
HC-S-36	0.9000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
HC-S-39	1.0000	0.8000	1.0000	1.0000	1.0000	0.8000	1.0000	0.9000
HC-S-42	0.9000	0.8000	1.0000	0.8000	0.9000	1.0000	1.0000	1.0000
control	0.9000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
HC-Ref-B	0.9625	0.9747	1.3535	1.1071	1.4120	8.476	8		
HC-Ref-C	0.9875	1.0000	1.3916	1.2490	1.4120	4.140	8		
HC-S-26	0.9250	0.9367	1.2951	1.1071	1.4120	10.505	8		
HC-S-28	0.8375	0.8481	1.1695	0.9912	1.4120	12.483	8		
HC-S-35	0.9500	0.9620	1.3390	0.9912	1.4120	11.328	8		
HC-S-36	0.9625	0.9747	1.3535	1.1071	1.4120	8.476	8	63.50	51.00
HC-S-39	0.9375	0.9494	1.3154	1.1071	1.4120	10.667	8		
HC-S-42	0.9250	0.9367	1.2951	1.1071	1.4120	10.505	8		
control	0.9875	1.0000	1.3916	1.2490	1.4120	4.140	8	68.00	51.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.39803	0.844	-2.5095	4.89796
F-Test indicates equal variances (p = 1.00)	1	8.88531		
The control means are not significantly different (p = 0.42)	0.83954	2.14479		

othesis Test (1-tail, 0.05)

ilcoxon Two-Sample Test indicates no significant differences

Comparisons made against HC-Ref-C MLR 2-10-99

Freshwater Sediment-10-day survival

Start Date:	10/20/98 14:00	Test ID: 592-1	Sample ID: NAS#1857F-1858F,1874F-1879F
End Date:	10/30/98 14:30	Lab ID: ORNAS-Northwestern Aquat	Sample Type: SED-Sediment
Sample Date:		Protocol: NASXXXHA4b-Hyalella sedi	Test Species: HA-Hyalella azteca

ɔments:

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	1.0000	1.0000	0.9000	1.0000	1.0000	1.0000	0.8000	1.0000
HC-Ref-C	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9000
HC-S-26	1.0000	0.9000	1.0000	0.8000	1.0000	1.0000	0.9000	0.8000
HC-S-28	0.7000	1.0000	0.9000	0.9000	0.8000	0.8000	0.9000	0.7000
HC-S-35	1.0000	1.0000	0.9000	1.0000	1.0000	1.0000	0.7000	1.0000
HC-S-36	0.9000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
HC-S-39	1.0000	0.8000	1.0000	1.0000	1.0000	0.8000	1.0000	0.9000
HC-S-42	0.9000	0.8000	1.0000	0.8000	0.9000	1.0000	1.0000	1.0000
control	0.9000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					1-Tailed		
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	0.9625	0.9747	1.3535	1.1071	1.4120	8.476	8			
HC-Ref-C	0.9875	1.0000	1.3916	1.2490	1.4120	4.140	8			
HC-S-26	0.9250	0.9367	1.2951	1.1071	1.4120	10.505	8			
*HC-S-28	0.8375	0.8481	1.1695	0.9912	1.4120	12.483	8	2.804	1.761	0.0076
HC-S-35	0.9500	0.9620	1.3390	0.9912	1.4120	11.328	8			
HC-S-36	0.9625	0.9747	1.3535	1.1071	1.4120	8.476	8			
HC-S-39	0.9375	0.9494	1.3154	1.1071	1.4120	10.667	8			
HC-S-42	0.9250	0.9367	1.2951	1.1071	1.4120	10.505	8			
control	0.9875	1.0000	1.3916	1.2490	1.4120	4.140	8			

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.88589	0.844	-0.4085	-0.049
F-Test indicates equal variances (p = 0.54)	1.61903	8.88531		
The control means are not significantly different (p = 0.42)	0.83954	2.14479		

ɔothesis Test (1-tail, 0.05)

...moscedastic Test indicates significant differences

Comparison made against HC-Ref-B - MSR 2-10-99

Freshwater Sediment-10-day survival

Start Date:	10/20/98 14:00	Test ID:	592-1	Sample ID:	NAS#1857F-1858F,1874F-1879F
End Date:	10/30/98 14:30	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	SED-Sediment
Sample Date:		Protocol:	NASXXXHA4b-Hyalella sedi	Test Species:	HA-Hyalella azteca
Comments:					

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	1.0000	1.0000	0.9000	1.0000	1.0000	1.0000	0.8000	1.0000
HC-Ref-C	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9000
HC-S-26	1.0000	0.9000	1.0000	0.8000	1.0000	1.0000	0.9000	0.8000
HC-S-28	0.7000	1.0000	0.9000	0.9000	0.8000	0.8000	0.9000	0.7000
HC-S-35	1.0000	1.0000	0.9000	1.0000	1.0000	1.0000	0.7000	1.0000
HC-S-36	0.9000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
HC-S-39	1.0000	0.8000	1.0000	1.0000	1.0000	0.8000	1.0000	0.9000
HC-S-42	0.9000	0.8000	1.0000	0.8000	0.9000	1.0000	1.0000	1.0000
control	0.9000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
HC-Ref-B	0.9625	0.9747	1.3535	1.1071	1.4120	8.476	8		
HC-Ref-C	0.9875	1.0000	1.3916	1.2490	1.4120	4.140	8		
HC-S-26	0.9250	0.9367	1.2951	1.1071	1.4120	10.505	8		
HC-S-28	0.8375	0.8481	1.1695	0.9912	1.4120	12.483	8		
HC-S-35	0.9500	0.9620	1.3390	0.9912	1.4120	11.328	8	67.50	51.00
HC-S-36	0.9625	0.9747	1.3535	1.1071	1.4120	8.476	8		
HC-S-39	0.9375	0.9494	1.3154	1.1071	1.4120	10.667	8	63.50	51.00
HC-S-42	0.9250	0.9367	1.2951	1.1071	1.4120	10.505	8	60.00	51.00
control	0.9875	1.0000	1.3916	1.2490	1.4120	4.140	8	72.50	51.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.82554	0.919	-1.2975	0.85212
Bartlett's Test indicates equal variances (p = 0.92)	0.90399	13.2767		
The control means are not significantly different (p = 0.42)	0.83954	2.14479		

Hypothesis Test (1-tail, 0.05)

Wilcoxon Two-Sample Test indicates no significant differences

Comparison made against HC-Ref-B MSR 2-10-99

Actual p-values for comparisons showing significant differences, calculated from the statistics returned by ToxCalc analysis					
Survival Data					
		degrees of			
Comparison	T stat	freedom *	tails	TDIST (=p)	
HC-S-26 vs. HC-Ref-C	1.849	14	1	0.04	
HC-S-36 vs. HC-Ref-C	Wilcoxon 2-sample; not significant				
control vs. HC-Ref-C	Wilcoxon 2-sample; not significant				
HC-S-28 vs. HC-Ref-B	2.804	14	1	0.01	
HC-S-35 vs. HC-Ref-B	Wilcoxon 2-sample; not significant				
HC-S-39 vs. HC-Ref-B	Wilcoxon 2-sample; not significant				
HC-S-42 vs. HC-Ref-B	Wilcoxon 2-sample; not significant				
control vs. HC-Ref-B	Wilcoxon 2-sample; not significant				
* (control replicates + treatment replicates - 2)					

Water Quality Data

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	COND	pH	S	NH3	HARD	ALK
2	1879F	HC-S-42	1	0	22.3	6.0	330	6.6	<0.02	0.5	100	100
14	1875F	HC-S-28	1	0	22.3	6.9	370	6.7	<0.02	1.0	140	100
20	1858F	HC-ref-C	1	0	22.4	6.9	310	7.0	<0.02	<0.5	120	80
27	1884F	control	1	0	22.5	7.3	430	7.7	<0.02	<0.5	120	80
39	1857F	HC-ref-B	1	0	22.4	5.9	340	7.2	<0.02	0.5	140	100
42	1877F	HC-S-36	1	0	22.4	6.4	340	7.5	<0.02	<0.5	120	80
45	1878F	HC-S-39	1	0	22.4	5.8	340	6.9	<0.02	1.0	140	100
63	1876F	HC-S-35	1	0	22.6	6.0	370	7.1	<0.02	0.5	140	100
64	1874F	HC-S-26	1	0	22.6	6.5	360	7.5	<0.02	<0.5	120	100
2	1879F	HC-S-42	1	1	22.3	6.6	320	7.2				
14	1875F	HC-S-28	1	1	22.3	5.7	340	7.1				
20	1858F	HC-ref-C	1	1	22.4	7.0	320	7.4				
27	1884F	control	1	1	22.4	7.2	340	7.6				
39	1857F	HC-ref-B	1	1	22.4	6.6	330	7.4				
42	1877F	HC-S-36	1	1	22.4	7.0	320	7.6				
45	1878F	HC-S-39	1	1	22.5	6.5	320	7.3				
63	1876F	HC-S-35	1	1	22.7	6.5	330	7.3				
64	1874F	HC-S-26	1	1	22.7	6.8	330	7.5				
2	1879F	HC-S-42	1	2	23.0	6.8						
14	1875F	HC-S-28	1	2	22.9	6.8						
20	1858F	HC-ref-C	1	2	22.9	7.0						
27	1884F	control	1	2	22.9	7.2						
39	1857F	HC-ref-B	1	2	22.9	6.8						
42	1877F	HC-S-36	1	2	22.9	6.9						
45	1878F	HC-S-39	1	2	22.9	6.8						
63	1876F	HC-S-35	1	2	23.0	7.1						
64	1874F	HC-S-26	1	2	23.1	7.0						
2	1879F	HC-S-42	1	3	22.4	6.6						
14	1875F	HC-S-28	1	3	22.4	6.5						
20	1858F	HC-ref-C	1	3	22.5	6.6						
27	1884F	control	1	3	22.5	6.8						
39	1857F	HC-ref-B	1	3	22.4	6.5						
42	1877F	HC-S-36	1	3	22.5	6.6						
45	1878F	HC-S-39	1	3	22.5	6.5						
63	1876F	HC-S-35	1	3	22.4	6.6						
64	1874F	HC-S-26	1	3	22.7	6.6						
2	1879F	HC-S-42	1	4	22.1	6.8						
14	1875F	HC-S-28	1	4	22.2	6.6						
20	1858F	HC-ref-C	1	4	22.2	6.7						
27	1884F	control	1	4	22.3	6.7						
39	1857F	HC-ref-B	1	4	22.5	6.8						
42	1877F	HC-S-36	1	4	22.5	6.6						
45	1878F	HC-S-39	1	4	22.6	6.6						
63	1876F	HC-S-35	1	4	22.6	6.7						
64	1874F	HC-S-26	1	4	22.6	6.5						

Data entry verified against laboratory bench sheets
MLR
1-29-99

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	COND	pH	S	NH3	HARD	ALK
2	1879F	HC-S-42	1	5	22.8	5.3						
14	1875F	HC-S-28	1	5	22.8	5.2						
20	1858F	HC-ref-C	1	5	22.6	4.8						
27	1884F	control	1	5	22.7	5.6						
39	1857F	HC-ref-B	1	5	22.6	5.8						
42	1877F	HC-S-36	1	5	22.8	5.1						
45	1878F	HC-S-39	1	5	22.8	4.9						
63	1876F	HC-S-35	1	5	22.9	5.9						
64	1874F	HC-S-26	1	5	22.9	5.5						
2	1879F	HC-S-42	1	6	22.6	6.8						
14	1875F	HC-S-28	1	6	22.6	6.6						
20	1858F	HC-ref-C	1	6	22.7	7.0						
27	1884F	control	1	6	22.6	7.0						
39	1857F	HC-ref-B	1	6	22.6	6.6						
42	1877F	HC-S-36	1	6	22.7	6.8						
45	1878F	HC-S-39	1	6	22.8	6.4						
63	1876F	HC-S-35	1	6	22.6	6.7						
64	1874F	HC-S-26	1	6	22.6	6.9						
2	1879F	HC-S-42	1	7	22.6	6.0						
14	1875F	HC-S-28	1	7	22.6	5.4						
20	1858F	HC-ref-C	1	7	22.6	5.8						
27	1884F	control	1	7	22.6	5.8						
39	1857F	HC-ref-B	1	7	22.7	5.8						
42	1877F	HC-S-36	1	7	22.6	5.6						
45	1878F	HC-S-39	1	7	22.6	5.5						
63	1876F	HC-S-35	1	7	22.9	5.8						
64	1874F	HC-S-26	1	7	22.9	5.7						
2	1879F	HC-S-42	1	8	22.3	6.8						
14	1875F	HC-S-28	1	8	22.3	6.6						
20	1858F	HC-ref-C	1	8	22.3	6.4						
27	1884F	control	1	8	22.3	6.6						
39	1857F	HC-ref-B	1	8	22.3	6.6						
42	1877F	HC-S-36	1	8	22.3	6.6						
45	1878F	HC-S-39	1	8	22.3	6.5						
63	1876F	HC-S-35	1	8	22.3	6.8						
64	1874F	HC-S-26	1	8	22.5	6.7						
2	1879F	HC-S-42	1	9	21.9	6.7						
14	1875F	HC-S-28	1	9	21.9	6.4						
20	1858F	HC-ref-C	1	9	21.9	6.6						
27	1884F	control	1	9	21.9	6.8						
39	1857F	HC-ref-B	1	9	22.0	6.6						
42	1877F	HC-S-36	1	9	21.9	6.8						
45	1878F	HC-S-39	1	9	22.0	6.6						
63	1876F	HC-S-35	1	9	21.9	6.6						
64	1874F	HC-S-26	1	9	21.9	6.6						
2	1879F	HC-S-42	1	10	22.5	7.0	290	7.7	<0.02	<0.5	100	80
14	1875F	HC-S-28	1	10	22.4	7.0	260	7.7	<0.02	<0.5	100	80

	NAS	CLIENT										
BKR	SMPL	DESCRIP	REPL	DAY	TEMP	DO	COND	pH	S	NH3	HARD	ALK
20	1858F	HC-ref-C	1	10	22.4	6.9	250	7.7	<0.02	<0.5	100	80
27	1884F	control	1	10	22.5	7.4	260	7.8	<0.02	<0.5	100	80
39	1857F	HC-ref-B	1	10	22.4	6.9	260	7.6	<0.02	<0.5	100	80
42	1877F	HC-S-36	1	10	22.5	7.0	250	7.6	<0.02	<0.5	100	80
45	1878F	HC-S-39	1	10	22.4	6.6	250	7.5	<0.02	<0.5	100	80
63	1876F	HC-S-35	1	10	22.8	7.1	260	7.5	<0.02	<0.5	100	80
64	1874F	HC-S-26	1	10	22.8	6.9	260	7.5	<0.02	<0.5	100	80
				Mean	22.5	6.5	314	7.4	—	—	113	87
				SD	0.3	0.5	46	0.3	—	—	17	10
				n	99	99	27	27	18	18	18	18
				Max	23.1	7.4	430	7.8	<0.02	1.0	140	100
				Min	21.9	4.8	250	6.6	<0.02	<0.5	100	80

-It™ brand fax transmittal memo 7671 | # of pages ▸ 1

Michele Redmond	From Scott Fellman
UAS	Co. ABS
	Phone #
5 265-2788	Fax #

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524

AQUATIC BIO SYSTEMS ABS INC.

Toll Free: 800/331-5916
Tel: 970/484-5091 Fax: 970/484-2514

ORGANISM HISTORY

DATE: 10/15/98

SPECIES: Hyalella azteca

AGE: 5-8 day

LIFE STAGE: Juvenile

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: Aspen leaves, YTC

Water Chemistry Record:	Mean	Range
TEMPERATURE:	24 °C	23-26°C
SALINITY / CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	106 mg/l	100-110 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	70 mg/l	60-75 mg/l
pH:	7.96	7.73-8.09

Comments:

Facility Supervisor

Aquatic BioSystems, Inc. • Quality Research Organisms

Custody Seal 3.9 °C

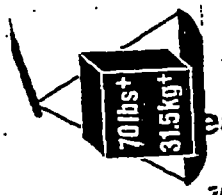
Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 1 of 10

Custody Seal 2.1 °C

Date 10/16/98 Project Samples

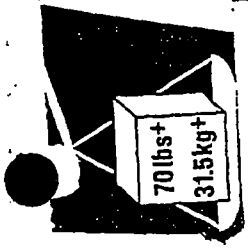
Signature Jennifer Stewart Container# 2 of 10



eal 3.0 °C

18 Project Samples

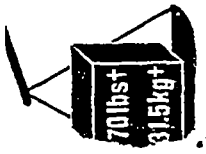
nifer Stewart Container# 3 of 10



Custody Seal 4.1°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 4 of 10



Custody Seal 2.3°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 5 of 10

Custody Seal 3.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 6 of 10

Custody Seal 2.5°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 7 of 10

Custody Seal 2.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 8 of 10

Custody Seal 3.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 9 of 10

Custody Seal 4.3°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 10 of 10

Sample Custody Record

Samples Shipped to: _____

HART CROWSER
1910 Fairview Avenue East
Seattle, Washington 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 5624-06 LAB NUMBER _____

PROJECT NAME Terminal 4/RI/FS

HART CROWSER CONTACT H. Cumberlad

SAMPLED BY: HERZOG

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	Archive	Bioassay	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	HC-S-11		10/14/98	0925	SED	X		4	#1866F
	HC-S14			1035		X		4	1867F
	HC-S-16			12:45		X		4	1868F
	HC-S-22			13:15		X		4	1872F
	HC-S-24			1345		X		4	1873F
	HC-S-26			1445			X	4	1874F
	HC-S-28			1530			X	4	1875F
	HC-S-35			16:25			X	4	1876F.
	~~HC-S-36~~			1730			X	4	

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/14/98	SIGNATURE	10/15
PRINT NAME John Herzog	TIME	PRINT NAME	TIME
COMPANY PC	1745	COMPANY	1750
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/16/98	SIGNATURE Linda K. Nemeth	10/17/98
PRINT NAME	TIME	PRINT NAME Linda K. Nemeth	TIME
COMPANY	2PM	COMPANY NW Aquatic	10:30

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____ for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

POPA0008325

Sample Custody Record

Samples Shipped to: _____

HARTCROWSER
1910 Fairview Avenue East
Seattle, Washington 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 5260-06 LAB NUMBER _____
PROJECT NAME Terminal 4 RI/FS
HART CROWSER CONTACT H. Cumberland
SAMPLED BY: JMH

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	REQUESTED ANALYSIS: Archive	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	HC-S-01		10/13/98	10:35	SED	X	4	Archive #1859F
	HC-S-02		10/13/98	11:45		X	4	1860F
	HC-S-03			12:35		X	4	1861F
	HC-S-04			1300		X	4	1862F
	HC-S-05			14:00		X	4	1863F
	HC-S-07			16:00		X	4	1864F
	~~HC-S-08~~			~~16:30~~		~~X~~	~~4~~	
	HC-S-09			16:45		X	4	1865F

TOTAL NUMBER OF CONTAINERS

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/13/98	SIGNATURE	10/13/98
PRINT NAME: JOHN Herro	TIME	PRINT NAME	TIME
COMPANY: HC		COMPANY	1735
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/16/98	SIGNATURE	10/14/98
PRINT NAME	TIME	PRINT NAME	TIME
COMPANY: HC	300	COMPANY: HC	830

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:
Hold until notified

Rec'd by Linda K. Nemeth 10/17/98 10:30 am for NW Aquatic

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____ for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

POPA008326

Sample Custody Record — Bioassay

Samples Shipped to: _____

HART CROWSER

1910 [illegible] Avenue East
Seattle, Washing 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 5624-06 LAB NUMBER _____

PROJECT NAME Terminal 4 RI/FS

HART CROWSER CONTACT H. Cumberland

SAMPLED BY: Herzog

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	REQUESTED ANALYSIS: ARSENIC	REQUESTED ANALYSIS: BIOASSAY	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
		HC-S-36	10/15/98	8100	SED		X	4	#1877F
		HC-S-39		0940			X	4	1878F
		HC-S-42		11:10			X	4	1879F
		HC-REF-B		1400		X	X	8	#1857F
		HC-REF-C		1500		X	X	8	1858F
		HC-S-18		1630		X		9	~~1869F~~ JM
		HC-S-19		1640		X		4	1870F
		HC-S-20		1650		X		4	1871F
		HC-S-30	10/15/98	17:10	received rather than HC-S-18 listed above (NOT REC'D BY NAS JM) 10/17/98 JM				1869F

RELINQUISHED BY: SIGNATURE _____ PRINT NAME John Herzog COMPANY HC — DATE 10/16 — TIME 9:49

RECEIVED BY: SIGNATURE _____ PRINT NAME _____ COMPANY _____ — DATE 10/16/98 — TIME 950

RELINQUISHED BY: SIGNATURE _____ PRINT NAME _____ COMPANY _____ — DATE 10/16/98 — TIME _____

RECEIVED BY: SIGNATURE Linda K. Nemeth PRINT NAME Linda K. Nemeth COMPANY NW Aquatic — DATE 10/17/98 — TIME 10:30

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____ for Other Contract Requirements

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION:
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

POPA0008327

APPENDIX III

RAW DATA - REFERENCE TOXICANT TEST

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-969 Client QC test Investigator Approved pH 2-12-99 GB

Test Type (rangefinding/definitive) Test Length (hr) 96

Species Hyalella azteca

STUDY MANAGEMENT

Client: QC test

Client's Study Monitor: NA

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.T. Irissarri / G.A. Buhler GB

QA Officer L.K. Nemeth

1. S. Bione 2. Erin Coffey

3. S Courbis 4.

Study Schedule:

Test Beginning: 10-20-98 1400 Test Ending: 10-24-98 1445

TEST MATERIAL

Description: cadmium as $CdCl_2 \cdot 2\frac{1}{2}H_2O$ Mallinckrodt Lot #TW2

NAS Sample No.: 1.0 mg/mL stock prepared: 6-23-98

Date of Collection:				
Date of Receipt:				
Temperature (°C):				
Dissolved oxygen (mg/L):				
Conductivity (umhos/cm):				
pH:				
Hardness (mg/L):				
Alkalinity (mg/L):				
:				

DILUTION WATER

Description: moderately hard synthetic water

Date of Preparation/Collection: 10-16-98

Water Quality: Cond. (umhos/cm) 230 Salinity (ppt) — pH 7.6

Hardness (mg/L as $CaCO_3$) 100 Alkalinity (mg/L as $CaCO_3$ 80

Treatments: aerated ≥ 24 hr.

TEST ORGANISMS

Species: Hyalella azteca Age: 9-12 days Size:

Source: Aquatic BioSystems, Fort Collins, CO

Acclimation Data:

Date	Temp (°C)	DO (mg/L)	pH	~~Sal~~/Cond	Comments
10-16-98	16.9	8.6	6.2	400	Reconstituted water
10-19-98	22.0	7.6	8.1	330	
Mean	19.4	8.1	7.2	365	
S.D.	—	—	—	—	
(N)	2	2	2	2	

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-969 Client QC test Investigator _____

TEST PROCEDURES AND CONDITIONS

Test concentrations: (50% series recommended) _____

60, 30, 15, 7.5, 3.75 and Ø ug/L

Test chambers: 250 mL beakers Test volume: 100 mL

Replicates/treatment: ~~(2)~~ 2 (10) Organisms/treatment: ~~(20)~~ ~~20 (10/rep)~~ 8* (8/1 rep)

Test water changes: none Aeration during test: none

Feeding: None Photoperiod: 16L:8D

Temperature: 23 ± 1 °C

Duration: 24-hr, 48-hr (96-hr) Renewal: none

Beaker placement: Stratified randomization

Randomization chart:

A	15	60	Ø	30	7.5	3.75
B	30	7.5	15	3.75	Ø	60
C						
D						

N →

MISCELLANEOUS NOTES

Test solution preparation:

1st working stock) made by 1:99 (1 mL ↑ 100 mL) dilution of conc. 1.0 mg/mL Cd stock; final conc. 10 µg/mL.

2nd working stock) made by 10:90 (10 mL ↑ 100 mL) dilution of 1st working stock); final conc. = 1 µg/mL

Test conc. (µg/L)	µg Cd needed per 100 mL	mL of 2nd working stock per 200 mL
60	6.0	12.0
30	3.0	6.0
15	1.5	3.0
7.5	0.75	1.5
3.75	0.375	0.75
Ø	Ø	Ø

10-20-98 KB

10-20-98 KB * Due to low numbers of Animals 1-repl. of 8-animals was used in this test.

Rev. 2/97

POPA0008330

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-969 Client QC test Investigator

DAY 0 (10/20/98) AC

Conc. (µg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 60	~~20.7~~ 20.8	9.1		300	~~7.5~~ 7.5	120	80	8	
2. 30	20.7	9.1		300	7.5			8	
3. 15	21.1	9.2		300	7.5			8	
4. 7.5	20.8	9.1		300	7.5			8	
5. 3.75	20.8	9.1		300	7.4			8	
6. Ø	20.9	9.2		300	7.4	120	80	8	

DAY 1 (10/21/98) BS

Conc. (µg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 60	23.1	8.0		320	7.8			8	
2. 30	23.1	8.0		320	7.8			8	
3. 15	23.0	8.0		320	7.8			7 (1m)	
4. 7.5	23.1	8.0		330	7.8			7 (1m)	
5. 3.75	23.1	7.9		320	7.9			8	
6. Ø	23.2	7.8		320	7.9			7 (1m)	

DAY 2 (10/22/98) MH

Conc. (µg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 60	23.4	7.8		300	7.6			4 (4d)	
2. 30	23.4	7.8		300	7.6			4 (4D)	
3. 15	23.3	7.8		300	7.6			5 (2D)	
4. 7.5	23.4	7.8		300	7.6			7	
5. 3.75	23.4	7.8		310	7.6			7 (1m)	
6. Ø	23.4	7.7 8		300	7.6			7	

DAY 3 (10/23/98) MH

Conc. (µg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 60	23.1	7.6		300	7.7			1 (3D)	
2. 30	23.2	7.6		290	7.7			4	
3. 15	23.2	7.6		300	7.7			4 (1d)	
4. 7.5	23.2	7.6		300	7.7			7	
5. 3.75	23.2	7.5		300	7.7			6 (1d)	
6. Ø	23.2	7.5		300	7.7			6 (1m)	

DAY 4 (10/24/98) MH

Conc. (µg/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 60	~~22.3~~ 22.8	~~7.6~~ 7.6		300	7.4	110	80	0 (1D)	
2. 30	~~22.8~~ 22.8	~~7.6~~ 7.6		300	7.4			3 (1D)	
3. 15	~~22.7~~ 22.7	~~7.6~~ 7.6		300	7.4			3 (1D)	
4. 7.5	~~22.8~~ 22.8	~~7.7~~ 7.7		310	7.4			6 (1D)	
5. 3.75	~~22.8~~ 22.8	~~7.5~~ 7.5		300	7.4			6	
6. Ø	~~22.3~~ 22.3	~~7.4~~ 7.4		300	7.4	100	80	6	

Remarks: Day 03, conc. 15, could not seperate the dead animal from the living. It was being canibalized. MH

Acute 96-hr Toxicity Test-96 Hr Survival

Start Date:	10/20/98 14:00	Test ID:	999-969	Sample ID:	REF-Ref Toxicant
End Date:	10/24/98 14:45	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	CDCL-Cadmium chloride
Sample Date:		Protocol:	EPAA 91-EPA Acute	Test Species:	HA-Hyalella azteca
Comments:					

Conc-ug/L	1
D-Control	1.0000
3.75	1.0000
7.5	0.8571
15	0.4286
30	0.3750
60	0.0000

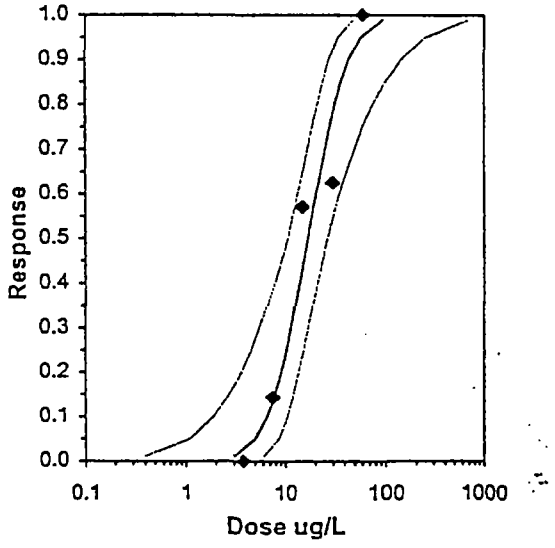
Conc-ug/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	6	6	1			0	6
3.75	1.0000	1.0000	0	6	6	1	1.0000	0.0500	0	6
7.5	0.8571	0.8571	1	6	7	1	0.5385	0.0500	1	7
*15	0.4286	0.4286	4	3	7	1	0.0490	0.0500	4	7
*30	0.3750	0.3750	5	3	8	1	0.0280	0.0500	5	8
60	0.0000	0.0000	8	0	8	1			8	8

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	7.5	15	10.6066	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	3.09723	0.83344	1.46369	4.73078	0	2.13246	7.81472	0.55	1.22983	0.32287	5
Intercept	1.19093	1.07129	-0.9088	3.29065							
TSCR											

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	3.01111	0.38875	5.99705
EC05	3.355	4.99758	1.10278	8.60543
EC10	3.718	6.54725	1.90336	10.5377
EC15	3.964	7.85597	2.73095	12.1684
EC20	4.158	9.08027	3.61539	13.7299
EC25	4.326	10.2816	4.57	15.3257
EC40	4.747	14.0616	7.91345	21.0728
EC50	5.000	16.9759	10.5515	26.6325
EC60	5.253	20.4942	13.5181	35.0311
EC75	5.674	28.0288	18.8877	59.6954
EC80	5.842	31.737	21.1658	75.1622
EC85	6.036	36.683	23.9616	99.1733
EC90	6.282	44.0155	27.7494	141.885
EC95	6.645	57.664	34.0699	244.245
EC99	7.326	95.7057	49.0075	691.18



Test: AT-Acute 96-hr Toxicity Test			Test ID: 999-969
Species: HA-Hyalella azteca			Protocol: EPAA 91-EPA Acute
Sample ID: REF-Ref Toxicant			Sample Type: CDCL-Cadmium chloride
Start Date: 10/20/98 14:00	End Date: 10/24/98 14:45		Lab ID: ORNAS-Northwestern Aquatic Sciences

Pos	ID	Rep	Group	Start	24 Hr	48 Hr	72 Hr	96 Hr	Notes
	1	1	D-Control	6				6	
	2	1	3.750	6				6	
	3	1	7.500	7				6	
	4	1	15.000	7				3	
	5	1	30.000	8				3	
	6	1	60.000	8				0	

Comments:

...t-It™ brand fax transmittal memo 7671 ...

Michele Redmond	From Scott Fellman
NAS	Co. ABS
	Phone #
541-265-2799	Fax #

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524

AQUATIC BIO SYSTEMS ABS INC.

Toll Free: 800/331-5916
Tel: 970/484-5091 Fax: 970/484-2514

ORGANISM HISTORY

DATE: 10/15/98

SPECIES: Hyalella azteca

AGE: 5-8 day

LIFE STAGE: Juvenile

HATCH DATE: Variable

BEGAN FEEDING: Immediately

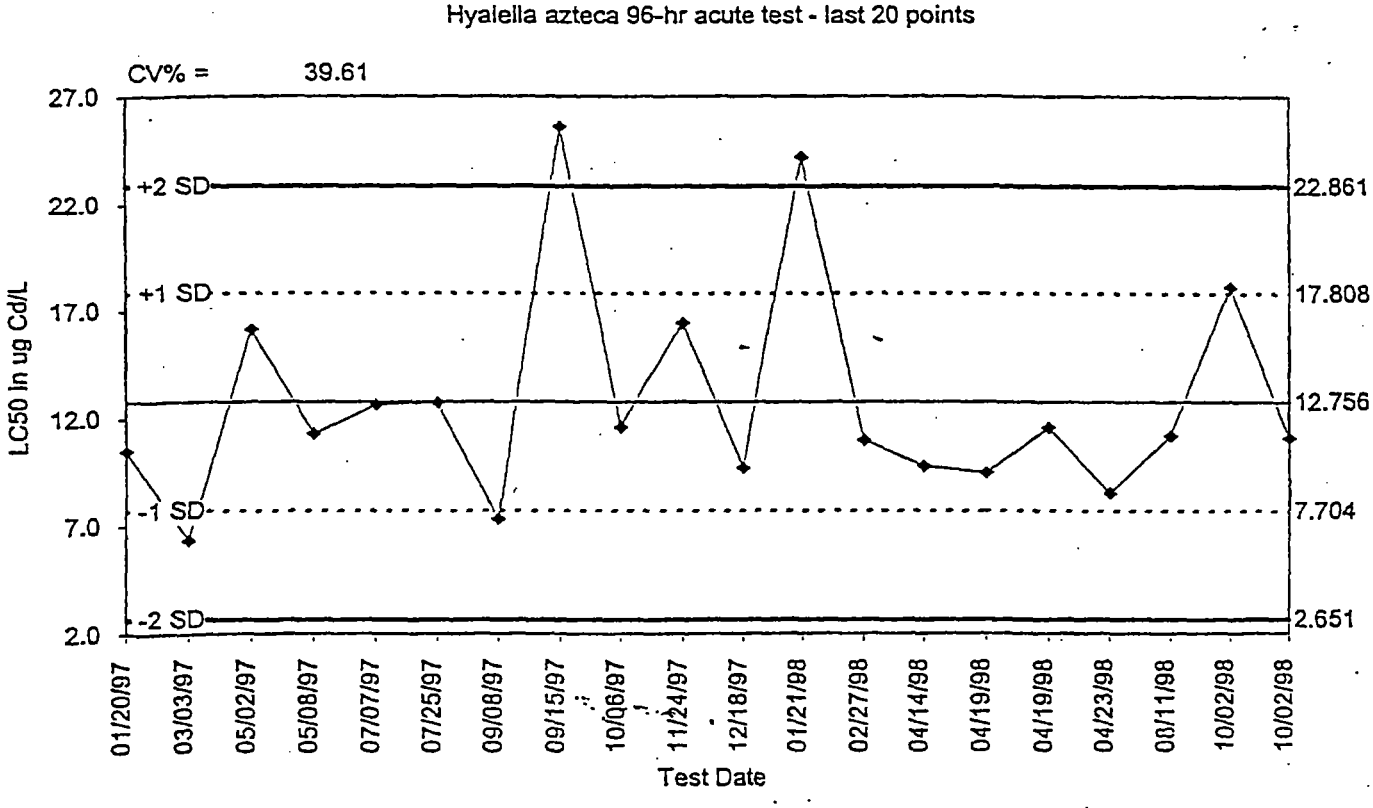
FOOD: Aspen leaves, YTC

Water Chemistry Record:	Mean	Range
TEMPERATURE:	24 °C	23-26°C
SALINITY / CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	106 mg/l	100-110 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	70 mg/l	60-75 mg/l
pH:	7.96	7.73-8.09

Comments:

Facility Supervisor

Aquatic BioSystems, Inc. • Quality Research Organisms



11-23-98

POPA0008335

SECTION B

Phase I

Midge (*Chironomus tentans*) sediment bioassay 592-2 data report

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test No.: 592-2

Title: Toxicity of freshwater sediments using a 10-day midge, *Chironomus tentans*, sediment bioassay.

Protocol No.: NAS-XXX-CT4b, April 7, 1998. Based on ASTM 1996 (Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates, E1706-95b), Am. Soc. Test. Mat., Phila., PA, and EPA Method 100.2 (Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates, EPA/600/R-94/024). Testing was also conducted with consideration of the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area (Draft, April 1998).

STUDY MANAGEMENT

Study Sponsor: Hart Crowser, Inc., 5 Center Pointe Dr., Suite 240, Lake Oswego, Oregon 97035

Sponsor's Study Monitor: Dr. Takashi Fuji

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365

Test Location: Newport laboratory

Laboratory's Study Personnel: G.J. Irissarri, B.S., Proj. Man.; G.A. Buhler, B.S., Study Dir.; L.K. Nemeth, B.A., QA Officer; M.S. Redmond, M.S., Aq. Toxicol.; E. Coffey, B.S., Sr. Tech.; S. Bione, B.S., Tech.; S. Courbis, B.S., Tech.

Study Schedule:

Test Beginning: 10-20-98, 1430 hrs.

Test Ending: 10-30-98, 1400 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Test Sediments: Unidentified freshwater test sediments. Details are as follows:

NAS Sample No.	1874F	1875F	1876F	1877F
Description	HC-S-26	HC-S-28	HC-S-35	HC-S-36
Collection Date	10-14-98	10-14-98	10-14-98	10-15-98
Receipt Date	10-17-98	10-17-98	10-17-98	10-17-98

NAS Sample No.	1878F	1879F	1857F	1858F
Description	HC-S-39	HC-S-42	HC-Ref-B	HC-Ref-C
Collection Date	10-15-98	10-15-98	10-15-98	10-15-98
Receipt Date	10-17-98	10-17-98	10-17-98	10-17-98

Control Sediment: The negative control sediment was collected on 10-19-98 from an area adjacent to the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR. The control sediment was sieved through a 1.0 mm screen, and rinsed three times with dilution water prior to use.

Storage: All test and reference sediments were placed under nitrogen upon receipt and stored at 4°C in the dark until used.

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TEST WATER

Source: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Dates of Preparation: 10-16-98, 10-23-98, 10-27-98
Water Quality: pH 7.6, 7.6, 7.9; conductivity 280,280, 230 µmhos/cm; hardness 100, 100, 100 mg/L as $CaCO_3$; alkalinity 80, 80, 70 mg/L as $CaCO_3$.
Pretreatment: Aerated ≥24 hr.

TEST ORGANISMS

Species: *Chironomus tentans*, midge.
Age/Size: 3rd instar, 0.18 mg average individual biomass
Source: NAS cultures, originally obtained from EPA, Duluth, MN.
Acclimation: Temperature, 23.4 ± 0.2°C; dissolved oxygen, 7.2 ± 1.3 mg/L; pH, 7.3 ± 0.2; conductivity, 380 ± 33 µmhos/cm; hardness, 110 mg/L as $CaCO_3$; and alkalinity, 70 mg/L as $CaCO_3$.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 300 ml high-form glass beakers
Test Volumes: 100 ml sediment layer; 175 ml test water.
Replicates/Treatment: 8
Organisms/Treatment: 80
Water Volume Changes: 2 water volumes per day
Aeration: None.
Feeding: Animals were fed 1.5 ml of TetraFin suspension (1.5 ml contains 6 mg dry solids) per beaker daily.
Effects Criteria: 1) survival after 10 days, and 2) average individual biomass (total biomass divided by the number of surviving midge) after 10 days. Death is defined as no visible movement or response to tactile stimulation. Missing organisms were considered to be dead.
Water Quality and Other Test Conditions: The temperature, dissolved oxygen, conductivity, pH, hardness, alkalinity, sulfide, and ammonia-nitrogen were measured in the overlying water of one replicate test container per treatment on days 0 and 10 of the test. Temperature and dissolved oxygen were measured daily in the overlying water of one replicate test container per treatment. Hardness and alkalinity were measured with titrimetric methods. Sulfide and ammonia-N were measured using Hach test kits based on the methylene blue (EPA Method 376.2) and salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric methods, respectively; samples were not distilled prior to analysis. The photoperiod was 16:8, L:D.

DATA ANALYSIS METHODS

Survival and individual biomass were calculated for each replicate as follows:

percent survival = 100 x (number surviving/initial number tested)
average individual biomass = (final wt. - tare wt.)/number weighed,
where:
final wt. = tare wt. + weight of organisms recovered on day 10, in mg

The mean and standard deviation for survival and average individual biomass were calculated for each treatment. The statistical software employed for these calculations was Microsoft EXCEL v.5.0

Values of survival and individual biomass for the test sediments were statistically compared against those for the reference sediment and the control sediment using ToxCalc v5.0.17. An arcsine square root transformation was performed on proportional data before analysis. Following transformation and determination of normality and homogeneity of variances, one-tailed homoscedastic or heteroscedastic t-tests, or Wilcoxon Two-Sample tests, were conducted at the 0.05 level of significance.

POPA0008338

PROTOCOL DEVIATIONS

1. The range of dilution water alkalinity (70-80 mg/L as $CaCO_3$) slightly exceeded the specified range of 60-70. This minor deviation is unlikely to have affected the test results.

REFERENCE TOXICANT TEST

The reference toxicant test is a standard multi-concentration toxicity test using potassium chloride, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-972
Reference Toxicant and Source: Potassium chloride (Mallinckrodt, Lot No. 68451).
Test Date: 10-23-98
Dilution Water Used: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Result: 96-hr LC50, 6.35 g/L. This result is within the laboratory's control chart warning limits (2.54 to 6.82 g/L).

TEST RESULTS

Water quality data are summarized in Table 1. A detailed tabulation of the water quality results by sample and test day can be found in Appendix II. The means and standard deviations of percent survival and growth (weight) of midges exposed for 10 days to sediments are summarized in Table 2. Detailed data organized by sample and replicate, and summary statistics for these observations, are given in Appendix II.

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Sulfides were not detected in the overlying water (detection limits, 0.02 mg/L) either at the beginning or the end of the test. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 1.5 mg/L. The test met acceptability criterion specified in the protocol with 85.0% mean control survival (70% required) and 1.69 mg average control weight (0.6 mg required). Survival of 71.3% and 80.0% in reference sediments HC-Ref-B (NAS#1857F) and HC-Ref-C (NAS#1858F), respectively, met the 65% survival criterion specified by the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area. The reference toxicant (positive control) result was within the laboratory's control chart limits (6.35 g/L; control chart mean ± 2 S.D. = 4.68 ± 2.14).

Survival in the control sediment was not significantly different from that in either reference sediment. Only one significant difference was detected in comparisons of test sediments to their appropriate reference sediments. Survival in sample HC-S-39 (58.8%; NAS #1878F) was significantly less than that in HC-Ref-B (71.3%).

Weights in the control sediment were not significantly different from those in either reference sediment. No test sediments had weights significantly less than that in their appropriate reference sediment.

STUDY APPROVAL

Project Manager	Date	Study Director	Date
Laboratory Director	Date	Quality Assurance Unit	Date

POPA0008339

Table 1. Summary of water quality conditions during tests of the midge, *Chironomus tentans*, exposed to freshwater sediments.

Water Quality Parameter	Mean ± S.D.	Minimum	Maximum	N
Temperature (°C)	22.8 ± 0.3	22.2	23.3	99
Dissolved oxygen (mg/L)	5.7 ± 0.8	3.5	7.6	99
Conductivity (µmhos/cm)	311 ± 46	250	400	27
pH	7.2 ± 0.2	7.0	7.8	27
Hardness (mg/L as $CaCO_3$)	111 ± 14	100	140	18
Alkalinity (mg/L as $CaCO_3$)	87 ± 12	80	120	18
Total sulfide (mg/L)	—	<0.02	<0.02	18
Total ammonia (mg/L)	—	< 0.5	1.5	18

Table 2. Survival and growth of *Chironomus tentans* exposed for 10 days to freshwater sediments. All comparisons were conducted at the 0.05 level of significance.

Sample Description	Reference Sediment for Comparison	Percent Survival (Mean ± SD)	Significant?	P	Average wt/midge (mg) [1] Mean ± SD	Significant?	P
HC-S-26 (NAS#1874F)	HC-Ref-C	72.5 ± 10.4	no	—	2.01 ± 0.70	no	—
HC-S-28 (NAS#1875F)	HC-Ref-B	60.0 ± 16.9	no	—	1.32 ± 0.36	no	—
HC-S-35 (NAS#1876F)	HC-Ref-B	65.0 ± 17.7	no	—	1.71 ± 0.59	no	—
HC-S-36 (NAS#1877F)	HC-Ref-C	73.8 ± 15.1	no	—	1.50 ± 0.27	no	—
HC-S-39 (NAS#1878F)	HC-Ref-B	58.8 ± 13.6	yes	0.03	1.64 ± 0.55	no	—
HC-S-42 (NAS#1879F)	HC-Ref-B	71.3 ± 17.3	no	—	1.46 ± 0.28	no	—
Control (NAS#1884F)	HC-Ref-B and -C	85.0 ± 12.0	no	—	1.69 ± 0.66	no	—
HC-Ref-B (NAS#1857F)	—	71.3 ± 11.3	—	—	1.60 ± 0.35	no	—
HC-Ref-C (NAS#1858F)	—	80.0 ± 15.1	—	—	1.73 ± 0.48	no	—

[1] Pupae were not included in the sample to estimate dry weight (as per EPA/600/R-94/024, p. 55, section 12.3.8.1)

POPA0008340

APPENDIX I

PROTOCOL

TEST PROTOCOL

FRESHWATER MIDGE, *CHIRONOMUS TENTANS*, 10-DAY SEDIMENT TOXICITY TEST

1. INTRODUCTION

1.1 Purpose of Study: The purpose of this study is to characterize the toxicity of freshwater sediments based on midge survival and growth using the midge, *Chironomus tentans*.

1.2 Referenced Method: This protocol is based on ASTM Method E 1706-95b (ASTM 1996) and EPA Method 100.2 (EPA/600/R-94/024).

1.3 Summary of Method: A summary of test conditions for the midge 10-day sediment toxicity test is tabulated below. The 10-day sediment toxicity test with Chironomus tentans is conducted at 23°C with a 16L:8D photoperiod at an illuminance of about 50-100 footcandles. Test chambers are 300-mL high-form lipless beakers containing 100 mL of sediment and 175 mL of overlying water. Ten third-instar midges are used in each replicate (all organisms must be third instar or younger and at least 50% of the larvae must be third instar). The number of replicates/treatment depends on the objective of the test. Eight replicates are recommended for routine testing. Midges in each test chamber are fed 1.5 mL of a 4 g/L fish food flakes suspension daily. Each chamber receives two volume additions per day of overlying water. Overlying water can be culture water, well water, surface water, site water, or reconstituted water. Test endpoints include survival and/or growth.

1. Test type	whole sediment toxicity test with renewal of overlying water
2. Test duration	10 days
3. Temperature	23 ± 1°C
4. Light quality	daylight flourescent light
5. Illuminance	50-100 footcandles
6. Photoperiod	16L:8D
7. Test chamber size	300-mL high-form lipless beakers (Pyrex® 1040 or equivalent)
8. Sediment volume	100 mL
9. Overlying water volume	175 mL
10. Renewal overlying water	2 volume additions/day (continuous or intermittent)
11. Age of test organisms	3rd instar or younger larvae (≥ 50% of organisms must be 3rd instar)
12. Organisms per test chamber	10
13. Replicates per treatment	8 recommended for routine (depends on design)
14. Organisms per treatment	80
15. Feeding regime	Fish food flakes, fed 1.5 mL daily/chamber (1.5 mL contains 6.0 mg of dry solids)
16. Aeration	None, unless DO falls below 40% saturation
17. Overlying (test) water	Culture water, well water, surface water, site water or reconstituted water
18. Water quality	Hardness, alkalinity, conductivity, pH, ammonia-N beginning and end; temperature and dissolved oxygen daily
19. Endpoints	Survival and growth (dry weight)
20. Test acceptability criteria	Minimum control survival of 70%; mean weight of surviving control organisms 0.6 mg
21. Sample holding	14 days at 4°C in the dark

POPA0008342

22. Sample volume required	1L (800 mL per sediment)
23. Reference toxicant	Concurrent testing required

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:

_____
_____
_____
_____

2.2 Sponsor's Study Monitor:

_____

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
3814 Yaquina Bay Road, P.O. Box 1437
Newport, OR 97365.

2.4 Test Location: _____

2.5 Laboratory's Personnel to be Assigned to the Study:
Study Director: _____
Quality Assurance Unit: _____
Aquatic Toxicologist: _____
Aquatic Toxicologist: _____

2.6 Proposed Testing Schedule: Tests are to begin within 14 days of sample collection. Reference toxicant test to be run concurrently.

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

3. TEST MATERIAL

The test materials are freshwater sediments. The control, reference, and test sediments are placed in solvent cleaned 1 L glass jars fitted with PTFE-lined screw caps. At the laboratory the samples are stored at 4°C in the dark. The original sealed containers may be stored for up to 14 days prior to testing. If jars are not full when received or if sediment is removed for testing, headspaces should be filled with nitrogen toretard deterioration. A negative control sediment is collected from a clean site. In addition, a reference sediment, a clean sediment with physical characteristics similar to the test sediments, may be employed as a comparison station.

4. TEST WATER

Test water (overlying water) at NAS is normally *C. tentans* culture water, which is moderately hard synthetic water at a hardness of 80-100 mg/L as $CaCO_3$ and alkalinity of 60-70 mg/L as $CaCO_3$. Dilution water is prepared from Milli-Q reagent grade water and reagent grade chemicals. Test water may also be well water, surface water or site water depending on the study design. Current research is being done by EPA on a new type of reconstituted water that may be used for this test in the future (STM 1996, EPA 1994).

5. TEST ORGANISMS

POPA0008343

5.1 Species: midge, *Chironomus tentans*.

5.2. Source: Cultured at NAS. Originally obtained from U.S. EPA Environmental Research Lab, Duluth, MN.

5.3 Age: Third instar or younger larvae (at least 50% of the larvae must be in the third instar at the start of the test). Third instar is normally 8.5 to 12.5 days after hatching; head capsule widths range from 0.33 to 0.45 mm.

5.4 Acclimation and Pretest Observation: Cultures are maintained at 23 ± 1°C under a 16:8 L:D photoperiod. The culture water is moderately hard synthetic water. Midge are fed finely ground Tetrafin flakes in suspension (10g Tetrafin in 100 mL Milli-Q water). Mortality during the 48-hr prior to testing should not be excessive.

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers used in the toxicity test are 300-mL high-form lipless glass beakers (Pyrex® 1040 or equivalent). Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or by placement in a temperature-controlled room. Aeration is not empolyed unless dissolved oxygen drops below 40% saturation. The test is conducted under an illuminance of 50-100 footcandles with a 16L:8D photoperiod.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA/600/4-90/027F. New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%, V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compounds (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: The test involves exposure of midge larvae to test, control, and reference sediments. The sediments are placed on the bottom of the test containers and are overlain with test water. The test exposure is for 10 days. The renewal of overlying water consists of two volume additions per day, either continuous or intermittent. Each treatment consists of eight replicate test containers, each containing 10 organisms. Test chamber positions are completely randomized. Test organisms are randomly distributed to the test chambers. Blind testing is normally used.

7.2 Setup of Test Containers: Sediments are homogenized and placed in test chambers on the day before addition of test organisms. Sediment (100 ml) is placed into each of eight replicate beakers. After addition of the sediment, 175 ml of test water is gently added to each beaker in a manner to prevent resuspension. The overlying water is replaced twice daily. The test begins when midges are introduced to the test chambers. Initial water quality measurements are taken prior to the addition of test organisms.

7.3 Effect Criterion: The acute effect criterion used in the midge bioassay is mortality, defined as the lack of movement of body or appendages on response to tactile stimulation. The optional chronic effect criterion is growth which is determined by using dry weight measurements.

7.4 Test Conditions: No aeration is employed unless dissoved oxygen falls below 40% saturation. The test temperature employed is 23°C (range of ± 1°C). A 16:8, L:D photoperiod is used. Illumination is supplied by daylight fluorescent lamps at 50-100 footcandles. The overlying water is replaced twice daily.

POPA0008344

7.5 Beginning the Test: The test is begun by adding the organisms to the equilibrated test containers as previously described. If the optional growth endpoint is to be used, three extra replicates of midge larvae should be counted out and randomly selected for drying to determine initial average weight data.

7.6 Feeding: Midge larvae are fed 1.5 mL daily per test chamber (1.5 mL contains 6.0 mg of dry solids). A feeding may be skipped if there is a build up of excess food. However, all beakers must be treated similarly.

7.7 Test Duration, Type and Frequency of Observations, and Methods: The duration of the acute toxicity test is 10 days. The type and frequency of observations to be made are summarized as follows:

TYPE OF OBSERVATION	TIMES OF OBSERVATION (ASTM 1996)
BIOLOGICAL DATA	
Survival, growth	Day 10
PHYSICAL AND CHEMICAL DATA	
Hardness, alkalinity, ammonia-N, conductivity, pH, dissolved oxygen, and temperature	Beginning and end of test in overlying water of one replicate beaker from each treatment.
Dissolved oxygen, temperature	Daily in overlying water of one replicate beaker from each treatment.

Dissolved oxygen is measured using a polarographic oxygen probe calibrated according to the manufacturer's recommendations. The pH is measured using a pH probe and a properly calibrated meter with scale divisions of 0.1 pH units. Temperature is measured with a calibrated mercury thermometer or telethermometer. Conductivity is measured with a conductivity meter. Hardness and alkalinity are measured using titrometric methods. Ammonia-nitrogen is measured using the salicylate colerimetric method (Clin. Chim. Acta 14:403, 1996).

7.8 Growth Measurement: Growth is measured as average dry weight of animals in a test replicate at the end of the test on day 10. Pooled animals from each test replicate are rinsed with deionized water, gently blotted and placed into tared aluminum weigh pans. The pans are dried at 60-90°C to constant weight. The dried organisms are placed into a dessicator and weighed as soon as possible to the nearest 0.01 mg (desirable to use 0.001 mg). The total weight of the dried midge in each pan is divided by the number of midge weighed to obtain an average dry weight per midge.

Criteria of Test Acceptance: The test results are acceptable if the minimum survival of organisms in the control treatment at the end of the test is at least 70% and the average weight of *C. tentans* in the surviving controls is at least 0.6 mg.

8. DATA ANALYSIS

The endpoints of the toxicity test are survival and growth. Survival is obtained as a direct count of living organisms in each test container at the end of the test. Average midge dry weight, also measured at the end of the test, may be used to compare growth between treatment sediments and the control or reference sediment. Ordinarily the following data analysis is performed. Due to special requirements, alternative methods may be used. The means and standard deviations are calculated for each treatment level. Identification of toxic sediments is established by statistical comparison of test endpoints between test and control or reference sediments. Between treatment comparisons may be made using a Student's t-test or Wilcoxon's Two-Sample test, where each treatment is compared to the control or the reference sediment. An arcsine-square root transformation of proportional data, and tests for normality and heterogeneity of variances, are performed prior to statistical comparisons.

9. REPORTING

POPA0008345

The final report of the test results must include all of the following standard information at a minimum: name and identification of the test; the investigator and laboratory; date and time of test beginning and end; information on the test material; information on the source and quality of the overlying/test water; detailed information about the test organisms including acclimation conditions; a description of the experimental design and test chambers and other test conditions including feeding, if any, and water quality; definition of the effect criteria and other observations; responses, if any, in the control treatment; tabulation and statistical analysis of measured responses and a summary table of endpoints; a description of the statistical methods used; any unusual information about the test or deviations from procedures; reference toxicant testing information.

10. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change, the date the change took effect and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

11. REFERENCE TOXICANT

The reference toxicant test is a standard multi-concentration toxicity test using a specified chemical toxicant to evaluate the performance of test organisms used in the study. Reference toxicant tests are 96-hour, water only exposures, not 10-day sediment exposures. The reference toxicant test is run concurrently. Performance is evaluated by comparing the results of the reference toxicant test with historical results (e.g., control charts) obtained at the laboratory.

12. REFERENCED GUIDELINES

ASTM. 1996. Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates. ASTM Standard Method No. E 1706-95b. Am. Soc. Test. Mat., Philadelphia, PA.

U.S. EPA. 1994. Section 12, Test Method 100.2, Chironomus tentans 10-d Survival and Gowth Test for Sediments, pp. 51-63. In: Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-94/024.

Weber, C.I. (Ed.) 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fourth Edition). EPA/600/4-90/027F.

13. APPROVALS

_____ for _____
Name Date

_____ for Northwestern Aquatic Sciences
Name Date

POPA0008346

APPENDIX II

RAW DATA

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator

STUDY MANAGEMENT

Client: Hart Crowser, Inc., 5 Center Pointe Dr., Suite 240, Lake Oswego, OR 97035

Client's Study Monitor: Dr. Takashi Fuji

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.J. Irissarri / G.A. Buhler

QA Officer L.K. Nemeth

1. M.S. Redmond MLR 2. Erin Coffey

3. S. Bione 4. S. Courbis

5. 6.

Study Schedule:

Test Beginning: 10-20-98 1430 Test Ending: 10-30-98 14:00

TEST MATERIAL

General description (see sample logbook/chain-of-custody for details):

NAS Sample No.:	1874F	1875F	1876F	1877F	1878F
Description:	HC-S-26	HC-S-28	HC-S-35	HC-S-36	HC-S-39
Collection Date:	10-14-98	10-14-98	10-14-98	10-15-98	10-15-98
Receipt Date:	10-17-98	10-17-98	10-17-98	10-17-98	10-17-98
Salinity:	0	0	0	0	0

NAS Sample No.:	1879F	1857F	1858F	1884F	
Description:	HC-S-42	HC-Ref-B	HC-Ref-C	control	
Collection Date:	10-15-98	10-15-98	10-15-98	10-19-98	
Receipt Date:	10-17-98	10-17-98	10-17-98	10-19-98	
Salinity:	0	0	0	0	

NAS Sample No.: All test and reference sediments
Description: were placed under nitrogen
Collection Date: upon receipt
Receipt Date: MLR

NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					
:					

NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					
:					

NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					
:					

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Test No. 592-2 Client Hart Crowser Investigator

MISCELLANEOUS NOTES

Head Capsule Measurements of Animals Used in Test: 0.37, 0.33, 0.44, 0.37, 0.37, 0.37, 0.40, 0.37, 0.33, 0.33 (mm)

Other:

N →

Randomization chart:

1	5	10	15	20	25	30	35	40	45	50
2	4	9	14	19	24	29	34	39	44	49
3	3	8	13	18	23	28	33	38	43	48
4	2	7	12	17	22	27	32	37	42	47
5	1	6	11	16	21	26	31	36	41	46

(A)

Randomization chart:

1	55	60	65	70						
2	54	59	64	69						
3	53	58	63	68						
4	52	57	62	67	72					
5	51	56	61	66	71					

(A)

Randomization chart:

1										
2										
3										
4										
5										

Randomization chart:

1										
2										
3										
4										
5										

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator _____

TEST WATER

Source: Moderately Hard Synthetic water Date of Preparation: 10-16-98, 10-23-98, 10-27-98

pH 7.6, 7.6, 7.9 Cond (umhos/cm) 230, 280 Hard (mg/L) 100, 100, 100 Alk (mg/L) 80, 80, 70

Treatments: Control 24hr

If more than one batch of test water is used, attach water prep benchsheets and mark appropriate batches.

TEST ORGANISMS

Species: Chironomus tentans, midge Age: _____ Head Capsule size Size: 0.33 → 0.44 (mm)

Source: NAS Cultures

Acclimation Data:

Date	Temp (C	DO (mg/L)	pH	Cond umh/cm	Hard (mg/L)	Alk (mg/L)	Comments
10-7-98	23.1	6.8	7.0	340			
10-9-98	23.4	7.2	7.3	360			
10-12-98	23.6	7.6	7.3	420	120	40	
10-14-98	23.4	6.0	7.1	420			
10-16-98	23.2	9.6	7.4	360			
10-19-98	23.5	6.2	7.7	380	100	100	
Mean	23.4	7.2	7.3	380	110	70	
S.D.	0.2	1.3	0.2	33	-	-	
(N)	6	6	6	6	2	2	

TEST PROCEDURES AND CONDITIONS

Test chambers: 300 mL high-form lipless glass beakers

Test volumes: 100 mL of test sediment; 175 mL of test water

Replicates/treatment: (8) 8 Organisms/replicate: (10) 10

Test water: Moderately hard synthetic water

Daily test water changes: two volumes/day

Aeration: None, unless DO falls below 40% saturation

Photoperiod: 16:8, L:D

Temperature: 23 ± 1|C

Feeding: fed 1.5 mL of Tetrafin (1.5 mL contains 6mg dry solids) suspension per beaker daily

Beaker placement: Total randomization

Water Quality Measurements:

Daily: temperature and dissolved oxygen; 1 repl./treatment

Beg. & End: Conductivity, hardness, alkalinity, pH, ammonia-nitrogen, temperature & dissolved oxygen; 1 repl./treatment

TEST SCHEDULE SUMMARY

Date	10-20-98	10-21-98	10-22-98	10-23-98	10-24-98	10-25-98	10-26-98	10-27-98	10-28-98	10-29-98	10-30-98
Day	0	1	2	3	4	5	6	7	8	9	10
Feed	X	X	X	X	X	X	X	X	X	X	X
Record WQ	X	X	X	X	X	X	X	X	X	X	X
Initials											

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CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator

SEDIMENT DESCRIPTIONS--SUPPLEMENTAL NOTES

Sample No.	Description
1857F	greenish-gray mud; chironomid larva present
1874F	greenish-gray sandy mud
1875F	greenish-gray sandy mud
1876F	greenish-gray mud
1877F	Gray sandy mud
1878F	Gray sandy mud
1879F	chironomids present, greenish-gray mud
1858F	Dark gray sand
Control	Brown Sr. Cl; sieved through 1.0 mm screen and rinsed with moderately hard synthetic water 3 times.
	The above descriptions were copied from test 592-1 (Hyalella azteca) test sheets concurrently with this test. - MSK 12-4-98.
	Chironomid larva was observed in 1857F. All sediments were therefore pressed through a 1.0 mm sieve to eliminate indigenous chironomids. However, after normal sieving, 1874F and 1877F had very little material go through the sieve. Therefore for these samples material was recombined after sieving; it is believed that any indigenous chironomids would have been killed by the sieving procedure. MSK 10-19-98
	1858F also would not go through a 1.0 mm sieve; 1879F also had chironomid larvae present.

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CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 0 (10/20/98) AC Initials: GRZ

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	22.6	6.0	400	7.1	120	120		Yes	S <.02
19	22.6	6.2	330	7.3	120	100			S <.02
40	22.6	7.6	380	7.8	80	80			S <.02
48	22.6	6.5	360	7.5	120	100			S <.02
51	22.6	6.5	350	7.5	120	80			S <.02
56	22.7	6.7	310	7.4	120	80			S <.02
57	22.6	6.0	340	7.0	140	100			S <.02
66	22.7	7.0	370	7.3	140	100			S <.02
67	22.7	7.2	340	7.3	120	80			

Day 1 (10/21/98) Initials: GRZ

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	22.9	5.6	330	7.3				Yes	water color good GRZ
19	22.7	6.2	320	7.5					" 0615 dc
40	22.7	6.8	340	7.7					
48	22.7	6.6	340	7.5					
51	22.8	6.6	320	7.5					
56	22.8	6.6	320	7.5					
57	22.8	6.4	280	7.3					
66	23.0	6.6	340	7.4					
67	23.0	6.2	330	7.4					

NORTHWESTERN AQUATIC SCIENCES

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 2 (10/22/98) Initials: GB/tr

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	23.0	6.2						Y	water added 0550 GB
19	23.0	6.3							" " 1600 "
40	23.1	6.6							
48	23.0	6.7							
51	23.1	6.6							
56	23.1	6.6							
57	23.2	6.5							
66	23.3	6.4							
67	23.3	6.5							

Day 3 (10/23/98 Initials: GB/tr

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	22.8	5.0						Y	water added 0550 GB
19	22.9	5.6							water added 1600 GB
40	22.7	6.0							
48	22.9	6.1							
51	22.9	6.1							
56	22.9	6.1							
57	22.9	5.7							
66	22.8	5.8							
67	23.0	5.8							

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CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator _____

DAILY RECORD SHEET

Day 4 (10/24/98) Initials: GAZ/

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	22.8	6.6						yes	water bath @ 0600 GAZ
19	23.0	6.6							" 1800 "
40	23.1	6.5							
48	23.1	6.5							
51	23.2	6.7							
56	23.2	6.5							
57	23.2	6.6							
66	23.3	6.8							
67	23.2	6.4							

Day 5 (10/25/98 Initials: GAZ/

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	23.0	4.6						yes	water bath @ 0600 GAZ
19	23.1	5.2							" 1700 "
40	23.1	4.5							
48	23.0	4.4							
51	23.1	5.0							
56	23.2	4.8							
57	23.2	4.6							
66	23.2	5.1							
67	23.3	5.3							

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CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 6 (10/26/98) Initials: GAT/CA

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	22.7	4.8						Yes	water bath 0550
19	22.7	4.6							" " 1650
40	22.6	5.7							
48	22.8	5.2							
51	22.7	5.4							
56	22.7	5.4							
57	22.8	5.0							
66	22.8	5.3							
67	22.8	5.4							

Day 7 (10/27/98) Initials: GAT/CA

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	23.0	4.1						Yes	water bath 0550
19	23.0	3.5							
40	23.0	4.6							water changed 1600
48	22.9	3.9							
51	22.9	4.2							
56	23.0	4.2							
57	23.0	3.9							
66	23.0	4.2							
67	23.1	4.2							

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator _____

DAILY RECORD SHEET

Day 8 (10/28/98) Initials: GB/LL

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	22-5	4.8						yes	water Δ'ed @ 0600 GB
19	22-5	5.0							water Δ'ed 1600 sc
40	22-5	5.6							
48	22-6	5.4							
51	22-6	5.8							
56	22-5	5.6							
57	22-5	5.4							
66	22-6	5.4							
67	22-7	5.3							

Day 9 (10/29/98) Initials: GB/LL

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	22-2	5.1						yes	water Δ'ed @ 0540 GB
19	22-2	5.0							" " 1630 [illegible]
40	22-2	6.0							
48	22-3	5.6							
51	22-3	5.6							
56	22-3	5.8							
57	22-3	5.0							
66	22-2	5.2							
67	22-4	5.2							

4/98

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CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator _____

DAILY RECORD SHEET

Day 10 (10/30/98) Initials: [illegible]

Beaker No.	Temp. (°C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4	22.9	5.4	250	7.4	100	80			water [illegible] S - <.02
19	22.9	5.0	250	7.4	100	80			S-<.02
40	23.0	6.2	250	7.6	100	80	[illegible]		S-<.02
48	22.9	5.6	260	7.5	100	80	[illegible]		S-<.02
51	23.0	5.4	260	7.5	100	80			S-<.02
56	23.0	5.6	260	7.5	100	80	[illegible]		S-<.02
57	22.9	5.2	250	7.4	100	80			S-<.02
66	23.2	5.4	260	7.4	100	80			S-<.02
67	23.2	5.6	260	7.4	100	80			S-<.02

Day _____ (/ /) Initials:

Beaker No.	Temp. (°C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
4									
19									
40									
48									
51									
56									
57									
66									
67									

4/98

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CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator

DAY 10 TEST TERMINATION SHEET

Beaker No.	Number of survivors	Init.
1	9	AC
2	6	AC
* 3	7 8	SR
4	5	SR
5	8	
6	8	AC
7	6	SR
8	4	SR
9	7	SR
10	7	AC
11	7	AC
12	8	SR
13	8	SR
14	9	SR
15	6	AC
16	7	SR
17	8	AC
18	9	SR
19	9	AC
20	10	SR
21	7	AC
22	8	SR
23	5	AC
24	8	AC
25	8	SR
26	5	AC
27	8	SR
28	8	AC
29	5	AC
30	5	SR
31	7	AC
32	8	AC
33	8	SR
35	9	AC
36	5	SR
37	7	SR
38	5	AC
39	6	AC
40	6	SR
41	8	AC
42	6	SR
43	6	AC
44	6	AC
45	6	AC
46	5	CAS

Beaker No.	Number of survivors	Init.
47	4	BK
48	7	CAS
49	6	AC
50	7	AC
51	7	CAS
52	5	AC
53	7	CAS
54	3	AC
55	10	CAS
56	8	AC
57	5	CAS
58	6	CAS
59	18	AC
60	10	CAS
61	9	AC
62	9	CAS
63	8	CAS
64	8	CAS
65	9	AC
66	7	CAS
67	10	AC
68	8	CAS
69	6	AC
70	9	AC
71	7	CAS
72	7	CAS
73		
74		
75		
76		
77		
78		
34	10	AC

* 8 animals were counted into weighing pan. Therefore there must have been 8 survivors – MLR 12-2-98.

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CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator _____

ZERO-TIME WEIGHING DATA SHEET

Tare: Date 10.15.98 Oven temp(|C) 62 Drying time(hr) 24 Init. JLF
Final: Date 10.21.98 Oven temp(|C) 60 Drying time(hr) 24 Init. JLF
Equip. Used: Oven Blue-M Balance Sartorius

Dry at 60|C to constant weight (~2 hrs); weigh to nearest 0.01 mg.

Repl. #	Pan #	Tare (mg)	Final Wt. (mg) 1	2	3	# weighed	mg/midge comments
	1	29.99	31.04	31.04	31.04	5	0.21
	2	29.15	29.83	29.84	29.84	5	0.14
	3	28.79	29.77	29.77	29.78	5	0.20
							$\bar{x}$ =

Remarks:

Balance Calibration:

JLF 10.15.98 100mg Std wt = 100.02

JLF 102198 100mg Std wt = 100.02

JLF 102298 100mg Std wt = 100.02mg

JLF 100mg Std wt = 100.02 10.23.98

NORTHWESTERN AQUATIC SCIENCES

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator

WEIGHING DATA SHEET

Tare: Date 10-28-98 Oven temp(|C) 63 Drying time(hr) 24H Init. JRF
Final: Date 11-2-98 Oven temp(|C) 59°F Drying time(hr) 24H Init. JRF
Equip. Used: Oven Precision Balance Sartorius

Dry at 60|C to constant weight (~2 hrs); weigh to nearest 0.01 mg.

Beaker #	Pan #	Tare (mg)	Final Wt. (mg) 1	2	3	# weighed	comments
	1	41.58	51.46	51.37	51.35	9	
	2	41.61	49.92	49.83	49.81	6	
	3	47.83	56.42	56.35	56.32	8	
	4	42.06	47.74	47.70	47.68	5	
	5	51.42	57.97	57.90	57.88	8	
	6	38.60	52.66	52.57	52.56	8	
	7	41.47	49.12	49.06	49.05	6	
	8	42.08	50.69	50.62	50.61	9	
	9	44.59	51.76	51.64	51.68	7	
	10	43.21	51.33	51.24	51.24	4	
	11	42.12	57.92	57.83	57.87	2	
	12	49.20	63.29	63.18	63.24	8	
	13	40.66	47.42	47.34	47.36	8	
	14	41.95	52.56	52.47	52.40	9	
	15	43.13	52.60	52.52	52.46	5	
	16	51.80	62.36	62.27	62.21	7	
	17	42.37	50.98	50.88	50.82	8	
	18	41.76	57.59	57.47	57.40	9	
	19	38.17	49.69	49.57	49.53	9	
	20	41.58	55.16	55.08	55.03	10	
	21	44.56	68.17	67.95	67.89	~~8~~ 7	
	22	42.68	59.02	58.83	58.80	8	
	23	46.42	54.92	54.84	54.82	5	
	24	39.53	59.58	59.41	59.38	8	
	25	42.78	58.63	58.50	58.47	8	
	26	43.37	52.51	52.43	52.00	5	
	27	44.16	54.61	55.16	54.73	8	
	28	43.11	53.80	53.63	53.21	8	
	29	47.80	62.45	62.80	62.37	5	
	30	45.58	55.91	56.23	55.91	5	
	31	43.19	53.80	54.16	53.74	7	
	32	40.52	54.18	54.50	54.08	8	
	33	43.49	51.93	52.29	51.86	8	
	34	43.73	50.13	50.50	50.08	6	
	35	49.94	63.80	64.15	63.73	7	

Remarks:

Balance Calibration:

JRF 10-28-98 100 mg Std Wt = 100.02 mg

JRF 11-2-98 100 mg Std Wt = 100.02 mg

JRF 11-3-98 100 mg Std Wt = 100.02 mg

JRF 11-4-98 100 mg Std Wt = 100.01

4/98

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. [illegible]

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator _____

WEIGHING DATA SHEET

Tare: Date 10-26-98 Oven temp(|C) 63 Drying time(hr) 24 Init. JMF
Final: Date 11-2-98 Oven temp(|C) ____ Drying time(hr) 24 Init. JMF
Equip. Used: Oven Blue M Balance Sartorius

Dry at 60|C to constant weight (~2 hrs); weigh to nearest 0.01 mg.

Beaker #	Pan #	Tare (mg)	Final Wt. (mg) 1	2	3	# weighed	comments
	36	42.96	50.93	51.26	50.85	5	
	37	41.28	52.93	53.24	52.82	7	
	38	40.23	49.08	49.41	48.98	5	
	39	42.26	48.70	49.07	48.64	6	
	40	41.23	55.23	55.61	55.16	6	
	41	41.48	54.99	55.36	54.89	8	
	42	41.93	48.82	49.20	48.75	6	
	43	48.60	58.68	59.05	58.61	6	
	44	40.55	50.02	50.40	49.96	6	
	45	44.99	55.74	56.13	55.69	6	
	46	45.13	52.95	53.32	52.88	5	
	47	43.32	46.90	47.32	46.89	4	
	48	41.46	51.26	51.62	51.19	7	
	49	41.97	52.07	52.43	52.01	6	
	50	44.17	56.42	56.76	56.32	7	
	51	43.98	53.72	54.00	53.60	7	
	52	46.99	53.81	54.14	53.72	5	
	53	45.41	60.24	60.49	60.07	7	
	54	42.69	48.68	49.01	48.59	3	
	55	42.66	69.16	69.39	68.96	10	
	56	39.18	49.98	50.27	49.84	~~5~~ 8	
	57	48.56	62.61	~~58~~ 62.89	62.45	5	
	58	45.70	53.05	53.39	52.95	6	
	59	44.50	65.00	65.29	64.85	10	
	60	43.61	58.52	58.77	58.35	~~5~~ 10	
	61	48.45	61.16	61.42	60.99	9	
	62	43.95	64.66	64.92	64.50	9	
	63	42.64	56.27	~~59~~ 56.54	56.13	8	
	64	45.77	56.45	56.75	56.33	8	
	65	43.01	64.30	64.30	63.88	9	
	66	47.97	58.24	58.51	58.09	7	
	67	41.33	56.71	56.96	56.52	10	
	68	41.38	56.42	56.67	56.23	8	
	69	44.74	57.16	57.46	57.03	6	
	70	45.13	58.07	58.36	57.92	7	

Remarks:

Balance Calibration:

4/98

POPA0008361

NORTHWESTERN AQUATIC SCIENCES

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-2 Client Hart Crowser Investigator _____

WEIGHING DATA SHEET

Tare: Date 10-28-96 Oven temp(|C) 63 Drying time(hr) 24 Init. JWF
Final: Date 11-2-96 Oven temp(|C) _____ Drying time(hr) 24 Init. JWF
Equip. Used: Oven Blue M Balance Sartorius

Dry at 60|C to constant weight (~2 hrs); weigh to nearest 0.01 mg.

Beaker #	Pan #	Tare (mg)	Final Wt. (mg) 1	2	3	# weighed	comments
	71	41.89	50.32	50.65	50.22	7	
	72	46.14	57.80	58.11	57.68	7	

Remarks:

Balance Calibration:

POPA0008362

[illegible] 11/4/98

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: Test 592-2 Hart Crowser Chironomid - Day Ø
10/20/98 - Overlying water

	BKR Sample description	BLK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	4		1.0													QC Std NH_3-N (mg/L)					
2	19			1.0												Nominal				Measured	
3	40				1.0												10			10.5	
4	48					1.0											3			3.0	
5	51						1.0										1			1.0	
6	56							1.0													
7	57								1.0												
8	66									1.0											
9	67										1.0										
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
	~~Seawater~~ Dilution water MLR	5.0	4.0	→							→										
	Measured concentration (mg/L)	<.1	.3	.1	<.1	<.1	<.1	<.1	.2	.1	.1										
	x multiplier	1.0	5.0	→							→										
	Final concentration (mg/L)	<.1	1.5	.5	<.5	<.5	<.5	<.5	1.0	.5	.5										

Add sufficient ~~seawater~~ dilution water MLR to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

POPA0008363

Ambrosia

TSC 11/4/98

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: Test 597-2 10/30/98 – Hard Creek Overlying water – Chronomid – Day 10

	Sample description	5SIK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	4		1.0																		
2	19			1.0																	
3	41				1.0																
4	48					1.0															
5	51						1.0														
6	56							1.0													
7	57								1.0												
8	66									1.0											
9	67										1.0										
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17																					
18																					
19	Dilution Seawater water	5.0	4.0	→							→										
	Measured concentration (mg/L)	<.1	4.0	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1										
	x multiplier	1.0	5.0	→							→										
	Final concentration (mg/L)	<.1	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5										

Add sufficient dilution water to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

-11-

POPA0008364

Randomization Key

	NAS	CLIENT	
BKR	SMPL	DESCRIP	REPL
48	1874F	HC-S-26	1
30	1874F	HC-S-26	2
11	1874F	HC-S-26	3
24	1874F	HC-S-26	4
68	1874F	HC-S-26	5
21	1874F	HC-S-26	6
3	1874F	HC-S-26	7
32	1874F	HC-S-26	8
4	1875F	HC-S-28	1
7	1875F	HC-S-28	2
13	1875F	HC-S-28	3
45	1875F	HC-S-28	4
36	1875F	HC-S-28	5
61	1875F	HC-S-28	6
23	1875F	HC-S-28	7
47	1875F	HC-S-28	8
66	1876F	HC-S-35	1
17	1876F	HC-S-35	2
12	1876F	HC-S-35	3
41	1876F	HC-S-35	4
39	1876F	HC-S-35	5
70	1876F	HC-S-35	6
54	1876F	HC-S-35	7
29	1876F	HC-S-35	8
51	1877F	HC-S-36	1
27	1877F	HC-S-36	2
71	1877F	HC-S-36	3
26	1877F	HC-S-36	4
25	1877F	HC-S-36	5
6	1877F	HC-S-36	6
2	1877F	HC-S-36	7
20	1877F	HC-S-36	8
57	1878F	HC-S-39	1
9	1878F	HC-S-39	2
46	1878F	HC-S-39	3
58	1878F	HC-S-39	4
16	1878F	HC-S-39	5
10	1878F	HC-S-39	6
64	1878F	HC-S-39	7
38	1878F	HC-S-39	8
67	1879F	HC-S-42	1
15	1879F	HC-S-42	2
1	1879F	HC-S-42	3
63	1879F	HC-S-42	4
43	1879F	HC-S-42	5
31	1879F	HC-S-42	6
34	1879F	HC-S-42	7

Randomization Key

	NAS	CLIENT	
BKR	SMPL	DESCRIP	REPL
52	1879F	HC-S-42	8
* 19	1857F	HC-ref-B	1
28	1857F	HC-ref-B	2
22	1857F	HC-ref-B	3
50	1857F	HC-ref-B	4
49	1857F	HC-ref-B	5
42	1857F	HC-ref-B	6
72	1857F	HC-ref-B	7
69	1857F	HC-ref-B	8
* 56	1858F	HC-ref-C	1
37	1858F	HC-ref-C	2
44	1858F	HC-ref-C	3
53	1858F	HC-ref-C	4
60	1858F	HC-ref-C	5
55	1858F	HC-ref-C	6
35	1858F	HC-ref-C	7
14	1858F	HC-ref-C	8
* 40	control	control	1
5	control	control	2
59	control	control	3
62	control	control	4
33	control	control	5
65	control	control	6
18	control	control	7
8	control	control	8

*water quality replicates

Endpoints Data Entry and Calculations File

BKR=beaker number
INIT=initial number
SURV=number survivors
MORT=number dead=INIT-SURV
PSURV=%survival=100(SURV/INIT)
PMORT=%mortality=100(MORT/INIT)

TARE WT= weight of pan used for that replicate on day 10 (mg)
WT COUNT= number of test organisms weighed at test end
FINAL WT= TARE WT + weight of test organisms recovered on day 10 (mg)
TWT=total biomass=FINAL WT-TARE WT
WT=average individual biomass=TWT/WT COUNT

Data entry verified against laboratory bench sheets
MR
12-2-98

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	SURV	MORT	PSURV	PMORT	TARE WT (mg)	WT COUNT	FINAL WT (mg)	TWT (mg)	WT (mg)		SURV	MORT	PSURV	PMORT	WT
1	48	1874F	HC-S-26	1	10	7	3	70.0	30.0	41.46	7	51.19	9.73	1.39						
2	30	1874F	HC-S-26	2	10	5	5	50.0	50.0	45.58	5	55.81	10.23	2.05						
3	11	1874F	HC-S-26	3	10	7	3	70.0	30.0	42.12	7	57.87	15.75	2.25						
4	24	1874F	HC-S-26	4	10	8	2	80.0	20.0	39.53	8	59.38	19.85	2.48						
5	68	1874F	HC-S-26	5	10	8	2	80.0	20.0	41.38	8	56.23	14.85	1.86	Mean	7.3	2.8	72.5	27.5	2.01
6	21	1874F	HC-S-26	6	10	7	3	70.0	30.0	44.56	7	67.89	23.33	3.33	SD	1.0	1.0	10.4	10.4	0.70
7	3	1874F	HC-S-26	7	10	8	2	80.0	20.0	47.83	8	56.32	8.49	1.06	n	8	8	8	8	8
8	32	1874F	HC-S-26	8	10	8	2	80.0	20.0	40.52	8	54.08	13.56	1.70						
9	4	1875F	HC-S-28	1	10	5	5	50.0	50.0	42.06	5	47.68	5.62	1.12						
10	7	1875F	HC-S-28	2	10	6	4	60.0	40.0	41.47	6	49.05	7.58	1.26						
11	13	1875F	HC-S-28	3	10	8	2	80.0	20.0	40.66	8	47.26	6.60	0.83						
12	45	1875F	HC-S-28	4	10	6	4	60.0	40.0	44.99	6	55.69	10.70	1.78						
13	36	1875F	HC-S-28	5	10	5	5	50.0	50.0	42.96	5	50.85	7.89	1.58	Mean	6.0	4.0	60.0	40.0	1.32
14	61	1875F	HC-S-28	6	10	9	1	90.0	10.0	48.45	9	60.99	12.54	1.39	SD	1.7	1.7	16.9	16.9	0.36
15	23	1875F	HC-S-28	7	10	5	5	50.0	50.0	46.42	5	54.82	8.40	1.68	n	8	8	8	8	8
16	47	1875F	HC-S-28	8	10	4	6	40.0	60.0	43.32	4	46.89	3.57	0.89						
17	66	1876F	HC-S-35	1	10	7	3	70.0	30.0	47.97	7	58.09	10.12	1.45						
18	17	1876F	HC-S-35	2	10	8	2	80.0	20.0	42.37	8	50.82	8.45	1.06						
19	12	1876F	HC-S-35	3	10	8	2	80.0	20.0	49.20	8	63.24	14.04	1.76						
20	41	1876F	HC-S-35	4	10	8	2	80.0	20.0	41.48	8	54.89	13.41	1.68						
21	39	1876F	HC-S-35	5	10	6	4	60.0	40.0	42.26	6	48.64	6.38	1.06	Mean	6.5	3.5	65.0	35.0	1.71
22	70	1876F	HC-S-35	6	10	7	3	70.0	30.0	45.13	7	57.92	12.79	1.83	SD	1.8	1.8	17.7	17.7	0.59
23	54	1876F	HC-S-35	7	10	3	7	30.0	70.0	42.69	3	48.59	5.90	1.97	n	8	8	8	8	8
24	29	1876F	HC-S-35	8	10	5	5	50.0	50.0	47.80	5	62.37	14.57	2.91						
25	51	1877F	HC-S-36	1	10	7	3	70.0	30.0	43.98	7	53.60	9.62	1.37						
26	27	1877F	HC-S-36	2	10	8	2	80.0	20.0	44.18	8	54.73	10.55	1.32						
27	71	1877F	HC-S-36	3	10	7	3	70.0	30.0	41.89	7	50.22	8.33	1.19						
28	26	1877F	HC-S-36	4	10	5	5	50.0	50.0	43.37	5	52.00	8.63	1.73						
29	25	1877F	HC-S-36	5	10	8	2	80.0	20.0	42.78	8	58.47	15.69	1.96	Mean	7.4	2.6	73.8	26.3	1.50
30	6	1877F	HC-S-36	6	10	8	2	80.0	20.0	38.60	8	52.56	13.96	1.75	SD	1.5	1.5	15.1	15.1	0.27
31	2	1877F	HC-S-36	7	10	6	4	60.0	40.0	41.61	6	49.81	8.20	1.37	n	8	8	8	8	8

POPA0008367

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	SURV	MORT	PSURV	PMORT	TARE WT (mg)	WT COUNT	FINAL WT (mg)	TWT (mg)	WT (mg)		SURV	MORT	PSURV	PMORT	WT
32	20	1877F	HC-S-36	8	10	10	0	100.0	0.0	41.58	10	55.03	13.45	1.35						
33	57	1878F	HC-S-39	1	10	5	5	50.0	50.0	48.56	5	62.45	13.89	2.78						
34	9	1878F	HC-S-39	2	10	7	3	70.0	30.0	44.59	7	51.68	7.09	1.01						
35	46	1878F	HC-S-39	3	10	5	5	50.0	50.0	45.13	5	52.88	7.75	1.55						
36	58	1878F	HC-S-39	4	10	6	4	60.0	40.0	45.70	6	52.95	7.25	1.21						
37	16	1878F	HC-S-39	5	10	7	3	70.0	30.0	51.80	7	62.21	10.41	1.49	Mean	5.9	4.1	58.8	41.3	1.64
38	10	1878F	HC-S-39	6	10	4	6	40.0	60.0	43.21	4	51.24	8.03	2.01	SD	1.4	1.4	13.6	13.6	0.55
39	64	1878F	HC-S-39	7	10	8	2	80.0	20.0	45.77	8	56.33	10.56	1.32	n	8	8	8	8	8
40	38	1878F	HC-S-39	8	10	5	5	50.0	50.0	40.23	5	48.98	8.75	1.75						
41	67	1879F	HC-S-42	1	10	10	0	100.0	0.0	41.33	10	56.52	15.19	1.52						
42	15	1879F	HC-S-42	2	10	6	4	60.0	40.0	43.13	5	52.46	9.33	1.87						
43	1	1879F	HC-S-42	3	10	9	1	90.0	10.0	41.58	9	51.33	9.75	1.08						
44	63	1879F	HC-S-42	4	10	8	2	80.0	20.0	42.64	8	56.13	13.49	1.69						
45	43	1879F	HC-S-42	5	10	6	4	60.0	40.0	48.80	6	58.61	9.81	1.64	Mean	7.1	2.9	71.3	28.8	1.46
46	31	1879F	HC-S-42	6	10	7	3	70.0	30.0	43.19	7	53.74	10.55	1.51	SD	1.7	1.7	17.3	17.3	0.28
47	34	1879F	HC-S-42	7	10	6	4	60.0	40.0	43.73	6	50.08	6.35	1.06	n	8	8	8	8	8
48	52	1879F	HC-S-42	8	10	5	5	50.0	50.0	46.99	5	53.72	6.73	1.35						
49	19	1857F	HC-ref-B	1	10	9	1	90.0	10.0	38.17	9	49.53	11.36	1.26						
50	28	1857F	HC-ref-B	2	10	8	2	80.0	20.0	43.11	8	53.21	10.10	1.26						
51	22	1857F	HC-ref-B	3	10	8	2	80.0	20.0	42.68	8	58.80	16.12	2.02						
52	50	1857F	HC-ref-B	4	10	7	3	70.0	30.0	44.17	7	56.32	12.15	1.74						
53	49	1857F	HC-ref-B	5	10	6	4	60.0	40.0	41.97	6	52.01	10.04	1.67	Mean	7.1	2.9	71.3	28.8	1.60
54	42	1857F	HC-ref-B	6	10	6	4	60.0	40.0	41.93	6	48.75	6.82	1.14	SD	1.1	1.1	11.3	11.3	0.35
55	72	1857F	HC-ref-B	7	10	7	3	70.0	30.0	46.14	7	57.68	11.54	1.65	n	8	8	8	8	8
56	69	1857F	HC-ref-B	8	10	6	4	60.0	40.0	44.74	6	57.03	12.29	2.05						
57	56	1858F	HC-ref-C	1	10	8	2	80.0	20.0	39.18	8	49.84	10.66	1.33						
58	37	1858F	HC-ref-C	2	10	7	3	70.0	30.0	41.28	7	52.82	11.54	1.65						
59	44	1858F	HC-ref-C	3	10	6	4	60.0	40.0	40.55	6	49.96	9.41	1.57						
60	53	1858F	HC-ref-C	4	10	7	3	70.0	30.0	45.41	7	60.07	14.66	2.09						
61	60	1858F	HC-ref-C	5	10	10	0	100.0	0.0	43.61	10	58.35	14.74	1.47	Mean	8.0	2.0	80.0	20.0	1.73
62	55	1858F	HC-ref-C	6	10	10	0	100.0	0.0	42.66	10	68.96	26.30	2.63	SD	1.5	1.5	15.1	15.1	0.48
63	35	1858F	HC-ref-C	7	10	7	3	70.0	30.0	49.94	7	63.73	13.79	1.97	n	8	8	8	8	8
64	14	1858F	HC-ref-C	8	10	9	1	90.0	10.0	41.95	9	52.40	10.45	1.16						
65	40	1884F	control	1	10	6	4	60.0	40.0	41.23	6	55.16	13.93	2.32						
66	5	1884F	control	2	10	8	2	80.0	20.0	51.42	8	57.88	6.46	0.81						
67	59	1884F	control	3	10	10	0	100.0	0.0	44.50	10	64.85	20.35	2.04						
68	62	1884F	control	4	10	9	1	90.0	10.0	43.95	9	64.50	20.55	2.28						
69	33	1884F	control	5	10	8	2	80.0	20.0	43.49	8	51.86	8.37	1.05	Mean	8.5	1.5	85.0	15.0	1.69
70	65	1884F	control	6	10	9	1	90.0	10.0	43.01	9	63.88	20.87	2.32	SD	1.2	1.2	12.0	12.0	0.66
71	18	1884F	control	7	10	9	1	90.0	10.0	41.76	9	57.40	15.64	1.74	n	8	8	8	8	8
72	8	1884F	control	8	10	9	1	90.0	10.0	42.08	9	50.61	8.53	0.95						

POPA0008368

Freshwater Sediment-10-day survival

Start Date:	10/20/98 14:30	Test ID:	592-2
End Date:	10/30/98 14:00	Lab ID:	ORNAS-Northwestern Aquat
Sample Date:		Protocol:	NASXXXCT4B
Comments:			

Sample ID:	NAS#1857F-1858F,1874F-1879F							
Sample Type:	SED-Sediment							
Test Species:	CT-Chironomus tentans							

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	0.9000	0.8000	0.8000	0.7000	0.6000	0.6000	0.7000	0.6000
HC-Ref-C	0.8000	0.7000	0.6000	0.7000	1.0000	1.0000	0.7000	0.9000
HC-S-26	0.7000	0.5000	0.7000	0.8000	0.8000	0.7000	0.8000	0.8000
HC-S-28	0.5000	0.6000	0.8000	0.6000	0.5000	0.9000	0.5000	0.4000
HC-S-35	0.7000	0.8000	0.8000	0.8000	0.6000	0.7000	0.3000	0.5000
HC-S-36	0.7000	0.8000	0.7000	0.5000	0.8000	0.8000	0.6000	1.0000
HC-S-39	0.5000	0.7000	0.5000	0.6000	0.7000	0.4000	0.8000	0.5000
HC-S-42	1.0000	0.6000	0.9000	0.8000	0.6000	0.7000	0.6000	0.5000
control	0.6000	0.8000	1.0000	0.9000	0.8000	0.9000	0.9000	0.9000

			Transform: Arcsin Square Root						1-Tailed	
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	0.7125	0.8906	1.0130	0.8861	1.2490	13.071	8			
HC-Ref-C	0.8000	1.0000	1.1300	0.8861	1.4120	18.047	8			
HC-S-26	0.7250	0.9063	1.0234	0.7854	1.1071	10.944	8	1.295	1.761	0.0119
HC-S-28	0.6000	0.7500	0.8962	0.6847	1.2490	21.120	8			
HC-S-35	0.6500	0.8125	0.9444	0.5796	1.1071	19.833	8			
HC-S-36	0.7375	0.9219	1.0484	0.7854	1.4120	17.832	8	0.834	1.761	0.0168
HC-S-39	0.5875	0.7344	0.8771	0.6847	1.1071	16.197	8			
HC-S-42	0.7125	0.8906	1.0254	0.7854	1.4120	20.955	8			
control	0.8500	1.0625	1.1886	0.8861	1.4120	13.085	8	-0.646	1.761	0.0145

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96137	0.904	0.18417	-0.0252
Bartlett's Test indicates equal variances (p = 0.48)	2.48295	11.3449		
The control means are not significantly different (p = 0.20)	1.36089	2.14479		

~~Hypothesis Test~~ (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Indicated samples were compared against HC-Ref-C. MSR 2-5-99

Freshwater Sediment-10-day survival

Start Date:	10/20/98 14:30	Test ID:	592-2	Sample ID:	NAS#1857F-1858F,1874F-1879F
End Date:	10/30/98 14:00	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	SED-Sediment
Sample Date:		Protocol:	NASXXXCT4B	Test Species:	CT-Chironomus tentans

ments:

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	0.9000	0.8000	0.8000	0.7000	0.6000	0.6000	0.7000	0.6000
HC-Ref-C	0.8000	0.7000	0.6000	0.7000	1.0000	1.0000	0.7000	0.9000
HC-S-26	0.7000	0.5000	0.7000	0.8000	0.8000	0.7000	0.8000	0.8000
HC-S-28	0.5000	0.6000	0.8000	0.6000	0.5000	0.9000	0.5000	0.4000
HC-S-35	0.7000	0.8000	0.8000	0.8000	0.6000	0.7000	0.3000	0.5000
HC-S-36	0.7000	0.8000	0.7000	0.5000	0.8000	0.8000	0.6000	1.0000
HC-S-39	0.5000	0.7000	0.5000	0.6000	0.7000	0.4000	0.8000	0.5000
HC-S-42	1.0000	0.6000	0.9000	0.8000	0.6000	0.7000	0.6000	0.5000
control	0.6000	0.8000	1.0000	0.9000	0.8000	0.9000	0.9000	0.9000

			Transform: Arcsin Square Root					1-Tailed		
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	0.7125	0.8906	1.0130	0.8861	1.2490	13.071	8			
HC-Ref-C	0.8000	1.0000	1.1300	0.8861	1.4120	18.047	8			
HC-S-26	0.7250	0.9063	1.0234	0.7854	1.1071	10.944	8			
HC-S-28	0.6000	0.7500	0.8962	0.6847	1.2490	21.120	8	1.431	1.761	0.0117
HC-S-35	0.6500	0.8125	0.9444	0.5796	1.1071	19.833	8	0.846	1.761	0.0116
HC-S-36	0.7375	0.9219	1.0484	0.7854	1.4120	17.832	8			
*HC-S-39	0.5875	0.7344	0.8771	0.6847	1.1071	16.197	8	1.980	1.761	0.0083
HC-S-42	0.7125	0.8906	1.0254	0.7854	1.4120	20.955	8	-0.139	1.761	0.0140
control	0.8500	1.0625	1.1886	0.8861	1.4120	13.085	8	-2.431	1.761	0.0092

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.92096	0.844	0.4699	-0.8898
F-Test indicates equal variances (p = 0.86)	1.15099	8.88531		
The control means are not significantly different (p = 0.20)	1.36089	2.14479		

pothesis Test (1-tail, 0.05)

omoscedastic t Test) indicates significant differences

Indicated samples were compared against HC-Ref-B. MJR 2-5-99

Freshwater Sediment-Average Individual Biomas

Start Date:	10/20/98 14:30	Test ID:	592-2	Sample ID:	NAS#1857F-1858F,1874F-1879F
End Date:	10/30/98 14:00	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	SED-Sediment
Sample Date:		Protocol:	NASXXXCT4B	Test Species:	CT-Chironomus tentans
Comments:					

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	1.2622	1.2625	2.0150	1.7357	1.6733	1.1367	1.6486	2.0483
HC-Ref-C	1.3325	1.6486	1.5683	2.0943	1.4740	2.6300	1.9700	1.1611
HC-S-26	1.3900	2.0460	2.2500	2.4813	1.8563	3.3329	1.0613	1.6950
HC-S-28	1.1240	1.2633	0.8250	1.7833	1.5780	1.3933	1.6800	0.8925
HC-S-35	1.4457	1.0563	1.7550	1.6763	1.0633	1.8271	1.9667	2.9140
HC-S-36	1.3743	1.3188	1.1900	1.7260	1.9613	1.7450	1.3667	1.3450
HC-S-39	2.7780	1.0129	1.5500	1.2083	1.4871	2.0075	1.3200	1.7500
HC-S-42	1.5190	1.8660	1.0833	1.6863	1.6350	1.5071	1.0583	1.3460
control	2.3217	0.8075	2.0350	2.2833	1.0463	2.3189	1.7378	0.9478

			Transform: Untransformed					1-Tailed		
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	1.5978	0.9210	1.5978	1.1367	2.0483	21.707	8			
HC-Ref-C	1.7349	1.0000	1.7349	1.1611	2.6300	27.386	8			
HC-S-26	2.0141	1.1610	2.0141	1.0613	3.3329	34.797	8	-0.933	1.761	0.1578
HC-S-28	1.3174	0.7594	1.3174	0.8250	1.7833	26.998	8			
HC-S-35	1.7130	0.9874	1.7130	1.0563	2.9140	34.519	8			
HC-S-36	1.5034	0.8666	1.5034	1.1900	1.9613	17.960	8	1.198	1.761	0.0657
HC-S-39	1.6392	0.9449	1.6392	1.0129	2.7780	33.854	8			
HC-S-42	1.4626	0.8431	1.4626	1.0583	1.8660	19.484	8			
control	1.6873	0.9726	1.6873	0.8075	2.3217	38.876	8	0.166	1.761	0.1444

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95577	0.844	-0.0395	-1.2308
F-Test indicates equal variances (p = 0.41)	1.9062	8.88531		
The control means are not significantly different (p = 0.52)	0.65903	2.14479		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Individual samples were compared against HC-Ref-C. MLR 2-5-99

Freshwater Sediment-Average Individual Biomas

Start Date:	10/20/98 14:30	Test ID:	592-2	Sample ID:	NAS#1857F-1858F,1874F-1879F
End Date:	10/30/98 14:00	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	SED-Sediment
Sample Date:		Protocol:	NASXXXCT4B	Test Species:	CT-Chironomus tentans

ments:

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	1.2622	1.2625	2.0150	1.7357	1.6733	1.1367	1.6486	2.0483
HC-Ref-C	1.3325	1.6486	1.5683	2.0943	1.4740	2.6300	1.9700	1.1611
HC-S-26	1.3900	2.0460	2.2500	2.4813	1.8563	3.3329	1.0613	1.6950
HC-S-28	1.1240	1.2633	0.8250	1.7833	1.5780	1.3933	1.6800	0.8925
HC-S-35	1.4457	1.0563	1.7550	1.6763	1.0633	1.8271	1.9667	2.9140
HC-S-36	1.3743	1.3188	1.1900	1.7260	1.9613	1.7450	1.3667	1.3450
HC-S-39	2.7780	1.0129	1.5500	1.2083	1.4871	2.0075	1.3200	1.7500
HC-S-42	1.5190	1.8660	1.0833	1.6863	1.6350	1.5071	1.0583	1.3460
control	2.3217	0.8075	2.0350	2.2833	1.0463	2.3189	1.7378	0.9478

			Transform: Untransformed						1-Tailed	
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	1.5978	0.9210	1.5978	1.1367	2.0483	21.707	8			
HC-Ref-C	1.7349	1.0000	1.7349	1.1611	2.6300	27.386	8			
HC-S-26	2.0141	1.1610	2.0141	1.0613	3.3329	34.797	8			
HC-S-28	1.3174	0.7594	1.3174	0.8250	1.7833	26.998	8	1.596	1.761	0.0543
HC-S-35	1.7130	0.9874	1.7130	1.0563	2.9140	34.519	8	-0.476	1.761	0.1035
HC-S-36	1.5034	0.8666	1.5034	1.1900	1.9613	17.960	8			
HC-S-39	1.6392	0.9449	1.6392	1.0129	2.7780	33.854	8	-0.179	1.761	0.0943
HC-S-42	1.4626	0.8431	1.4626	1.0583	1.8660	19.484	8	0.852	1.761	0.0444
control	1.6873	0.9726	1.6873	0.8075	2.3217	38.876	8	-0.341	1.761	0.1212

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93102	0.844	0.98863	1.38537
F-Test indicates equal variances (p = 0.24)	2.56015	8.88531		
The control means are not significantly different (p = 0.52)	0.65903	2.14479		

~~pothesis Test~~ (1-tail, 0.05)

omoscedastic t Test indicates no significant differences

Indicated samples were compared against HC-Ref-B. MLR 2-5-99

ToxCalc v5.0.17

Actual p-values calculated from the statistics returned by ToxCalc analysis				
Survival Data				
		degrees of		
Comparison	T stat	freedom *	tails	TDIST (=p)
HC-S-26 vs. HC-Ref-C	1.295	14	1	0.11
HC-S-36 vs. HC-Ref-C	0.834	14	1	0.21
control vs. HC-Ref-C	-0.646	14	1	#NUM!
HC-S-28 vs. HC-Ref-B	1.431	14	1	0.09
HC-S-35 vs. HC-Ref-B	0.846	14	1	0.21
HC-S-39 vs. HC-Ref-B	1.98	14	1	0.03
HC-S-42 vs. HC-Ref-B	-0.139	14	1	#NUM!
control vs. HC-Ref-B	-2.431	14	1	#NUM!
* (control replicates + treatment replicates - 2)				
Growth Data				
		degrees of		
Comparison	T stat	freedom *	tails	TDIST (=p)
HC-S-26 vs. HC-Ref-C	-0.933	14	1	#NUM!
HC-S-36 vs. HC-Ref-C	1.198	14	1	0.13
control vs. HC-Ref-C	0.166	14	1	0.44
HC-S-28 vs. HC-Ref-B	1.596	14	1	0.07
HC-S-35 vs. HC-Ref-B	-0.476	14	1	#NUM!
HC-S-39 vs. HC-Ref-B	-0.179	14	1	#NUM!
HC-S-42 vs. HC-Ref-B	0.852	14	1	0.20
control vs. HC-Ref-B	-0.341	14	1	#NUM!
* (control replicates + treatment replicates - 2)				

POPA0008373

Water Quality Data

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	COND	pH	S	NH3	HARD	ALK
4	1875F	HC-S-28	1	0	22.6	6.0	400	7.1	<0.02	1.5	120	120
19	1857F	HC-ref-B	1	0	22.6	6.2	330	7.3	<0.02	0.5	120	100
40	1884F	control	1	0	22.6	7.6	380	7.8	<0.02	<0.5	100	80
48	1874F	HC-S-26	1	0	22.6	6.5	360	7.5	<0.02	<0.5	120	100
51	1877F	HC-S-36	1	0	22.6	6.5	350	7.5	<0.02	<0.5	120	80
56	1858F	HC-ref-C	1	0	22.7	6.7	310	7.4	<0.02	<0.5	120	80
57	1878F	HC-S-39	1	0	22.6	6.0	340	7.0	<0.02	1.0	140	100
66	1876F	HC-S-35	1	0	22.7	7.0	370	7.3	<0.02	0.5	140	100
67	1879F	HC-S-42	1	0	22.7	7.2	340	7.3	<0.02	0.5	120	80
4	1875F	HC-S-28	1	1	22.8	6.6	330	7.3				
19	1857F	HC-ref-B	1	1	22.7	6.2	320	7.5				
40	1884F	control	1	1	22.7	6.8	340	7.7				
48	1874F	HC-S-26	1	1	22.7	6.6	340	7.5				
51	1877F	HC-S-36	1	1	22.8	6.6	320	7.5				
56	1858F	HC-ref-C	1	1	22.8	6.6	320	7.5				
57	1878F	HC-S-39	1	1	22.8	6.4	280	7.3				
66	1876F	HC-S-35	1	1	23.0	6.6	340	7.4				
67	1879F	HC-S-42	1	1	23.0	6.2	330	7.4				
4	1875F	HC-S-28	1	2	23.0	6.2						
19	1857F	HC-ref-B	1	2	23.0	6.3						
40	1884F	control	1	2	23.1	6.6						
48	1874F	HC-S-26	1	2	23.0	6.7						
51	1877F	HC-S-36	1	2	23.1	6.6						
56	1858F	HC-ref-C	1	2	23.1	6.6						
57	1878F	HC-S-39	1	2	23.2	6.5						
66	1876F	HC-S-35	1	2	23.3	6.4						
67	1879F	HC-S-42	1	2	23.3	6.5						
4	1875F	HC-S-28	1	3	22.8	5.0						
19	1857F	HC-ref-B	1	3	22.9	5.6						
40	1884F	control	1	3	22.7	6.0						
48	1874F	HC-S-26	1	3	22.9	6.1						
51	1877F	HC-S-36	1	3	22.9	6.1						
56	1858F	HC-ref-C	1	3	22.9	6.1						
57	1878F	HC-S-39	1	3	22.9	5.7						
66	1876F	HC-S-35	1	3	22.8	5.8						
67	1879F	HC-S-42	1	3	23.0	5.8						
4	1875F	HC-S-28	1	4	22.8	6.6						
19	1857F	HC-ref-B	1	4	23.0	6.6						
40	1884F	control	1	4	23.1	6.5						
48	1874F	HC-S-26	1	4	23.1	6.5						
51	1877F	HC-S-36	1	4	23.2	6.7						
56	1858F	HC-ref-C	1	4	23.2	6.5						
57	1878F	HC-S-39	1	4	23.2	6.6						
66	1876F	HC-S-35	1	4	23.3	6.8						
67	1879F	HC-S-42	1	4	23.2	6.4						

Data Entry Verified against Laboratory bench sheets 2-11-99

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	COND	pH	S	NH3	HARD	ALK
4	1875F	HC-S-28	1	5	23.0	4.6						
19	1857F	HC-ref-B	1	5	23.1	5.2						
40	1884F	control	1	5	23.1	4.5						
48	1874F	HC-S-26	1	5	23.0	4.4						
51	1877F	HC-S-36	1	5	23.1	5.0						
56	1858F	HC-ref-C	1	5	23.2	4.8						
57	1878F	HC-S-39	1	5	23.2	4.6						
66	1876F	HC-S-35	1	5	23.2	5.1						
67	1879F	HC-S-42	1	5	23.3	5.3						
4	1875F	HC-S-28	1	6	22.7	4.8						
19	1857F	HC-ref-B	1	6	22.7	4.6						
40	1884F	control	1	6	22.6	5.7						
48	1874F	HC-S-26	1	6	22.8	5.2						
51	1877F	HC-S-36	1	6	22.7	5.4						
56	1858F	HC-ref-C	1	6	22.7	5.4						
57	1878F	HC-S-39	1	6	22.8	5.0						
66	1876F	HC-S-35	1	6	22.8	5.3						
67	1879F	HC-S-42	1	6	22.8	5.4						
4	1875F	HC-S-28	1	7	23.0	4.1						
19	1857F	HC-ref-B	1	7	23.0	3.5						
40	1884F	control	1	7	23.0	4.6						
48	1874F	HC-S-26	1	7	22.9	3.9						
51	1877F	HC-S-36	1	7	22.9	4.2						
56	1858F	HC-ref-C	1	7	23.0	4.2						
57	1878F	HC-S-39	1	7	23.0	3.9						
66	1876F	HC-S-35	1	7	23.0	4.2						
67	1879F	HC-S-42	1	7	23.1	4.2						
4	1875F	HC-S-28	1	8	22.5	4.8						
19	1857F	HC-ref-B	1	8	22.5	5.0						
40	1884F	control	1	8	22.5	5.6						
48	1874F	HC-S-26	1	8	22.6	5.4						
51	1877F	HC-S-36	1	8	22.6	5.8						
56	1858F	HC-ref-C	1	8	22.5	5.6						
57	1878F	HC-S-39	1	8	22.5	5.4						
66	1876F	HC-S-35	1	8	22.6	5.4						
67	1879F	HC-S-42	1	8	22.7	5.3						
4	1875F	HC-S-28	1	9	22.2	5.1						
19	1857F	HC-ref-B	1	9	22.2	5.0						
40	1884F	control	1	9	22.2	6.0						
48	1874F	HC-S-26	1	9	22.3	5.6						
51	1877F	HC-S-36	1	9	22.3	5.6						
56	1858F	HC-ref-C	1	9	22.3	5.8						
57	1878F	HC-S-39	1	9	22.3	5.0						
66	1876F	HC-S-35	1	9	22.2	5.2						
67	1879F	HC-S-42	1	9	22.4	5.2						
4	1875F	HC-S-28	1	10	22.9	5.4	250	7.4	<0.02	<0.5	100	80
19	1857F	HC-ref-B	1	10	22.9	5.0	250	7.4	<0.02	<0.5	100	80

	NAS	CLIENT										
BKR	SMPL	DESCRIP	REPL	DAY	TEMP	DO	COND	pH	S	NH3	HARD	ALK
40	1884F	control	1	10	23.0	6.2	250	7.6	<0.02	<0.5	100	80
48	1874F	HC-S-26	1	10	22.9	5.6	260	7.5	<0.02	<0.5	100	80
51	1877F	HC-S-36	1	10	23.0	5.4	260	7.5	<0.02	<0.5	100	80
56	1858F	HC-ref-C	1	10	23.0	5.6	260	7.5	<0.02	<0.5	100	80
57	1878F	HC-S-39	1	10	22.9	5.2	250	7.4	<0.02	<0.5	100	80
66	1876F	HC-S-35	1	10	23.2	5.4	260	7.4	<0.02	<0.5	100	80
67	1879F	HC-S-42	1	10	23.2	5.6	260	7.4	<0.02	<0.5	100	80
				Mean	22.8	5.7	311	7.4	—	—	111	87
				SD	0.3	0.8	46	0.2	—	—	14	12
				n	99	99	27	27	18	18	18	18
				Max	23.3	7.6	400	7.8	<0.02	1.5	140	120
				Min	22.2	3.5	250	7.0	<0.02	<0.5	100	80

Custody Seal

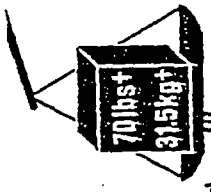
Date 10/16/98 Project Samples 3.9°C

Signature Jennifer Stewart Container# 1 of 10

Custody Seal

Date 10/16/98 Project Samples 2.1°C

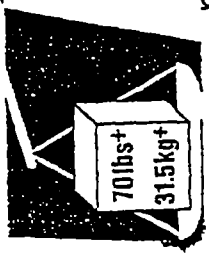
Signature Jennifer Stewart Container# 2 of 10

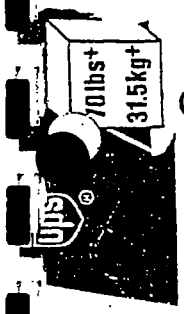


eal

18 Project Samples 3.0°C

nifer Stewart Container# 3 of 10





Custody Seal

4.1°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 4 of 10

Custody Seal

2.3°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 5 of 10

Custody Seal

3.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 6 of 10

Custody Seal 2.5°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 7 of 10

Custody Seal 2.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 8 of 10

Custody Seal 3.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 9 of 10

Custody Seal 4.3°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 10 of 10

POPA0008379

Sample Custody Record

Samples Shipped to: _____

HARTCROWSER
Seattle, Wash[illegible] 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 5624-06 LAB NUMBER _____

PROJECT NAME Terminal 4 RI/FS

HART CROWSER CONTACT M. Cumberland

SAMPLED BY: Herzog

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	ARSENIC	BIOASSAY	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
		HC-S-36	10/15/98	0900	SED		X	4	#1877F
		HC-S-39		0940			X	4	1878F
		HC-S-42		11:10			X	4	1879F
		HC-REF-B		1400		X	X	8	#1857F
		HC-REF-C		1500		X	X	8	1858F
		HC-S-18		1630		X		9	~~1869F~~ JM
		HC-S-19		1640		X		4	1870F
		HC-S-20		1650		X		4	1871F
		HC-S-30	10/15/98	17:10	received rather than HC-S-18 listed above				1869F
									10/17/98 JM

(NOT REC'D BY NAS JM)

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/16	SIGNATURE	10/16/98
PRINT NAME John Herzog	TIME 9:49	PRINT NAME	TIME
COMPANY HC		COMPANY GES	950
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/16/98	SIGNATURE Linda K. Nemeth	10/17/98
PRINT NAME	TIME 3:00	PRINT NAME Linda K. Nemeth	TIME 10:30
COMPANY GES		COMPANY NW Aquatic	

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____ for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

POPA0008380

133-

Bioassay

Sample Custody Record

Samples Shipped to: _____

HART CROWSER

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle, Washington 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 5260-06 LAB NUMBER _____

PROJECT NAME Terminal 4 RI/FS

HART CROWSER CONTACT H. Lumbard

SAMPLED BY: JMH

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	REQUESTED ANALYSIS: Archive	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	HC-S-01		10/13/98	10:35	SED	X	4	Archive #1859F
	HC-S-02		10/13/98	11:45		X	4	1860F
	HC-S-03			12:35		X	4	1861F
	HC-S-04			1300		X	4	1862F
	HC-S-05			14:00		X	4	1863F
	HC-S-07			16:00		X	4	1864F
	~~HC-S-08~~			~~16:30~~		~~X~~	~~4~~	
	HC-S-09			16:45		X	4	1865F

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/13/98	SIGNATURE	10/13/98
PRINT NAME: JOHN Herzo	TIME	PRINT NAME	TIME
COMPANY: HC		COMPANY	1705
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/16/98	SIGNATURE	10/14/98
PRINT NAME	TIME	PRINT NAME	TIME
COMPANY	2:15	COMPANY	8:20

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:
Hold until notified

Rec'd by Linda K. Nemeth 10/17/98 10:30 am for NW Aquatic

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____
for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

POPA0008381

Sample Custody Record

Samples Shipped to: _____

HARTCROWSER
1910 [illegible] Avenue East
Seattle, Washington 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 5624-06 LAB NUMBER _____
PROJECT NAME Terminal 4/ RI/FS
HART CROWSER CONTACT H. Cumberlad
SAMPLED BY: HERZOG

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	REQUESTED ANALYSIS: Archive	REQUESTED ANALYSIS: Bioassay	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	HC-S-11		10/14/98	0925	SED	X		4	#1866F
	HC-S14		"	1035	"	X		4	1867F
	HC-S16		"	12:45	"	X		4	1868F
	HC-S-22		"	13:15	"	X		4	1872F
	HC-S-24		"	1345	"	X		4	1873F
	HC-S-26		"	1445	"		X	4	1874F
	HC-S-28		"	1530	"		X	4	1875F
	HC-S-35		"	16:25	"		X	4	1876F
	~~HC-S36~~		"	1730			X	4	

-35-

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/14/98	SIGNATURE	10/15
PRINT NAME John Herzog	TIME	PRINT NAME Richard Adler / Kiersten Grenier	TIME
COMPANY HC	1745	COMPANY CWS	1750
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/16/98	SIGNATURE Linda K. Nemeth	10/17/98
PRINT NAME	TIME	PRINT NAME Linda K. Nemeth	TIME
COMPANY HC	300	COMPANY NW Aquatic	10:30

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____
for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

POPA0008382

APPENDIX III

RAW DATA - REFERENCE TOXICANT TEST

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-972 Client QC TEST Investigator Approved ppt 2-1-99 BMY

Test Type (rangefinding/definitive) _____ Test Length (hr) 96

Species Ceriodaphnia dubia

STUDY MANAGEMENT

Client: QC TEST

Client's Study Monitor: N/A

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. C.J. Evisserril E.A.Blu Inc. GH

QA Officer [illegible]

1. _____ 2. Erin Cottey

3. _____ 4. _____

Study Schedule:

Test Beginning: 10-23-98 1430 Test Ending: 10-27-98 1500

TEST MATERIAL

Description: Potassium dichromate crystals (Mallinckrodt Lot #68451)

NAS Sample No.:				
Date of Collection:				
Date of Receipt:				
Temperature (°C):				
Dissolved oxygen (mg/L):				
Conductivity (umhos/cm):				
pH:				
Hardness (mg/L):				
Alkalinity (mg/L):				
_____:				

DILUTION WATER

Description: Moderately hard synthetic water

Date of Preparation/Collection: 10-16-98

Water Quality: Cond.(umhos/cm) 320 Salinity (ppt) — pH 7.6

Hardness (mg/L as $CaCO_3$) 100 Alkalinity (mg/L as $CaCO_3$ 80

Treatments: Control = 3 Lit

TEST ORGANISMS

Species: C. dubia Age: _____ Size: _____

Source: NAS Cultures

Acclimation Data:

Date	Temp (°C)	DO (mg/L)	pH	~~Sal~~/Cond	Comments
10-12-98	23.6	7.6	7.3	420	H=120, A=40
10-14-98	23.4	6.0	7.1	420	
10-16-98	23.2	9.6	7.4	360	
10-19-98	23.5	6.2	7.7	380	H=100, A=100
10-21-98	23.4	7.2	7.3	350	
10-23-98	23.6	6.4	7.0	300	
Mean	23.4	7.2	7.3	372	H: 110 A: 70
S.D.	0.2	1.3	0.2	46	— —
(N)	6	6	6	6	2 2

Rev. 2/97

POPA0008384

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 794-972 Client QC TEST Investigator

TEST PROCEDURES AND CONDITIONS

Test concentrations: (50% series recommended) 10, 7.5, 5, 2.5, 1.25, 3 Ø g/L

Test chambers: 30 mL plastic cups Test volume: 20 mL

Replicates/treatment: (2) 10 Organisms/treatment: (20) 10 (1/rep)

Test water changes: None Aeration during test: None

Feeding: ~~None~~ Feed 0.25 mL of 4 g/L Photoperiod: 16:8 L:D

Temperature: 23 ± 1°C Tetrafins suspension on day Ø & day 2

Duration: 24-hr, 48-hr, 96-hr Renewal: None

Beaker placement: Stratified randomization

Randomization chart:

A						
B						
C						
D						

MISCELLANEOUS NOTES

Working stock made with 5g KCl crystals in 500 mL of moderately hard synthetic water. Final conc = 10 g/L

KCl concentration (g/L)	mL KCl working stock per 200 mL	mL dilution water per 200 mL
10	200	Ø
7.5	150	50
5.0	100	100
2.5	50	150
1.25	25	175
Ø	Ø	200

GB 10-23-98

Rev. 2/97

POPA0008385

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-972 Client QC TEST Investigator

DAY 0 (10/23/98) [illegible] Temp Bearing 23.5 °C

	Conc. (g/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10	23.4	8.3		12800	7.8	100	80	10	
2.	7.5	23.4	8.3		10000	7.7	—	—	10	
3.	5.0	23.4	8.3		6900	7.6	—	—	10	
4.	2.5	23.4	8.3		3800	7.6	—	—	10	
5.	1.25	23.3	8.3		21000	7.6	—	—	10	
6.	Ø	23.2	8.4		280	7.6	100	80	10	

Animals Fed? Yes

DAY 1 (10/24/98) [illegible] Temp Bearing 23.6 °C

	Conc. (g/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10								5(50)	
2.	7.5								10	
3.	5.0								10	
4.	2.5								10	
5.	1.25								10	
6.	Ø								10	

DAY 2 (10/25/98) [illegible] Temp Bearing 22.8 °C

	Conc. (g/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10								0(50)	
2.	7.5								5(50)	
3.	5.0								10	
4.	2.0								10	
5.	1.25								10	
6.	Ø								10	

Animals Fed? Yes

DAY 3 (10/26/98) [illegible] Temp Bearing 22.9 °C

	Conc. (g/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10								0	
2.	7.5								5	
3.	5								10	
4.	2.5								10	
5.	1.25								10	
6.	Ø								10	

DAY 4 (10/27/98) [illegible] Temp Bearing 22.9 °C

	Conc. (g/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10	—	—		—	—	—	—	0	
2.	7.5	23.2	7.2		960	7.7	—	—	1(40)	
3.	5	23.1	7.2		6800	7.6	—	—	10	
4.	2.5	23.1	7.2		3700	7.6	—	—	10	
5.	1.25	23.1	7.2		2000	7.4	—	—	10	
6.	10	23.1	7.2		320	7.3	100	80	9(10)	

Remarks:

Rev. 2/97

POPA0008386

Acute 96-hr Toxicity Test-96 Hr Survival

Start Date:	10/23/98 14:30	Test ID:	999-972	Sample ID:	REF-Ref Toxicant
End Date:	10/27/98 15:00	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CT-Chironomus tentans

Comments:

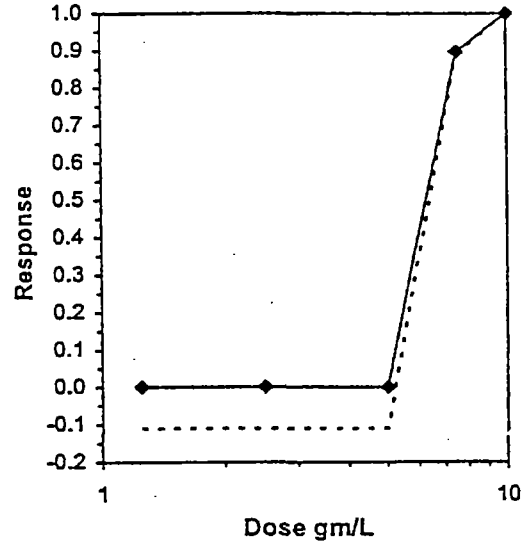
Conc-gm/L	1
D-Control	0.9000
1.25	1.0000
2.5	1.0000
5	1.0000
7.5	0.1000
10	0.0000

Conc-gm/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	0.9000	1.0000	1	9	10	1			1	10
1.25	1.0000	1.1111	0	10	10	1	0.5000	0.0500	0	10
2.5	1.0000	1.1111	0	10	10	1	0.5000	0.0500	0	10
5	1.0000	1.1111	0	10	10	1	0.5000	0.0500	0	10
7.5	0.1000	0.1111	9	1	10	1	0.0005	0.0500	9	10
10	0.0000	0.0000	10	0	10	1			10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	5	7.5	6.12372	

Trimmed Spearman-Karber

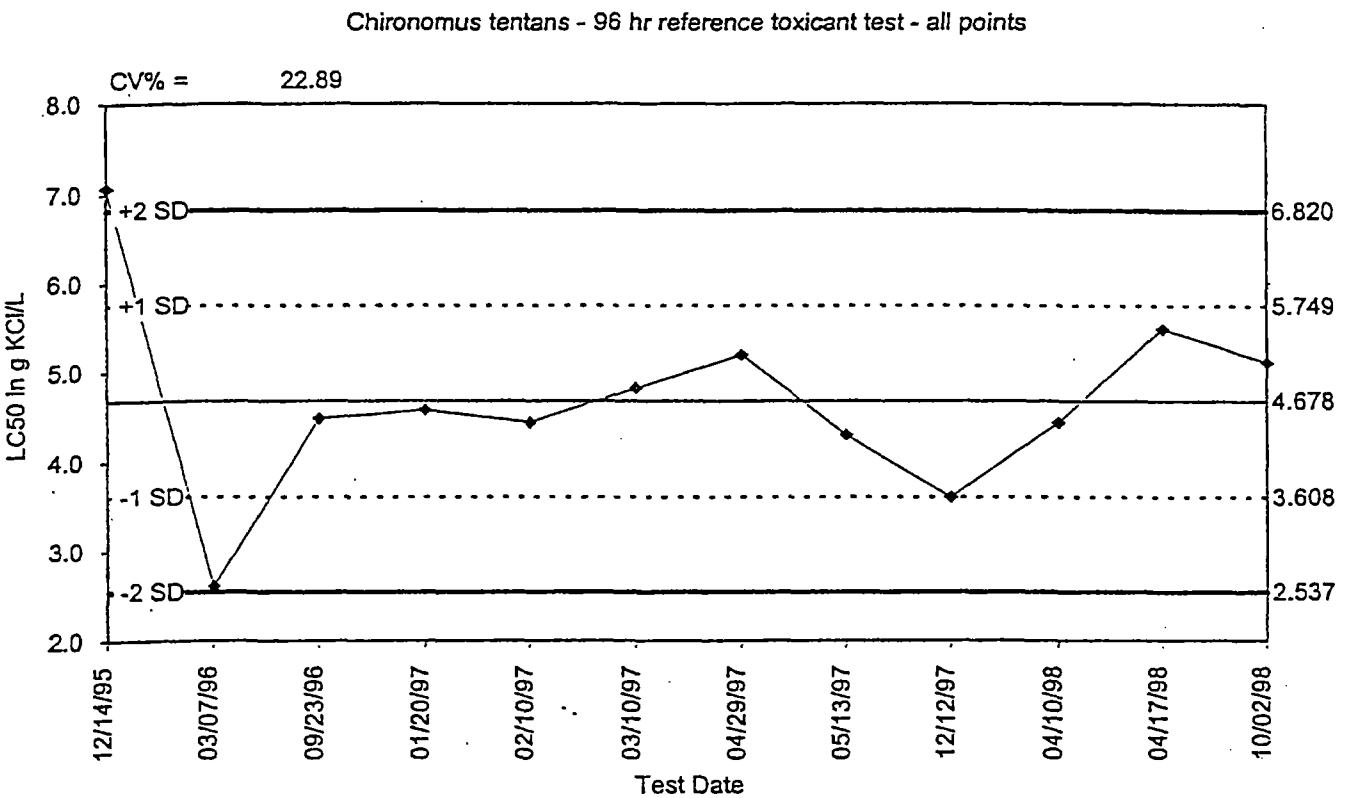
Trim Level	EC50	95% CL	
0.0%	6.3453	5.9371	6.7816
5.0%	6.2899	5.8839	6.7240
10.0%	6.2673	5.9561	6.5948
20.0%	6.2673	5.9718	6.5774
Auto-0.0%	6.3453	5.9371	6.7816



Test: AT-Acute 96-hr Toxicity Test			Test ID: 999-972
Species: CT-Chironomus tentans			Protocol: EPAF 91-EPA Freshwater
Sample ID: REF-Ref Toxicant			Sample Type: KCL-Potassium chloride
Start Date: 10/23/98 14:30	End Date: 10/27/98 15:00		Lab ID: ORNAS-Northwestern Aquatic Sciences

Pos	ID	Rep	Group	Start	24 Hr	48 Hr	72 Hr	96 Hr	Notes
	1	1	D-Control	10				9	
	2	1	1.250	10				10	
	3	1	2.500	10				10	
	4	1	5.000	10				10	
	5	1	7.500	10				1	
	6	1	10.000	10				0	

Comments:


Chironomus tentans - 96 hr reference toxicant test - all points
CV% = 22.89
8.0
7.0
6.0
5.0
4.0
3.0
2.0
LC50 ln g KCl/L
+2 SD
+1 SD
-1 SD
-2 SD
6.820
5.749
4.678
3.608
2.537
12/14/95
03/07/96
09/23/96
01/20/97
02/10/97
03/10/97
04/29/97
05/13/97
12/12/97
04/10/98
04/17/98
10/02/98
Test Date

yrsR
12-7-98

SECTION C

Phase II

Amphipod (*Hyalella azteca*) sediment bioassay 592-3 data report

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test No.: 592-3

Title: Toxicity of freshwater sediments using a 10-day amphipod, *Hyalella azteca*, sediment bioassay.

Protocol No.: NAS-XXX-HA4b, April 7, 1998. Based on ASTM 1996 (Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates, E1706-95b), Am. Soc. Test. Mat., Phila., PA, and EPA Method 100.1 (Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates, EPA/600/R-94/024). Testing was also conducted with consideration of the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area (Draft, April 1998).

STUDY MANAGEMENT

Study Sponsor: Hart Crowser, Inc., 5 Center Pointe Dr., Suite 240, Lake Oswego, Oregon 97035

Sponsor's Study Monitor: Dr. Takashi Fuji

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365

Test Location: Newport laboratory

Laboratory's Study Personnel: G.J. Irissarri, B.S., Proj. Man./ Study Dir.; L.K. Nemeth, B.A., QA Officer; G.A. Buhler, B.S., Aq. Toxicol.; M.S. Redmond, M.S., Aq. Toxicol.; E. Coffey, B.S., Sr. Tech.; S. Bione, B.S., Tech.

Study Schedule:

Test Beginning: 12-8-98

Test Ending: 12-18-98, 0930 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Test Sediments: Unidentified freshwater test sediments. Details are as follows:

NAS Sample No.	1859F	1862F	1863F	1864F
Description	HC-S-01	HC-S-04	HC-S-05	HC-S-07
Collection Date	10-13-98	10-13-98	10-13-98	10-13-98
Receipt Date	10-17-98	10-17-98	10-17-98	10-17-98

NAS Sample No.	1866F	1868F	1870F	1872F
Description	HC-S-11	HC-S-16	HC-S-19	HC-S-22
Collection Date	10-14-98	10-14-98	10-15-98	10-14-98
Receipt Date	10-17-98	10-17-98	10-17-98	10-17-98

NAS Sample No.	1873F	1869F	1857F	1858F
Description	HC-S-24	HC-S-30	HC-Ref-B	HC-Ref-C
Collection Date	10-14-98	10-15-98	10-15-98	10-15-98
Receipt Date	10-17-98	10-17-98	10-17-98	10-17-98

Control Sediment: The negative control sediment was collected on 12-3-98 from an area adjacent to the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR. The control sediment was rinsed through a 1.0 mm screen three times with dechlorinated tap water and once with dilution water prior to use.

POPA0008391

Storage: All test and reference sediments were placed under nitrogen upon receipt and stored at 4°C in the dark until used.

TEST WATER

Source: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Date of Preparation: 12-3-98
Water Quality: pH 7.3, conductivity 250 µmhos/cm, hardness 90 mg/L as $CaCO_3$, alkalinity 80 mg/L as $CaCO_3$.
Pretreatment: Aerated ≥24 hr.

TEST ORGANISMS

Species: *Hyalella azteca*, amphipod.
Age/Size: 7-11 days old
Source: Aquatic Biosystems, Fort Collins, Colorado; received 12-4-98.
Acclimation: Temperature, 19.4 ± 5.5°C; dissolved oxygen, 9.5 ± 4.8 mg/L; pH, 6.9 ± 0.7; conductivity, 413 ± 12 µmhos/cm; hardness, 110 ± 10 mg/L as $CaCO_3$; and alkalinity, 80 ± 0 mg/L as $CaCO_3$.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 300 ml high-form glass beakers
Test Volumes: 100 ml sediment layer; 175 ml test water.
Replicates/Treatment: 8
Organisms/Treatment: 80
Water Volume Changes: 2 water volumes per day
Aeration: None.
Feeding: Animals are fed 1.5 ml of YCT suspension per beaker daily.
Effects Criteria: Survival after 10 days. Death is defined as no visible movement or response to tactile stimulation. Missing organisms were considered to be dead.
Water Quality and Other Test Conditions: The temperature, dissolved oxygen, conductivity, pH, hardness, alkalinity and ammonia-nitrogen were measured in the overlying water of one replicate test container per treatment on days 0 and 10 of the test. Temperature and dissolved oxygen were measured daily in the overlying water of one replicate test container per treatment. Hardness and alkalinity were measured with titrimetric methods. Ammonia-N was measured using a Hach test kit based on the salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric method; samples were not distilled prior to analysis. The photoperiod was 16:8, L:D.

DATA ANALYSIS METHODS

The percent amphipod survival was calculated for each replicate as follows:

percent survival = 100 x (number surviving/initial number tested)

Control and treatment means and standard deviations for percent survival and for water quality data were computed using Microsoft EXCEL v5.0.

Proportional survival values for the test sediments were statistically compared against those for the appropriate reference sediment, as specified by the client, using ToxCalc v5.0.17. An arcsine square root transformation was performed on the proportional data before analysis. Following transformation and determination of normality and homogeneity of variances, one-tailed homoscedastic or heteroscedastic t-tests, or Wilcoxon Two-Sample tests, were conducted at the 0.05 level of significance.

POPA0008392

PROTOCOL DEVIATIONS

1. The dilution water alkalinity (80 mg/L as $CaCO_3$) slightly exceeded the specified range of 60-70. This minor deviation is unlikely to have affected the test results.

REFERENCE TOXICANT TEST

The reference toxicant test is a standard multi-concentration toxicity test using cadmium as $CdCl_2 \bullet 2½ H_2O$, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-980
Reference Toxicant and Source: Cadmium as $CdCl_2 \bullet 2½ H_2O$, Mallinckrodt Lot #TNZ, 1.0 mg/ml stock prepared 6-23-98.
Test Date: 12-8-98
Dilution Water Used: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Result: 96-hr LC50, 15.2 µg/L. This result is within the laboratory's control chart warning limits (2.86 - 23.3 µg/L).

TEST RESULTS

Water quality data are summarized in Table 1. A detailed tabulation of the water quality results by sample and test day can be found in Appendix II. The means and standard deviations of percent survival of *Hyalella azteca* exposed for 10 days to sediments are summarized in Table 2. Detailed data organized by sample and replicate, and summary statistics for these observations, are given in Appendix II.

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 0.5 mg/L. The test met acceptability criterion specified in the protocol with 85.0% mean control survival (80% required). Survival of 86.3% and 73.8% in reference sediments HC-Ref-B (NAS#1857F) and HC-Ref-C (NAS#1858F), respectively, met the 70% survival criterion specified by the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area. The reference toxicant (positive control) result was within the laboratory's control chart limits (15.2 µg/L; control chart mean ± 2 S.D. = 13.1 ± 10.2).

Survival in the control sediment was not significantly different from that in either reference sediment. Five test sediments showed significantly lower survival than that of their appropriate reference sediments. Survival in samples HC-S-01 (65.0%; NAS #1859F), HC-S-04 (62.5%; NAS #1862F), HC-S-05 (71.2%; NAS #1863F), HC-S-16 (72.5%; NAS #1868F), and HC-S-22 (70.0%, NAS #1872F) was significantly less than that in HC-Ref-B (87.5%).

STUDY APPROVAL

Gerald Ghisarri 2-24-99
Project Manager Date

Gerald Ghisarri 2-24-99
Study Director Date

Richard D. Caldwell 2/25/99
Laboratory Director Date

Dillie R. Fiori 2-12-99
Quality Assurance Unit Date

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Table 1. Summary of water quality conditions during tests of the amphipod, *Hyalella azteca*, exposed to freshwater sediments.

Water Quality Parameter	Mean ± S.D.	Minimum	Maximum	N
Temperature (°C)	22.7 ± 0.3	22.2	23.5	143
Dissolved oxygen (mg/L)	6.0 ± 0.7	4.4	8.1	143
Conductivity (µmhos/cm)	332 ± 12	310	360	26
pH	7.5 ± 0.2	7.2	7.8	26
Hardness (mg/L as $CaCO_3$)	102 ± 4	100	110	26
Alkalinity (mg/L as $CaCO_3$)	80 ± 0	80	80	26
Total ammonia (mg/L)	—	< 0.5	0.5	26

Table 2. Survival of amphipods, *Hyalella azteca*, exposed for 10 days to freshwater sediments. All comparisons were conducted at the 0.05 level of significance.

Sample Description	Reference Sediment for Comparison	Percent Survival (Mean ± SD)	Significant?	P
HC-S-01 (NAS#1859F)	HC-Ref-B	65.0 ± 9.3	yes	0.003
HC-S-04 (NAS#1862F)	HC-Ref-B	62.5 ± 10.4	yes	0.002
HC-S-05 (NAS#1863F)	HC-Ref-B	71.3 ± 16.4	yes	0.04
HC-S-07 (NAS#1864F)	HC-Ref-B	80.0 ± 14.1	no	---
HC-S-11 (NAS#1866F)	HC-Ref-B	81.3 ± 15.5	no	---
HC-S-16 (NAS#1868F)	HC-Ref-B	72.5 ± 14.9	yes	0.04
HC-S-19 (NAS#1870F)	HC-Ref-C	83.8 ± 16.0	no	---
HC-S-22 (NAS#1872F)	HC-Ref-B	70.0 ± 10.7	yes	0.01
HC-S-24 (NAS#1873F)	HC-Ref-C	66.3 ± 16.9	no	---
HC-S-30 (NAS#1869F)	HC-Ref-C	87.5 ± 8.9	no	---
Control (NAS#1884F)	HC-Ref-B and -C	85.0 ± 13.1	no	---
HC-Ref-B (NAS#1857F)	—	86.3 ± 16.0	---	---
HC-Ref-C (NAS#1858F)	—	73.8 ± 14.1	---	---

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APPENDIX I

PROTOCOL

TEST PROTOCOL

FRESHWATER AMPHIPOD, *HYALELLA AZTECA*, 10-DAY SEDIMENT TOXICITY TEST

1. INTRODUCTION

1.1 Purpose of Study: The purpose of this study is to characterize the toxicity of freshwater sediments based on survival and, optionally, growth using the amphipod, *Hyalella azteca*.

1.2 Referenced Method: This protocol is based on ASTM Method E 1706-95b (ASTM 1996) and EPA Method 100.1 (EPA/600/R-94/024).

1.3 Summary of Method: A summary of test conditions for the amphipod 10-day sediment toxicity test is tabulated below. The 10-day sediment toxicity test with *Hyalella azteca* is conducted at 23 ± 1°C with a 16L:8D photoperiod at an illuminance of about 50 to 100 footcandles. Test chambers are 300-mL high-form lipless beakers containing 100 mL of sediment and 175 mL of overlying water. Ten 7-14 day old amphipods are used in each replicate. The number of replicates/treatment depends on the objective of the test. Eight replicates are recommended for routine testing. Amphipods in each test chamber are fed 1.5 mL of a YCT food daily. Each chamber receives two volume additions per day of overlying water. Overlying water can be culture water, well water, surface water, site water, or reconstituted water. Test endpoints include survival and/or growth.

1. Test type	whole sediment toxicity test with renewal of overlying water
2. Test duration	10 days
3. Temperature	23 ± 1°C
4. Light quality	daylight flourescent light
5. Illuminance	50-100 footcandles
6. Photoperiod	16L:8D
7. Test chamber size	300-mL high-form lipless beakers, (Pyrex® 1040 or equivalent)
8. Sediment volume	100 mL
9. Overlying water volume	175 mL
10. Renewal overlying water	2 volume additions/day (continuous or intermittent)
11. Age of test organisms	7-14 days old at test initiation
12. Organisms per test chamber	10
13. Replicates per treatment	8 recommended for routine testing (depends on design)
14. Organisms per treatment	80
15. Feeding regime	YCT food, fed 1.5 mL daily/chamber
16. Cleaning	if screens are used, clean as needed
17. Aeration	None, unless DO falls below 40% saturation
18. Overlying (test) water	Culture water, well water, surface water, site water or reconstituted water
19. Water quality	Hardness, alkalinity, conductivity, pH, ammonia-N beginning and end; temperature and dissolved oxygen daily
20. Endpoints	Survival (optional, grwoth by dry weight or length)
21. Test acceptability criteria	Minimum control survival of 80%
22. Sample holding	14 days at 4°C in the dark

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23. Sample volume required	1L (800 mL per sediment)
24. Reference toxicant	Concurrent testing required

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:

_____
_____
_____
_____

2.2 Sponsor's Study Monitor:

_____

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
3814 Yaquina Bay Road, P.O. Box 1437
Newport, OR 97365.

2.4 Test Location: _____

2.5 Laboratory's Personnel to be Assigned to the Study:
Study Director: _____
Quality Assurance Unit: _____
Aquatic Toxicologist: _____
Aquatic Toxicologist: _____

2.6 Proposed Testing Schedule: Tests are to begin within 14 days of sample collection. Reference toxicant test to be run concurrently.

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

3. TEST MATERIAL

The test materials are freshwater sediments. The control, reference, and test sediments are placed in solvent cleaned 1 L glass jars fitted with PTFE-lined screw caps. At the laboratory the samples are stored at 4°C in the dark. The original sealed containers may be stored for up to 14 days prior to testing. If jars are not not full when received or if sediment is removed for testing, headspaces should be filled with nitrogen to retard deterioration. A negative control sediment is collected from a clean site. In addition, a reference sediment, a clean sediment with physical characteristics similar to the test sediments, may be employed as a comparison station.

4. TEST WATER

Test water (overlying water) at NAS is normally moderately hard synthetic water at a hardness of 80-100 mg/L as $CaCO_3$ and alkalinity of 60-70 mg/L as $CaCO_3$. Dilution water is prepared from Milli-Q reagent grade water and reagent grade chemicals. Test water may also be well water, surface water or site water, depending on the study design. Current research is being done by EPA on a new type of reconstituted water that may be used for this test in the future (STM 1996, EPA 1994).

5. TEST ORGANISMS

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5.1 Species: amphipod, *Hyalella azteca*.

5.2 Source: Cultured at NAS. Originally purchased from ESE in Gainesville, FL.

5.3 Age: 7-14 days old at start of test; if using growth endpoint, it may be desirable to reduce the age range.

5.4 Acclimation and Pretest Observation: Cultures are maintained at 23 ± 1°C under a 16:8 L:D photoperiod. Cultured amphipods are fed dried maple leaves with occasional Tetramin® flake or rabbit chow supplements. Acclimation of test organisms to the test water may be desirable, depending on culture water, but it is not required by ASTM. If test organisms are to be acclimated, they could be held for 2 hr in a 50:50 mixture of culture water to overlying water, then for 2 hr in a 25:75 mixture, followed by a transfer into 100 % overlying water for 2 hrs. Mortality during the 48-hr prior to testing should not be excessive.

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers used in the toxicity test are 300-mL high-form lipless glass beakers. Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or by placement in a temperature-controlled room. Aeration is not empolyed unless dissolved oxygen drops below 40% saturation. The test is conducted under an illuminance of 500 to 1000 lx with a 16L:8D photoperiod.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA/600/4-90/027F. New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%, V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compounds (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: The test involves exposure of amphipods to test, control, and reference sediments. The sediments are placed on the bottom of the test containers and are overlain with test water. The test exposure is for 10 days. The renewal of overlying water consists of two volume additions per day, either continuous or intermittent. Each treatment consists of eight replicate test containers, each containing 10 organisms. Test chamber positions are completely randomized. Test organisms are randomly distributed to the test chambers. Blind testing is normally used.

7.2 Setup of Test Containers: Sediments are homogenized and placed in test chambers on the day before addition of test organisms. Sediment (100 ml) is placed into each of eight replicate beakers. After addition of the sediment, 175 ml of test water is gently added to each beaker in a manner to prevent resuspension. The overlying water is replaced twice daily. The test begins when amphipods are introduced to the test chambers. Initial water quality measurements are taken prior to the addition of test organisms.

7.3 Effect Criterion: The acute effect criterion used in the amphipod bioassay is mortality, defined as the lack of movement of body or appendages on response to tactile stimulation. The optional chronic effect criterion is growth which is determined by using dry weight measurements, or alternatively body measurements.

7.4 Test Conditions: No aeration is employed unless dissoved oxygen falls below 40% saturation. The test temperature employed is 23 ± 1°C. A 16:8, L:D photoperiod is used. Illumination is supplied by daylight fluorescent lamps at 50-100 footcandles. The overlying water is replaced twice daily.

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7.5 Beginning the Test: On the day the test begins, amphipods are impartially counted into small containers of test water (10/container). The test is begun by rinsing test organisms into the equilibrated test containers. If the optional growth endpoint is to be used, time-zero weight/length data should be collected.

7.6 Feeding: Amphipods are fed 1.5 mL of YCT daily per test chamber. A feeding may be skipped if there is a build up of excess food. However, all beakers must be treated similarly.

7.7 Test Duration, Type and Frequency of Observations, and Methods:
The duration of the acute toxicity test is 10 days. The type and frequency of observations to be made are summarized as follows:

TYPE OF OBSERVATION	TIMES OF OBSERVATION (ASTM 1996)
BIOLOGICAL DATA	
Survival, growth	Day 10
PHYSICAL AND CHEMICAL DATA	
Hardness, alkalinity, ammonia-N, conductivity, pH, dissolved oxygen, and temperature	Beginning and end of test in overlying water of one replicate beaker from each treatment.
Dissolved oxygen, temperature	Daily in overlying water of one replicate beaker from each treatment.

Dissolved oxygen is measured using a polarographic oxygen probe calibrated according to the manufacturer's recommendations. The pH is measured using a pH probe and a properly calibrated meter with scale divisions of 0.1 pH units. Temperature is measured with a calibrated mercury thermometer or telethermometer. Conductivity is measured with a conductivity meter. Hardness and alkalinity are measured using titrometric methods. Ammonia-nitrogen is measured using the salicylate colerimetric method (Clin. Chim. Acta 14:403, 1996).

Overlying water should be sampled just before water renewal from about 1 to 2 cm above the sediment surface using a pipet. It may be necessay to pool water samples from individual replicates. The pipet should be checked to make sure no organisms are removed during sampling of overlying water.

7.8 Growth Measurement: Growth is measured as average dry weight of animals in a test replicate at the end of the test on day 10 or average total length of preserved animals. Pooled animals from each test replicate are rinsed with deionized water, gently blotted and placed into tared aluminum weigh pans. The pans are dried at 60-90°C to constant weight. The dried amphipods are placed into a dessicator and weighed as soon as possible to the nearest 0.01 mg (desirable to use 0.001 mg). The total weight of the dried amphipods in each pan is divided by the number of amphipods weighed to obtain an average dry weight per surviving amphipod per replicate.

If the length growth endpoint is to be used, either in place of or along with the weight endpoint, amphipods from each replicate are pooled and preserved in vials. Later, the preserved amphipods from one vial are carefully stretched out on a glass microscope slide and quickly measured using a dissecting microscope fitted with a calibrated ocular micrometer. Then, if weight is to be determined, the animals are quickly transferred to tared aluminum foil cups. Fine-tipped forceps are required for these handling operations.

If both measurements are to be used, total length measurements are taken first, then the animals are transferred to tared aluminum foil cups for weighing.

7.9 Criteria of Test Acceptance: The test results are acceptable if the minimum survival of organisms in the control treatment at the end of the test is at least 80%.

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8. DATA ANALYSIS

The endpoints of the toxicity test are survival and growth (optional). Survival is obtained as a direct count of living organisms in each test container at the end of the test. Average amphipod dry weight, also measured at the end of the test, may be used to compare growth between treatment sediments and the control or reference sediment. Ordinarily the following data analysis is performed. Due to special requirements, alternative methods may be used. The means and standard deviations are calculated for each treatment level. Identification of toxic sediments is established by statistical comparison of test endpoints between test and control or reference sediments. Between treatment comparisons may be made using a Student's t-test or Wilcoxon's Two-Sample test, where each treatment is compared to the control or the reference sediment. An arcsine-square root transformation of proportional data, and tests for normality and heterogeneity of variances, are performed prior to statistical comparisons.

9. REPORTING

The final report of the test results must include all of the following standard information at a minimum: name and identification of the test; the investigator and laboratory; date and time of test beginning and end; information on the test material; information on the source and quality of the overlying/test water; detailed information about the test organisms including acclimation conditions; a description of the experimental design and test chambers and other test conditions including feeding, if any, and water quality; definition of the effect criteria and other observations; responses, if any, in the control treatment; tabulation and statistical analysis of measured responses and a summary table of endpoints; a description of the statistical methods used; any unusual information about the test or deviations from procedures; reference toxicant testing information.

10. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change, the date the change took effect and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

11. REFERENCE TOXICANT

The reference toxicant test is a standard multi-concentration toxicity test using a specified chemical toxicant to evaluate the performance of test organisms used in the study. Reference toxicant tests are 96-hour, water only exposures, not 10-day sediment exposures. The reference toxicant test is run concurrently. Performance is evaluated by comparing the results of the reference toxicant test with historical results (e.g., control charts) obtained at the laboratory.

12. REFERENCED GUIDELINES

ASTM. 1996. Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates. ASTM Standard Method No. E 1706-95b. Am. Soc. Test. Mat., Philadelphia, PA.

U.S. EPA. 1994. Section 11, Test Method 100.1, Hyalella azteca 10-d Survival Test for Sediments, pp. 44-50 In: Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-94/024.

Weber, C.I. (Ed.) 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fourth Edition). EPA/600/4-90/027F.

13. APPROVALS

_____ for _____
Name Date

_____ for Northwestern Aquatic Sciences
Name Date

POPA0008401

APPENDIX II

RAW DATA

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XAA-HA4

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST approved 1-32 page 6.31

Test No. 592-3 Client HART CROWSER Investigator

STUDY MANAGEMENT

Client: HART CROWSER, INC, 5 CENTER POINTE DR, SUITE 240, LAKE OSWEGO, 97035

Client's Study Monitor: TAKU FUJI

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: NEWPORT LABORATORY

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.J. IRISSARRI GJI

QA Officer L.K. NEMETH

1. [illegible] 2. [illegible]

3. Erin Coffey 4. M.S. Redmond MSR

5. 6.

Study Schedule:

Test Beginning: 12-8-98 Test Ending: 12-18-98 0930

TEST MATERIAL

General description (see sample logbook/chain-of-custody for details):

NAS Sample No.:	1859F	1862F	1863F	1864F	1866F
Description:	HC-S-01	HC-S-04	HC-S-05	HC-S-07	HC-S-11
Collection Date:	10-13-98	10-13-98	10-13-98	10-13-98	10-14-98
Receipt Date:	10-17-98	10-17-98	10-17-98	10-17-98	10-17-98

NAS Sample No.:	1868F	1870F	1872F	1873F	1869F
Description:	HC-S-16	HC-S-19	HC-S-22	HC-S-24	HC-S-30
Collection Date:	10-14-98	10-15-98	10-14-98	10-14-98	10-15-98
Receipt Date:	10-17-98	10-17-98	10-17-98	10-17-98	10-17-98

NAS Sample No.:	1857F	1858F	2185F		
Description:	HC-REF B	HCREF C	CONTROL		
Collection Date:	10-15-98	10-15-98	12-3-98		
Receipt Date:	10-17-98	10-17-98	12-3-98		

NAS Sample No.:	All test and reference sediments				
Description:	were placed under nitrogen upon				
Collection Date:	receipt.		MSR		
Receipt Date:					

NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					

NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					

POPA0008403

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-3 Client HART CROWSER Investigator

TEST WATER

Source: MODERATELY HARD SYNTHETIC Date of Preparation: 12-3-98

pH 7.3 Cond (umhos/cm) 250 Hard (mg/L) 90 Alk (mg/L) 80

Treatments: AERATED ≥ 24 HRS

If more than one batch of test water is used, attach water prep benchsheets and mark appropriate batches.

TEST ORGANISMS

Species: Hyalella azteca, amphipod Age: 7-11 DAYS Size:

Source: AQUATIC BIOSYSTEMS, FT. COLLINS, CO

Acclimation Data:

Date	Temp (C)	DO (mg/L)	pH	Cond umh/cm	Hard (mg/L)	Alk (mg/L)	Comments
12-4-98	13.0	>15.6	6.1	400	120	80	RECEIVING WATER
12-7-98	22.4	6.8	7.3	420	110	80	
12-8-98	22.8	6.6	7.4	420	100	90	
Mean	19.4	9.5	6.9	413	110	80	
S.D.	5.5	4.8	0.7	12	10	0	
(N)	3	3	3	3	3	3	

TEST PROCEDURES AND CONDITIONS

Test chambers: 300 mL high-form lipless glass beakers

Test volumes: 100 mL of test sediment; 175 mL of test water

Replicates/treatment: (8) 8 Organisms/replicate: (10) 10

Test water: Moderately hard synthetic water

Daily test water changes: two volumes/day

Aeration: None, unless DO falls below 40% saturation

Photoperiod: 16:8, L:D

Temperature: 23 ▪ 1|C

Feeding: fed 1.5 mL of YCT per beaker daily

Beaker placement: Total randomization

Water Quality Measurements:

Daily: temperature and dissolved oxygen; 1 repl./treatment

Beg. & End: Conductivity, hardness, alkalinity, pH, ammonia-nitrogen, temperature & dissolved oxygen; 1 repl./treatment

TEST SCHEDULE SUMMARY

Date	12-3-98	12-4-98	12-5-98	12-6-98	12-7-98	12-8-98	12-9-98	12-10-98	12-11-98	12-12-98
Day	0	1	2	3	4	5	6	7	8	9	10
Feed	X	X	X	X	X	X	X	X	X	X	X
Record WQ	X	X	X	X	X	X	X	X	X	X	X
Initials	[illegible]										

POPA0008404

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-3 Client HART CROWSER Investigator

SEDIMENT DESCRIPTIONS--SUPPLEMENTAL NOTES

Sample No.	Description
1859F	DARK BROWN - silt
1862F	Dark Green - Grey Fine
1863F	Dark Green-Grey Fine
1864F	DARK GREEN/GRAY, FINE
1866F	BROWN - GREEN - SILT, mud
1865F	BROWN/Green-Grey, Fine
1870F	DARK GREEN/GRAY, SAND, LARGE ROCKS, SOME PLANT DEBRIS
1972F	BROWN - silt - ONE DEAD CLAM
1873F	DARK GREEN/GRAY, FINE
1869F	Brown - Green - Grey - Fine w/ Sand
1857F	BROWN - GREEN - SILT
1858F	Brown Sand
2155F	GREEN/GRAY, SAND

POPA0008405

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-3 Client HART CROWSER Investigator

MISCELLANEOUS NOTES

Control sediment was collected from Beaver Creek, Oregon, on 12-3-98, & rinsed 3 times with dechlorinated tap water and once with moderately hard synthetic water through a 1.0 mm sieve.

OM #1

TOP SHELF

Randomization chart:

1	5	10	15	20	25	30	35	40	45	50
2	4	9	14	19	24	29	34	39	44	49
3	3	8	13	18	23	28	33	38	43	48
4	2	7	12	17	22	27	32	37	42	47
5	1	6	11	16	21	26	31	36	41	46

Randomization chart:

1	55	60	65	70	75	80	85	90	95	100
2	54	59	64	69	74	79	84	89	94	99
3	53	58	63	68	73	78	83	88	93	98
4	52	57	62	67	72	77	82	87	92	97
5	51	56	61	66	71	76	81	86	91	96

Randomization chart:

1										
2	104									
3	103									
4	102									
5	101									

Randomization chart:

1										
2										
3										
4										
5										

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-3 Client HART CROWSER Investigator

DAILY RECORD SHEET

Day Ø (12/8/98) Initials: GAB/SB

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	23.0	7.2	310	7.2	100	80		YES	water Δ'ed @ 0600 GAB
4	23.0	7.3	320	7.4	110	80			
9	22.9	6.9	320	7.3	100	80	Sw		
14	22.9	7.0	320	7.2	110	80			
25	22.8	8.1	320	7.8	100	80			
27	22.9	7.0	320	7.3	100	80			~~WATER~~ GSL
44	22.8	7.2	320	7.3	100	80			
47	22.8	7.1	320	7.5	100	80			
74	23.0	7.0	330	7.4	100	80			
80	23.0	7.2	320	7.4	100	80			
90	23.1	6.7	340	7.4	110	80			
94	23.2	6.6	320	7.6	100	80			
101	23.3	7.3	340	7.4	110	80			

Day 1 (12/9/98) Initials: GB/SB

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	22.9	6.2						YES	water Δ'ed @ 0520 GAB
4	22.9	6.2							
9	22.9	6.4							
14	22.8	6.7							WATER CHANGED 1600 GSL
25	22.8	6.7							
27	22.7	7.0							
44	22.7	7.1							
47	22.8	6.4							
74	22.7	6.4							
80	22.9	6.2							
90	22.9	6.2							
94	23.1	7.0							
101	23.0	7.0							

4/98

POPA0008407

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-3 Client HART CROWSER Investigator

DAILY RECORD SHEET

Day 2 (12/10/98 Initials: GAB/GJZ

Beaker No.	Temp. (°C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	23.4	6.1						YES	water Δ'ed @ 0510 GAB
4	23.3	6.3							
9	23.2	6.2							WATER CHANGED 1650 GJZ
14	23.2	6.3							
25	23.0	6.9							
27	23.2	6.2							
44	23.1	6.3							
47	23.1	6.5							
74	23.2	6.1							
80	23.2	6.4							
90	23.4	6.0							
94	23.4	6.6							
101	23.5	6.4							

Day 3 12/11/98 Initials: GAB/GJZ

Beaker No.	Temp. (°C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	22.6	5.8						YES	water Δ'ed @ 0515 GAB
4	22.5	6.4							
9	22.5	5.8							WATER CHANGED 1645 GJZ
14	22.4	6.2							
25	22.3	6.8							
27	22.5	6.4							
44	22.2	6.2							
47	22.3	6.3							
74	22.4	6.0							
80	22.4	6.5							
90	22.5	6.0							
94	22.5	6.4							
101	22.7	5.8							

POPA0008408

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-3 Client HART CROWSER Investigator

DAILY RECORD SHEET

Day 4 (12/14/98) Initials: KT/GJL

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	22.3	5.8						yes	water bath 0530 KT
4	22.3	6.0							
9	22.6	6.0							
14	22.7	5.9							WATER CHANGED 1700 GJL
25	22.7	7.0							
27	22.7	6.1							
44	22.7	5.6							
47	22.7	6.0							
74	22.7	6.0							
80	22.7	5.8							
90	22.7	5.7							
94	22.7	6.2							
101	22.8	6.0							

Day 5 (12/15/98) Initials: KT/GJL

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	22.4	5.7						yes	water bath 0500 KT
4	22.6	5.6							
9	22.6	5.6							WATER CHANGED 1710 GJL
14	22.6	5.8							
25	22.6	6.6							
27	22.5	6.0							
44	22.4	5.8							
47	22.4	5.9							
74	22.5	5.6							
80	22.5	5.6							
90	22.6	5.8							
97	22.6	5.8							
101	22.6	5.7							

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-3 Client HART CROWSER Investigator

DAILY RECORD SHEET

Day 6 (12/14/98) Initials: GJ1/cn

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	22.7	5.5						YES	WATER CHANGED 0510 GJ1
4	22.6	5.9							11 11 1610 cn
9	22.5	5.8							
14	22.5	5.8							
25	22.4	6.6							
27	22.5	5.9							
44	22.4	5.9							
47	22.4	6.1							
74	22.5	5.6							
80	22.5	5.9							
90	22.6	5.8							
94	22.6	6.0							
101	22.6	5.8							

Day 7 (12/15/98) Initials: GJ1/cn

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	22.8	5.4						YES	WATER CHANGED 0500 GJ1
4	22.7	5.8							11 11 1630 cn
9	22.7	5.5							
14	22.7	5.8							
25	22.5	6.4							
27	22.6	5.8							
44	22.5	5.6							
47	22.5	6.0							
74	22.6	5.2							
80	22.4	5.8							
90	22.7	5.6							
94	22.7	5.8							
101	22.8	5.6							

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4b

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-3 Client HART CROWSER Investigator

DAILY RECORD SHEET

Day 8 (12/16/98) Initials: GJI

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	22.8	4.8						YES	WATER CHANGED 0550 GJI
4	22.8	5.0							water changed 1730 MJR
9	22.7	5.2							
14	22.7	4.8							
25	22.6	5.4							
27	22.7	5.0							
44	22.6	4.6							
47	22.7	5.2							
74	22.7	4.6							
80	22.6	4.4							
90	22.7	4.8							
94	22.7	4.8							
101	22.8	4.6							

Day 9 (12/17/98) Initials: GJI/MJR

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	22.8	4.8						YES	WATER CHANGED 0510 GJI
4	22.7	5.2							" " 1630 ↑
9	22.6	4.4							
14	22.6	4.6							
25	22.5	5.6							
27	22.6	5.4							
44	22.5	4.8							
47	22.5	5.3							
74	22.6	5.0							
80	22.6	5.4							
90	22.7	5.2							
94	22.7	5.4							
101	22.7	5.1							

POPA0008411

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO: NAS-XLX-HA4D

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-3 Client HART CROWSER Investigator

DAILY RECORD SHEET

Day 10 (12/18/98) Initials: GJL/

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1	22.7	6.8	360	7.6	100	80			WATER CHANGED 0510 GJL
4	22.5	7.0	340	7.8	100	80			
9	22.4	6.7	340	7.6	100	80			
14	22.4	6.8	340	7.5	100	80			
25	22.2	7.4	340	7.5	100	80			
27	22.4	6.9	350	7.7	100	80			
44	22.2	6.9	330	7.6	100	80			
47	22.2	6.9	340	7.6	100	80			
74	22.4	6.8	340	7.6	100	80			
80	22.4	6.9	340	7.5	100	80			
90	22.4	6.7	340	7.6	100	80			
94	22.5	7.2	340	7.6	100	80			
101	22.6	6.8	340	7.6	100	80			

Day ____ (/ /) Initials:

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3-N mg/L	FED	Comments
1									
4									
9									
14									
25									
27									
44									
47									
74									
80									
90									
94									
101									

GJL

POPA0008412

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 597-3 Client HART CROWSER Investigator _____

DAY 10 TEST TERMINATION SHEET

Beaker No.	Number of survivors	Init.
1	7	GJL
2	8	"
3	8	"
4	8	"
5	7	"
6	8	GJL
7	8	"
8	8	"
9	7	GJL
10	5	"
11	9	GJL
12	10	"
13	9	GJL
14	8	"
15	6	"
16	9	"
17	8	GJL
18	10	GJL
19	6	"
20	10	GJL
21	7	GJL
22	10	"
23	10	"
24	8	GJL
25	10	GJL
26	9	"
27	GJL 9	GJL "
28	10	GJL
29	8	GJL
30	9	"
31	7	GJL
32	5	"
33	9	GJL
34	8	GJL
35	10	GJL
36	8	"
37	7	GJL
38	7	"
39	10	"
40	9	GJL
41	6	"
42	10	GJL
43	9	GJL
44	6	"
45	6	GJL

Beaker No.	Number of survivors	Init.
46	8	"
47	6	"
48	7	GJL
49	8	"
50	8	"
51	8	GJL
52	6	GJL
53	10	"
54	5	"
55	8	GJL
56	9	"
57	6	GJL
58	7	"
59	4	"
60	6	GJL
61	8	GJL
62	8	"
63	6	GJL
64	7	"
65	7	GJL
66	10	"
67	7	GJL
68	8	"
69	5	GJL
70	6	GJL
71	7	"
72	5	"
73	8	GJL
74	5	"
75	8	GJL
76	6	"
77	9	GJL
78	5	"
79	8	GJL
80	5	"
81	6	GJL
82	6	"
83	7	GJL
84	4	"
85	6	"
86	10	GJL
87	7	"
88	7	GJL
89	6	"
90	8	"

HYALELLA AZTECA 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-3 Client HART CROWSER Investigator

DAY 10 TEST TERMINATION SHEET

Beaker No.	Number of survivors	Init.
91	6	GJL
92	9	〃
93	7	〃
94	8	GJL
95	10	〃
96	8	GJL
97	5	〃
98	8	〃
99	8	GJL
100	6	〃
101	6	GJL
102	7	GJL
103	10	〃
104	8	〃

Beaker No.	Number of survivors	Init.

RSL 1/15/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 592-3 Hart-Crowser Day Ø
12-8-98 Overlying Water

	BKR# Sample description	BK	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1		1.0													Qe Stds – NH_3 (mg/L)					
2	4			1.0												Nominal			Measured		
3	9				1.0												10		10.0		
4	14					1.0											3		2.5		
5	25						1.0										1		.5		
6	27							1.0													
7	44								1.0												
8	47									1.0											
9	74										1.0										
10	80											1.0									
11	90												1.0								
12	94													1.0							
13	101														1.0						
14																					
15																					
16																					
17																					
18																					
	~~Seawater~~ DI ~~DAI~~ H_2O	5.0	4.0	→	→	→	→	→	→	→	→	→	→	→	→						
	Measured concentration (mg/L)	<.1	<.1	<.1	.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1						
	x multiplier	1.0	5.0	→	→	→	→	→	→	→	→	→	→	→	→						
	Final concentration (mg/L)	<.1	<.5	<.5	.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.5						

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

1/15/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 597-3 Hart Crowser - Day 10 12-10-97 - Overlying Water

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1		1.0													QStar -			NH3 (mg/L)		
2	4			1.0												Normal			Measured		
3	9				1.0												10		1	0.0	
4	14					1.0											5			2.5	
5	25						1.0										1			0.5	
6	27							1.0													
7	44								1.0												
8	47									1.0											
9	74										1.0										
10	80											1.0									
11	90												1.0								
12	94													1.0							
13	101														1.0						
14																					
15																					
16																					
17																					
18																					
	~~Seawater~~ DI Water	5.0	4.0												→						
	Measured concentration (mg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1						
	x multiplier	1.0	5.0												→						
	Final concentration (mg/L)	<0.1	<0.5												→						

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanurate reagent packet contents with mixing.

POPA0008416

BKR	NAS SMPL	CLIENT DESCRIP	REPL
* 9	1859F	HC-S-01	1
2	1859F	HC-S-01	2
91	1859F	HC-S-01	3
41	1859F	HC-S-01	4
69	1859F	HC-S-01	5
48	1859F	HC-S-01	6
52	1859F	HC-S-01	7
65	1859F	HC-S-01	8
* 80	1862F	HC-S-04	1
57	1862F	HC-S-04	2
15	1862F	HC-S-04	3
81	1862F	HC-S-04	4
58	1862F	HC-S-04	5
32	1862F	HC-S-04	6
61	1862F	HC-S-04	7
102	1862F	HC-S-04	8
* 1	1863F	HC-S-05	1
36	1863F	HC-S-05	2
68	1863F	HC-S-05	3
83	1863F	HC-S-05	4
5	1863F	HC-S-05	5
103	1863F	HC-S-05	6
78	1863F	HC-S-05	7
97	1863F	HC-S-05	8
*101	1864F	HC-S-07	1
50	1864F	HC-S-07	2
62	1864F	HC-S-07	3
22	1864F	HC-S-07	4
76	1864F	HC-S-07	5
75	1864F	HC-S-07	6
13	1864F	HC-S-07	7
40	1864F	HC-S-07	8
* 74	1866F	HC-S-11	1
87	1866F	HC-S-11	2
11	1866F	HC-S-11	3
104	1866F	HC-S-11	4
33	1866F	HC-S-11	5
28	1866F	HC-S-11	6
92	1866F	HC-S-11	7
46	1866F	HC-S-11	8
* 14	1868F	HC-S-16	1
70	1868F	HC-S-16	2
51	1868F	HC-S-16	3
93	1868F	HC-S-16	4
26	1868F	HC-S-16	5
54	1868F	HC-S-16	6
56	1868F	HC-S-16	7
45	1868F	HC-S-16	8
* 44	1870F	HC-S-19	1
35	1870F	HC-S-19	2
98	1870F	HC-S-19	3
64	1870F	HC-S-19	4
23	1870F	HC-S-19	5

Randomization Key

* WATER QUALITY BEAKER>

	NAS	CLIENT	
BKR	SMPL	DESCRIP	REPL
30	1870F	HC-S-19	6
39	1870F	HC-S-19	7
21	1870F	HC-S-19	8
* 90	1872F	HC-S-22	1
96	1872F	HC-S-22	2
37	1872F	HC-S-22	3
88	1872F	HC-S-22	4
63	1872F	HC-S-22	5
29	1872F	HC-S-22	6
10	1872F	HC-S-22	7
38	1872F	HC-S-22	8
* 27	1873F	HC-S-24	1
59	1873F	HC-S-24	2
85	1873F	HC-S-24	3
49	1873F	HC-S-24	4
72	1873F	HC-S-24	5
7	1873F	HC-S-24	6
82	1873F	HC-S-24	7
67	1873F	HC-S-24	8
* 4	1869F	HC-S-30	1
66	1869F	HC-S-30	2
3	1869F	HC-S-30	3
84	1869F	HC-S-30	4
95	1869F	HC-S-30	5
6	1869F	HC-S-30	6
24	1869F	HC-S-30	7
77	1869F	HC-S-30	8
* 47	1857F	Ref B	1
20	1857F	Ref B	2
31	1857F	Ref B	3
99	1857F	Ref B	4
18	1857F	Ref B	5
12	1857F	Ref B	6
53	1857F	Ref B	7
17	1857F	Ref B	8
* 94	1858F	Ref C	1
60	1858F	Ref C	2
73	1858F	Ref C	3
19	1858F	Ref C	4
34	1858F	Ref C	5
71	1858F	Ref C	6
100	1858F	Ref C	7
86	1858F	Ref C	8
* 25	2185F	Control	1
42	2185F	Control	2
55	2185F	Control	3
79	2185F	Control	4
43	2185F	Control	5
16	2185F	Control	6
89	2185F	Control	7
8	2185F	Control	8

HC-Ref-B

HC-Ref-C

* WATER QUALITY BEAKERS

Endpoints Data Entry and Calculations File

BKR=beaker number
INIT=initial number
SURV=number survivors
MORT=number dead=INIT-SURV
PSURV=%survival=100(SURV/INIT)
PMORT=%mortality=100(MORT/INIT)

Data entry verified against laboratory bench sheets MLR 1-12-99

INDE	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	SURV	MORT	PSURV	PMORT		SURV	MORT	PSURV	PMORT
1	9	1859F	HC-S-01	1	10	7	3	70.0	30.0					
2	2	1859F	HC-S-01	2	10	8	2	80.0	20.0	Mean	6.5	3.5	65.0	35.0
3	91	1859F	HC-S-01	3	10	6	4	60.0	40.0	SD	0.9	0.9	9.3	9.3
4	41	1859F	HC-S-01	4	10	6	4	60.0	40.0	n	8	8	8	8
5	69	1859F	HC-S-01	5	10	5	5	50.0	50.0					
6	48	1859F	HC-S-01	6	10	7	3	70.0	30.0					
7	52	1859F	HC-S-01	7	10	6	4	60.0	40.0					
8	65	1859F	HC-S-01	8	10	7	3	70.0	30.0					
9	80	1862F	HC-S-04	1	10	5	5	50.0	50.0					
10	57	1862F	HC-S-04	2	10	6	4	60.0	40.0	Mean	6.3	3.8	62.5	37.5
11	15	1862F	HC-S-04	3	10	6	4	60.0	40.0	SD	1.0	1.0	10.4	10.4
12	81	1862F	HC-S-04	4	10	6	4	60.0	40.0	n	8	8	8	8
13	58	1862F	HC-S-04	5	10	7	3	70.0	30.0					
14	32	1862F	HC-S-04	6	10	5	5	50.0	50.0					
15	61	1862F	HC-S-04	7	10	8	2	80.0	20.0					
16	102	1862F	HC-S-04	8	10	7	3	70.0	30.0					
17	1	1863F	HC-S-05	1	10	7	3	70.0	30.0					
18	36	1863F	HC-S-05	2	10	8	2	80.0	20.0	Mean	7.1	2.9	71.3	28.8
19	68	1863F	HC-S-05	3	10	8	2	80.0	20.0	SD	1.6	1.6	16.4	16.4
20	83	1863F	HC-S-05	4	10	7	3	70.0	30.0	n	8	8	8	8
21	5	1863F	HC-S-05	5	10	7	3	70.0	30.0					
22	103	1863F	HC-S-05	6	10	10	0	100.0	0.0					
23	78	1863F	HC-S-05	7	10	5	5	50.0	50.0					
24	97	1863F	HC-S-05	8	10	5	5	50.0	50.0					
25	101	1864F	HC-S-07	1	10	6	4	60.0	40.0					
26	50	1864F	HC-S-07	2	10	8	2	80.0	20.0	Mean	8.0	2.0	80.0	20.0
27	62	1864F	HC-S-07	3	10	8	2	80.0	20.0	SD	1.4	1.4	14.1	14.1
28	22	1864F	HC-S-07	4	10	10	0	100.0	0.0	n	8	8	8	8
29	76	1864F	HC-S-07	5	10	6	4	60.0	40.0					
30	75	1864F	HC-S-07	6	10	8	2	80.0	20.0					
31	13	1864F	HC-S-07	7	10	9	1	90.0	10.0					
32	40	1864F	HC-S-07	8	10	9	1	90.0	10.0					
33	74	1866F	HC-S-11	1	10	5	5	50.0	50.0					
34	87	1866F	HC-S-11	2	10	7	3	70.0	30.0	Mean	8.1	1.9	81.3	18.8
35	11	1866F	HC-S-11	3	10	9	1	90.0	10.0	SD	1.6	1.6	15.5	15.5
36	104	1866F	HC-S-11	4	10	8	2	80.0	20.0	n	8	8	8	8
37	33	1866F	HC-S-11	5	10	9	1	90.0	10.0					
38	28	1866F	HC-S-11	6	10	10	0	100.0	0.0					
39	92	1866F	HC-S-11	7	10	9	1	90.0	10.0					
40	46	1866F	HC-S-11	8	10	8	2	80.0	20.0					
41	14	1868F	HC-S-16	1	10	8	2	80.0	20.0					
42	70	1868F	HC-S-16	2	10	6	4	60.0	40.0	Mean	7.3	2.8	72.5	27.5
43	51	1868F	HC-S-16	3	10	8	2	80.0	20.0	SD	1.5	1.5	14.9	14.9
44	93	1868F	HC-S-16	4	10	7	3	70.0	30.0	n	8	8	8	8
45	26	1868F	HC-S-16	5	10	9	1	90.0	10.0					
46	54	1868F	HC-S-16	6	10	5	5	50.0	50.0					
47	56	1868F	HC-S-16	7	10	9	1	90.0	10.0					
48	45	1868F	HC-S-16	8	10	6	4	60.0	40.0					
49	44	1870F	HC-S-19	1	10	6	4	60.0	40.0					
50	35	1870F	HC-S-19	2	10	10	0	100.0	0.0	Mean	8.4	1.6	83.8	16.3

INDE	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	SURV	MORT	PSURV	PMORT		SURV	MORT	PSURV	PMORT
51	98	1870F	HC-S-19	3	10	8	2	80.0	20.0	SD	1.6	1.6	16.0	16.0
52	64	1870F	HC-S-19	4	10	7	3	70.0	30.0	n	8	8	8	8
53	23	1870F	HC-S-19	5	10	10	0	100.0	0.0					
54	30	1870F	HC-S-19	6	10	9	1	90.0	10.0					
55	39	1870F	HC-S-19	7	10	10	0	100.0	0.0					
56	21	1870F	HC-S-19	8	10	7	3	70.0	30.0					
57	90	1872F	HC-S-22	1	10	8	2	80.0	20.0					
58	96	1872F	HC-S-22	2	10	8	2	80.0	20.0	Mean	7.0	3.0	70.0	30.0
59	37	1872F	HC-S-22	3	10	7	3	70.0	30.0	SD	1.1	1.1	10.7	10.7
60	88	1872F	HC-S-22	4	10	7	3	70.0	30.0	n	8	8	8	8
61	63	1872F	HC-S-22	5	10	6	4	60.0	40.0					
62	29	1872F	HC-S-22	6	10	8	2	80.0	20.0					
63	10	1872F	HC-S-22	7	10	5	5	50.0	50.0					
64	38	1872F	HC-S-22	8	10	7	3	70.0	30.0					
65	27	1873F	HC-S-24	1	10	9	1	90.0	10.0					
66	59	1873F	HC-S-24	2	10	4	6	40.0	60.0	Mean	6.6	3.4	66.3	33.8
67	85	1873F	HC-S-24	3	10	6	4	60.0	40.0	SD	1.7	1.7	16.9	16.9
68	49	1873F	HC-S-24	4	10	8	2	80.0	20.0	n	8	8	8	8
69	72	1873F	HC-S-24	5	10	5	5	50.0	50.0					
70	7	1873F	HC-S-24	6	10	8	2	80.0	20.0					
71	82	1873F	HC-S-24	7	10	6	4	60.0	40.0					
72	67	1873F	HC-S-24	8	10	7	3	70.0	30.0					
73	4	1869F	HC-S-30	1	10	8	2	80.0	20.0					
74	66	1869F	HC-S-30	2	10	10	0	100.0	0.0	Mean	8.8	1.3	87.5	12.5
75	3	1869F	HC-S-30	3	10	8	2	80.0	20.0	SD	0.9	0.9	8.9	8.9
76	84	1869F	HC-S-30	4	10	9	1	90.0	10.0	n	8	8	8	8
77	95	1869F	HC-S-30	5	10	10	0	100.0	0.0					
78	6	1869F	HC-S-30	6	10	8	2	80.0	20.0					
79	24	1869F	HC-S-30	7	10	8	2	80.0	20.0					
80	77	1869F	HC-S-30	8	10	9	1	90.0	10.0					
81	47	1857F	Ref B	1	10	6	4	60.0	40.0					
82	20	1857F	Ref B	2	10	10	0	100.0	0.0	Mean	8.6	1.4	86.3	13.8
83	31	1857F	Ref B	3	10	7	3	70.0	30.0	SD	1.6	1.6	16.0	16.0
84	99	1857F	Ref B	4	10	8	2	80.0	20.0	n	8	8	8	8
85	18	1857F	Ref B	5	10	10	0	100.0	0.0					
86	12	1857F	Ref B	6	10	10	0	100.0	0.0					
87	53	1857F	Ref B	7	10	10	0	100.0	0.0					
88	17	1857F	Ref B	8	10	8	2	80.0	20.0					
89	94	1858F	Ref C	1	10	8	2	80.0	20.0					
90	60	1858F	Ref C	2	10	6	4	60.0	40.0	Mean	7.4	2.6	73.8	26.3
91	73	1858F	Ref C	3	10	8	2	80.0	20.0	SD	1.4	1.4	14.1	14.1
92	19	1858F	Ref C	4	10	6	4	60.0	40.0	n	8	8	8	8
93	34	1858F	RefC	5	10	8	2	80.0	20.0					
94	71	1858F	RefC	6	10	7	3	70.0	30.0					
95	100	1858F	RefC	7	10	6	4	60.0	40.0					
96	86	1858F	RefC	8	10	10	0	100.0	0.0					
97	25	2185F	Control	1	10	10	0	100.0	0.0					
98	42	2185F	Control	2	10	10	0	100.0	0.0	Mean	8.5	1.5	85.0	15.0
99	55	2185F	Control	3	10	8	2	80.0	20.0	SD	1.3	1.3	13.1	13.1
100	79	2185F	Control	4	10	8	2	80.0	20.0	n	8	8	8	8
101	43	2185F	Control	5	10	9	1	90.0	10.0					
102	16	2185F	Control	6	10	9	1	90.0	10.0					
103	89	2185F	Control	7	10	6	4	60.0	40.0					
104	8	2185F	Control	8	10	8	2	80.0	20.0					

HC-Ref-B

HC-Ref-C

Freshwater Sediment-10-day survival

Start Date:	12/8/98	Test ID: 592-3	Sample ID:
End Date:	12/18/98 09:30	Lab ID: ORNAS-Northwestern Aquat	Sample Type: SED-Sediment
Sample Date:		Protocol: NASXXXHA4B	Test Species: HA-Hyalella azteca

nments: NAS#1857F-1859F,1862F-1864F,1866F,1868F-1870F,1872F-1873F

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	0.6000	1.0000	0.7000	0.8000	1.0000	1.0000	1.0000	0.8000
HC-Ref-C	0.8000	0.6000	0.8000	0.6000	0.8000	0.7000	0.6000	1.0000
HC-S-01	0.7000	0.8000	0.6000	0.6000	0.5000	0.7000	0.6000	0.7000
HC-S-04	0.5000	0.6000	0.6000	0.6000	0.7000	0.5000	0.8000	0.7000
HC-S-05	0.7000	0.8000	0.8000	0.7000	0.7000	1.0000	0.5000	0.5000
HC-S-07	0.6000	0.8000	0.8000	1.0000	0.6000	0.8000	0.9000	0.9000
HC-S-11	0.5000	0.7000	0.9000	0.8000	0.9000	1.0000	0.9000	0.8000
HC-S-16	0.8000	0.6000	0.8000	0.7000	0.9000	0.5000	0.9000	0.6000
HC-S-19	0.6000	1.0000	0.8000	0.7000	1.0000	0.9000	1.0000	0.7000
HC-S-22	0.8000	0.8000	0.7000	0.7000	0.6000	0.8000	0.5000	0.7000
HC-S-24	0.9000	0.4000	0.6000	0.8000	0.5000	0.8000	0.6000	0.7000
HC-S-30	0.8000	1.0000	0.8000	0.9000	1.0000	0.8000	0.8000	0.9000
control	1.0000	1.0000	0.8000	0.8000	0.9000	0.9000	0.6000	0.8000

			Transform: Arcsin Square Root					1-Tailed		
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	0.8625	1.1695	1.2174	0.8861	1.4120	18.016	8			
HC-Ref-C	0.7375	1.0000	1.0479	0.8861	1.4120	17.106	8			
HC-S-01	0.6500	0.8814	0.9405	0.7854	1.1071	10.511	8			
HC-S-04	0.6250	0.8475	0.9148	0.7854	1.1071	12.019	8			
HC-S-05	0.7125	0.9661	1.0213	0.7854	1.4120	19.632	8			
HC-S-07	0.8000	1.0847	1.1255	0.8861	1.4120	16.045	8			
HC-S-11	0.8125	1.1017	1.1438	0.7854	1.4120	16.838	8			
HC-S-16	0.7250	0.9831	1.0326	0.7854	1.2490	16.796	8			
HC-S-19	0.8375	1.1356	1.1826	0.8861	1.4120	18.339	8	-1.354	1.761	0.0174
HC-S-22	0.7000	0.9492	0.9958	0.7854	1.1071	11.610	8			
HC-S-24	0.6625	0.8983	0.9621	0.6847	1.2490	19.445	8	0.936	1.761	0.0148
HC-S-30	0.8750	1.1864	1.2188	1.1071	1.4120	11.023	8	-2.159	1.761	0.0110
control	0.8500	1.1525	1.1912	0.8861	1.4120	14.832	8	-1.611	1.761	0.0139

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95263	0.844	0.52293	-0.2245
F-Test indicates equal variances (p = 0.91)	1.08934	8.88531		
The control means are not significantly different (p = 0.11)	1.69342	2.14479		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Comparisons made against HC-Ref-C MLR 2-12-99

Freshwater Sediment-10-day survival

Start Date:	12/8/98	Test ID:	592-3	Sample ID:		
End Date:	12/18/98 09:30	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	SED-Sediment	
Sample Date:		Protocol:	NASXXXHA4B	Test Species:	HA-Hyalella azteca	

Comments: NAS#1857F-1859F,1862F-1864F,1866F,1868F-1870F,1872F-1873F

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	0.6000	1.0000	0.7000	0.8000	1.0000	1.0000	1.0000	0.8000
HC-Ref-C	0.8000	0.6000	0.8000	0.6000	0.8000	0.7000	0.6000	1.0000
HC-S-01	0.7000	0.8000	0.6000	0.6000	0.5000	0.7000	0.6000	0.7000
HC-S-04	0.5000	0.6000	0.6000	0.6000	0.7000	0.5000	0.8000	0.7000
HC-S-05	0.7000	0.8000	0.8000	0.7000	0.7000	1.0000	0.5000	0.5000
HC-S-07	0.6000	0.8000	0.8000	1.0000	0.6000	0.8000	0.9000	0.9000
HC-S-11	0.5000	0.7000	0.9000	0.8000	0.9000	1.0000	0.9000	0.8000
HC-S-16	0.8000	0.6000	0.8000	0.7000	0.9000	0.5000	0.9000	0.6000
HC-S-19	0.6000	1.0000	0.8000	0.7000	1.0000	0.9000	1.0000	0.7000
HC-S-22	0.8000	0.8000	0.7000	0.7000	0.6000	0.8000	0.5000	0.7000
HC-S-24	0.9000	0.4000	0.6000	0.8000	0.5000	0.8000	0.6000	0.7000
HC-S-30	0.8000	1.0000	0.8000	0.9000	1.0000	0.8000	0.8000	0.9000
control	1.0000	1.0000	0.8000	0.8000	0.9000	0.9000	0.6000	0.8000

			Transform: Arcsin Square Root						1-Tailed	
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	0.8625	1.1695	1.2174	0.8861	1.4120	18.016	8			
HC-Ref-C	0.7375	1.0000	1.0479	0.8861	1.4120	17.106	8			
*HC-S-01	0.6500	0.8814	0.9405	0.7854	1.1071	10.511	8	3.256	1.761	0.0127
*HC-S-04	0.6250	0.8475	0.9148	0.7854	1.1071	12.019	8	3.489	1.761	0.0133
*HC-S-05	0.7125	0.9661	1.0213	0.7854	1.4120	19.632	8	1.867	1.761	0.0194
HC-S-07	0.8000	1.0847	1.1255	0.8861	1.4120	16.045	8	0.916	1.761	0.0178
HC-S-11	0.8125	1.1017	1.1438	0.7854	1.4120	16.838	8	0.714	1.761	0.0188
*HC-S-16	0.7250	0.9831	1.0326	0.7854	1.2490	16.796	8	1.869	1.761	0.0172
HC-S-19	0.8375	1.1356	1.1826	0.8861	1.4120	18.339	8			
*HC-S-22	0.7000	0.9492	0.9958	0.7854	1.1071	11.610	8	2.528	1.761	0.0135
HC-S-24	0.6625	0.8983	0.9621	0.6847	1.2490	19.445	8			
HC-S-30	0.8750	1.1864	1.2188	1.1071	1.4120	11.023	8			
control	0.8500	1.1525	1.1912	0.8861	1.4120	14.832	8	0.264	1.761	0.0175

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97991	0.929	0.06978	-0.182
Bartlett's Test indicates equal variances (p = 0.27)	6.40396	15.0863		
The control means are not significantly different (p = 0.11)	1.69342	2.14479		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

Comparisons made against HC-Ref-B MSK 2-12-99

Actual p-values for comparisons showing significant differences, calculated from the statistics returned by ToxCalc analysis					
Survival Data					
		degrees of			
Comparison	T stat	freedom *	tails	TDIST (=p)	
HC-S-19 vs. HC-Ref-C	-1.354	14	1	#NUM!	
HC-S-24 vs. HC-Ref-C	0.936	14	1	0.18	
HC-S-30 vs. HC-Ref-C	-2.159	14	1	#NUM!	
control vs. HC-Ref-C	-1.611	14	1	#NUM!	
HC-S-01 vs. HC-Ref-B	3.256	14	1	0.003	
HC-S-04 vs. HC-Ref-B	3.489	14	1	0.002	
HC-S-05 vs. HC-Ref-B	1.867	14	1	0.041	
HC-S-07 vs. HC-Ref-B	0.916	14	1	0.188	
HC-S-11 vs. HC-Ref-B	0.714	14	1	0.243	
HC-S-16 vs. HC-Ref-B	1.869	14	1	0.041	
HC-S-22 vs. HC-Ref-B	2.528	14	1	0.012	
control vs. HC-Ref-B	0.264	14	1	0.398	
* (control replicates + treatment replicates - 2)					

Water Quality Data

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	COND	pH	NH3	HARD	ALK
1	1863F	HC-S-05	1	0	23.0	7.2	310	7.2	<0.5	100	80
4	1869F	HC-S-30	1	0	23.0	7.3	320	7.4	<0.5	110	80
9	1859F	HC-S-01	1	0	22.9	6.9	320	7.3	0.5	100	80
14	1868F	HC-S-16	1	0	22.9	7.0	320	7.2	<0.5	110	80
25	2185F	Control	1	0	22.8	8.1	320	7.8	<0.5	100	80
27	1873F	HC-S-24	1	0	22.9	7.0	320	7.3	<0.5	100	80
44	1870F	HC-S-19	1	0	22.8	7.2	320	7.3	<0.5	100	80
47	1857F	HC-Ref-B	1	0	22.8	7.1	320	7.5	<0.5	100	80
74	1866F	HC-S-11	1	0	23.0	7.0	330	7.4	<0.5	100	80
80	1862F	HC-S-04	1	0	23.0	7.2	320	7.4	<0.5	100	80
90	1872F	HC-S-22	1	0	23.1	6.7	340	7.4	<0.5	110	80
94	1858F	HC-Ref-C	1	0	23.2	6.6	320	7.6	<0.5	100	80
101	1864F	HC-S-07	1	0	23.3	7.3	340	7.4	<0.5	110	80
1	1863F	HC-S-05	1	1	22.9	6.2					
4	1869F	HC-S-30	1	1	22.9	6.2					
9	1859F	HC-S-01	1	1	22.9	6.4					
14	1868F	HC-S-16	1	1	22.8	6.7					
25	2185F	Control	1	1	22.8	6.7					
27	1873F	HC-S-24	1	1	22.7	7.0					
44	1870F	HC-S-19	1	1	22.7	7.1					
47	1857F	HC-Ref-B	1	1	22.8	6.4					
74	1866F	HC-S-11	1	1	22.7	6.4					
80	1862F	HC-S-04	1	1	22.9	6.2					
90	1872F	HC-S-22	1	1	22.9	6.2					
94	1858F	HC-Ref-C	1	1	23.1	7.0					
101	1864F	HC-S-07	1	1	23.0	7.0					
1	1863F	HC-S-05	1	2	23.4	6.1					
4	1869F	HC-S-30	1	2	23.3	6.3					
9	1859F	HC-S-01	1	2	23.2	6.2					
14	1868F	HC-S-16	1	2	23.2	6.3					
25	2185F	Control	1	2	23.0	6.9					
27	1873F	HC-S-24	1	2	23.2	6.2					
44	1870F	HC-S-19	1	2	23.1	6.3					
47	1857F	HC-Ref-B	1	2	23.1	6.5					
74	1866F	HC-S-11	1	2	23.2	6.1					
80	1862F	HC-S-04	1	2	23.2	6.4					
90	1872F	HC-S-22	1	2	23.4	6.0					
94	1858F	HC-Ref-C	1	2	23.4	6.6					
101	1864F	HC-S-07	1	2	23.5	6.4					
1	1863F	HC-S-05	1	3	22.6	5.8					
4	1869F	HC-S-30	1	3	22.5	6.4					
9	1859F	HC-S-01	1	3	22.5	5.8					
14	1868F	HC-S-16	1	3	22.4	6.2					
25	2185F	Control	1	3	22.3	6.8					
27	1873F	HC-S-24	1	3	22.5	6.4					

Data Verified against Laboratory Bench Sheets 2-12-99 JLC

	NAS	CLIENT									
BKR	SMPL	DESCRIP	REPL	DAY	TEMP	DO	COND	pH	NH3	HARD	ALK
44	1870F	HC-S-19	1	3	22.2	6.2					
47	1857F	HC-Ref-B	1	3	22.3	6.3					
74	1866F	HC-S-11	1	3	22.4	6.0					
80	1862F	HC-S-04	1	3	22.4	6.5					
90	1872F	HC-S-22	1	3	22.5	6.0					
94	1858F	HC-Ref-C	1	3	22.5	6.4					
101	1864F	HC-S-07	1	3	22.7	5.8					
1	1863F	HC-S-05	1	4	22.8	5.8					
4	1869F	HC-S-30	1	4	22.8	6.0					
9	1859F	HC-S-01	1	4	22.8	6.0					
14	1868F	HC-S-16	1	4	22.7	5.9					
25	2185F	Control	1	4	22.6	7.0					
27	1873F	HC-S-24	1	4	22.7	6.1					
44	1870F	HC-S-19	1	4	22.7	5.6					
47	1857F	HC-Ref-B	1	4	22.7	6.0					
74	1866F	HC-S-11	1	4	22.7	6.0					
80	1862F	HC-S-04	1	4	22.7	5.8					
90	1872F	HC-S-22	1	4	22.7	5.9					
94	1858F	HC-Ref-C	1	4	22.7	6.2					
101	1864F	HC-S-07	1	4	22.8	6.0					
1	1863F	HC-S-05	1	5	22.6	5.7					
4	1869F	HC-S-30	1	5	22.6	5.6					
9	1859F	HC-S-01	1	5	22.6	5.6					
14	1868F	HC-S-16	1	5	22.6	5.8					
25	2185F	Control	1	5	22.6	6.6					
27	1873F	HC-S-24	1	5	22.5	6.0					
44	1870F	HC-S-19	1	5	22.4	5.8					
47	1857F	HC-Ref-B	1	5	22.4	5.9					
74	1866F	HC-S-11	1	5	22.5	5.6					
80	1862F	HC-S-04	1	5	22.5	5.6					
90	1872F	HC-S-22	1	5	22.6	5.8					
94	1858F	HC-Ref-C	1	5	22.6	5.8					
101	1864F	HC-S-07	1	5	22.6	5.7					
1	1863F	HC-S-05	1	6	22.7	5.5					
4	1869F	HC-S-30	1	6	22.6	5.9					
9	1859F	HC-S-01	1	6	22.5	5.8					
14	1868F	HC-S-16	1	6	22.5	5.8					
25	2185F	Control	1	6	22.4	6.6					
27	1873F	HC-S-24	1	6	22.5	5.9					
44	1870F	HC-S-19	1	6	22.4	5.9					
47	1857F	HC-Ref-B	1	6	22.4	6.1					
74	1866F	HC-S-11	1	6	22.5	5.6					
80	1862F	HC-S-04	1	6	22.5	5.9					
90	1872F	HC-S-22	1	6	22.6	5.8					
94	1858F	HC-Ref-C	1	6	22.6	6.0					
101	1864F	HC-S-07	1	6	22.6	5.8					
1	1863F	HC-S-05	1	7	22.8	5.4					

	NAS	CLIENT									
BKR	SMPL	DESCRIP	REPL	DAY	TEMP	DO	COND	pH	NH3	HARD	ALK
4	1869F	HC-S-30	1	7	22.7	5.8					
9	1859F	HC-S-01	1	7	22.7	5.5					
14	1868F	HC-S-16	1	7	22.7	5.8					
25	2185F	Control	1	7	22.5	6.4					
27	1873F	HC-S-24	1	7	22.6	5.8					
44	1870F	HC-S-19	1	7	22.5	5.6					
47	1857F	HC-Ref-B	1	7	22.5	6.0					
74	1866F	HC-S-11	1	7	22.6	5.2					
80	1862F	HC-S-04	1	7	22.6	5.8					
90	1872F	HC-S-22	1	7	22.7	5.6					
94	1858F	HC-Ref-C	1	7	22.7	5.8					
101	1864F	HC-S-07	1	7	22.8	5.6					
1	1863F	HC-S-05	1	8	22.8	4.8					
4	1869F	HC-S-30	1	8	22.8	5.0					
9	1859F	HC-S-01	1	8	22.7	5.2					
14	1868F	HC-S-16	1	8	22.7	4.8					
25	2185F	Control	1	8	22.6	5.4					
27	1873F	HC-S-24	1	8	22.7	5.0					
44	1870F	HC-S-19	1	8	22.6	4.6					
47	1857F	HC-Ref-B	1	8	22.7	5.2					
74	1866F	HC-S-11	1	8	22.7	4.6					
80	1862F	HC-S-04	1	8	22.6	4.4					
90	1872F	HC-S-22	1	8	22.7	4.8					
94	1858F	HC-Ref-C	1	8	22.7	4.8					
101	1864F	HC-S-07	1	8	22.8	4.6					
1	1863F	HC-S-05	1	9	22.8	4.8					
4	1869F	HC-S-30	1	9	22.7	5.2					
9	1859F	HC-S-01	1	9	22.6	4.4					
14	1868F	HC-S-16	1	9	22.6	4.6					
25	2185F	Control	1	9	22.5	5.6					
27	1873F	HC-S-24	1	9	22.6	5.4					
44	1870F	HC-S-19	1	9	22.5	4.8					
47	1857F	HC-Ref-B	1	9	22.5	5.3					
74	1866F	HC-S-11	1	9	22.6	5.0					
80	1862F	HC-S-04	1	9	22.6	5.4					
90	1872F	HC-S-22	1	9	22.7	5.2					
94	1858F	HC-Ref-C	1	9	22.7	5.4					
101	1864F	HC-S-07	1	9	22.7	5.1					
1	1863F	HC-S-05	1	10	22.7	6.8	360	7.6	<0.5	100	80
4	1869F	HC-S-30	1	10	22.5	7.0	340	7.8	<0.5	100	80
9	1859F	HC-S-01	1	10	22.4	6.7	340	7.6	<0.5	100	80
14	1868F	HC-S-16	1	10	22.4	6.8	340	7.5	<0.5	100	80
25	2185F	Control	1	10	22.2	7.4	340	7.8	<0.5	100	80
27	1873F	HC-S-24	1	10	22.4	6.9	350	7.7	<0.5	100	80
44	1870F	HC-S-19	1	10	22.2	6.9	330	7.6	<0.5	100	80
47	1857F	HC-Ref-B	1	10	22.2	6.9	340	7.6	<0.5	100	80
74	1866F	HC-S-11	1	10	22.4	6.8	340	7.6	<0.5	100	80

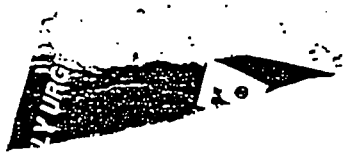
	NAS	CLIENT									
BKR	SMPL	DESCRIP	REPL	DAY	TEMP	DO	COND	pH	NH3	HARD	ALK
80	1862F	HC-S-04	1	10	22.4	6.9	340	7.5	<0.5	100	80
90	1872F	HC-S-22	1	10	22.4	6.7	340	7.6	<0.5	100	80
94	1858F	HC-Ref-C	1	10	22.5	7.2	340	7.6	<0.5	100	80
101	1864F	HC-S-07	1	10	22.6	6.8	340	7.6	<0.5	100	80
				Mean	22.7	6.0	332	7.5	—	102	80
				SD	0.3	0.7	12	0.2	—	4	0
				n	143	143	26	26	26	26	26
				Max	23.5	8.1	360	7.8	0.5	110	80
				Min	22.2	4.4	310	7.2	<0.5	100	80

mdk 2-12-99

Custody Seal 3.7°C

Date 10/16/98 Project Samples

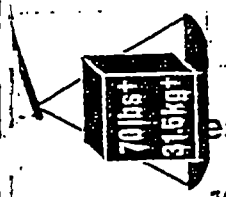
Signature Jennifer Stewart Container# 1 of 10



Custody Seal 2.1°C

Date 10/16/98 Project Samples

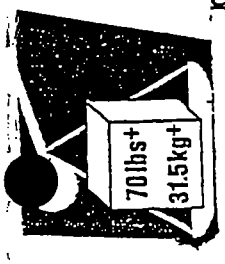
Signature Jennifer Stewart Container# 2 of 10



eal 3.0°C

8 Project Samples

nifer Stewart Container# 3 of 10



Custody Seal 4.1°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 4 of 10

Custody Seal 2.3°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 5 of 10

Custody Seal 3.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 6 of 10

Custody Seal 2.5°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 7 of 10

Custody Seal 2.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 8 of 10

Custody Seal 3.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 9 of 10

Custody Seal 4.3°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 10 of 10

Sample Custody Record

Samples Shipped to: _____

HARTCROWSER

1910 [illegible]w Avenue East
Seattle, Wash[illegible]ton 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 5624-06 LAB NUMBER _____

PROJECT NAME Terminal 4/ RI/FS

HART CROWSER CONTACT H. Cumberland

SAMPLED BY: HERZOG

REQUESTED ANALYSIS

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	Archive	Bioassay	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	HC-S-11		10/14/98	0925	SED	X		4	#1866F
	HC-S-14			1035		X		4	1867F
	HC-S-16			12:45		X		4	1868F
	HC-S-22			13:15		X		4	1872F
	HC-S-24			1345		X		4	1873F
	HC-S-26			1445			X	4	1874F
	HC-S-28			1530			X	4	1875F
	HC-S-35			16:25			X	4	1876F.
	~~HC-S-36~~			~~1730~~			~~X~~	~~4~~	

RELINQUISHED BY	DATE	RECEIVED BY	DATE
[signature]	10/14/98	[signature]	10/15
SIGNATURE		SIGNATURE	
John Herzog	TIME	Richard [illegible]	TIME
PRINT NAME		PRINT NAME	
HC	1745		1750
COMPANY		COMPANY OAS	

RELINQUISHED BY	DATE	RECEIVED BY	DATE
[signature]	10/16/98	Linda K Nemeth	10/17/98
SIGNATURE		SIGNATURE	
[signature]	TIME	Linda K Nemeth	TIME
PRINT NAME		PRINT NAME	
OAS	300	NW Aquatic	10:30
COMPANY		COMPANY	

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____
for Other Contract Requirements

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS:
☐YES ☐NO ☐N/A
GOOD CONDITION
☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND
☐COURIER ☐OVERNIGHT

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

POPA0008431

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Sample Custody Record

Samples Shipped to: _____

HARTCROWSER

Seattle, Wa[illegible]ton 98102-369
Phone: 206-324-9530 FAX: 206-328-558

JOB 5624-06 LAB NUMBER _____

PROJECT NAME Terminal 4 RI/FS

HART CROWSER CONTACT H. Cumberland

SAMPLED BY: Herzog

REQUESTED ANALYSIS

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	Arsenic	Bioassay											NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
		HC-S-36	10/15/98	8100	SED		X											4	#1877F
		HC-S-39		0940			X											4	1878F
		HC-S-42		11:10			X											4	1879F
		HC-REF-B		1400		X	X											8	#1857F
		HC-REF C		1500		X	X											8	1858F
		HC-S-18		1630		X				(NOT REC'D BY NAS)								9	~~1869F~~ JM
		HC-S-19		1640		X												4	1870F
		HC-S-20		1650		X												4	1871F
		HC-S-30	10/15/98	17:10	received rather than HC-S-18 listed above 10/17/98 JM														1869F

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE [signature]	10/16	SIGNATURE [signature]	10/16/98
PRINT NAME John Herzog	TIME	PRINT NAME [signature]	TIME
COMPANY HC	9:49	COMPANY CTS 10/16/98	950

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE [signature]	10/16/98	SIGNATURE Linda K. Nemeth	10/17/98
PRINT NAME [signature]	TIME	PRINT NAME Linda K. Nemeth	TIME
COMPANY CTS	300	COMPANY NW Aquatic	10:30

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____ for Other Contract Requirements

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

White and Yellow Copies to Lab Pink to Project Manager Lab to Return White Copy to Hart Crowser Gold to Sample Custodian

-30

POPA0008432

Sample Custody Record

Samples Shipped to: _____

HARTCROWSER
1910 K[illegible]w Avenue East
Seattle, Washi[illegible]on 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 5760-06 LAB NUMBER _____

PROJECT NAME Terminal 4 RI/FS

HART CROWSER CONTACT H. Cumberland

SAMPLED BY: JMH

REQUESTED ANALYSIS

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	Archive	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	HC-S-01		10/13/98	10:35	SED	X	4	Archive #1859F
	HC-S-02		10/13/98	11:45		X	4	1860F
	HC-S-03			12:35		X	4	1861F
	HC-S-04			1300		X	4	1862F
	HC-S-05			14:00		X	4	1863F
	HC-S-07			16:00		X	4	1864F
	~~HC-S-08~~			~~16:20~~		~~X~~	~~4~~	
	HC-S-09			16:45		X	4	1865F

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE [signature]	10/13/98	SIGNATURE [signature]	10/13/98
PRINT NAME JOHN Heiron	TIME	PRINT NAME	TIME
COMPANY HC		COMPANY	1705

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE [signature]	10/14/98	SIGNATURE [signature]	10/14/98
PRINT NAME [illegible]	TIME	PRINT NAME [illegible]	TIME
COMPANY CAS	300	COMPANY CAS	830

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:
Hold until notified

Rec'd by Linda K. Nemeth 10/17/98 10:30am for NW Aquatic

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____ for Other Contract Requirements

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

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POPA0008433

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524

Toll Free: 800/331-5916
Tel: 970/484-5091 Fax: 970/484-2514

Ship date was 12-3-98
as per Scott Kellman
2-12-99 (GS)

ORGANISM HISTORY

DATE:	11/23/98
SPECIES:	Hyalella azteca
AGE:	2-6 day
LIFE STAGE:	Juvenile
HATCH DATE:	Variable
BEGAN FEEDING:	Immediately
FOOD:	Aspen leaves, YTC

Water Chemistry Record:	Mean	Range
TEMPERATURE:	24°C	23-26°C
SALINITY / CONDUCTIVITY:	–	–
TOTAL HARDNESS (as $CaCO_3$):	110 mg/l	108-112 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	75 mg/l	70-85 mg/l
pH:	8.18	8.12-8.29

Comments:

Facility Supervisor

APPENDIX III

RAW DATA - REFERENCE TOXICANT TEST

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-
ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-930 Client QC TEST Investigator
Test Type (rangefinding/definitive) Test Length (hr) 96
Species HYALELLA AZTECA

STUDY MANAGEMENT
Client: QC TEST
Client's Study Monitor: N/A
Testing Laboratory: Northwestern Aquatic Sciences
Test Location: NEWPORT LABORATORY
Laboratory's Study Personnel:
Proj. Man./Study Dir. G.J. IRISSARRI GJI
QA Officer L.K. NEMETH
1. GA Schulz GAS 2. Erin Coffey EC
3. M.S. Redmond MSR 4.
Study Schedule:
Test Beginning: 12-8-98 Test Ending: 12-12-98 1640

TEST MATERIAL
Description: CADMIUM AS $CdCl_2 \cdot 2\frac{1}{2} H_2O$ (1.0 mg/mL) PREP'D: 6-23-98 MALLINCKRODT LOT #
NAS Sample No.:
Date of Collection:
Date of Receipt:
Temperature (°C):
Dissolved oxygen (mg/L):
Conductivity (umhos/cm):
pH:
Hardness (mg/L):
Alkalinity (mg/L):
:

DILUTION WATER
Description: MODERATELY HARD SYNTHETIC WATER
Date of Preparation/Collection: 12-3-98
Water Quality: Cond. (umhos/cm) 250 Salinity (ppt) — pH 7.3
Hardness (mg/L as $CaCO_3$) 90 Alkalinity (mg/L as $CaCO_3$ 80
Treatments: AERATED ≥ 24 HRS

TEST ORGANISMS
Species: HYALELLA AZTECA Age: 7-14 DAYS Size: JUVENILE
Source: AQUATIC BIOSYSTEMS, FT COLLINS, CO
Acclimation Data:

Date	Temp (°C)	DO (mg/L)	pH	~~Sal~~/Cond	Comments
12-4-98	13.0	>15.0	6.1	400	RECEIVING WATER: H=120, A=80
12-7-98	22.4	6.8	7.3	420	H=110 A=90
12-8-98	22.8	6.6	7.4	420	H=100 A=90
Mean	19.4	9.5	6.9	413	H: 110 A: 80
S.D.	5.5	4.8	0.7	12	10 0
(N)	3	3	3	3	3 3

POPA0008436

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-
ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-980 Client QC TEST Investigator _____

TEST PROCEDURES AND CONDITIONS
Test concentrations: (50% series recommended) 60, 30, 15, 7.5, 3.75, Ø ug/L
Test chambers: 250 mL Beakers Test volume: 100 mL
Replicates/treatment: (2) 2 Organisms/treatment: (20) 20 ceriodaphnia
Test water changes: N.A. Aeration during test: none
Feeding: None Photoperiod: 16:8 L:D
Temperature: 23 ± 1°C
Duration: 24-hr, 48-hr, 96-hr Renewal: none
Beaker placement: Stratified randomization

Randomization chart:

A	15	Ø	7.5	30	3.75	60
B	7.5	30	Ø	15	60	3.75
C						
D						

MISCELLANEOUS NOTES

TEST SOLUTION PREP:

GB 12-8-97

1ST WORKING STOCK MADE BY 1:99 (1 mL + 100 mL) OF CONC. 1.0 mg/mL Cd STOCK; ~~FINAL~~ WI FINAL CONC: 10 ug/mL

2ND WORKING STOCK (W.S.2) MADE BY 10:90 (10 mL + 100 mL) DILUTION OF 1ST WORKING STOCK; FINAL CONC: 1 ug/mL

TEST CONC (ug/L)	ug Cd NEEDED FOR 100 mL	mL W.S.2 PER 200 mL
60	6.0	12.0
30	3.0	6.0
15	1.5	3.0
7.5	0.75	1.5
3.75	0.375	0.75
Ø	Ø	Ø

POPA0008437

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-980 Client QC Test Investigator

0 (12/8/98 BB/EJL

Conc. (ug/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 60	23.5	8.2		320	7.7	100	80	10	10
2. 30	23.6	8.2		320	7.9	—	—	10	10
3. 15	23.6	8.2		320	7.9	—	—	10	10
4. 7.5	23.4	8.2		320	7.9	—	—	10	10
5. 3.75	23.5	8.2		320	7.9	—	—	10	10
6. Ø	23.2	8.2		320	7.9	100	80	10	10

DAY 1 (12/9/98) BB/EJL

Conc. (ug/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 60	23.9	7.6		360	8.1			10	10
2. 30	23.9	7.5		360	8.2			10	10
3. 15	23.9	7.5		360	8.2			10	10
4. 7.5	23.7	7.4		360	8.2			10	10
5. 3.75	23.9	7.4		360	8.1			10	9 (1D)
6. Ø	23.6	7.4		~~420~~ 400	8.1			10	10

DAY 2 (12/10/98) BB/EJL

Conc. (ug/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 60	23.8	7.6		380	7.6			6(4D)	7(3D)
2. 30	24.0	7.6		360	7.7			9(1D)	10
3. 15	23.9	7.6		360	7.7			8(2D)	10
4. 7.5	23.8	7.6		370	7.7			10	10
5. 3.75	23.7	7.5		360	7.6			9(1M)	9
6. Ø	23.7	7.8		430	7.8 7.6 BB			9(1M)	9(1D)

DAY 3 (12/11/98) BB/EJL

Conc. (ug/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 60	23.1	7.7		380	7.8			1(5D)	2(5D)
2. 30	23.1	7.6		380	7.8			9	8(2D)
3. 15	23.0	7.7		380	7.9			8	9(1D)
4. 7.5	22.9	7.6		380	7.9			9(1M)	10
5. 3.75	23.2	7.6		380	7.8			9	9
6. Ø	22.6	7.8		420	7.9			9	9

DAY 4 (12/12/98) EJL

Conc. (ug/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH 7.6	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1. 60	22.9	7.4		360	7.7	100	80	Ø(1D)	Ø(2D)
2. 30	22.8	7.4		360	7.6	—	—	2(7D)	Ø(8D)
3. 15	22.9	7.3		380	7.6	—	—	5(3D)	3(6D)
4. 7.5	22.9	7.4		380	7.6	—	—	9	10
5. 3.75	22.8	7.2		360	7.7	—	—	9	9
6. Ø	22.7	7.2		400	7.6	100	70	8(1M)	9

Remarks:

Acute 96-hr Toxicity Test-96 Hr Survival

Start Date:	12/8/98	Test ID:	999-980	Sample ID:	REF-Ref Toxicant
End Date:	12/12/98 16:40	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	CDCL-Cadmium chloride
Sample Date:		Protocol:	NASXXXHA1-Hyalella Acute	Test Species:	HA-Hyalella azteca
Comments:					

Conc-ug/L	1	2
D-Control	1.0000	0.9000
3.75	1.0000	0.9000
7.5	1.0000	1.0000
15	0.5000	0.3000
30	0.2000	0.0000
60	0.0000	0.0000

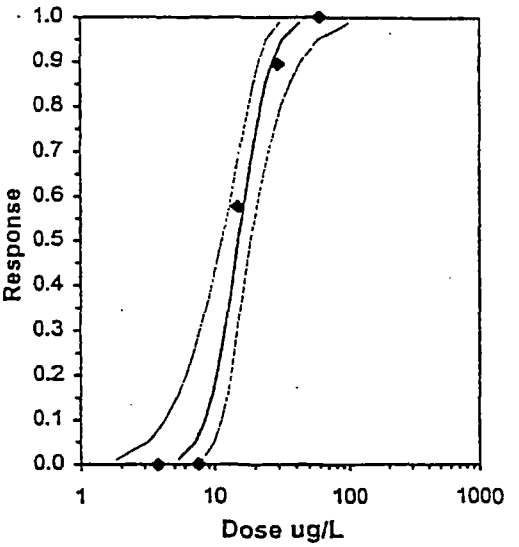
			Transform: Arcsin Square Root					Number	Total
Conc-ug/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Resp	Number
D-Control	0.9500	1.0000	1.3211	1.2490	1.3931	7.710	2	1	18
3.75	0.9500	1.0000	1.3262	1.2490	1.4033	8.227	2	1	19
7.5	1.0000	1.0526	1.4077	1.4033	1.4120	0.435	2	0	19
15	0.4000	0.4211	0.6825	0.5796	0.7854	21.317	2	12	20
30	0.1000	0.1053	0.3112	0.1588	0.4636	69.269	2	18	20
60	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	2	20	20

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Normality of the data set cannot be confirmed				
Bartlett's Test indicates equal variances (p = 0.37)	4.30252	13.2767		

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	5.07672	1.20481	2.71529	7.43815	0.05556	1.7981	7.81472	0.62	1.18218	0.19698	11
Intercept	-1.0016	1.49058	-3.9231	1.91993							
TSCR	0.04404	0.03353	-0.0217	0.10976							

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	5.29594	1.81233	8.02728
EC05	3.355	7.2141	3.19013	10.037
EC10	3.718	8.50638	4.29636	11.3489
EC15	3.964	9.50665	5.23879	12.3609
EC20	4.158	10.3849	6.11993	13.2579
EC25	4.326	11.2027	6.97837	14.1087
EC40	4.747	13.5606	9.58309	16.7284
EC50	5.000	15.2118	11.4266	18.8109
EC60	5.253	17.0642	13.4002	21.507
EC75	5.674	20.6557	16.7448	28.024
EC80	5.842	22.2824	18.063	31.524
EC85	6.036	24.3408	19.6026	36.3962
EC90	6.282	27.2031	21.5708	43.9269
EC95	6.645	32.076	24.6216	58.6032
EC99	7.326	43.6938	31.0557	102.259

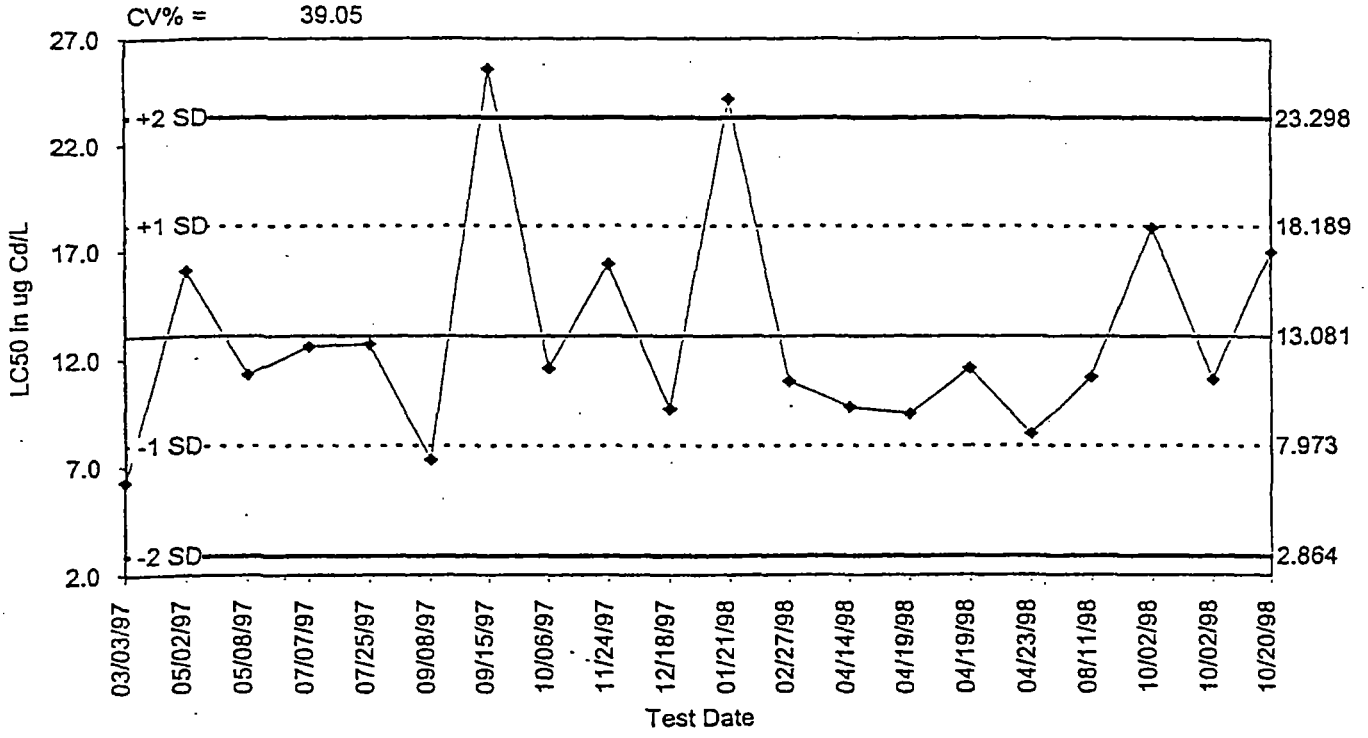


Test: AT-Acute 96-hr Toxicity Test			Test ID: 999-980
Species: HA-Hyalella azteca			Protocol: NASXXXHA1-Hyalella Acute
Sample ID: REF-Ref Toxicant			Sample Type: CDCL-Cadmium chloride
Start Date: 12/8/98	End Date: 12/12/98 16:40		Lab ID: ORNAS-Northwestern Aquatic Sciences

Pos	ID	Rep	Group	Start	24 Hr	48 Hr	72 Hr	96 Hr	Notes
	1	1	D-Control	8				8	
	2	2	D-Control	10				9	
	3	1	3.750	9				9	
	4	2	3.750	10				9	
	5	1	7.500	9				9	
	6	2	7.500	10				10	
	7	1	15.000	10				5	
	8	2	15.000	10				3	
	9	1	30.000	10				2	
	10	2	30.000	10				0	
	11	1	60.000	10				0	
	12	2	60.000	10				0	

Comments:

Hyalella azteca 96-hr acute test - last 20 points



MSR
2-12-99

00 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524

AQUATIC BIO SYSTEMS ABS INC.

Toll Free: 800/331-5916
Tel: 970/484-5091 Fax: 970/484-2514

Ship date was 12-3-98
as per Scott Kellman
2-12-99 GTS

ORGANISM HISTORY

DATE: 11/23/98

SPECIES: Hyalella azteca

AGE: 2-6 day

LIFE STAGE: Juvenile

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: Aspen leaves, YTC

Water Chemistry Record:	Mean	Range
TEMPERATURE:	24 °C	23-26°C
SALINITY / CONDUCTIVITY:	–	–
TOTAL HARDNESS (as $CaCO_3$):	110 mg/l	108-112 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	75 mg/l	70-85 mg/l
pH:	8.18	8.12-8.29

Comments:

Facility Supervisor

SECTION D

Phase II

Midge (*Chironomus tentans*) sediment bioassay 592-4 data report

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test No.: 592-4

Title: Toxicity of freshwater sediments using a 10-day midge, *Chironomus tentans*, sediment bioassay.

Protocol No.: NAS-XXX-CT4b, April 7, 1998. Based on ASTM 1996 (Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates, E1706-95b), Am. Soc. Test. Mat., Phila., PA, and EPA Method 100.2 (Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates, EPA/600/R-94/024). Testing was also conducted with consideration of the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area (Draft, April 1998).

STUDY MANAGEMENT

Study Sponsor: Hart Crowser, Inc., 5 Center Pointe Dr., Suite 240, Lake Oswego, Oregon 97035

Sponsor's Study Monitor: Dr. Takashi Fuji

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365

Test Location: Newport laboratory

Laboratory's Study Personnel: G.J. Irissarri, B.S., Proj. Man./ Study Dir.; L.K. Nemeth, B.A., QA Officer; G.A. Buhler, B.S., Aq. Toxicol.; M.S. Redmond, M.S., Aq. Toxicol.; E. Coffey, B.S., Sr. Tech.; S. Bione, B.S., Tech.

Study Schedule:

Test Beginning: 12-8-98, 1030 hrs.

Test Ending: 12-18-98, 0930 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Test Sediments: Unidentified freshwater test sediments. Details are as follows:

NAS Sample No.	1859F	1862F	1863F	1864F
Description	HC-S-01	HC-S-04	HC-S-05	HC-S-07
Collection Date	10-13-98	10-13-98	10-13-98	10-13-98
Receipt Date	10-17-98	10-17-98	10-17-98	10-17-98
NAS Sample No.	1866F	1868F	1870F	1872F
Description	HC-S-11	HC-S-16	HC-S-19	HC-S-22
Collection Date	10-14-98	10-14-98	10-15-98	10-14-98
Receipt Date	10-17-98	10-17-98	10-17-98	10-17-98
NAS Sample No.	1873F	1869F	1857F	1858F
Description	HC-S-24	HC-S-30	HC-Ref-B	HC-Ref-C
Collection Date	10-14-98	10-15-98	10-15-98	10-15-98
Receipt Date	10-17-98	10-17-98	10-17-98	10-17-98

Control Sediment: The negative control sediment was collected on 12-3-98 from an area adjacent to the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR. The control sediment was rinsed through a 1.0 mm screen three times with dechlorinated tap water and once with dilution water prior to use.

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Storage: All test and reference sediments were placed under nitrogen and stored at 4°C in the dark until used.

TEST WATER

Source: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Date of Preparation: 12-3-98
Water Quality: pH 7.3, conductivity 250 µmhos/cm, hardness 90 mg/L as $CaCO_3$, alkalinity 80 mg/L as $CaCO_3$.
Pretreatment: Aerated ≥24 hr.

TEST ORGANISMS

Species: *Chironomus tentans*, midge.
Age/Size: 3rd instar, 0.19 mg average individual biomass
Source: NAS cultures, originally obtained from EPA, Duluth, MN.
Acclimation: Temperature, 21.1 ± 0.7°C; dissolved oxygen, 7.2 ± 0.8 mg/L; pH, 7.6 ± 0.4; conductivity, 335 ± 28 µmhos/cm; hardness, 120 mg/L as $CaCO_3$; and alkalinity, 85 mg/L as $CaCO_3$.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 300 ml high-form glass beakers
Test Volumes: 100 ml sediment layer; 175 ml test water.
Replicates/Treatment: 8
Organisms/Treatment: 80
Water Volume Changes: 2 water volumes per day
Aeration: None.
Feeding: Animals were fed 1.5 ml of TetraFin suspension (1.5 ml contains 6 mg dry solids) per beaker daily.
Effects Criteria: 1) survival after 10 days, and 2) average individual biomass (total biomass divided by the number of surviving midge) after 10 days. Death is defined as no visible movement or response to tactile stimulation. Missing organisms were considered to be dead.
Water Quality and Other Test Conditions: The temperature, dissolved oxygen, conductivity, pH, hardness, alkalinity, sulfide, and ammonia-nitrogen were measured in the overlying water of one replicate test container per treatment on days 0 and 10 of the test. Temperature and dissolved oxygen were measured daily in the overlying water of one replicate test container per treatment. Hardness and alkalinity were measured with titrimetric methods. Ammonia-N was measured using a Hach test kits based on the salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric method; samples were not distilled prior to analysis. The photoperiod was 16:8, L:D.

DATA ANALYSIS METHODS

Survival and individual biomass were calculated for each replicate as follows:

percent survival = 100 x (number surviving/initial number tested)
average individual biomass = (final wt. - tare wt.)/number weighed,
where:
final wt. = tare wt. + weight of organisms recovered on day 10, in mg

The mean and standard deviation for survival and average individual biomass were calculated for each treatment. The statistical software employed for these calculations was Microsoft EXCEL v.5.0

Values of survival and individual biomass for the test sediments were statistically compared against those for the reference sediment and the control sediment using ToxCalc v5.0.17. An arcsine square root transformation was performed on proportional data before analysis. Following transformation and determination of normality

and homogeneity of variances, one-tailed homoscedastic or heteroscedastic t-tests, or Wilcoxon Two-Sample tests, were conducted at the 0.05 level of significance.

PROTOCOL DEVIATIONS

1. The range of dilution water alkalinity (80 mg/L as $CaCO_3$) slightly exceeded the specified range of 60-70. This minor deviation is unlikely to have affected the test results.

REFERENCE TOXICANT TEST

The reference toxicant test is a standard multi-concentration toxicity test using potassium chloride, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-981
Reference Toxicant and Source: Potassium chloride (Mallinckrodt, Lot No. 68451).
Test Date: 12-8-98
Dilution Water Used: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Result: 96-hr LC50, 3.14 g/L. This result is within the laboratory's control chart warning limits (2.65 to 7.12 g/L).

TEST RESULTS

Water quality data are summarized in Table 1. A detailed tabulation of the water quality results by sample and test day can be found in Appendix II. The means and standard deviations of percent survival and growth (weight) of midges exposed for 10 days to sediments are summarized in Table 2. Detailed data organized by sample and replicate, and summary statistics for these observations, are given in Appendix II.

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Ammonia-N in the overlying water ranged from <0.5 mg/L (detection limit) to 0.5 mg/L. The test met acceptability criterion specified in the protocol with 96.3% mean control survival (70% required) and 1.46 mg average control weight (0.6 mg required). Survival of 87.5% and 78.8% in reference sediments HC-Ref-B (NAS#1857F) and HC-Ref-C (NAS#1858F), respectively, met the 65% survival criterion specified by the Dredged Material Evaluation Framework Guidance for the Lower Columbia River Management Area. The reference toxicant (positive control) result was within the laboratory's control chart limits (3.14 g/L; control chart mean ± 2 S.D. = 4.88 ± 2.24).

Survival in the control sediment was not significantly different from that in either reference sediment. Four test sediments showed significantly lower survival when compared to their appropriate reference sediments. Survival in samples HC-S-01 (52.5%; NAS #1859F), HC-S-04 (70.0%; NAS #1862F), HC-S-05 (68.8%; NAS #1863F), and HC-S-22 (66.2%, NAS #1872F) was significantly less than that in HC-Ref-B (87.5%).

Weights in the control sediment were not significantly different from those in either reference sediment. Eight test sediments had weights significantly less than that in their appropriate reference sediment. Average individual biomass in samples HC-S-01 (0.19 mg), HC-S-04 (0.37 mg), HC-S-05 (0.51 mg), HC-S-07 (0.59 mg; NAS #1864F), HC-S-11 (0.81 mg; NAS #1866F), and HC-S-16 (0.74 mg; NAS #1868F) was significantly less than that in HC-Ref-B (1.15 mg). Average individual biomass in samples HC-S-24 (0.96 mg; NAS #1873F) and HC-S-30 (0.95 mg; NAS #1869F) was significantly less than that in HC-Ref-C (1.37 mg).

POPA0008446

STUDY APPROVAL

Gerald Lissari 2-24-99
Project Manager Date

Gerald Lissari 2-24-99
Study Director Date

Richard S. Caldwell 2/25/99
Laboratory Director Date

Mike R. Fiore 2-12-99
Quality Assurance Unit Date

Table 1. Summary of water quality conditions during tests of the midge, *Chironomus tentans*, exposed to freshwater sediments.

Water Quality Parameter	Mean ± S.D.	Minimum	Maximum	N
Temperature (°C)	22.6 ± 0.3	22.1	23.3	143
Dissolved oxygen (mg/L)	5.3 ± 1.0	3.5	8.2	143
Conductivity (µmhos/cm)	337 ± 12	320	360	26
pH	7.4 ± 0.2	6.9	8.0	26
Hardness (mg/L as $CaCO_3$)	100 ± 7	80	110	26
Alkalinity (mg/L as $CaCO_3$)	80 ± 0	80	80	26
Total ammonia (mg/L)	—	< 0.5	0.5	26

Table 2. Survival and growth of *Chironomus tentans* exposed for 10 days to freshwater sediments. All comparisons were conducted at the 0.05 level of significance.

Sample Description	Reference Sediment for Comparison	Percent Survival (Mean ± SD)	Significant?	P	Average wt/midge (mg) [1] Mean ± SD	Significant?	P
HC-S-01 (NAS#1859F)	HC-Ref-B	52.5 ± 11.6	yes	0.00001	0.19 ± 0.07	yes	0.00002
HC-S-04 (NAS#1862F)	HC-Ref-B	70.0 ± 20.0	yes	0.03	0.37 ± 0.19	yes	0.00001
HC-S-05 (NAS#1863F)	HC-Ref-B	68.8 ± 22.3	yes	0.04	0.51 ± 0.11	yes	0.00002
HC-S-07 (NAS#1864F)	HC-Ref-B	75.0 ± 17.7	no	—	0.59 ± 0.21	yes	0.0003
HC-S-11 (NAS#1866F)	HC-Ref-B	73.8 ± 20.0	no	—	0.81 ± 0.22	yes	0.009
HC-S-16 (NAS#1868F)	HC-Ref-B	82.5 ± 13.9	no	—	0.74 ± 0.19	yes	0.002
HC-S-19 (NAS#1870F)	HC-Ref-C	87.5 ± 12.8	no	—	1.09 ± 0.23	no	—
HC-S-22 (NAS#1872F)	HC-Ref-B	66.3 ± 20.7	yes	0.007	1.02 ± 0.38	no	—
HC-S-24 (NAS#1873F)	HC-Ref-C	70.0 ± 17.7	no	—	0.96 ± 0.22	yes	0.08
HC-S-30 (NAS#1869F)	HC-Ref-C	91.4 ± 9.0	no	—	0.95 ± 0.16	yes	0.01
Control (NAS#2185F)	HC-Ref-B and -C	96.3 ± 5.2	no	—	1.46 ± 0.50	no	—
HC-Ref-B (NAS#1857F)	—	87.5 ± 8.9	—	—	1.15 ± 0.29	—	—
HC-Ref-C (NAS#1858F)	—	78.8 ± 12.5	—	—	1.37 ± 0.43	—	—

[1] Pupae were not included in the sample to estimate dry weight (as per EPA/600/R-94/024, p. 55, section 12.3.8.1)

POPA0008448

TEST PROTOCOL

FRESHWATER MIDGE, *CHIRONOMUS TENTANS*, 10-DAY SEDIMENT TOXICITY TEST

1. INTRODUCTION

1.1 Purpose of Study: The purpose of this study is to characterize the toxicity of freshwater sediments based on midge survival and growth using the midge, *Chironomus tentans*.

1.2 Referenced Method: This protocol is based on ASTM Method E 1706-95b (ASTM 1996) and EPA Method 100.2 (EPA/600/R-94/024).

1.3 Summary of Method: A summary of test conditions for the midge 10-day sediment toxicity test is tabulated below. The 10-day sediment toxicity test with Chironomus tentans is conducted at 23°C with a 16L:8D photoperiod at an illuminance of about 50-100 footcandles. Test chambers are 300-mL high-form lipless beakers containing 100 mL of sediment and 175 mL of overlying water. Ten third-instar midges are used in each replicate (all organisms must be third instar or younger and at least 50% of the larvae must be third instar). The number of replicates/treatment depends on the objective of the test. Eight replicates are recommended for routine testing. Midges in each test chamber are fed 1.5 mL of a 4 g/L fish food flakes suspension daily. Each chamber receives two volume additions per day of overlying water. Overlying water can be culture water, well water, surface water, site water, or reconstituted water. Test endpoints include survival and/or growth.

1. Test type	whole sediment toxicity test with renewal of overlying water
2. Test duration	10 days
3. Temperature	23 ± 1°C
4. Light quality	daylight flourescent light
5. Illuminance	50-100 footcandles
6. Photoperiod	16L:8D
7. Test chamber size	300-mL high-form lipless beakers (Pyrex® 1040 or equivalent)
8. Sediment volume	100 mL
9. Overlying water volume	175 mL
10. Renewal overlying water	2 volume additions/day (continuous or intermittent)
11. Age of test organisms	3rd instar or younger larvae (≥ 50% of organisms must be 3rd instar)
12. Organisms per test chamber	10
13. Replicates per treatment	8 recommended for routine (depends on design)
14. Organisms per treatment	80
15. Feeding regime	Fish food flakes, fed 1.5 mL daily/chamber (1.5 mL contains 6.0 mg of dry solids)
16. Aeration	None, unless DO falls below 40% saturation
17. Overlying (test) water	Culture water, well water, surface water, site water or reconstituted water
18. Water quality	Hardness, alkalinity, conductivity, pH, ammonia-N beginning and end; temperature and dissolved oxygen daily
19. Endpoints	Survival and growth (dry weight)
20. Test acceptability criteria	Minimum control survival of 70%; mean weight of surviving control organisms 0.6 mg
21. Sample holding	14 days at 4°C in the dark

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22. Sample volume required	1L (800 mL per sediment)
23. Reference toxicant	Concurrent testing required

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:

_____
_____
_____
_____

2.2 Sponsor's Study Monitor:

_____

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
3814 Yaquina Bay Road, P.O. Box 1437
Newport, OR 97365.

2.4 Test Location: _____

2.5 Laboratory's Personnel to be Assigned to the Study:
Study Director: _____
Quality Assurance Unit: _____
Aquatic Toxicologist: _____
Aquatic Toxicologist: _____

2.6 Proposed Testing Schedule: Tests are to begin within 14 days of sample collection. Reference toxicant test to be run concurrently.

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

3. TEST MATERIAL

The test materials are freshwater sediments. The control, reference, and test sediments are placed in solvent cleaned 1 L glass jars fitted with PTFE-lined screw caps. At the laboratory the samples are stored at 4°C in the dark. The original sealed containers may be stored for up to 14 days prior to testing. If jars are not full when received or if sediment is removed for testing, headspaces should be filled with nitrogen toretard deterioration. A negative control sediment is collected from a clean site. In addition, a reference sediment, a clean sediment with physical characteristics similar to the test sediments, may be employed as a comparison station.

4. TEST WATER

Test water (overlying water) at NAS is normally *C. tentans* culture water, which is moderately hard synthetic water at a hardness of 80-100 mg/L as $CaCO_3$ and alkalinity of 60-70 mg/L as $CaCO_3$. Dilution water is prepared from Milli-Q reagent grade water and reagent grade chemicals. Test water may also be well water, surface water or site water depending on the study design. Current research is being done by EPA on a new type of reconstituted water that may be used for this test in the future (STM 1996, EPA 1994).

5. TEST ORGANISMS

POPA0008451

5.1 Species: midge, *Chironomus tentans*.

5.2. Source: Cultured at NAS. Originally obtained from U.S. EPA Environmental Research Lab, Duluth, MN.

5.3 Age: Third instar or younger larvae (at least 50% of the larvae must be in the third instar at the start of the test). Third instar is normally 8.5 to 12.5 days after hatching; head capsule widths range from 0.33 to 0.45 mm.

5.4 Acclimation and Pretest Observation: Cultures are maintained at 23 ± 1°C under a 16:8 L:D photoperiod. The culture water is moderately hard synthetic water. Midge are fed finely ground Tetrafin flakes in suspension (10g Tetrafin in 100 mL Milli-Q water). Mortality during the 48-hr prior to testing should not be excessive.

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers used in the toxicity test are 300-mL high-form lipless glass beakers (Pyrex® 1040 or equivalent). Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or by placement in a temperature-controlled room. Aeration is not empolyed unless dissolved oxygen drops below 40% saturation. The test is conducted under an illuminance of 50-100 footcandles with a 16L:8D photoperiod.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA/600/4-90/027F. New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%, V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compounds (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: The test involves exposure of midge larvae to test, control, and reference sediments. The sediments are placed on the bottom of the test containers and are overlain with test water. The test exposure is for 10 days. The renewal of overlying water consists of two volume additions per day, either continuous or intermittent. Each treatment consists of eight replicate test containers, each containing 10 organisms. Test chamber positions are completely randomized. Test organisms are randomly distributed to the test chambers. Blind testing is normally used.

7.2 Setup of Test Containers: Sediments are homogenized and placed in test chambers on the day before addition of test organisms. Sediment (100 ml) is placed into each of eight replicate beakers. After addition of the sediment, 175 ml of test water is gently added to each beaker in a manner to prevent resuspension. The overlying water is replaced twice daily. The test begins when midges are introduced to the test chambers. Initial water quality measurements are taken prior to the addition of test organisms.

7.3 Effect Criterion: The acute effect criterion used in the midge bioassay is mortality, defined as the lack of movement of body or appendages on response to tactile stimulation. The optional chronic effect criterion is growth which is determined by using dry weight measurements.

7.4 Test Conditions: No aeration is employed unless dissoved oxygen falls below 40% saturation. The test temperature employed is 23°C (range of ± 1°C). A 16:8, L:D photoperiod is used. Illumination is supplied by daylight fluorescent lamps at 50-100 footcandles. The overlying water is replaced twice daily.

POPA0008452

7.5 Beginning the Test: The test is begun by adding the organisms to the equilibrated test containers as previously described. If the optional growth endpoint is to be used, three extra replicates of midge larvae should be counted out and randomly selected for drying to determine initial average weight data.

7.6 Feeding: Midge larvae are fed 1.5 mL daily per test chamber (1.5 mL contains 6.0 mg of dry solids). A feeding may be skipped if there is a build up of excess food. However, all beakers must be treated similarly.

7.7 Test Duration, Type and Frequency of Observations, and Methods: The duration of the acute toxicity test is 10 days. The type and frequency of observations to be made are summarized as follows:

TYPE OF OBSERVATION	TIMES OF OBSERVATION (ASTM 1996)
BIOLOGICAL DATA	
Survival, growth	Day 10
PHYSICAL AND CHEMICAL DATA	
Hardness, alkalinity, ammonia-N, conductivity, pH, dissolved oxygen, and temperature	Beginning and end of test in overlying water of one replicate beaker from each treatment.
Dissolved oxygen, temperature	Daily in overlying water of one replicate beaker from each treatment.

Dissolved oxygen is measured using a polarographic oxygen probe calibrated according to the manufacturer's recommendations. The pH is measured using a pH probe and a properly calibrated meter with scale divisions of 0.1 pH units. Temperature is measured with a calibrated mercury thermometer or telethermometer. Conductivity is measured with a conductivity meter. Hardness and alkalinity are measured using titrometric methods. Ammonia-nitrogen is measured using the salicylate colerimetric method (Clin. Chim. Acta 14:403, 1996).

7.8 Growth Measurement: Growth is measured as average dry weight of animals in a test replicate at the end of the test on day 10. Pooled animals from each test replicate are rinsed with deionized water, gently blotted and placed into tared aluminum weigh pans. The pans are dried at 60-90°C to constant weight. The dried organisms are placed into a dessicator and weighed as soon as possible to the nearest 0.01 mg (desirable to use 0.001 mg). The total weight of the dried midge in each pan is divided by the number of midge weighed to obtain an average dry weight per midge.

Criteria of Test Acceptance: The test results are acceptable if the minimum survival of organisms in the control treatment at the end of the test is at least 70% and the average weight of *C. tentans* in the surviving controls is at least 0.6 mg.

8. DATA ANALYSIS

The endpoints of the toxicity test are survival and growth. Survival is obtained as a direct count of living organisms in each test container at the end of the test. Average midge dry weight, also measured at the end of the test, may be used to compare growth between treatment sediments and the control or reference sediment. Ordinarily the following data analysis is performed. Due to special requirements, alternative methods may be used. The means and standard deviations are calculated for each treatment level. Identification of toxic sediments is established by statistical comparison of test endpoints between test and control or reference sediments. Between treatment comparisons may be made using a Student's t-test or Wilcoxon's Two-Sample test, where each treatment is compared to the control or the reference sediment. An arcsine-square root transformation of proportional data, and tests for normality and heterogeneity of variances, are performed prior to statistical comparisons.

9. REPORTING

POPA0008453

The final report of the test results must include all of the following standard information at a minimum: name and identification of the test; the investigator and laboratory; date and time of test beginning and end; information on the test material; information on the source and quality of the overlying/test water; detailed information about the test organisms including acclimation conditions; a description of the experimental design and test chambers and other test conditions including feeding, if any, and water quality; definition of the effect criteria and other observations; responses, if any, in the control treatment; tabulation and statistical analysis of measured responses and a summary table of endpoints; a description of the statistical methods used; any unusual information about the test or deviations from procedures; reference toxicant testing information.

10. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change, the date the change took effect and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

11. REFERENCE TOXICANT

The reference toxicant test is a standard multi-concentration toxicity test using a specified chemical toxicant to evaluate the performance of test organisms used in the study. Reference toxicant tests are 96-hour, water only exposures, not 10-day sediment exposures. The reference toxicant test is run concurrently. Performance is evaluated by comparing the results of the reference toxicant test with historical results (e.g., control charts) obtained at the laboratory.

12. REFERENCED GUIDELINES

ASTM. 1996. Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates. ASTM Standard Method No. E 1706-95b. Am. Soc. Test. Mat., Philadelphia, PA.

U.S. EPA. 1994. Section 12, Test Method 100.2, Chironomus tentans 10-d Survival and Gowth Test for Sediments, pp. 51-63. In: Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-94/024.

Weber, C.I. (Ed.) 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fourth Edition). EPA/600/4-90/027F.

13. APPROVALS

_____ for _____
Name Date

_____ for Northwestern Aquatic Sciences
Name Date

POPA0008454

APPENDIX II

RAW DATA

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4b

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST approved Page 1-39

Test No. 592-4 Client HART CROWSER Investigator GJI

STUDY MANAGEMENT

Client: HART CROWSER, INC, 5 CENTER POINTE DR, SUITE 240, LAKE OSWEGO, OR 97035

Client's Study Monitor: TAKU FUJI

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: NEWPORT LABORATORY

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.J. IRISSARRI GJI

QA Officer L.K. NEMETH

1. [illegible] GJI 2. Erin Coffey EC

3. Sue DeTar SD 4. M.S. Redmond MSR

5. _____ 6. _____

Study Schedule:

Test Beginning: 12-8-98 1030 Test Ending: 12-15-98 0930

TEST MATERIAL

General description (see sample logbook/chain-of-custody for details):

NAS Sample No.:	1859F	1862F	1863F	1864F	1866F
Description:	HC-S-01	HC-S-04	HC-S-05	HC-S-07	HC-S-11
Collection Date:	10-13-98	10-13-98	10-13-98	10-13-98	10-14-98
Receipt Date:	10-17-98	10-17-98	10-17-98	10-17-98	10-17-98

NAS Sample No.:	1868F	1870F	1872F	1873F	1869F
Description:	HC-S-16	HC-S-19	HC-S-22	HC-S-24	HC-S-30
Collection Date:	10-14-98	10-15-98	10-14-98	10-14-98	10-15-98
Receipt Date:	10-17-98	10-17-98	10-17-98	10-17-98	10-17-98

NAS Sample No.:	1857F	1858F	2185F		
Description:	HC-REF B	HC-REF C	CONTROL		
Collection Date:	10-15-98	10-15-98	12-3-98		
Receipt Date:	10-17-98	10-17-98	12-3-98		

NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					

NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					

NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					

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NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4b

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator _____

MISCELLANEOUS NOTES

Head Capsule Measurements of Animals Used in Test: 0.35, 0.40, 0.35, 0.35, 0.30, 0.40, 0.30, 0.30, 0.35, 0.35 mm

Other: Control sediment was collected from Beaver Creek, Oregon on 12-3-98, and rinsed 3 times with dechlorinated tap water and one time with moderately hard synthetic water through a 1.0 mm mesh.

ROOM #1

Randomization chart:

TOP SHELF

1	5	10	15	20	25	30	35	40	45	50
2	4	9	14	19	24	29	34	39	44	49
3	3	8	13	18	23	28	33	38	43	48
4	2	7	12	17	22	27	32	37	42	47
5	1	6	11	16	21	26	31	36	41	46

Randomization chart:

TOP SHELF

1	55	60	65	70	75	80	85	90	95	100
2	54	59	64	69	74	79	84	89	94	99
3	53	58	63	68	73	78	83	88	93	98
4	52	57	62	67	72	77	82	87	92	97
5	51	56	61	66	71	76	81	86	91	96

Randomization chart:

TOP SHELF

1										
2	104									
3	103									
4	102									
5	101									

Randomization chart:

1										
2										
3										
4										
5										

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator _____

TEST WATER

Source: MODERATELY HARD SYNTHETIC Date of Preparation: 12-3-98

pH 7.3 Cond (umhos/cm) 250 Hard (mg/L) 90 Alk (mg/L) 80

Treatments: AERATED ≥ 24 HRS

If more than one batch of test water is used, attach water prep benchsheets and mark appropriate batches.

TEST ORGANISMS

Species: Chironomus tentans, midge Age: 3RD INSTAR Size: _____

Source: NAS CULTURES

Acclimation Data:

Date	Temp (°C)	DO (mg/L)	pH	Cond umh/cm	Hard (mg/L)	Alk (mg/L)	Comments
11-25-98	22.0	6.4	7.5	320	—	—	
11-27-98	20.1	7.1	7.2	340	—	—	
11-30-98	21.5	7.0	7.5	320	120	90	
12-2-98	21.7	5.0	8.1	320	—	—	
12-4-98	20.5	6.2	8.0	320	—	—	
12-7-98	20.8	8.2	7.2	390	120	80	
Mean	21.1	7.2	7.6	335	120	85	
S.D.	0.7	0.8	0.4	28	—	—	
(N)	6	6	6	6	2	2	

TEST PROCEDURES AND CONDITIONS

Test chambers: 300 mL high-form lipless glass beakers

Test volumes: 100 mL of test sediment; 175 mL of test water

Replicates/treatment: (8) 8 Organisms/replicate: (10) 10

Test water: Moderately hard synthetic water

Daily test water changes: two volumes/day

Aeration: None, unless DO falls below 40% saturation

Photoperiod: 16:8, L:D

Temperature: 23 ± 1°C

Feeding: fed 1.5 mL of Tetrafin (1.5 mL contains 6mg dry solids) suspension per beaker daily

Beaker placement: Total randomization

Water Quality Measurements:

Daily: temperature and dissolved oxygen; 1 repl./treatment

Beg. & End: Conductivity, hardness, alkalinity, pH, ammonia-nitrogen, temperature & dissolved oxygen; 1 repl./treatment

TEST SCHEDULE SUMMARY

Date	12-8-98	12-9-98	12-10-98	12-11-98	12-12-98	12-13-98	12-14-98	12-15-98	12-16-98	12-17-98	12-18-98
Day	0	1	2	3	4	5	6	7	8	9	10
Feed	X	X	X	X	X	X	X	X	X	X	X
Record WQ	X	X	X	X	X	X	X	X	X	X	X
Initials	[illegible]										

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NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4b

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator

SEDIMENT DESCRIPTIONS--SUPPLEMENTAL NOTES

Sample No.	Description
1859F	DARK BROWN - silt
1862F	Dark Green - Grey Fine
1863F	Dark Green - Grey Fine
1864F	DARK GEEN/GRAY, FINE
1866F	BOWN - GREEN - SILT, mud
1868F	BROWN/Green - Grey, FINE
1870F	DARK GREEN/GRAY, SAND, LARGE ROCKS, SONE PLANT DERRIS
1972F	BOWN - silt - ONE DEAD CLAM
1873F	DARK GEEN/GRAY, FINE
1869F	Brown - Green - Grey - FINE w/ sand
1857F	BROWN - GREEN - SILT
1858F	Brown sand
2195	GREEN/GRAY, SAND

The above information was copied from sediment description page for test 592-3, which was run concurrently with the same test sediments.
MJR 1-29-99

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CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator

DAILY RECORD SHEET

Day Ø (12/8/98) Initials: GJI/ [illegible]

Beaker No.	Temp. (°C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.7	6.8	340	7.4	110	80		YES	WATER CHANGED
14	22.7	6.8	330	7.3	110	80			AT 0600 [illegible]
19	22.6	6.7	330	7.3	110	80	[illegible]		
37	22.7	6.2	340	7.2	110	80	[illegible]		
47	22.7	6.9	320	7.5	100	80	[illegible]		
53	22.8	6.9	330	7.4	110	80	[illegible]		
54	22.8	6.8	330	7.4	100	80			
58	22.8	6.6	330	7.4	100	80			
67	23.0	7.6	320	7.6	100	80			
68	23.0	6.9	330	7.4	100	80			
90	22.9	8.2	320	8.0	100	80			
93	23.0	6.8	320	7.4	100	80			
96	23.2	7.1	320	7.4	100	80			

Day 1 (12/9/98) Initials: GB/[illegible]

Beaker No.	Temp. (°C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.3	6.2						yes	water d'ed @ 0520 GB
14	22.4	6.2							
19	22.3	6.4							
37	22.4	5.6							
47	22.4	6.0							WATER CHANGED 1600
53	22.6	6.0							
54	22.6	6.4							
58	22.7	6.2							
67	22.6	6.2							
68	22.6	6.0							
90	22.7	6.2							
93	22.7	6.2							
96	22.8	6.1							

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4D

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator _____

DAILY RECORD SHEET

Day 7 (12/10/98) Initials: KB/GJ

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.8	6.2						Y	WATER ADDED @ 0515 KB
14	22.8	6.0							
19	22.8	6.1							WATER CHANGED 1650 GJ
37	22.8	6.0							
47	22.9	6.1							
53	23.0	5.8							
54	23.0	5.7							
58	23.0	6.0							
67	23.2	6.2							
68	23.2	5.9							
90	23.2	6.8							
93	23.3	6.2							
96	23.3	5.8							

Day 3 (12/11/98) Initials: KB/GJ

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.1	5.8						Y	WATER ADDED @ 0515 KB
14	22.1	6.0							
19	22.1	5.8							
37	22.2	5.7							WATER CHANGED 1645 GJ
47	22.2	5.8							
53	22.3	5.8							
54	22.3	5.6							
58	22.3	6.0							
67	22.4	5.6							
68	22.4	5.6							
90	22.4	5.0							
93	22.5	6.0							
96	22.6	5.8							

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-[illegible]

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator

DAILY RECORD SHEET

Day 0 (12/12/97) Initials: GT/GJL

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.4	5.2						Yes	water side 0530 GJL
14	22.4	5.0							
19	22.5	5.1							WATER CHANGED 1700 GJL
37	22.5	4.7							
47	22.5	4.4							
53	22.6	5.0							
54	22.6	4.6							
58	22.5	5.2							
67	22.7	4.6							
68	22.6	4.8							
90	22.6	5.2							
93	22.6	5.0							
96	22.7	5.3							

Day 1 (12/13/97) Initials GT/GJL

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.5	4.3						Yes	water side 0500 GJL
14	22.5	4.4							
19	22.5	4.6							
37	22.5	5.0							WATER CHANGED 1700 GJL
47	22.4	4.6							
53	22.5	4.7							
54	22.5	4.6							
58	22.5	4.8							
67	22.5	3.7							
68	22.5	4.4							
90	22.5	3.5							
93	22.5	5.6							
96	22.5	5.1							

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NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4b

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator

DAILY RECORD SHEET

Day 6 (12/14/98) Initials: GJ2/L

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.3	5.5						YES	WATER CHANGED 0510 GJ2
14	22.3	5.5							" " 1630 L
19	22.3	5.5							
37	22.3	5.2							
47	22.4	5.4							
53	22.4	5.4							
54	22.4	5.5							
58	22.4	6.2							
67	22.5	5.5							
68	22.5	5.2							
90	22.5	4.5							
93	22.6	5.6							
96	22.7	5.2							

Day 7 (12/15/98) Initials: GJ1/L

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.2	4.5						YES	WATER CHANGED 0500 GJ2
14	22.3	4.8							" " 1600 L
19	22.4	4.8							
37	22.4	4.8							
47	22.4	4.8							
53	22.5	4.8							
54	22.5	4.8							
58	22.5	5.6							
67	22.6	5.0							
68	22.6	4.5							
90	22.6	4.5							
93	22.7	5.2							
96	22.8	4.6							

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-CT4b

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator

DAILY RECORD SHEET

Day 8 (12/16/98) Initials: GJT

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.5	3.8						YES	WATER CHANGED 0500 GJT
14	22.5	3.8							water changed 1700 MLR
19	22.5	3.6							
37	22.6	3.8							
47	22.6	3.7							
53	22.6	3.8							
54	22.6	4.1							
58	22.6	4.4							
67	22.7	3.8							
68	22.7	3.8							
90	22.7	4.1							
93	22.7	3.6							
96	22.9	3.8							

Day 9 (12/17/98) Initials: GJT/

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.2	4.2						YES	WATER CHANGED 0510 GJT
14	22.3	4.1							" " 1600 MLR
19	22.3	4.1							
37	22.4	4.2							
47	22.4	4.0							
53	22.5	4.1							
54	22.5	3.9							
58	22.5	4.3							
67	22.6	4.0							
68	22.6	3.9							
90	22.5	4.0							
93	22.7	4.3							
96	22.8	4.0							

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NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-XXX-CT4b

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator _____

DAILY RECORD SHEET

Day 10 (12/18/98) Initials: BSL/lc

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12	22.1	6.0	340	6.9	80	80			WATER CHANGED 0510 6.5L
14	22.1	5.6	340	7.1	100	80			
19	22.1	5.5	340	7.1	100	80			
37	22.1	5.6	350	7.2	100	80			
47	22.1	6.0	350	7.3	100	80			
53	22.3	5.7	350	7.3	100	80			
54	22.3	5.7	340	7.3	100	80			
58	22.3	5.9	340	7.4	100	80			
67	22.5	6.2	350	7.4	100	80			
68	22.5	5.6	350	7.4	80	80			
90	22.4	6.2	340	7.6	100	80			
93	22.5	5.7	350	7.4	100	80			
96	22.7	5.7	350	7.5	100	80			

Day ____ (/ /) Initials:

Beaker No.	Temp. (C)	DO (ppm)	Cond. (umh)	pH	Hard. mg/L	Alk. mg/L	NH3N mg/L	FED	Comments
12									
14									
19									
37									
47									
53									
54									
58									
67									
68									
90									
93									
96									

POPA0008465

NORTHWESTERN AQUATIC SCIENCES — PROTOCOL NO. NAS-xxx

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator _____

DAY 10 TEST TERMINATION SHEET

Beaker No.	Number of survivors	Init.
1	8	MSR
2	5	SB
3	8	SB
4	9	MSR
5	8	SB
6	10	SB
7	8	SB
8	7	MSR
9	9	SB
10	8	MSR
11	9	MSR
12	5	MSR
13	8	SB
14	9	MSR
15	7	SB
16	9	SB
17	8	SB
18	8	SB
19	6	SB
20	9	SB
21	8	MSR
22	10	SB
23	4	SB
24	9	SB
25	9	MSR
26	4	SB
27	4	MSR
28	9	RSK
29	6	SB
30	5	RSK
31	5	MSR
32	6	SB
33	5	RSK
34	8	SB
35	6	MSR
36	3	SB
37	7	SKN
38	5	SB
* 39		
40	7	MSR
41	10	SK
42	5	SB
43	2	MSR
44	9	RSK
45	15	SB

* Accidentally discarded

Beaker No.	Number of survivors	Init.
46	13	MSR ole very small
47	7	SB
48	10	SB
49	11	RSK
50	8	SB
51	9	SB
52	9	RSK
53	6	RSK
54	8	SB
55	8	SB
56	11	MSR
57	6	SKN
58	5	SB
59	5	SKN
60	5	MSR
61	4	SB
62	10	RSK
63	8	MSR
64	10	RSK
65	7	RSK
66	7	MSR
67	7	RSK
68	7+1 pupa	MSR
69	10	RSK
70	8	MSR
71	8	RSK
72	7+1 pupa	MSR
73	10	RSK
74	8	RSK
75	7	RSK
76	10	RSK
77	8	RSK
78	9	RSK
79	5	RSK
80	7	RSK
81	7	SB
82	10	SB
83	8	RSK
84	5	RSK
85	5	SB
86	6	SB
87	10	SB
88	8	SB
89	10	SB
90	10	RSK

POPA0008466

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-ALA-CHAD

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator _____

DAY 10 TEST TERMINATION SHEET

Beaker No.	Number of survivors	Init.
91	7	NC
92	10	
93	7	
94	9	
95	8	
96	6	
97	8	
98	10	
99	6	
100	10	
101	8	
102	9	
103	8	
104	10	RC.

Beaker No.	Number of survivors	Init.

POPA0008467

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No 592-4 Client Hart Crowser Investigator _____

ZERO-TIME WEIGHING DATA SHEET

Tare: Date 12-7-98 Oven temp(|C) 59 Drying time(hr) 24H Init. JMF
Final: Date 12-10-98 Oven temp(|C) 61 Drying time(hr) 24H Init. JMF
Equip. Used: Oven Blue-M Balance Sartorius

Dry at 60|C to constant weight (~2 hrs); weigh to nearest 0.01 mg.

Repl. #	Pan #	Tare (mg)	Final Wt. (mg) 1	2	3	# weighed	comments
	1	29.90	31.67	31.67		10	0.18
	2	32.45	34.29	34.30		10	0.18
	3	26.46	26.53	26.53		10	0.21
							$\bar{x}$ = 0.19

Remarks:

Balance Calibration:

JMF 12-7-98 100 mg std wt = 100.02 mg
JMF 12-10-98 100 mg std wt = 100.01 mg
JMF 12-11-98 100 mg std wt = 100.02 mg

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4D

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator _____

WEIGHING DATA SHEET

Tare: Date 12.19.96 Oven temp(|C) 60 Drying time(hr) 24 Init. JNF

Final: Date _____ Oven temp(|C) 61 Drying time(hr) _____ Init. JNF

Equip. Used: Oven BLUE M Balance Sartorius

Dry at 60|C to constant weight (~2 hrs); weigh to nearest 0.01 mg.

Beaker #	Pan #	Tare (mg)	Final Wt. (mg) 1	2	3	# weighed	comments
	1	40.72	47.52	47.49		8	
	2	41.21	42.51	42.50		5	
	3	43.44	48.44	48.41		8	
	4	43.20	50.60	50.58		9	
	5	44.07	45.81	45.80		8	
	6	41.43	50.79	50.76		10	
	7	43.38	48.88	48.85		8	
	8	41.37	46.44	48.41		7	
	9	39.67	47.21	47.17		9	
	10	42.42	47.57	47.55		8	
	11	41.78	48.88	48.85		9	
	12	41.87	44.58	44.57		5	
	13	41.49	47.10	47.05		8	
	14	41.84	46.82	46.78		9	
	15	42.88	47.34	47.31		7	
	16	38.06	44.68	44.64		9	
	17	46.83	48.62	48.57		8	
	18	37.88	43.60	43.55		8	
	19	44.07	48.02	47.96		6	
	20	39.93	47.84	47.78		9	
	21	40.25	48.01	47.98		8	
	22	41.93	49.78	49.76		10	
	23	41.33	42.64	42.63		4	
	24	39.46	50.29	50.29		9	
	25	42.69	43.93	43.92		9	
	26	41.35	41.89	41.88		4	
	27	37.02	37.66	37.64		4	
	28	39.60	47.35	47.33		9	
	29	38.19	41.25	41.23		6	
	30	40.18	41.16	41.15		5	
	31	40.70	43.29	43.26		5	
	32	43.06	44.31	44.30		5	
	33	39.85	41.11	41.10		5	
	34	43.72	51.72	51.68		8	
	35	41.66	52.70	52.67		10	

Remarks:

Balance Calibration:

12-23 JNF 100 mg Std wt = 100.03

12-21 98 JNF 100 mg std wt = 100.02

12-22 98 JNF 100 mg std wt = 100.02

POPA0008469

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4b

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator _____

WEIGHING DATA SHEET

Tare: Date 12-17-98 Oven temp(|C) 60 Drying time(hr) 24 Init. JMF

Final: Date 12-21-98 Oven temp(|C) 61 Drying time(hr) _____ Init. JMF

Equip. Used: Oven Blue M Balance Sartorius

Dry at 60|C to constant weight (~2 hrs); weigh to nearest 0.01 mg.

Beaker #	Pan #	Tare (mg)	Final Wt. (mg) 1	2	3	# weighed	comments
	36	44.77	47.69	47.67		3	
	37	46.22	52.51	52.46		7	
	38	45.51	49.47	49.45		5	
	39	40.60	—	—	—	0	
	40	46.01	54.66	54.64		7	
	41	41.29	46.91	46.85		10	
	42	40.10	43.07	43.06		5	
	43	39.97	51.89	51.85		12	
	44	42.05	48.54	48.51		9	
	45	45.15	56.16	56.12		15	
	46	45.99	53.23	53.18		13	
	47	41.95	52.00	51.93		7	
	48	42.52	53.70	53.67		10	
	49	40.96	47.17	47.15		10	
	50	40.06	44.25	44.23		8	
	51	42.85	48.43	48.41		9	
	52	40.57	59.86	59.86		9	
	53	37.94	44.71	44.69		5	
	54	42.24	51.17	51.15		8	
	55	35.10	43.66	43.64		8	
	56	50.92	62.33	63.32		11	
	57	40.94	46.27	46.26		6	
	58	40.81	41.42	41.41		5	
	59	39.82	40.50	40.50		5	
	60	40.38	41.87	41.87		5	
	61	45.27	49.71	49.70		4	
	62	42.36	55.14	55.12		10	
	63	46.40	56.13	56.12		8	
	64	47.06	55.82	55.81		10	
	65	41.48	50.83	50.81		7	
	66	39.29	42.13	42.13		7	
	67	37.57	50.22	50.21		7	
	68	42.65	52.19	52.18		7	
	69	38.33	48.48	48.46		10	
	70	41.75	49.50	49.96		8	

Remarks:

Balance Calibration:

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-CT4b

CHIRONOMUS TENTANS 10-DAY SOLID PHASE SEDIMENT TEST

Test No. 592-4 Client HART CROWSER Investigator _____

WEIGHING DATA SHEET

Tare: Date 12.17.98 Oven temp(|C) 60 Drying time(hr) 24 Init. JMF

Final: Date 12-21-98 Oven temp(|C) 61 Drying time(hr) _____ Init. JMF

Equip. Used: Oven Blue M Balance Sartorius

Dry at 60|C to constant weight (~2 hrs); weigh to nearest 0.01 mg.

Beaker #	Pan #	Tare (mg)	Final Wt. (mg) 1	2	3	# weighed	comments
	71	38.46	44.61	44.59		8	
	72	39.57	49.79	49.75		7	
	73	42.25	56.00	55.96		10	
	74	42.01	45.13	45.11		8	
	75	40.42	45.05	45.02		7	
	76	43.62	50.66	50.64		10	
	77	42.74	52.04	52.02		9	
	78	40.55	52.20	52.16		9	
	79	47.55	48.19	48.17		5	
	80	42.58	53.85	53.82		7	
	81	39.11	46.09	46.07		7	
	82	41.38	46.51	46.50		10	
	83	43.86	49.76	49.73		8	
	84	41.60	44.30	44.26		5	
	85	43.99	45.30	45.27		5	
	86	40.47	46.30	46.27		6	
	87	40.08	48.99	48.94		10	
	88	42.74	54.96	54.89		8	
	89	45.81	54.43	54.42		10	
	90	43.38	60.39	60.34		10	
	91	44.44	47.12	47.11		7	
	92	39.05	51.96	51.95		10	
	93	39.97	44.10	44.08		7	
	94	44.00	63.74	63.71		9	
	95	41.96	47.97	47.96		8	
	96	41.86	43.63	43.62		6	
	97	40.05	50.59	50.57		8	
	98	42.65	54.98	54.97		10	
	99	42.98	50.03	50.01		10	
	100	41.90	51.54	51.53		10	
	101	42.85	50.65	50.63		8	
	102	40.24	50.33	50.31		9	
	103	42.40	57.00	56.99		8	
	104	40.61	53.96	53.95		10	

Remarks:

Balance Calibration:

BKL 1/15/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 592-4 Hart Crowser - Day 4
12/8/98 - Overlying water

	BKL Sample description	BKL	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	12		1.0													QC Stds - NH_3 (mg/L)					
2	14			1.0												Nominal			Measured		
3	19				1.0												10			10.0	
4	37					1.0											3			2.5	
5	47						1.0										1			0.5	
6	53							1.0													
7	54								1.0												
8	58									1.0											
9	67										1.0										
10	68											1.0									
11	90												1.0								
12	93													1.0							
13	96														1.0						
14																					
15																					
16																					
17																					
18																					
	~~Seawater~~ DI water	5.0	4.0																		
	Measured concentration (mg/L)	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	.1	<.1	<.1	<.1	<.1	<.1						
	x multiplier	1.0	5.0																		
	Final concentration (mg/L)	<.1	<.5	<.5	<.5	<.5	<.5	<.5	<.5	~~<.5~~ .5	<.5	<.5	<.5	<.5	<.5						

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

-17-

POPA0008472

Am

Rge 1/15/99

ANALYSIS BENCHSHEET - AMMONIA-N

Description of analytical group: 592-4 Hart Crowser - Day 10
12-18-98 - Overlying Water

	Sample description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	12		1.0													Qestals - NH3 (mg/L)					
2	14			1.0												Nominal			Measured		
3	19				1.0												10			10.0	
4	37					1.0											3			2.5	
5	47						1.0										1			0.5	
6	53							1.0													
7	54								1.0												
8	58									1.0											
9	67										1.0										
10	68											1.0									
11	90												1.0								
12	93													1.0							
13	96														1.0						
14																					
15																					
16																					
17																					
18																					
	Seawater DI water	5.0	4.0	→											→						
	Measured concentration (mg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1						
	x multiplier	1.0	5.0	→											→						
	Final concentration (mg/L)	<0.1	<0.5	→											→						

Add sufficient seawater to make 5 ml. Then add one salicylate followed by one cyanuarate reagent packet contents with mixing.

-18-

POPA0008473

BEI SH.XLS

BKR	NAS SMPL	CLIENT DESCRIP	REPL
* 58	1859F	HC-S-01	1
33	1859F	HC-S-01	2
79	1859F	HC-S-01	3
59	1859F	HC-S-01	4
5	1859F	HC-S-01	5
32	1859F	HC-S-01	6
26	1859F	HC-S-01	7
60	1859F	HC-S-01	8
* 96	1862F	HC-S-04	1
66	1862F	HC-S-04	2
49	1862F	HC-S-04	3
85	1862F	HC-S-04	4
74	1862F	HC-S-04	5
75	1862F	HC-S-04	6
25	1862F	HC-S-04	7
27	1862F	HC-S-04	8
* 93	1863F	HC-S-05	1
46	1863F	HC-S-05	2
82	1863F	HC-S-05	3
50	1863F	HC-S-05	4
42	1863F	HC-S-05	5
84	1863F	HC-S-05	6
31	1863F	HC-S-05	7
2	1863F	HC-S-05	8
* 19	1864F	HC-S-07	1
44	1864F	HC-S-07	2
91	1864F	HC-S-07	3
51	1864F	HC-S-07	4
30	1864F	HC-S-07	5
57	1864F	HC-S-07	6
41	1864F	HC-S-07	7
55	1864F	HC-S-07	8
* 12	1866F	HC-S-11	1
99	1866F	HC-S-11	2
38	1866F	HC-S-11	3
48	1866F	HC-S-11	4
15	1866F	HC-S-11	5
95	1866F	HC-S-11	6
71	1866F	HC-S-11	7
76	1866F	HC-S-11	8
* 14	1868F	HC-S-16	1
83	1868F	HC-S-16	2
3	1868F	HC-S-16	3
100	1868F	HC-S-16	4
29	1868F	HC-S-16	5
81	1868F	HC-S-16	6
87	1868F	HC-S-16	7
10	1868F	HC-S-16	8
* 47	1870F	HC-S-19	1
8	1870F	HC-S-19	2
1	1870F	HC-S-19	3
16	1870F	HC-S-19	4
77	1870F	HC-S-19	5

Randomization Key

	NAS	CLIENT	
BKR	SMPL	DESCRIP	REPL
69	1870F	HC-S-19	6
104	1870F	HC-S-19	7
98	1870F	HC-S-19	8
* 37	1872F	HC-S-22	1
40	1872F	HC-S-22	2
34	1872F	HC-S-22	3
11	1872F	HC-S-22	4
23	1872F	HC-S-22	5
36	1872F	HC-S-22	6
80	1872F	HC-S-22	7
97	1872F	HC-S-22	8
* 53	1873F	HC-S-24	1
61	1873F	HC-S-24	2
86	1873F	HC-S-24	3
7	1873F	HC-S-24	4
70	1873F	HC-S-24	5
13	1873F	HC-S-24	6
101	1873F	HC-S-24	7
28	1873F	HC-S-24	8
* 54	1869F	HC-S-30	1
22	1869F	HC-S-30	2
9	1869F	HC-S-30	3
89	1869F	HC-S-30	4
39	1869F	HC-S-30	5
24	1869F	HC-S-30	6
21	1869F	HC-S-30	7
64	1869F	HC-S-30	8
* 68	1857F	Ref B	1
45	1857F	Ref B	2
88	1857F	Ref B	3
92	1857F	Ref B	4
102	1857F	Ref B	5
63	1857F	Ref B	6
78	1857F	Ref B	7
18	1857F	Ref B	8
* 67	1858F	Ref C	1
65	1858F	Ref C	2
17	1858F	Ref C	3
103	1858F	Ref C	4
35	1858F	Ref C	5
6	1858F	Ref C	6
4	1858F	Ref C	7
72	1858F	Ref C	8
* 90	2185F	Control	1
62	2185F	Control	2
52	2185F	Control	3
73	2185F	Control	4
94	2185F	Control	5
20	2185F	Control	6
56	2185F	Control	7
43	2185F	Control	8

HC-Ref B 2-2-99
HC-Ref C 2-2-99

* WATER QUALITY BEAKERS

INDE	BKR	NAS SMPL	CLIENT DESCRIP	REPL	INIT	SURV	MORT	PSURV	PMORT	TARE WT (mg)	WT COUNT	FINAL WT (mg)	TWT (mg)	WT (mg)		SURV	MORT	PSURV	PMORT	WT
70	13	1873F	HC-S-24	6	10	8	2	80.0	20.0	41.49	8	47.05	5.56	0.69						
71	101	1873F	HC-S-24	7	10	8	2	80.0	20.0	42.85	8	50.63	7.78	0.97						
72	28	1873F	HC-S-24	8	10	9	1	90.0	10.0	39.60	9	47.33	7.73	0.86						
73	54	1869F	HC-S-30	1	10	8	2	80.0	20.0	42.24	8	51.15	8.91	1.11						
74	22	1869F	HC-S-30	2	10	10	0	100.0	0.0	41.93	10	49.76	7.83	0.78	Mean	9.1	0.9	91.4	8.6	0.95
75	9	1869F	HC-S-30	3	10	9	1	90.0	10.0	39.67	9	47.17	7.50	0.83	SD	0.9	0.9	9.0	9.0	0.16
76	89	1869F	HC-S-30	4	10	10	0	100.0	0.0	45.81	10	54.42	8.61	0.86	n	7	7	7	7	7
77	39	1869F	HC-S-30	5	10															
78	24	1869F	HC-S-30	6	10	9	1	90.0	10.0	39.46	9	50.29	10.83	1.20						
79	21	1869F	HC-S-30	7	10	8	2	80.0	20.0	40.25	8	47.98	7.73	0.97						
80	64	1869F	HC-S-30	8	10	10	0	100.0	0.0	47.06	10	55.81	8.75	0.88						
81	68	1857F	Ref B	1	10	8	2	80.0	20.0	42.65	7	52.18	9.53	1.36						
82	45	1857F	Ref B	2	15	15	0	100.0	0.0	45.15	15	56.12	10.97	0.73	Mean	9.4	1.3	87.5	12.5	1.15
83	88	1857F	Ref B	3	10	8	2	80.0	20.0	42.74	8	54.89	12.15	1.52	SD	2.4	0.9	8.9	8.9	0.29
84	92	1857F	Ref B	4	10	10	0	100.0	0.0	39.05	10	51.95	12.90	1.29	n	8	8	8	8	8
85	102	1857F	Ref B	5	10	9	1	90.0	10.0	40.24	9	50.31	10.07	1.12						
86	63	1857F	Ref B	6	10	8	2	80.0	20.0	46.40	8	56.12	9.72	1.22						
87	78	1857F	Ref B	7	10	9	1	90.0	10.0	40.55	9	52.16	11.61	1.29						
88	18	1857F	Ref B	8	10	8	2	80.0	20.0	37.88	8	43.55	5.67	0.71						
89	67	1858F	Ref C	1	10	7	3	70.0	30.0	37.57	7	50.21	12.64	1.81						
90	65	1858F	Ref C	2	10	7	3	70.0	30.0	41.48	7	50.81	9.33	1.33	Mean	7.9	2.1	78.8	21.3	1.37
91	17	1858F	Ref C	3	10	8	2	80.0	20.0	40.83	8	48.57	7.74	0.97	SD	1.2	1.2	12.5	12.5	0.43
92	103	1858F	Ref C	4	10	8	2	80.0	20.0	42.40	8	56.99	14.59	1.82	n	8	8	8	8	8
93	35	1858F	RefC	5	10	6	4	60.0	40.0	41.66	6	52.67	11.01	1.84						
94	6	1858F	RefC	6	10	10	0	100.0	0.0	41.43	10	50.76	9.33	0.93						
95	4	1858F	RefC	7	10	9	1	90.0	10.0	43.20	9	50.58	7.38	0.82						
96	72	1858F	RefC	8	10	8	2	80.0	20.0	39.57	7	49.75	10.18	1.45						
97	90	2185F	Control	1	10	10	0	100.0	0.0	43.38	10	60.34	16.96	1.70						
98	62	2185F	Control	2	10	10	0	100.0	0.0	42.38	10	55.12	12.74	1.27	Mean	10.0	0.4	96.3	3.8	1.46
99	52	2185F	Control	3	10	9	1	90.0	10.0	40.57	9	59.86	19.29	2.14	SD	1.1	0.5	5.2	5.2	0.50
100	73	2185F	Control	4	10	10	0	100.0	0.0	42.25	10	55.96	13.71	1.37	n	8	8	8	8	8
101	94	2185F	Control	5	10	9	1	90.0	10.0	44.00	9	63.71	19.71	2.19						
102	20	2185F	Control	6	10	9	1	90.0	10.0	39.93	9	47.78	7.85	0.87						
103	56	2185F	Control	7	11	11	0	100.0	0.0	50.92	11	63.32	12.40	1.13						
104	43	2185F	Control	8	12	12	0	100.0	0.0	39.97	12	51.85	11.88	0.99						

POPA0008476

Freshwater Sediment 10-day survival

Start Date:	12/8/98 10:30	Test ID:	592-4	Sample ID:	
End Date:	12/18/98 09:30	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	SED-Sediment
Sample Date:		Protocol:	NASXXXCT4B	Test Species:	CT-Chironomus tentans
Comments:	NAS#1857F-1859F,1862F-1864F,1866F,1868F-1870F,1872F-1873F				

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	0.8000	1.0000	0.8000	1.0000	0.9000	0.8000	0.9000	0.8000
HC-Ref-C	0.7000	0.7000	0.8000	0.8000	0.6000	1.0000	0.9000	0.8000
HC-S-01	0.5000	0.5000	0.5000	0.5000	0.8000	0.5000	0.4000	0.5000
HC-S-04	0.6000	0.7000	1.0000	0.5000	0.8000	0.7000	0.9000	0.4000
HC-S-05	0.7000	1.0000	1.0000	0.8000	0.5000	0.5000	0.5000	0.5000
HC-S-07	0.6000	0.9000	0.7000	0.9000	0.5000	0.6000	1.0000	0.8000
HC-S-11	0.5000	0.6000	0.5000	1.0000	0.7000	0.8000	0.8000	1.0000
HC-S-16	0.9000	0.8000	0.8000	1.0000	0.6000	0.7000	1.0000	0.8000
HC-S-19	0.7000	0.7000	0.8000	0.9000	0.9000	1.0000	1.0000	1.0000
HC-S-22	0.7000	0.7000	0.8000	0.9000	0.4000	0.3000	0.7000	0.8000
HC-S-24	0.5000	0.4000	0.6000	0.8000	0.8000	0.8000	0.8000	0.9000
HC-S-30	0.8000	1.0000	0.9000	1.0000	0.9000	0.8000	1.0000	
control	1.0000	1.0000	0.9000	1.0000	0.9000	0.9000	1.0000	1.0000

			Transform: Arcsin Square Root						1-Tailed	
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	0.8750	1.1111	1.2225	1.1071	1.4413	11.503	8			
HC-Ref-C	0.7875	1.0000	1.1064	0.8861	1.4120	14.846	8			
HC-S-01	0.5250	0.6667	0.8130	0.6847	1.1071	15.246	8			
HC-S-04	0.7000	0.8889	1.0133	0.6847	1.4120	23.603	8			
HC-S-05	0.6875	0.8730	1.0104	0.7854	1.4317	27.766	8			
HC-S-07	0.7500	0.9524	1.0707	0.7854	1.4120	20.502	8			
HC-S-11	0.7375	0.9365	1.0608	0.7854	1.4120	23.583	8			
HC-S-16	0.8250	1.0476	1.1590	0.8861	1.4120	16.204	8			
HC-S-19	0.8750	1.1111	1.2280	0.9912	1.4120	14.738	8	-1.407	1.761	0.0132
HC-S-22	0.6625	0.8413	0.9626	0.5796	1.2490	23.234	8			
HC-S-24	0.7000	0.8889	1.0042	0.6847	1.2490	19.420	8	1.133	1.761	0.0143
HC-S-30	0.9143	1.1610	1.2783	1.1071	1.4120	10.780	7	-2.177	1.771	0.0110
control	0.9625	1.2222	1.3536	1.2490	1.4260	6.404	8	-3.765	1.761	0.0076

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93235	0.844	0.58011	1.01637
F-Test indicates equal variances (p = 0.11)	3.59005	8.88531		
The control means are not significantly different (p = 0.15)	1.51921	2.14479		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Comparisons made against HC-Ref-C YMR 2-12-99

Freshwater Sediment 10-day survival

Start Date:	12/8/98 10:30	Test ID: 592-4	Sample ID:
End Date:	12/18/98 09:30	Lab ID: ORNAS-Northwestern Aquat	Sample Type: SED-Sediment
Sample Date:		Protocol: NASXXXCT4B	Test Species: CT-Chironomus tentans

Comments: NAS#1857F-1859F,1862F-1864F,1866F,1868F-1870F,1872F-1873F

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	0.8000	1.0000	0.8000	1.0000	0.9000	0.8000	0.9000	0.8000
HC-Ref-C	0.7000	0.7000	0.8000	0.8000	0.6000	1.0000	0.9000	0.8000
HC-S-01	0.5000	0.5000	0.5000	0.5000	0.8000	0.5000	0.4000	0.5000
HC-S-04	0.6000	0.7000	1.0000	0.5000	0.8000	0.7000	0.9000	0.4000
HC-S-05	0.7000	1.0000	1.0000	0.8000	0.5000	0.5000	0.5000	0.5000
HC-S-07	0.6000	0.9000	0.7000	0.9000	0.5000	0.6000	1.0000	0.8000
HC-S-11	0.5000	0.6000	0.5000	1.0000	0.7000	0.8000	0.8000	1.0000
HC-S-16	0.9000	0.8000	0.8000	1.0000	0.6000	0.7000	1.0000	0.8000
HC-S-19	0.7000	0.7000	0.8000	0.9000	0.9000	1.0000	1.0000	1.0000
HC-S-22	0.7000	0.7000	0.8000	0.9000	0.4000	0.3000	0.7000	0.8000
HC-S-24	0.5000	0.4000	0.6000	0.8000	0.8000	0.8000	0.8000	0.9000
HC-S-30	0.8000	1.0000	0.9000	1.0000	0.9000	0.8000	1.0000	
control	1.0000	1.0000	0.9000	1.0000	0.9000	0.9000	1.0000	1.0000

			Transform: Arcsin Square Root						1-Tailed	
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	0.8750	1.1111	1.2225	1.1071	1.4413	11.503	8			
HC-Ref-C	0.7875	1.0000	1.1064	0.8861	1.4120	14.846	8			
*HC-S-01	0.5250	0.6667	0.8130	0.6847	1.1071	15.246	8	6.178	1.761	0.0077
*HC-S-04	0.7000	0.8889	1.0133	0.6847	1.4120	23.603	8	2.132	1.761	0.0169
*HC-S-05	0.6875	0.8730	1.0104	0.7854	1.4317	27.766	8	1.911	1.761	0.0217
HC-S-07	0.7500	0.9524	1.0707	0.7854	1.4120	20.502	8	1.646	1.761	0.0150
HC-S-11	0.7375	0.9365	1.0608	0.7854	1.4120	23.583	8	1.594	1.761	0.0181
HC-S-16	0.8250	1.0476	1.1590	0.8861	1.4120	16.204	8	0.766	1.761	0.0121
HC-S-19	0.8750	1.1111	1.2280	0.9912	1.4120	14.738	8			
*HC-S-22	0.6625	0.8413	0.9626	0.5796	1.2490	23.234	8	2.782	1.761	0.0154
HC-S-24	0.7000	0.8889	1.0042	0.6847	1.2490	19.420	8			
HC-S-30	0.9143	1.1610	1.2783	1.1071	1.4120	10.780	7	-0.774	1.771	0.0092
control	0.9625	1.2222	1.3536	1.2490	1.4260	6.404	8	-2.244	1.761	0.0060

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95866	0.919	0.37218	-0.2439
Bartlett's Test indicates equal variances (p = 0.20)	5.95747	13.2767		
The control means are not significantly different (p = 0.15)	1.51921	2.14479		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

Comparisons made against HC-Ref-B. MSK 2-12-99

Freshwater Sediment Average Individual Biomas

Start Date:	12/8/98 10:30	Test ID: 592-4	Sample ID:
End Date:	12/18/98 09:30	Lab ID: ORNAS-Northwestern Aquat	Sample Type: SED-Sediment
Sample Date:		Protocol: NASXXXCT4B	Test Species: CT-Chironomus tentans

Comments: NAS#1857F-1859F,1862F-1864F,1866F,1868F-1870F,1872F-1873F

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	1.3614	0.7313	1.5188	1.2900	1.1189	1.2150	1.2900	0.7087
HC-Ref-C	1.8057	1.3329	0.9675	1.8238	1.8350	0.9330	0.8200	1.4543
HC-S-01	0.1200	0.2500	0.1240	0.1360	0.2163	0.2480	0.1325	0.2980
HC-S-04	0.2933	0.4057	0.6190	0.2760	0.3875	0.6571	0.1367	0.1550
HC-S-05	0.5871	0.5531	0.5120	0.5212	0.5920	0.5320	0.5120	0.2580
HC-S-07	0.6517	0.7178	0.3814	0.6178	0.1940	0.8867	0.5590	0.6925
HC-S-11	0.5400	1.1717	0.7880	1.1150	0.6329	0.7500	0.7663	0.7020
HC-S-16	0.5489	0.7338	0.6213	0.9630	0.5067	0.9943	0.8860	0.6413
HC-S-19	1.4257	1.0057	0.9088	0.7311	1.0311	1.0130	1.3340	1.2320
HC-S-22	0.8943	1.2329	0.9950	0.7856	0.3250	0.9667	1.6057	1.3175
HC-S-24	1.3500	1.1075	0.9667	0.6838	1.0263	0.6950	0.9725	0.8589
HC-S-30	1.1138	0.7830	0.8333	0.8610	1.2033	0.9663	0.8750	
control	1.6960	1.2740	2.1433	1.3710	2.1900	0.8722	1.1273	0.9900

			Transform: Untransformed						1-Tailed	
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	1.1543	0.8416	1.1543	0.7087	1.5188	25.256	8			
HC-Ref-C	1.3715	1.0000	1.3715	0.8200	1.8350	31.129	8			
HC-S-01	0.1906	0.1390	0.1906	0.1200	0.2980	36.990	8			
HC-S-04	0.3663	0.2671	0.3663	0.1367	0.6571	52.747	8			
HC-S-05	0.5084	0.3707	0.5084	0.2580	0.5920	20.846	8			
HC-S-07	0.5876	0.4284	0.5876	0.1940	0.8867	36.424	8			
HC-S-11	0.8082	0.5893	0.8082	0.5400	1.1717	27.498	8			
HC-S-16	0.7369	0.5373	0.7369	0.5067	0.9943	25.671	8			
HC-S-19	1.0852	0.7912	1.0852	0.7311	1.4257	21.197	8	1.670	1.761	0.0518
HC-S-22	1.0153	0.7403	1.0153	0.3250	1.6057	37.853	8			
*HC-S-24	0.9576	0.6982	0.9576	0.6838	1.3500	22.851	8	2.441	1.761	0.0507
*HC-S-30	0.9480	0.6912	0.9480	0.7830	1.2033	16.471	7	2.474	1.771	0.0519
control	1.4580	1.0630	1.4580	0.8722	2.1900	34.539	8	-0.370	1.761	0.0960

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96673	0.881	-0.0108	-0.4571
Bartlett's Test indicates unequal variances (p = 2.52E-04)	16.5735	9.21035		
The control means are not significantly different (p = 0.25)	1.18858	2.14479		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

Comparisons made against HC-Ref-C YMR 2-12-99

Freshwater Sediment-Average Individual Biomas

Start Date: 12/8/98 10:30 Test ID: 592-4 Sample ID:
End Date: 12/18/98 09:30 Lab ID: ORNAS-Northwestern Aquat Sample Type: SED-Sediment
Sample Date: Protocol: NASXXXCT4b-Chironomid s Test Species: CT-Chironomus tentans
Comments: NAS#1857F-1859F,1862F-1864F,1866F,1868F-1870F,1872F-1873F

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	1.3614	0.7313	1.5188	1.2900	1.1189	1.2150	1.2900	0.7087
HC-Ref-C	1.8057	1.3329	0.9675	1.8238	1.8350	0.9330	0.8200	1.4543
HC-S-01	0.1200	0.2500	0.1240	0.1360	0.2163	0.2480	0.1325	0.2980
HC-S-04	0.2933	0.4057	0.6190	0.2760	0.3875	0.6571	0.1367	0.1550
HC-S-05	0.5871	0.5531	0.5120	0.5212	0.5920	0.5320	0.5120	0.2580
HC-S-07	0.6517	0.7178	0.3814	0.6178	0.1940	0.8867	0.5590	0.6925
HC-S-11	0.5400	1.1717	0.7880	1.1150	0.6329	0.7500	0.7663	0.7020
HC-S-16	0.5489	0.7338	0.6213	0.9630	0.5067	0.9943	0.8860	0.6413
HC-S-19	1.4257	1.0057	0.9088	0.7311	1.0311	1.0130	1.3340	1.2320
HC-S-22	0.8943	1.2329	0.9950	0.7856	0.3250	0.9667	1.6057	1.3175
HC-S-24	1.3500	1.1075	0.9667	0.6838	1.0263	0.6950	0.9725	0.8589
HC-S-30	1.1138	0.7830	0.8333	0.8610	1.2033	0.9663	0.8750	
control	1.6960	1.2740	2.1433	1.3710	2.1900	0.8722	1.1273	0.9900

			Transform: Untransformed						1-Tailed	
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	1.1543	0.8416	1.1543	0.7087	1.5188	25.256	8			
HC-Ref-C	1.3715	1.0000	1.3715	0.8200	1.8350	31.129	8			
*HC-S-01	0.1906	0.1390	0.1906	0.1200	0.2980	36.990	8	9.088	1.895	0.0213
HC-S-04	0.3663	0.2671	0.3663	0.1367	0.6571	52.747	8			
HC-S-05	0.5084	0.3707	0.5084	0.2580	0.5920	20.846	8			
HC-S-07	0.5876	0.4284	0.5876	0.1940	0.8867	36.424	8			
HC-S-11	0.8082	0.5893	0.8082	0.5400	1.1717	27.498	8			
HC-S-16	0.7369	0.5373	0.7369	0.5067	0.9943	25.671	8			
HC-S-19	1.0852	0.7912	1.0852	0.7311	1.4257	21.197	8			
HC-S-22	1.0153	0.7403	1.0153	0.3250	1.6057	37.853	8			
HC-S-24	0.9576	0.6982	0.9576	0.6838	1.3500	22.851	8			
HC-S-30	0.9480	0.6912	0.9480	0.7830	1.2033	16.471	7			
control	1.4580	1.0630	1.4580	0.8722	2.1900	34.539	8			

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.89296	0.844	-0.8941	1.48107
F-Test indicates unequal variances (p = 1.32E-03)	17.0988	8.88531		
The control means are not significantly different (p = 0.25)	1.18858	2.14479		

Hypothesis Test (1-tail, 0.05)

Heteroscedastic t Test indicates significant differences

Comparison made against HC-Ref-B MLR 2-11-99

Freshwater Sediment Average Individual Biomas

Start Date:	12/8/98 10:30	Test ID: 592-4	Sample ID:
End Date:	12/18/98 09:30	Lab ID: ORNAS-Northwestern Aquat	Sample Type: SED-Sediment
Sample Date:		Protocol: NASXXXCT4B	Test Species: CT-Chironomus tentans
Comments:	NAS#1857F-1859F,1862F-1864F,1866F,1868F-1870F,1872F-1873F		

Conc-	1	2	3	4	5	6	7	8
HC-Ref-B	1.3614	0.7313	1.5188	1.2900	1.1189	1.2150	1.2900	0.7087
HC-Ref-C	1.8057	1.3329	0.9675	1.8238	1.8350	0.9330	0.8200	1.4543
HC-S-01	0.1200	0.2500	0.1240	0.1360	0.2163	0.2480	0.1325	0.2980
HC-S-04	0.2933	0.4057	0.6190	0.2760	0.3875	0.6571	0.1367	0.1550
HC-S-05	0.5871	0.5531	0.5120	0.5212	0.5920	0.5320	0.5120	0.2580
HC-S-07	0.6517	0.7178	0.3814	0.6178	0.1940	0.8867	0.5590	0.6925
HC-S-11	0.5400	1.1717	0.7880	1.1150	0.6329	0.7500	0.7663	0.7020
HC-S-16	0.5489	0.7338	0.6213	0.9630	0.5067	0.9943	0.8860	0.6413
HC-S-19	1.4257	1.0057	0.9088	0.7311	1.0311	1.0130	1.3340	1.2320
HC-S-22	0.8943	1.2329	0.9950	0.7856	0.3250	0.9667	1.6057	1.3175
HC-S-24	1.3500	1.1075	0.9667	0.6838	1.0263	0.6950	0.9725	0.8589
HC-S-30	1.1138	0.7830	0.8333	0.8610	1.2033	0.9663	0.8750	
control	1.6960	1.2740	2.1433	1.3710	2.1900	0.8722	1.1273	0.9900

			Transform: Untransformed					1-Tailed		
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
HC-Ref-B	1.1543	0.8416	1.1543	0.7087	1.5188	25.256	8			
HC-Ref-C	1.3715	1.0000	1.3715	0.8200	1.8350	31.129	8			
HC-S-01	0.1906	0.1390	0.1906	0.1200	0.2980	36.990	8			
*HC-S-04	0.3663	0.2671	0.3663	0.1367	0.6571	52.747	8	6.373	1.761	0.0269
*HC-S-05	0.5084	0.3707	0.5084	0.2580	0.5920	20.846	8	5.889	1.761	0.0212
*HC-S-07	0.5876	0.4284	0.5876	0.1940	0.8867	36.424	8	4.432	1.761	0.0288
*HC-S-11	0.8082	0.5893	0.8082	0.5400	1.1717	27.498	8	2.670	1.761	0.0296
*HC-S-16	0.7369	0.5373	0.7369	0.5067	0.9943	25.671	8	3.397	1.761	0.0266
HC-S-19	1.0852	0.7912	1.0852	0.7311	1.4257	21.197	8			
HC-S-22	1.0153	0.7403	1.0153	0.3250	1.6057	37.853	8	0.815	1.761	0.0512
HC-S-24	0.9576	0.6982	0.9576	0.6838	1.3500	22.851	8			
HC-S-30	0.9480	0.6912	0.9480	0.7830	1.2033	16.471	7			
control	1.4580	1.0630	1.4580	0.8722	2.1900	34.539	8	-1.476	1.761	0.0745

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates ~~normal~~ distribution ($p > 0.01$)	0.97092	0.929	-0.2157	-0.2372
Bartlett's Test indicates equal variances ($p = 0.01$)	14.3592	15.0863		
The control means are not significantly different ($p = 0.25$)	1.18858	2.14479		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

Comparisons made against HC-Ref-B MLK 2-12-99

Actual p-values for comparisons showing significant differences, calculated from the statistics returned by ToxCalc analysis

Survival Data

Comparison	T stat	degrees of freedom *	tails	TDIST (=p)
HC-S-19 vs. HC-Ref-C	-1.407	14	1	#NUM!
HC-S-24 vs. HC-Ref-C	2.568	14	1	0.011
HC-S-30 vs. HC-Ref-C	-2.177	13	1	#NUM!
control vs. HC-Ref-C	-3.765	14	1	#NUM!
HC-S-01 vs. HC-Ref-B	6.178	14	1	0.00001
HC-S-04 vs. HC-Ref-B	2.132	14	1	0.026
HC-S-05 vs. HC-Ref-B	1.911	14	1	0.038
HC-S-07 vs. HC-Ref-B	1.646	14	1	0.061
HC-S-11 vs. HC-Ref-B	1.594	14	1	0.067
HC-S-16 vs. HC-Ref-B	0.766	14	1	0.228
HC-S-22 vs. HC-Ref-B	2.782	14	1	0.007
control vs. HC-Ref-B	-2.244	14	1	#NUM!

* (control replicates + treatment replicates - 2), except as noted

Growth Data

Comparison	T stat	degrees of freedom *	tails	TDIST (=p)
HC-S-19 vs. HC-Ref-C	1.67	14	1	0.059
HC-S-24 vs. HC-Ref-B	1.526	14	1	0.075
HC-S-30 vs. HC-Ref-C	2.474	13	1	0.014
control vs. HC-Ref-C	-0.37	14	1	#NUM!
HC-S-01 vs. HC-Ref-B **	9.088	7	1	0.00002
HC-S-04 vs. HC-Ref-B	6.373	14	1	0.00001
HC-S-05 vs. HC-Ref-B	5.889	14	1	0.00002
HC-S-07 vs. HC-Ref-B	4.432	14	1	0.0003
HC-S-11 vs. HC-Ref-B	2.67	14	1	0.009
HC-S-16 vs. HC-Ref-B	3.397	14	1	0.002
HC-S-22 vs. HC-Ref-B	0.815	14	1	0.214
control vs. HC-Ref-B	-1.476	14	1	#NUM!

* (control replicates + treatment replicates - 2), except as noted

** heteroscedastic t-test; degrees of freedom=7

Water Quality Data

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	COND	pH	NH3	HARD	ALK
12	1866F	HC-S-11	1	0	22.7	6.8	340	7.4	<0.5	110	80
14	1868F	HC-S-16	1	0	22.7	6.8	330	7.3	<0.5	110	80
19	1864F	HC-S-07	1	0	22.6	6.7	330	7.3	<0.5	110	80
37	1872F	HC-S-22	1	0	22.7	6.2	340	7.3	<0.5	110	80
47	1870F	HC-S-19	1	0	22.7	6.9	320	7.5	<0.5	100	80
53	1873F	HC-S-24	1	0	22.8	6.9	330	7.4	<0.5	110	80
54	1869F	HC-S-30	1	0	22.8	6.8	330	7.4	<0.5	100	80
58	1859F	HC-S-01	1	0	22.8	6.6	330	7.4	0.5	100	80
67	1858F	HC-Ref-C	1	0	23.0	7.6	320	7.6	<0.5	100	80
68	1857F	HC-Ref-B	1	0	23.0	6.9	330	7.4	<0.5	100	80
90	2185F	Control	1	0	22.9	8.2	320	8.0	<0.5	100	80
93	1863F	HC-S-05	1	0	23.0	6.8	320	7.4	<0.5	100	80
96	1862F	HC-S-04	1	0	23.2	7.1	320	7.4	<0.5	100	80
12	1866F	HC-S-11	1	1	22.3	6.2					
14	1868F	HC-S-16	1	1	22.4	6.2					
19	1864F	HC-S-07	1	1	22.3	6.4					
37	1872F	HC-S-22	1	1	22.4	5.6					
47	1870F	HC-S-19	1	1	22.4	6.0					
53	1873F	HC-S-24	1	1	22.6	6.0					
54	1869F	HC-S-30	1	1	22.6	6.4					
58	1859F	HC-S-01	1	1	22.7	6.2					
67	1858F	HC-Ref-C	1	1	22.6	6.2					
68	1857F	HC-Ref-B	1	1	22.6	6.0					
90	2185F	Control	1	1	22.7	6.2					
93	1863F	HC-S-05	1	1	22.7	6.2					
96	1862F	HC-S-04	1	1	22.8	6.1					
12	1866F	HC-S-11	1	2	22.8	6.2					
14	1868F	HC-S-16	1	2	22.8	6.0					
19	1864F	HC-S-07	1	2	22.8	6.1					
37	1872F	HC-S-22	1	2	22.8	6.0					
47	1870F	HC-S-19	1	2	22.9	6.1					
53	1873F	HC-S-24	1	2	23.0	5.8					
54	1869F	HC-S-30	1	2	23.0	5.7					
58	1859F	HC-S-01	1	2	23.0	6.0					
67	1858F	HC-Ref-C	1	2	23.2	6.2					
68	1857F	HC-Ref-B	1	2	23.2	5.9					
90	2185F	Control	1	2	23.2	6.8					
93	1863F	HC-S-05	1	2	23.3	6.2					
96	1862F	HC-S-04	1	2	23.3	5.8					
12	1866F	HC-S-11	1	3	22.1	5.8					
14	1868F	HC-S-16	1	3	22.1	6.0					
19	1864F	HC-S-07	1	3	22.1	5.8					
37	1872F	HC-S-22	1	3	22.2	5.7					
47	1870F	HC-S-19	1	3	22.2	5.8					
53	1873F	HC-S-24	1	3	22.3	5.8					

Data Verified against Lab bench sheets 2-12-99 JRF

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	COND	pH	NH3	HARD	ALK
54	1869F	HC-S-30	1	3	22.3	5.6					
58	1859F	HC-S-01	1	3	22.3	6.0					
67	1858F	HC-Ref-C	1	3	22.4	5.6					
68	1857F	HC-Ref-B	1	3	22.4	5.6					
90	2185F	Control	1	3	22.4	5.0					
93	1863F	HC-S-05	1	3	22.5	6.0					
96	1862F	HC-S-04	1	3	22.6	5.8					
12	1866F	HC-S-11	1	4	22.4	5.2					
14	1868F	HC-S-16	1	4	22.4	5.0					
19	1864F	HC-S-07	1	4	22.5	5.1					
37	1872F	HC-S-22	1	4	22.5	4.9					
47	1870F	HC-S-19	1	4	22.5	4.4					
53	1873F	HC-S-24	1	4	22.6	5.0					
54	1869F	HC-S-30	1	4	22.6	4.6					
58	1859F	HC-S-01	1	4	22.5	5.2					
67	1858F	HC-Ref-C	1	4	22.7	4.6					
68	1857F	HC-Ref-B	1	4	22.6	4.8					
90	2185F	Control	1	4	22.6	5.2					
93	1863F	HC-S-05	1	4	22.6	5.0					
96	1862F	HC-S-04	1	4	22.7	5.3					
12	1866F	HC-S-11	1	5	22.5	4.8					
14	1868F	HC-S-16	1	5	22.5	4.4					
19	1864F	HC-S-07	1	5	22.5	4.6					
37	1872F	HC-S-22	1	5	22.5	5.0					
47	1870F	HC-S-19	1	5	22.4	4.6					
53	1873F	HC-S-24	1	5	22.5	4.7					
54	1869F	HC-S-30	1	5	22.5	4.6					
58	1859F	HC-S-01	1	5	22.5	4.8					
67	1858F	HC-Ref-C	1	5	22.5	3.7					
68	1857F	HC-Ref-B	1	5	22.5	4.4					
90	2185F	Control	1	5	22.5	3.5					
93	1863F	HC-S-05	1	5	22.5	5.6					
96	1862F	HC-S-04	1	5	22.5	5.1					
12	1866F	HC-S-11	1	6	22.3	5.5					
14	1868F	HC-S-16	1	6	22.3	5.5					
19	1864F	HC-S-07	1	6	22.3	5.5					
37	1872F	HC-S-22	1	6	22.3	5.2					
47	1870F	HC-S-19	1	6	22.4	5.4					
53	1873F	HC-S-24	1	6	22.4	5.4					
54	1869F	HC-S-30	1	6	22.4	5.5					
58	1859F	HC-S-01	1	6	22.4	6.2					
67	1858F	HC-Ref-C	1	6	22.5	5.5					
68	1857F	HC-Ref-B	1	6	22.5	5.2					
90	2185F	Control	1	6	22.5	4.5					
93	1863F	HC-S-05	1	6	22.6	5.6					
96	1862F	HC-S-04	1	6	22.7	5.2					
12	1866F	HC-S-11	1	7	22.2	4.5					

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	TEMP	DO	COND	pH	NH3	HARD	ALK
14	1868F	HC-S-16	1	7	22.3	4.8					
19	1864F	HC-S-07	1	7	22.4	4.8					
37	1872F	HC-S-22	1	7	22.4	4.8					
47	1870F	HC-S-19	1	7	22.4	4.8					
53	1873F	HC-S-24	1	7	22.5	4.8					
54	1869F	HC-S-30	1	7	22.5	4.8					
58	1859F	HC-S-01	1	7	22.5	5.6					
67	1858F	HC-Ref-C	1	7	22.6	5.0					
68	1857F	HC-Ref-B	1	7	22.6	4.5					
90	2185F	Control	1	7	22.6	4.5					
93	1863F	HC-S-05	1	7	22.7	5.2					
96	1862F	HC-S-04	1	7	22.8	4.6					
12	1866F	HC-S-11	1	8	22.5	3.8					
14	1868F	HC-S-16	1	8	22.5	3.8					
19	1864F	HC-S-07	1	8	22.5	3.6					
37	1872F	HC-S-22	1	8	22.6	3.8					
47	1870F	HC-S-19	1	8	22.6	3.7					
53	1873F	HC-S-24	1	8	22.6	3.8					
54	1869F	HC-S-30	1	8	22.6	4.1					
58	1859F	HC-S-01	1	8	22.6	4.4					
67	1858F	HC-Ref-C	1	8	22.7	3.8					
68	1857F	HC-Ref-B	1	8	22.7	3.8					
90	2185F	Control	1	8	22.7	4.1					
93	1863F	HC-S-05	1	8	22.7	3.6					
96	1862F	HC-S-04	1	8	22.9	3.8					
12	1866F	HC-S-11	1	9	22.2	4.2					
14	1868F	HC-S-16	1	9	22.3	4.1					
19	1864F	HC-S-07	1	9	22.3	4.1					
37	1872F	HC-S-22	1	9	22.4	4.2					
47	1870F	HC-S-19	1	9	22.4	4.0					
53	1873F	HC-S-24	1	9	22.5	4.1					
54	1869F	HC-S-30	1	9	22.5	3.9					
58	1859F	HC-S-01	1	9	22.5	4.3					
67	1858F	HC-Ref-C	1	9	22.6	4.0					
68	1857F	HC-Ref-B	1	9	22.6	3.9					
90	2185F	Control	1	9	22.5	4.0					
93	1863F	HC-S-05	1	9	22.7	4.3					
96	1862F	HC-S-04	1	9	22.8	4.0					
12	1866F	HC-S-11	1	10	22.1	6.0	340	6.9	<0.5	80	80
14	1868F	HC-S-16	1	10	22.1	5.6	340	7.1	<0.5	100	80
19	1864F	HC-S-07	1	10	22.1	5.5	340	7.1	<0.5	100	80
37	1872F	HC-S-22	1	10	22.1	5.6	350	7.2	<0.5	100	80
47	1870F	HC-S-19	1	10	22.1	6.0	350	7.3	<0.5	100	80
53	1873F	HC-S-24	1	10	22.3	5.7	350	7.3	<0.5	100	80
54	1869F	HC-S-30	1	10	22.3	5.7	340	7.3	<0.5	100	80
58	1859F	HC-S-01	1	10	22.3	5.9	340	7.4	<0.5	100	80
67	1858F	HC-Ref-C	1	10	22.5	6.2	350	7.4	<0.5	100	80

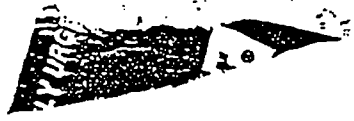
	NAS	CLIENT									
BKR	SMPL	DESCRIP	REPL	DAY	TEMP	DO	COND	pH	NH3	HARD	ALK
68	1857F	HC-Ref-B	1	10	22.5	5.6	350	7.4	<0.5	80	80
90	2185F	Control	1	10	22.4	6.2	360	7.6	<0.5	100	80
93	1863F	HC-S-05	1	10	22.5	5.7	350	7.4	<0.5	100	80
96	1862F	HC-S-04	1	10	22.7	5.7	350	7.5	<0.5	100	80
				Mean	22.6	5.3	337	7.4	—	100	80
				SD	0.3	1.0	12	0.2	—	7	0
				n	143	143	26	26	26	26	26
				Max	23.3	8.2	360	8.0	0.5	110	80
				Min	22.1	3.5	320	6.9	<0.5	80	80

Custody Seal

3.9°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 1 of 10

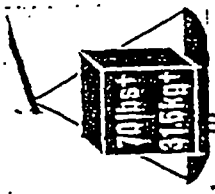


Custody Seal

2.1°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 2 of 10

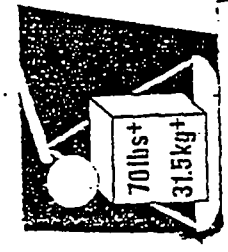


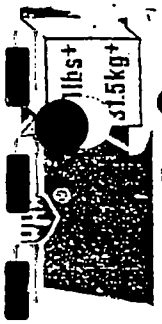
eal

3.0°C

8 Project Samples

nifer Stewart Container# 3 of 10





Custody Seal

4.1°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 4 of 10

Custody Seal

2.3°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 5 of 10

Custody Seal

3.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 6 of 10

Custody Seal 2.5°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 7 of 10

Custody Seal 2.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 8 of 10

Custody Seal 3.0°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 9 of 10

Custody Seal 4.3°C

Date 10/16/98 Project Samples

Signature Jennifer Stewart Container# 10 of 10

Samples Shipp[illegible]

HARTCROWSER

Seattle, Wash[illegible]ton 98102-3699
Phone: 206-324-9530 [illegible]X: 206-328-5581

JOB 5624-06 LAB NUMBER

PROJECT NAME Terminal 4/RI/FS

HART CROWSER CONTACT H. Cumberland

SAMPLED BY: HERZOG

REQUESTED ANALYSIS

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	Archive	Bioassay	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
	HC-S-11		10/14/98	0925	SED	X		4	#1866F
	HC-S-14			1035		X		4	1867F
	HC-S-16			12:45		X		4	1868F
	HC-S-22			13:15		X		4	1872F
	HC-S-24			1345		X		4	1873F
	HC-S-26			1445			X	4	1874F
	HC-S-28			1530			X	4	1875F
	HC-S-35			16:25			X	4	1876F.
	~~HC-S-36~~			~~1730~~			~~X~~	~~4~~	

POPA0008490

-37-

RELINQUISHED BY	DATE	RECEIVED BY	DATE
[signature] SIGNATURE	10/14/98	[signature] SIGNATURE	10/15
John Herzog PRINT NAME	TIME	Richard [illegible] PRINT NAME	TIME
HC COMPANY	1745	OAS COMPANY	1750

RELINQUISHED BY	DATE	RECEIVED BY	DATE
[signature] SIGNATURE	10/16/98	Linda K Nemeth SIGNATURE	10/17/98
[signature] PRINT NAME	TIME	Linda K Nemeth PRINT NAME	TIME
OAS COMPANY	300	NW Aquatic COMPANY	10:30

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____ for Other Contract Requirements

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

White and Yellow Copies to Lab Pink to Project Manager Lab to Return White Copy to Hart Crowser Gold to Sample Custodian

Sample Custody Record

Samples Shipped to: _____

HART CROWSER

1910 Fairview Avenue East
Seattle, Washington 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 5624-06 LAB NUMBER _____

PROJECT NAME Terminal 4 RI/FS

HART CROWSER CONTACT H. Cumberland

SAMPLED BY: Herzog

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	REQUESTED ANALYSIS: ARSENIC	REQUESTED ANALYSIS: BIOASSAY	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
POPA000491		HC-S-36	10/15/98	8100	SED		X	4	#1877F
		HC-S-39		0940			X	4	1878F
		HC-S-42		11:10			X	4	1879F
		HC-REF-B		1400		X	X	8	#1857F
		HC-REF-C		1500		X	X	8	1858F
		HC-S-18		1630		X		9	~~1869F~~ JM
		HC-S-19		1640		X		4	1870F
		HC-S-20		1650		X		4	1871F
		HC-S-30	10/15/98	17:10	received rather than HC-S-18 listed above				1869F

(NOT REC'D BY NAS JM 10/17/98)

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/16	SIGNATURE	10/16/98
PRINT NAME John Herzog	TIME 9:44	PRINT NAME	TIME
COMPANY HC		COMPANY	950
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/16/98	SIGNATURE Linda K. Neneth	10/17/98
PRINT NAME	TIME 300	PRINT NAME Linda K. Neneth	TIME 10:30
COMPANY		COMPANY NW Aquatic	

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____
for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS OTHER _____

and copies to Project Manager, Lab to White, Hart to Sample Custody

Sample Custody Record

Samples Shipped: _____

HARTCROWSER

Seattle, Washington 98102-3699
Phone: 206-324-9530 FAX: 206-328-5581

JOB 5760-06 LAB NUMBER _____
PROJECT NAME Terminal 4 RI/FS
HART CROWSER CONTACT H. Winbeld
SAMPLED BY: JMH

REQUESTED ANALYSIS: Archive

LAB NO.	SAMPLE ID	DESCRIPTION	DATE	TIME	MATRIX	Archive	NO. OF CONTAINERS	OBSERVATIONS/COMMENTS/ COMPOSITING INSTRUCTIONS
POPA0008492	HC-S-01		10/13/98	10:35	SED	X	4	Archive #1859F
	HC-S-02		10/13/98	11:45		X	4	1860F
	HC-S-03			12:35		X	4	1861F
	HC-S-04			1300		X	4	1862F
	HC-S-05			14:00		X	4	1863F
	HC-S-07			16:00		X	4	1864F
	~~HC-S-08~~			~~16:30~~		~~X~~	~~4~~	
	HC-S-09			16:45		X	4	1865F

RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/13/98	SIGNATURE	10/13/98
PRINT NAME: John Herron	TIME	PRINT NAME	TIME
COMPANY: HC		COMPANY	1705
RELINQUISHED BY	DATE	RECEIVED BY	DATE
SIGNATURE	10/14/98	SIGNATURE	10/14/98
PRINT NAME: Mike Hattl	TIME	PRINT NAME	TIME
COMPANY: CAS	300	COMPANY: CAS	830

SPECIAL SHIPMENT HANDLING OR STORAGE REQUIREMENTS:
Hold until notified

Rec'd by Linda K. Nemeth 10/17/98 10:30 am for NW Aquatic

TOTAL NUMBER OF CONTAINERS

SAMPLE RECEIPT INFORMATION
CUSTODY SEALS: ☐YES ☐NO ☐N/A
GOOD CONDITION ☐YES ☐NO
TEMPERATURE _____
SHIPMENT METHOD: ☐HAND ☐COURIER ☐OVERNIGHT

COOLER NO.: STORAGE LOCATION:

See Lab Work Order No. _____ for Other Contract Requirements

TURNAROUND TIME:
☐ 24 HOURS ☐ 1 WEEK
☐ 48 HOURS ☐ STANDARD
☐ 72 HOURS ☐ OTHER _____

White and Yellow Copies to Lab — Pink to Project Manager — Lab to Return White Copy to Hart Crowser — Gold to Sample Custodian

APPENDIX III

RAW DATA - REFERENCE TOXICANT TEST

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 99-981 Client QC TEST Investigator

Test Type (rangefinding/definitive) Test Length (hr) 96

Species Chironomus tentans

STUDY MANAGEMENT

Client: QC TEST

Client's Study Monitor: NA

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.J. IRISSARRI GJI

QA Officer L-K- Nemeth

1. GABuhler GAB 2. Erin Coffey EC

3. 4.

Study Schedule:

Test Beginning: 12-8-98 1500 Test Ending: 12-12-98 1700

TEST MATERIAL

Description: Potassium chloride (KCl) mallinckrodt Lot # 6845KTRJ

NAS Sample No.:				
Date of Collection:				
Date of Receipt:				
Temperature (°C):				
Dissolved oxygen (mg/L):				
Conductivity (umhos/cm):				
pH:				
Hardness (mg/L):				
Alkalinity (mg/L):				
:				

DILUTION WATER

Description: Moderately Hard Synthetic water

Date of Preparation/Collection: 12-3-98

Water Quality: Cond.(umhos/cm) 250 Salinity (ppt) — pH 7.3

Hardness (mg/L as $CaCO_3$) 90 Alkalinity (mg/L as $CaCO_3$ 80

Treatments: Aerated ≥ 24 hr

TEST ORGANISMS

Species: Chironomus tentans Age: 3RD INSTAR Size: 3rd Instar

Source: NAS Cultures

Acclimation Data:

Date	Temp (°C)	DO (mg/L)	pH	Sal/Cond	Comments
11-25-98	22.0	6.4	7.5	320	
11-27-98	20.1	7.1	7.2	370	
11-30-98	21.5	7.0	7.5	320	H=120 A=90
12-2-98	21.7	5.0	8.1	320	
12-4-98	20.5	6.2	8.0	320	
12-7-98	20.8	8.2	7.2	390	H=120 A=80
Mean	21.1	7.2	7.6	335	H-120 A-85
S.D.	0.7	0.8	0.4	28	— —
(N)	6	6	6	6	2 2

POPA0008494

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-981 Client QC TEST Investigator _____

TEST PROCEDURES AND CONDITIONS

Test concentrations: (50% series recommended) 10, 7.5, 5, 2.5, 1.25, Ø g/L

Test chambers: 30mL Plastic cups Test volume: 20mL

Replicates/treatment: ~~(2)~~ 10 Organisms/treatment: ~~(20)~~ 10 (1/rep)

Test water changes: NONE Aeration during test: _____

Feeding: ~~None~~ 0.25mL of 4 g/L Tetrafin susp on Day 0 & Day 2 Photoperiod:

Temperature: 23±1°C

Duration: 24-hr, 48-hr, 96-hr Renewal: NONE

Beaker placement: Stratified randomization

Randomization chart:

10	1.25	2.5	5	5	Ø	7.5	Ø	7.5	5
5	7.5	10	Ø	7.5	1.25	Ø	5	2.5	7.5
2.5	2.5	Ø	7.5	1.25	10	~~5~~ 5 (lol)	10	5	1.25
7.5	Ø	5	10	2.5	7.5	10	2.5	1.25	Ø
Ø	5	1.25	2.5	10	2.5	1.25	7.5	Ø	10
1.25	10	7.5	1.25	Ø	5	2.5	1.25	10	2.5

MISCELLANEOUS NOTES

TEST solution prep:

Working stock made with 5.0 g of KCl crystals in 500 mL of dilution water. Final concentration = 10g/L KCl.

KCl concentration	Vol. KCl stock (mL's/200mL)	Vol. Dil'n water (mL's/200mL)
10	200	Ø
7.5	150	50
5	100	100
2.5	50	150
1.25	25	175
Ø	Ø	200

CMS 12-8-93

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-981 Client QC TEST Investigator

DAY 0 (12/8/98) ~~EAS~~/GJI Temp Beaker: 22.9°C

	Conc. (g/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10	23.3	8.2		15,500	7.9	70	80	10	
2.	7.5	23.3	8.2		12,000	7.9	—	—	10	
3.	5	23.4	8.2		8200	8.0	—	—	10	
4.	2.5	23.4	8.3		4,800	8.0	—	—	10	
5.	1.25	23.3	8.2		2,400	8.0	—	—	10	
6.	Ø	23.4	8.2		320	8.0	100	80	10	

Fed? YES

DAY 1 (12/9/98) BS/GJI Temp Beaker: 23.0°C

	Conc. (g/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10								5	(5D)
2.	7.5								7	(3D)
3.	5								7	(3D)
4.	2.5								9	(1D)
5.	1.25								10	
6.	Ø								10	

DAY 2 (12/10/98) EAS/GJI Temp Beaker: 22.6 °C

	Conc. (g/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10								Ø	(5D)
2.	7.5								3	(4D)
3.	5								6	(1D)
4.	2.5								9	
5.	1.25								9	(1D)
6.	Ø								10	

Fed? YES

DAY 3 (12/11/98) EA/GJI Temp Beaker: 22.5 °C

	Conc. (g/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10								Ø	
2.	7.5								2	(1D)
3.	5								6	
4.	2.5								8	(1D)
5.	1.25								9	
6.	Ø								10	

DAY 4 (12/12/98) GJI Temp Beaker: 22.6 °C

	Conc. (g/L)	Temp. (°C)	DO (mg/L)	Sal. (ppt)	Cond. (umh/cm)	pH 7.7	Hard. (mg/L)	Alk. (mg/L)	Survivors A	Survivors B
1.	10	22.8	7.8		16,000	7.7	80	80	Ø	
2.	7.5	22.8	7.7		12500	7.7	—	—	Ø	(2D)
3.	5	22.7	7.7		8000	7.8	—	—	5	(1D)
4.	2.5	22.7	7.4		5100 GJI	7.8	—	—	7	(1D)
5.	1.25	22.6	7.4		2400	7.7	—	—	8	(1D)
6.	Ø	22.7	7.6		340	7.8	100	80	10	

Remarks:

POPA0008496

Rev. 2/97

Acute 96-hr Toxicity Test-96 Hr Survival

Start Date:	12/8/98 15:00	Test ID:	999-981	Sample ID:	REF-Ref Toxicant
End Date:	12/12/98 17:00	Lab ID:	ORNAS-Northwestern Aquat	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CT-Chironomus tentans
Comments:					

c-gm/L	1
D-Control	1.0000
1.25	0.8000
2.5	0.7000
5	0.5000
7.5	0.0000
10	0.0000

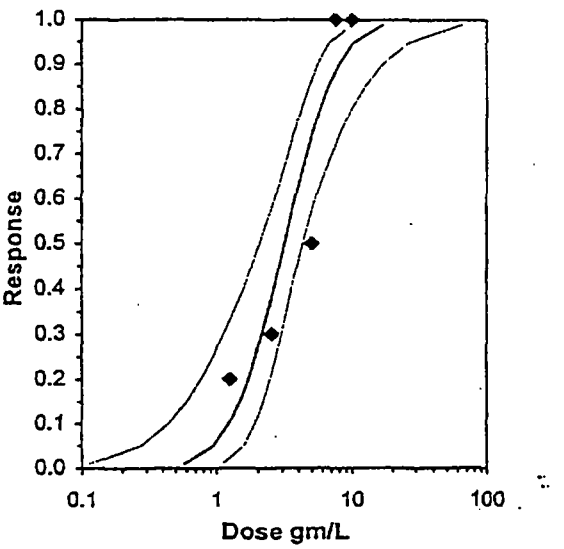
Conc-gm/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	1			0	10
1.25	0.8000	0.8000	2	8	10	1	0.2368	0.0500	2	10
2.5	0.7000	0.7000	3	7	10	1	0.1053	0.0500	3	10
*5	0.5000	0.5000	5	5	10	1	0.0163	0.0500	5	10
7.5	0.0000	0.0000	10	0	10	1			10	10
10	0.0000	0.0000	10	0	10	1			10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	2.5	5	3.53553	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	3.15751	0.73631	1.71435	4.60068	0	6.11365	7.81472	0.11	0.49659	0.31671	5
Intercept	3.43202	0.47768	2.49577	4.36828							
TSCR											

Point	Probits	gm/L	95% Fiducial Limits	
EC01	2.674	0.5752	0.11154	1.09679
EC05	3.355	0.94548	0.27358	1.57075
EC10	3.718	1.23229	0.43892	1.91291
EC15	3.964	1.47347	0.60147	2.19346
EC20	4.158	1.6984	0.77001	2.45373
EC25	4.326	1.91854	0.94861	2.71052
EC40	4.747	2.60825	1.56955	3.56092
EC50	5.000	3.13751	2.07274	4.3017
EC60	5.253	3.77417	2.66135	5.3448
EC75	5.674	5.13097	3.7629	8.2169
EC80	5.842	5.79604	4.23287	9.94062
EC85	6.036	6.68081	4.80849	12.532
EC90	6.282	7.98839	5.58682	16.9482
EC95	6.645	10.4116	6.88537	26.8687
EC99	7.326	17.114	9.96824	65.1943

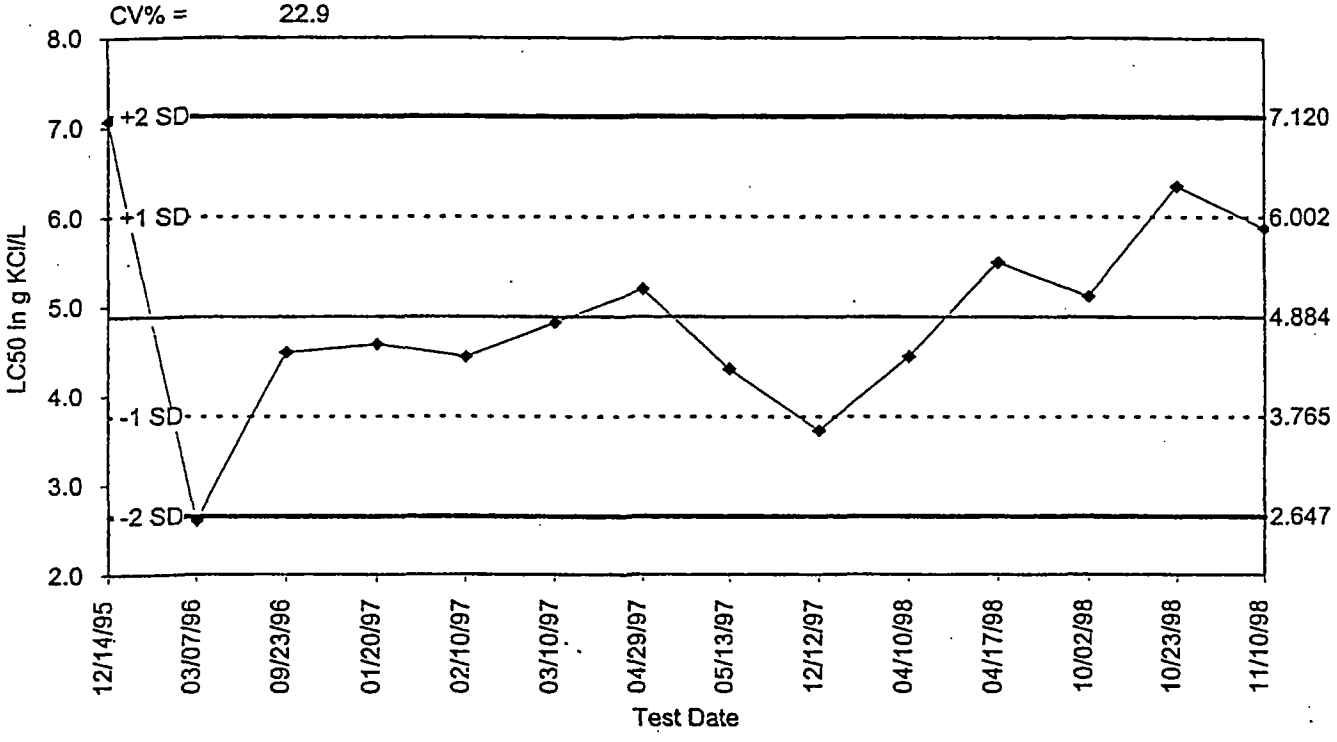


Test: AT-Acute 96-hr Toxicity Test			Test ID: 999-981
Species: CT-Chironomus tentans			Protocol: EPAF 91-EPA Freshwater
Sample ID: REF-Ref Toxicant			Sample Type: KCL-Potassium chloride
Start Date: 12/8/98 15:00	End Date: 12/12/98 17:00		Lab ID: ORNAS-Northwestern Aquatic Sciences

Pos	ID	Rep	Group	Start	24 Hr	48 Hr	72 Hr	96 Hr	Notes
	1	1	D-Control	10				10	
	2	1	1.250	10				8	
	3	1	2.500	10				7	
	4	1	5.000	10				5	
	5	1	7.500	10				0	
	6	1	10.000	10				0	

Comments:

Chironomus tentans - 96 hr reference toxicant test - all points



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4.1.7

HARTCROWSER

Earth and Environmental Technologies

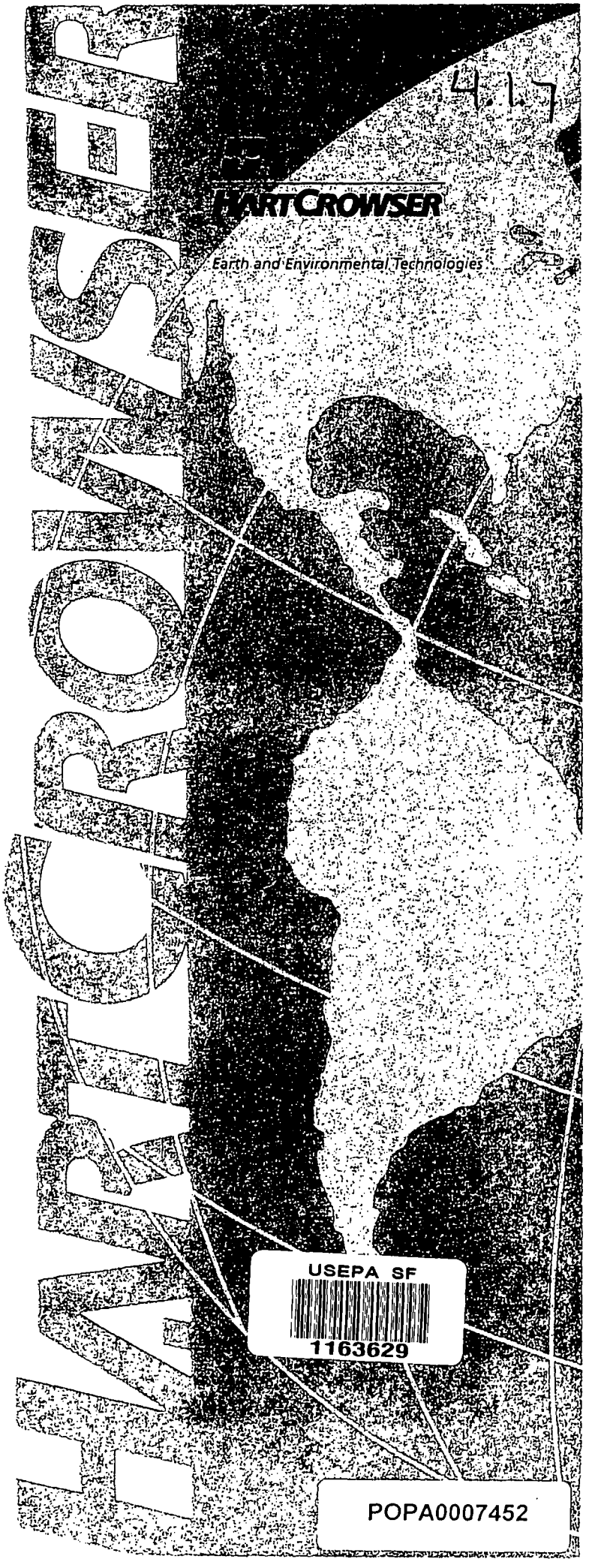
Summary of Sediment Data Findings
Terminal 4, Slip 3 Sediments
Port of Portland
Portland, Oregon

Volume III
Appendix I

Prepared for
Port of Portland

Port Project No. 23640
Port Task No. 310

April 18, 2000
J-5624-10



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JUN 2 7 2003

Environmental Cleanup Office

HART CROWSER INC.

MAY 15 2000

Portland Office

Columbia Analytical Services INC.

An Employee-Owned Company

July 7, 1999

Service Request No: K9904280

Howard Cumberland
Hart Crowser, Inc.
Five Centerpointe Drive, Suite 240
Lake Oswego, OR 97035

Re: Port of Portland Terminal 4

Dear Howard:

Enclosed is a report that summarizes the hydrocarbon differentiation analyses performed on samples collected at Port of Portland Terminal 4. The report presents a summary of the study, a detailed report of the preliminary investigation in which the analytical procedures were tested, and a detailed report of the site investigation. For your reference, these analyses have been assigned our service request number K9904280.

Please call if you have any questions. My extension is 246.

Respectfully submitted,

Columbia Analytical Services, Inc.

Joe Wiegel
Organic Lab Manager

JW/klg

POPA0007453

1317 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 360/577-7222 • Fax 360/636-1068

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Hart Crowser, Inc.	**Service Request No.:**	K9904280
Project:	Port of Portland Terminal 4/5624	**Date Received:**	10/14-16/98
Sample Matrix:	Sediment		

CASE NARRATIVE

Overview

The data presented in this report is a summary of pencil pitch and diesel results for samples delivered and analyzed under three service requests: K9807097, K9807115, and K9807169. Table 1 is a summary of the results.

The concentrations of pencil pitch and diesel were obtained using a variety of techniques. Most of the pencil pitch values were calculated using a sum of the HPAH concentrations measured by 8270 SIM. This data was originally reported as "Base Neutral and Acid Semivolatile Organic Compounds". The HPAHs used in the calculation of pencil pitch are those prescribed in the "LCRMA Dredge Material Evaluation Framework", Draft, 1998. For samples HC-S-12, HC-S-23, HC-S-36, HC-S-40, HC-S-19, and HC-S-31, pencil pitch was also calculated using a sum of the HPAH concentrations measured by GC/MS SIM. However, the analyses were performed as part of a fingerprinting evaluations performed independent of the RI at the site. The same HPAHs were used in calculating the pencil pitch concentrations. For samples HC-S-10, HC-S-15, HC-S-17, HC-S-27, HC-S-29, HC-S-18, and HC-S-21, pencil pitch was measured using NWTPH-Dx. It was necessary to use multiple sources of pencil pitch measurements because the samples were not all subjected to the same battery of analytical test procedures.

Diesel concentrations were determined using two different analytical techniques. All samples for which diesel was included as an analyte of concern were analyzed by NWTPH-Dx. A subset of 21 samples were selected for a more detailed hydrocarbon analysis that included fractionation into aliphatic and aromatic components. The aliphatic fraction was analyzed by GC/FID for specific alkane hydrocarbons including C10 - C40 normal alkanes, pristane, and phytane. The results of this analysis were used to identify diesel contribution to the total hydrocarbon content in the sediments and to calculate the amount of diesel detected. The aromatic fraction was analyzed by GC/MS SIM for PAHs and their alkylated homologs. As previously mentioned in the preceding paragraph, this data was used to identify pencil pitch contribution to the total hydrocarbon content in the sediments and to calculate the amount of pencil pitch detected.

A more detailed description of these techniques is provided below.

Preliminary Investigation

A detailed analysis of the two primary sources of hydrocarbons at the site was conducted in April, 1998. The hydrocarbon products analyzed were T4 Diesel (collected from the pipeline at the site) and pencil pitch. Results of this investigation were originally summarized in a report titled "Differentiation of Pencil Pitch and Fuel Oils at Terminal 4, Port of Portland, Portland Oregon: Preliminary Investigation".

The analyses included GC/FID for aliphatic hydrocarbons and GC/MS SIM for PAHs and their alkylated homologs. This data was used to develop fingerprint characteristics for each hydrocarbon product and to establish correlation factors for calculating concentrations of each product based on measured concentrations of key indicator compounds specific to each hydrocarbon product. Results of this study are summarized in tables 2 - 5.

The significant fingerprint characteristics for each hydrocarbon product are discussed below.

POPA0007454

Summary Tables

Table 1: Summary of Pencil Pitch and Diesel Results for Terminal 4 Sediments (mg/Kg).

Sample Name	Lab Code	Pencil Pitch[1]	Pencil Pitch[2]	Pencil Pitch[3]	Diesel[4]	Diesel[5]
HC-VC-18-S1	K9807097-001	-	385	-	nr	nr
HC-VC-18-S2	K9807097-002	-	166	-	nr	nr
HC-VC-7-S1	K9807097-004	-	1920	-	nr	nr
HC-VC-7-S2	K9807097-005	-	938	-	nr	nr
HC-VC-13-S1	K9807097-007	-	23	-	<25	-
HC-VC-13-S2	K9807097-008	-	21	-	nr	nr
HC-VC-104	K9807097-011	-	47	-	nr	nr
HC-VC-11-S1	K9807097-013	-	703	-	<100	-
HC-VC-11-S2	K9807097-014	-	1400	-	<100	-
HC-VC-22-S1	K9807097-016	-	26	-	nr	nr
HC-VC-22-S2	K9807097-017	-	ND	-	nr	nr
HC-VC-27-S1	K9807097-019	-	385	-	nr	nr
HC-VC-27-S2	K9807097-020	-	422	-	nr	nr
HC-VC-32-S1	K9807097-022	-	48	-	nr	nr
HC-VC-32-S2	K9807097-023	-	ND	-	nr	nr
HC-VC-39-S1	K9807097-025	-	80	-	nr	nr
HC-VC-39-S2	K9807097-026	-	54	-	nr	nr
HC-VC-42-S1	K9807097-028	-	906	-	nr	nr
HC-VC-42-S2	K9807097-029	-	2000	-	nr	nr
HC-S-01	K9807097-031	-	7730	-	-	779
HC-S-02	K9807097-032	-	7620	-	-	87
HC-S-03	K9807097-033	-	2940	-	-	<50
HC-S-04	K9807097-034	-	1350	-	-	183
HC-S-05	K9807097-035	-	963	-	-	115
HC-S-06	K9807097-036	-	763	-	-	135
HC-S-07	K9807097-037	-	1240	-	-	106
HC-S-08	K9807097-038	-	894	-	<100	-
HC-S-09	K9807097-039	-	1080	-	<100	-
HC-S-101	K9807097-040	-	1260	-	<100	-
HC-S-10	K9807115-001	960	-	-	<100	-
HC-S-11	K9807115-002	-	1230	-	<100	-
HC-S-12	K9807115-003	-	-	647	-	77
HC-S-13	K9807115-004	-	551	-	<100	-
HC-S-14	K9807115-005	-	630	-	<100	-
HC-S-15	K9807115-006	350	-	-	<100	-
HC-S-16	K9807115-007	-	1130	-	-	115
HC-S-17	K9807115-008	1100	-	-	<100	-
HC-S-22	K9807115-009	-	449	-	<100	-
HC-S-23	K9807115-010	-	-	573	-	58
HC-S-24	K9807115-011	-	4320	-	-	77
HC-S-102	K9807115-012	-	1930	-	<25	-
HC-S-25	K9807115-013	-	157	-	-	962
HC-S-26	K9807115-014	-	289	-	<100	-
HC-S-27	K9807115-015	1400	-	-	<100	-
HC-S-28	K9807115-016	-	384	-	<100	-
HC-S-29	K9807115-017	910	-	-	<100	-
HC-S-35	K9807115-018	-	170	-	<100	-

POPA0007456

000116

Table 1: Summary of Pencil Pitch and Diesel Results for Terminal 4 Sediments (mg/Kg).

Sample Name	Lab Code	Pencil Pitch[1]	Pencil Pitch[2]	Pencil Pitch[3]	Diesel[4]	Diesel[5]
HC-S-37	K9807115-019	-	88.7	-	<100	-
HC-S-32	K9807115-020	-	130	-	<100	-
HC-S-33	K9807115-021	-	-	131	-	212
HC-S-36	K9807169-001	-	20.9	-	-	96
HC-S-34	K9807169-002	-	100	-	-	375
HC-S-40	K9807169-003	-	-	195	-	<50
HC-S-39	K9807169-004	-	727	-	-	<50
HC-S-38	K9807169-005	-	3360	-	-	<50
HC-S-44	K9807169-006	-	84.1	-	<100	-
HC-S-43	K9807169-007	-	101	-	<100	-
HC-S-42	K9807169-008	-	1220	-	<100	-
HC-S-41	K9807169-009	-	1710	-	<100	-
HC-S-18	K9807169-012	2600	-	-	<100	-
HC-S-19	K9807169-013	-	-	8430	-	<50
HC-S-20	K9807169-014	-	1600	-	<100	-
HC-S-21	K9807169-015	1800	-	-	<100	-
HC-S-31	K9807169-016	-	-	57.6	-	<50
HC-S-30	K9807169-017	-	319	-	-	<50

Notes

1	Pencil Pitch measured by NWTPH-Dx.
2	Pencil Pitch calculated as a function of LCRMA HPAHs using the BNA extract for analysis.
3	Pencil Pitch calculated as a function of LCRMA HPAHs + alkylated homologs of fluoranthene, pyrene and chrysene. The aromatic fraction of the NWTPH-Dx extract was used for the analysis.
4	Diesel measured by NWTPH-Dx.
5	Diesel calculated as a function of Pristane and Phytane. The aliphatic fraction of the NWTPH-Dx extract was used for the analysis.
nr	not reported

Table 2: Concentration of PAHs and TPH as n-Alkanes in standard solutions of T4 Diesel and Pencil Pitch (standard concentration @ 5000 ppm; results presented as ug/ml).

Analyte	T4 Diesel	Pencil Pitch
Naphthalene	<0.10	<0.10
Acenaphthylene	<0.10	<0.10
Acenaphthene	0.16	1.9
Dibenzofuran	0.13	0.72
Fluorene	0.74	1.6
Phenanthrene	1.2	24
Anthracene	<0.10	4.9
Fluoranthene	<0.10	72
Pyrene	<0.10	62
Benz(a)anthracene	<0.10	39
Chrysene	0.10	47
Benzo(b)fluoranthene	<0.10	39
Benzo(k)fluoranthene	<0.10	34
Benzo(a)pyrene	<0.10	54
Indeno(1,2,3-cd)pyrene	<0.10	49
Dibenz(a,h)anthracene	<0.10	10
Benzo(g,h,i)perylene	<0.10	42
LPAHs	2.23	33.12
HPAHs	0.10	448.00
Total PAHs	2.33	481.12
TPH as n-Alkanes	4100	761

Table 3: Percent PAHs found in T4 Diesel and Pencil Pitch.

Analyte Group	T4 Diesel	Pencil Pitch
% PAH	0.05	9.62
% LPAH	0.04	0.66
% HPAH	0.002	8.96

Table 4: Percent PAHs found in T4 Diesel and Pencil Pitch normalized to TPH as n-Alkanes[a].

Analyte Group	T4 Diesel	Pencil Pitch
% PAH	0.06	63.2
% LPAH	0.05	4.35
% HPAH	0.002	58.9

a) These values indicate the percent PAH relative to the extractable TPH present in the standard.

Table 5: Summary of Correlation Factors Used to Calculate Hydrocarbon Components in the Sediments.

Hydrocarbon Component	Determinant	Correlation Factor	Function	Comment
Pencil Pitch	LCRMA HPAHs	10.1	multiply	pencil pitch calculated as a function of the sum of high molecular weight PAHs
Diesel	Pristane + Phytane	96.2	multiply	Diesel calculated as a function of the sum of pristane plus phytane

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807097
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/12-13/98
Sample Matrix:	Sediment	Date Received:	10/14/98
		Date Extracted:	10/19-27/98
		Date Analyzed:	11/27-12/6/98

Pencil Pitch
GC/MS SIM[a,b]
Units: mg/Kg (ppm)
Dry Weight Basis

Analyte:		Total HPAH	Pencil Pitch
Method Reporting Limit:		0.5	5
Sample Name	**Lab Code**		
HC-VC-18-S1	K9807097-001	38.1	385
HC-VC-18-S2	K9807097-002	16.4	166
HC-VC-7-S1	K9807097-004	190	1920
HC-VC-7-S2	K9807097-005	92.9	938
HC-VC-13-S1	K9807097-007	2.26	23
HC-VC-13-S2	K9807097-008	2.07	21
HC-VC-104	K9807097-011	4.70	47
HC-VC-11-S1	K9807097-013	69.6	703
HC-VC-11-S2	K9807097-014	139	1400
HC-VC-22-S1	K9807097-016	2.56	26
HC-VC-22-S2	K9807097-017	ND	ND
HC-VC-27-S1	K9807097-019	38.1	385
HC-VC-27-S2	K9807097-020	41.8	422
HC-VC-32-S1	K9807097-022	4.72	48
HC-VC-32-S2	K9807097-023	ND	ND
HC-VC-39-S1	K9807097-025	7.96	80
HC-VC-39-S2	K9807097-026	5.33	54
HC-VC-42-S1	K9807097-028	89.7	906
HC-VC-42-S2	K9807097-029	198	2000
HC-S-01	K9807097-031	765	7730
HC-S-02	K9807097-032	754	7620
HC-S-03	K9807097-033	291	2940
HC-S-04	K9807097-034	134	1350

a Results from this analysis were originally reported as "Base Neutral/Acid Semivolatile Organic Compounds". Pencil Pitch results have been calculated as a funtion of Total HPAHs identified in the samples (correlation factor = 10.1).

b Total HPAH was calculated as the sum of high molecular weight PAHs as listed in the LCRMA Dredge Material Evaluation Framework, Draft, 1998.

Approved By: _____ Date: 5/25/99

POPA0007461

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12-13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/19-27/98
		Date Analyzed:	11/27-12/6/98

Pencil Pitch
GC/MS SIM[a,b]
Units: mg/Kg (ppm)
Dry Weight Basis

	Analyte:	**Total HPAH**	**Pencil Pitch**
	Method Reporting Limit:	0.5	5
Sample Name	**Lab Code**		
HC-S-05	K9807097-035	95.3	963
HC-S-06	K9807097-036	75.5	763
HC-S-07	K9807097-037	123	1240
HC-S-08	K9807097-038	88.5	894
HC-S-09	K9807097-039	107	1080
HC-S-101	K9807097-040	125	1260

a Results from this analysis were originally reported as "Base Neutral/Acid Semivolatile Organic Compounds". Pencil Pitch results have been calculated as a funtion of Total HPAHs identified in the samples (correlation factor = 10.1).

b Total HPAH was calculated as the sum of high molecular weight PAHs as listed in the LCRMA Dredge Material Evaluation Framework, Draft, 1998.

POPA0007462

Approved By: [signature] Date: 5/29/99

2A/102094
07097PHC.JW1 (TPHs (2) 3/4/05

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	10/23/98
		Date Analyzed:	12/1-2/98

Pencil Pitch
GC/MS SIM[a]
Units: mg/Kg (ppm)
Dry Weight Basis

	Analyte:	Total HPAH	Pencil Pitch
	Method Reporting Limit:	0.5	5
Sample Name	**Lab Code**		
HC-S-11	K9807115-002	122	1230
HC-S-13	K9807115-004	54.6	551
HC-S-14	K9807115-005	62.4	630
HC-S-16	K9807115-007	112	1130
HC-S-22	K9807115-009	44.5	449
HC-S-24	K9807115-011	428	4320
HC-S-102	K9807115-012	191	1930
HC-S-25	K9807115-013	15.5	157
HC-S-26	K9807115-014	28.6	289
HC-S-28	K9807115-016	38.0	384
HC-S-35	K9807115-018	16.8	170
HC-S-37	K9807115-019	8.79	88.7
HC-S-32	K9807115-020	12.9	130

a Results from this analysis were originally reported as "Base Neutral/Acid Semivolatile Organic Compounds". Pencil Pitch results have been calculated as a funtion of Total HPAHs identified in the samples (correlation factor = 10.1).

b Total HPAH was calculated as the sum of high molecular weight PAHs as listed in the LCRMA Dredge Material Evaluation Framework, Draft, 1998.

POPA0007463

Approved By: _____ Date: 5/25/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12-15/98
Sample Matrix:	Sediment	**Date Received:**	10/14-16/98
		Date Extracted:	10/23/98
		Date Analyzed:	1/11-12/99

Pencil Pitch
GC/MS SIM[a,b]
Units: mg/Kg (ppm)
Dry Weight Basis

Analyte:		Total HPAH	Pencil Pitch
Method Reporting Limit:		0.5	5
Sample Name	**Lab Code**		
HC-S-01	K9807097-031	497	5020
HC-S-02	K9807097-032	303	3060
HC-S-03	K9807097-033	204	2060
HC-S-04	K9807097-034	96.9	979
HC-S-05	K9807097-035	76.4	772
HC-S-06	K9807097-036	67.1	678
HC-S-07	K9807097-037	77.1	779
HC-S-12	K9807115-003	64.1	647
HC-S-16	K9807115-007	106	1070
HC-S-23	K9807115-010	56.6	572
HC-S-24	K9807115-011	317	3200
HC-S-25	K9807115-013	1.7	17.2
HC-S-33	K9807115-021	13.0	131
HC-S-36	K9807169-001	1.2	12.1
HC-S-34	K9807169-002	7.4	74.7
HC-S-40	K9807169-003	19.3	195
HC-S-39	K9807169-004	45.4	459
HC-S-38	K9807169-005	129	1300
HC-S-19	K9807169-013	835	8430
HC-S-31	K9807169-016	5.7	57.6
HC-S-30	K9807169-017	30.8	311

a Results from this analysis were originally summarized in the document titled "Differentiation of Pencil Pitch and Diesel Fuel at Terminal 4, Port of Portland, Portland Oregon: Site Investigation". Pencil Pitch results have been calculated as a funtion of Total HPAHs identified in the samples (correlation factor = 10.1). The analyses were performed on the aromatic fractions of the NWTPH-Dx extracts.

b Total HPAH was calculated as the sum of high molecular weight PAHs as listed in the LCRMA Dredge Material Evaluation Framework, Draft, 1998.

POPA0007464

Approved By: _____ Date: 5/26/99

2A/102094
07097PHC.JW1 GRH 5/26/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	10/19-27/98
		Date Analyzed:	1/11-2/12/99

Pencil Pitch
GC/MS SIM[a,b]
Units: mg/Kg (ppm)
Dry Weight Basis

Analyte:		Total HPAH	Pencil Pitch
Method Reporting Limit:		0.5	5
Sample Name	**Lab Code**		
HC-S-36	K9807169-001	2.07	20.9
HC-S-34	K9807169-002	9.91	100
HC-S-40	K9807169-003	16.6	168
HC-S-39	K9807169-004	72.0	727
HC-S-38	K9807169-005	333	3360
HC-S-44	K9807169-006	8.33	84.1
HC-S-43	K9807169-007	10.0	101
HC-S-42	K9807169-008	121	1220
HC-S-41	K9807169-009	169	1710
HC-REF-B	K9807169-010	ND	ND
HC-REF-C	K9807169-011	ND	ND
HC-S-19	K9807169-013	471	4760
HC-S-20	K9807169-014	158	1600
HC-S-30	K9807169-017	31.6	319
HC-WS-01-M	K9807169-018	ND	ND
HC-WS-03-B	K9807169-023	ND	ND
HC-RB-100	K9807169-024	ND	ND
HC-RB-101	K9807169-025	ND	ND

a Results from this analysis were originally reported as "Base Neutral/Acid Semivolatile Organic Compounds". Pencil Pitch results have been calculated as a funtion of Total HPAHs identified in the samples (correlation factor = 10.1).

b Total HPAH was calculated as the sum of high molecular weight PAHs as listed in the LCRMA Dredge Material Evaluation Framework, Draft, 1998.

POPA0007465

Approved By: _____ Date: 5/25/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12-13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/23/98
		Date Analyzed:	10/26-31/98

Diesel and Pencil Pitch
NWTPH-Dx[a]
Units: mg/Kg (ppm)
Dry Weight Basis

	Analyte:	**Diesel**	**Pencil Pitch**
	Method Reporting Limit:	25	25
Sample Name	**Lab Code**		
HC-VC-13-S1	K9807097-007	ND	102
HC-VC-11-S1	K9807097-013	<100(B)	1500
HC-VC-11-S2	K9807097-014	<100(B)	2300
HC-S-01	K9807097-031	2100	11000
HC-S-02	K9807097-032	<200(B)	5200
HC-S-03	K9807097-033	<100(B)	3600
HC-S-04	K9807097-034	640	2200
HC-S-05	K9807097-035	550	1600
HC-S-06	K9807097-036	440	1900
HC-S-07	K9807097-037	400	1800
HC-S-08	K9807097-038	<100(B)	1900
HC-S-09	K9807097-039	<100(B)	3000
HC-S-101	K9807097-040	<100(B)	1900

a Results from this analysis were originally reported as "Semivolatile Petroleum Products".
B The MRL is elevated because of matrix interferences.

Approved By: [signature] Date: 5/25/99

2A/102094
07097PHC.JW1 -EPH (5) 5/28/99

POPA0007466

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	10/24/98
		Date Analyzed:	11/2-3/98

Diesel and Pencil Pitch
NWTPH-Dx[a]
Units: mg/Kg (ppm)
Dry Weight Basis

	Analyte:	Diesel	Pencil Pitch
	Method Reporting Limit:	25	25
Sample Name	**Lab Code**		
HC-S-10	K9807115-001	<100(B)	960
HC-S-11	K9807115-002	<100(B)	750
HC-S-12	K9807115-003	360	1500
HC-S-13	K9807115-004	<100(B)	600
HC-S-14	K9807115-005	<100(B)	310
HC-S-15	K9807115-006	<100(B)	350
HC-S-16	K9807115-007	410	1700
HC-S-17	K9807115-008	<100(B)	1100
HC-S-22	K9807115-009	<100(B)	1100
HC-S-23	K9807115-010	<100(B)	1700
HC-S-24	K9807115-011	<100(B)	4500
HC-S-102	K9807115-012	ND	2100
HC-S-25	K9807115-013	960	<300(B)
HC-S-26	K9807115-014	<100(B)	560
HC-S-27	K9807115-015	<100(B)	1400
HC-S-28	K9807115-016	<100(B)	1100
HC-S-29	K9807115-017	<100(B)	910
HC-S-35	K9807115-018	<100(B)	580
HC-S-37	K9807115-019	<100(B)	<100(B)
HC-S-32	K9807115-020	<100(B)	860
HC-S-33	K9807115-021	230	<200(B)

a Results from this analysis were originally reported as "Semivolatile Petroleum Products".
B The MRL is elevated because of matrix interferences.

POPA0007467

Approved By: [signature] Date: 5/25/99

2A/102094
07115PHC.JW5 [illegible]

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	10/28/98
		Date Analyzed:	11/3-4/98

Diesel and Pencil Pitch
NWTPH-Dx[a]
Units: mg/Kg (ppm)
Dry Weight Basis

	Analyte:	**Diesel**	**Pencil Pitch**
	Method Reporting Limit:	25	25
Sample Name	**Lab Code**		
HC-S-36	K9807169-001	<100(B)	<100(B)
HC-S-34	K9807169-002	480	<200(B)
HC-S-40	K9807169-003	<100(B)	770
HC-S-39	K9807169-004	<100(B)	1200
HC-S-38	K9807169-005	<100(B)	2100
HC-S-44	K9807169-006	<100(B)	<100(B)
HC-S-43	K9807169-007	<100(B)	720
HC-S-42	K9807169-008	<100(B)	1800
HC-S-41	K9807169-009	<100(B)	2400
HC-S-18	K9807169-012	<100(B)	2600
HC-S-19	K9807169-013	ND	14000
HC-S-20	K9807169-014	<100(B)	3700
HC-S-21	K9807169-015	<100(B)	1800
HC-S-31	K9807169-016	<100(B)	<100(B)
HC-S-30	K9807169-017	<100(B)	880

a Results from this analysis were originally reported as "Semivolatile Petroleum Products".
B The MRL is elevated because of matrix interferences.

POPA0007468

Approved By: [signature] Date: 5/25/99

2A/102094
07169PHC.JW4 TPHs (2) 5/21/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/12-15/98
Sample Matrix:	Sediment	**Date Received:**	10/14-16/98
		Date Extracted:	10/23-28/98
		Date Analyzed:	1/14-15/99

Diesel
GC-FID[a]
Units: mg/Kg (ppm)
Dry Weight Basis

Analyte:		Pristane + Phytane	Diesel
Method Reporting Limit:		0.5	50
Sample Name	**Lab Code**		
HC-S-01	K9807097-031	8.1	779
HC-S-02	K9807097-032	0.9	87
HC-S-03	K9807097-033	ND	ND
HC-S-04	K9807097-034	1.9	183
HC-S-05	K9807097-035	1.2	115
HC-S-06	K9807097-036	1.4	135
HC-S-07	K9807097-037	1.1	106
HC-S-12	K9807115-003	0.8	77
HC-S-16	K9807115-007	1.2	115
HC-S-23	K9807115-010	0.6	58
HC-S-24	K9807115-011	0.8	77
HC-S-25	K9807115-013	10	962
HC-S-33	K9807115-021	2.2	212
HC-S-36	K9807169-001	1.0	96
HC-S-34	K9807169-002	3.9	375
HC-S-40	K9807169-003	ND	ND
HC-S-39	K9807169-004	ND	ND
HC-S-38	K9807169-005	ND	ND
HC-S-19	K9807169-013	ND	ND
HC-S-31	K9807169-016	ND	ND
HC-S-30	K9807169-017	ND	ND

a Results from this analysis were originally summarized in the document titled "Differentiation of Pencil Pitch and Diesel Fuel at Terminal 4, Port of Portland, Portland Oregon: Site Investigation". Pencil Pitch results have been calculated as a funtion of Pristane + Phytane identified in the samples (correlation factor = 96.2). The analyses were performed on the aliphatic fractions of the NWTPH-Dx extracts.

POPA0007469

Approved By: _____ Date: 5/25/99

2A/102094
07097PHC_JW1 [illegible]

Preliminary Investigation

POPA0007470

Differentiation of Pencil Pitch and Fuel Oils at Terminal 4, Port of Portland, Portland Oregon: Preliminary Investigation

Abstract:

Characterization analyses were performed on site specific standards (diesel and pencil pitch) collected at Terminal 4, Port of Portland, Portland Oregon. The goal of the investigation was to fully characterize the hydrocarbon constituent in the samples, to identify unique indicator compounds specific to each product, and to evaluate potential differentiation techniques that could later be applied to sediment analysis at the site. Polynuclear Aromatic Hydrocarbon (PAH) fingerprints were established for each product. Data was used to develop an identification model capable of differentiation between pencil pitch and fuel oil products. A mixing curve was analyzed and plotted to estimate the percent diesel in a mixture of pencil pitch and diesel. The accuracy of the mixing curve was evaluated for usefulness in estimating percentages of component products of mixtures. The investigation suggests that positive identification of individual component products is possible and that determination of relative contribution of each component can be achieved in standards. An analytical approach for processing and evaluating field samples is suggested.

Analytical Testing:

Two site specific standards were prepared from samples collected at Terminal 4. Standards were made by accurately weighing an aliquot of each sample and diluting to a known volume with methylene chloride. Standards were prepared at 5000 parts per million (ppm).

Sample MW-14 (diesel) was completely miscible in solvent. Pencil Pitch contained a significant insoluble fraction. For purposes of establishing a concentration for the Pencil Pitch standard, the total weight was used rather than soluble weight. This approach allows a determination of total pencil pitch as opposed to soluble pencil pitch.

The standards were analyzed for total petroleum hydrocarbons (quantified using an alkane composite standard) using NWTPH-Dx. Analyses were performed before and after acid/ silica gel clean-up to determine if the samples contained a significant biogenic fraction.

Following TPH analysis, a potion of each standard was back extracted into pH 12 water to remove acid compounds. This fraction was pH adjusted, extracted with methylene chloride and analyzed using EPA Method 8270 for phenolics and tentatively identified compounds (TICs). The remaining standard was fractionated on a silica gel column into an aliphatic (F1) fraction, an aromatic (F2) fraction, and a polar (F3) fraction. The aliphatic fraction was analyzed by GC/FID for alkane hydrocarbons. The aromatic fraction was analyzed by 8270 (base-neutral targets and TICs) and for PAHs and alkylated homologs by GC/MS SIM. The polar fraction was analyzed by 8270 (base-neutral targets and TICs).

In addition to site specific standards, three fresh petroleum products were analyzed: Fresh Diesel, Commercial Grade Bunker C, #6 Fuel Oil. These standards were analyzed to provide reference information.

Results:

Data has been summarized in Table 1 and in the following analytical reports. From this data, a product identification model has been developed that systematically evaluates the chemistry data to determine the nature of hydrocarbon content in a sample. This model has been included in Appendix A.

The TPH analysis of Sample MW-14 indicates a weathered diesel pattern. The sample quantified at 82% of true value against an alkane composite standard. MW-14 is 43% aliphatic hydrocarbon. The sample has a prominent unresolved complex mixture (40% of the TPH). The normal alkane peaks are completely weathered or degraded out of the sample. The predominant resolved peaks include pristane and phytane, in addition to several unidentified C12 - C15 isoprenoids.

The TPH analysis of Pencil Pitch indicates discrete peaks eluting in the high molecular weight PAH range. The sample quantified at 15% of true value against an alkane composite standard. Pencil Pitch has no aliphatic (F1) fraction. The soluble portion of the sample is mostly discrete PAH.

Analysis of the acid fraction by 8270 for phenols confirms that no significant phenolic indicator compounds are present in either of the two samples. This would allow for a determination of potential biases imposed by creosote by inclusion of an option in the analytical plan for phenols (if creosote is expected to be present in the sediment samples).

Analysis of the base-neutral aromatic and polar (F2 and F3) fractions by 8270 indicates that PAHs are the predominant aromatic constituents for both samples, with no significant chromatographable polar constituents.

Analysis of the base-neutral aromatic (F2) fraction by GC/MS SIM indicates significant differences between individual PAH compounds in MW-14 and Pencil Pitch. This data was used to generate PAH fingerprints that graphically distinguish the two products. Fingerprints have been included in Appendix B.

Data Analysis:

Data analysis involved three primary evaluations:

1. Analytical results were evaluated for relative percentages with respect to Total Petroleum Hydrocarbon, Aliphatic Hydrocarbons (F1 fraction), and PAHs. Relative percentages are summarized in Table 1. These relations were used in creating a model to evaluate samples. The model provides a systematic approach to identify individual products of concern or to identify when product mixtures are suspected.
2. PAH fingerprints were identified by charting relative percentages of individual PAH compounds.
3. A mixing curve was created using known amounts of each standard. The curve appears to be determinative with respect to identifying the amount of diesel present in a product mixture. The curve's accuracy was tested by comparing estimated values predicted by the curve to known product ratios in the standards. Accuracy was further tested by comparing predicted results to calculated values using key indicator compounds unique to each sample.

Discussion

The product identification model is able to differentiate individual products and can determine the presence of product mixtures. For the standards analyzed, the model was able to accurately identify each product type. Using the model to determine the presence of product mixtures in sediment samples provides a systematic approach to evaluating site chemistry. If product mixtures are suspected based on a preliminary review of the FID chromatograms, the model becomes a useful tool to validate this qualitative review. Furthermore, if a product mixture is not identified, the model should provide additional documentation that the qualitative evaluation of the FID chromatograms accurately identified the hydrocarbon product in the samples.

PAH fingerprints provide good graphical representation of the major differences between diesel, residual fuel oil and pencil pitch. Pencil pitch and diesel are distinctly different with respect to the PAH distribution in the products. Diesel contains predominantly low molecular weight PAHs while pencil pitch is almost exclusively high molecular weight PAHs. The fingerprints are useful in demonstrating the importance of a systematic evaluation tool such as the product identification model described above. The PAH fingerprint of a 50:50 diesel/pencil pitch mixture demonstrates the difficulty in identifying mixtures of petroleum products. Because Pencil Pitch has such a high PAH content, low contributions of weathered diesel fuel can be masked when evaluated on the basis of relative contribution to total PAHs. An evaluation of key diesel indicator compounds (such as those included in the product identification model) will accurately detect the presence of diesel even when the contribution is low relative to the amount of pencil pitch present in the sample.

A mixing curve was generated uing total PAH and F1 hydrocarbon data for known mixtures of site specific diesel and pencil pitch standards. The mixing curve appears to be a good tool for estimating the amount of diesel in a product mixture. Estimated values are corroborated using key indicator chemicals unique to each product. The curve and supporting evaluations are included in Appendix C.

Conclusion:

Results of this initial investigation suggest that pencil pitch and diesel fuel can be positively identified as individual products and in product mixtures. Furthermore, comparison of fresh diesel and residual fuel oil standards indicates that pencil pitch has significant uniqueness that will allow accurate quantitation using standard analytical techniques in combination with the data evaluation tools used in this study.

The following issues were not addressed and may require additional investigation:

1. Although the techniques used during this study were successful in identifying and quantifying diesel and pencil pitch in laboratory prepared standards, the techniques should be tested on environmental samples. It is suggested that an attempt be made to create a standard reference material containing a known mixture of the two products.
2. There are several petroleum and carbonized coal products that may interfere with accurate identification and quantitation of diesel and pencil pitch. Most significantly, the effects of lube oil and creosote were not evaluated. Also, though the techniques are able to differentiate pencil pitch from weathered diesel, fresh diesel and fresh residual fuel oil, a weathered residual fuel oil was not available for testing. Weathered residual fuel oil can be a significant contaminant in river sediment. Although an evaluation of its masking ability may not be feasible, possible effects of its presence should be considered.

The suggested analytical approach for differentiation/determination of pencil pitch and diesel in sediment samples is as follows:

Samples will be extracted using sonication by EPA Method 3550B. The extracts will be screened using NWTPH-Dx for initial fingerprint and characterization. This analysis will be expanded to include key aliphatic and aromatic indicator compounds. If no indication of a pencil pitch is observed, the hydrocarbon content will be quantified and reported in accordance with NWTPH-Dx.

Samples exhibiting a pencil pitch fingerprint or a mixture of pencil pitch and diesel will be selected for additional testing. These extracts will be fractionated using silica gel into aliphatic and aromatic hydrocarbons. Both fractions will be analyzed by GC/FID to provide a primary determination of diesel and pencil pitch. Secondary determinations using theoretically calculated values based on key indicator compounds will be used to verify these measurements.

The aromatic fraction will also be analyzed using GC/MS SIM for PAHs and alkylated PAH homologs. This data will be used to establish confirmation of pencil pitch by comparison of the PAH fingerprints to a site specific pencil pitch standard. Pencil Pitch content will be established using theoretically calculated values based on key indicator compounds. PAH data will be summed and plotted against the Diesel/Pencil Pitch mixing curve. Percent diesel will be established using the curve.

A strong correlation between measured concentrations, theoretically calculated concentrations, and predicted amounts as determined by the mixing curve will provide confirmation of the measured results from the GC/FID analyses. Poor correlation would indicate a bias in the GC/FID results. The GC/MS data will be used to explain discrepancies should any become apparent.

This analytical approach is outlined in the attached flow diagrams (Appendix D).

Analytical Results

Table 1: Relative amounts of Aliphatic and Aromatic Hydrocarbons

Parameter	MW-14			Pencil Pitch			50:50 Mix (MW-14 : Pencil Pitch)			Fresh Diesel Fuel			Commercial Grade Bunker C			# 6 Fuel Oil		
	% TPH	% FI	% PAH	% TPH	% FI	% PAH	% TPH	% FI	% PAH	% TPH	% FI	% PAH	% TPH	% FI	% PAH	% TPH	% FI	% PAH
TPH as n-Alkanes	100	-	-	100	-	-	100	-	-	100	-	-	100	-	-	100	-	-
Total Aliphatics (FI Hydrocarbon)	*43*	*100*	-	*0.0*	*ERR*	-	*33*	*100*	-	*41*	*100*	-	*21*	*100*	-	*22*	*100*	-
Aliphatic UCM	*40*	*93*	-	*0.0*	*ERR*	-	*30*	*93*	-	*35*	*85*	-	*18*	*86*	-	*20*	*90*	-
Pristane + Phytane	*1.3*	*3.0*	-	*0.0*	*ERR*	-	*1.1*	*3.4*	-	*0.80*	*2.0*	-	*0.20*	*1.0*	-	*0.20*	*0.90*	-
Total PAHs	*1.2*	*2.8*	*100*	*84*	*ERR*	*100*	*14*	*44*	*100*	*0.91*	*2.2*	*100*	*3.3*	*16*	*100*	*2.5*	*11*	*100*
LPAHs	*1.2*	*2.7*	*96*	*6.6*	*ERR*	*7.8*	*2.1*	*6.4*	*14*	*0.85*	*2.1*	*94*	*2.9*	*14*	*86*	*2.0*	*9.1*	*80*
HPAHs	*0.050*	*0.12*	*4.1*	*78*	*ERR*	*92*	*12*	*38*	*86*	*0.054*	*0.1*	*6.0*	*0.47*	*2.3*	*14*	*0.5*	*2.3*	*20*
Naphthalene	0.001	0.003	0.092	0.006	ERR	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.18	1.1	0.023	0.10	0.90
2-Methylnaphthalene	0.000	0.000	0.000	0.010	ERR	0.012	0.002	0.005	0.011	0.000	0.000	0.000	0.32	1.5	9.4	0.11	0.52	4.5
1-Methylnaphthalene	0.054	0.13	4.4	0.006	ERR	0.007	0.035	0.11	0.24	0.000	0.000	0.000	0.15	0.74	4.6	0.054	0.24	2.1
C2-Naphthalenes	0.20	0.48	17	0.007	ERR	0.008	0.17	0.53	1.2	0.065	0.16	7.1	0.54	2.6	16	0.22	0.97	8.6
C3-Naphthalenes	0.20	0.46	16	0.005	ERR	0.006	0.16	0.51	1.1	0.11	0.26	12	0.32	1.6	9.6	0.15	0.67	5.9
C4-Naphthalenes	0.10	0.24	8.6	0.000	ERR	0.000	0.091	0.28	0.63	0.075	0.18	8.2	0.13	0.64	4.0	0.070	0.32	2.8
Acenaphthylene	0.000	0.000	0.000	0.000	ERR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthene	0.004	0.009	0.32	0.25	ERR	0.30	0.049	0.15	0.34	0.000	0.000	0.000	0.014	0.067	0.41	0.005	0.024	0.21
Dibenzofuran	0.003	0.007	0.26	0.095	ERR	0.11	0.019	0.059	0.13	0.005	0.013	0.56	0.011	0.055	0.34	0.005	0.024	0.21
Fluorene	0.018	0.042	1.5	0.21	ERR	0.25	0.058	0.18	0.40	0.014	0.034	1.5	0.027	0.13	0.82	0.013	0.057	0.51
C1-Fluorenes	0.039	0.091	3.2	0.12	ERR	0.15	0.053	0.16	0.37	0.050	0.12	5.5	0.055	0.27	1.6	0.032	0.14	1.3
C2-Fluorenes	0.088	0.20	7.2	0.046	ERR	0.055	0.091	0.28	0.63	0.11	0.28	13	0.11	0.54	3.3	0.086	0.39	3.4
C3-Fluorenes	0.085	0.20	7.0	0.03	ERR	0.03	0.078	0.24	0.54	0.11	0.27	12	0.11	0.55	3.4	0.097	0.44	3.9
Dibenzothiophene	0.006	0.015	0.52	0.12	ERR	0.15	0.029	0.090	0.20	0.000	0.000	0.000	0.021	0.10	0.63	0.016	0.072	0.64
C1-Dibenzothiophenes	0.056	0.13	4.6	0.00	ERR	0.00	0.058	0.18	0.40	0.044	0.11	4.9	0.046	0.23	1.4	0.027	0.12	1.1
C2-Dibenzothiophenes	0.029	0.068	2.4	0.013	ERR	0.016	0.029	0.088	0.20	0.002	0.006	0.26	0.069	0.34	2.1	0.11	0.48	4.2
C3-Dibenzothiophenes	0.016	0.038	1.3	0.006	ERR	0.007	0.016	0.051	0.11	0.000	0.000	0.000	0.052	0.25	1.6	0.072	0.32	2.9
Phenanthrene	0.029	0.068	2.4	3.2	ERR	3.7	0.53	1.6	3.7	0.027	0.066	3.0	0.094	0.46	2.8	0.062	0.28	2.5
Anthracene	0.000	0.000	0.000	0.64	ERR	0.76	0.11	0.34	0.77	0.003	0.008	0.34	0.009	0.046	0.28	0.005	0.024	0.21
C1-Phenanthrenes/Anthracenes	0.068	0.16	5.6	0.64	ERR	0.76	0.18	0.54	1.2	0.081	0.20	8.9	0.20	1.00	6.1	0.22	1.00	8.8
C2-Phenanthrenes/Anthracenes	0.071	0.16	5.8	0.21	ERR	0.25	0.12	0.35	0.80	0.089	0.22	9.8	0.27	1.3	8.0	0.34	1.5	13
C3-Phenanthrenes/Anthracenes	0.059	0.14	4.8	0.085	ERR	0.10	0.066	0.20	0.46	0.054	0.13	5.9	0.19	0.91	5.6	0.21	0.95	8.4
C4-Phenanthrenes/Anthracenes	0.032	0.074	2.6	0.021	ERR	0.025	0.022	0.068	0.15	0.016	0.040	1.8	0.088	0.43	2.6	0.089	0.40	3.5
Carbazole	0.000	0.000	0.000	0.88	ERR	1.0	0.10	0.32	0.71	0.000	0.000	0.000	0.006	0.027	0.16	0.004	0.018	0.16

Table 1: Relative amounts of Aliphatic and Aromatic Hydrocarbons

Parameter	MW-14			Pencil Pitch			50:50 Mix (MW-14 : Pencil Pitch)			Fresh Diesel Fuel			Commercial Grade Bunker C			# 6 Fuel Oil		
	% TPH	% FI	% PAH	% TPH	% FI	% PAH	% TPH	% FI	% PAH	% TPH	% FI	% PAH	% TPH	% FI	% PAH	% TPH	% FI	% PAH
Fluoranthene	*0.001*	*0.002*	*0.068*	*9.5*	*ERR*	*11*	*1.5*	*4.5*	*10*	*0.000*	*0.000*	*0.000*	*0.005*	*0.026*	*0.16*	*0.006*	*0.025*	*0.22*
Pyrene	0.002	0.005	0.16	8.1	ERR	9.7	1.4	4.4	10	0.007	0.018	0.82	0.033	0.16	1.0	0.034	0.15	1.4
C1-Fluoranthenes/Pyrenes	0.018	0.041	1.5	2.5	ERR	3.0	0.49	1.5	3.4	0.006	0.016	0.69	0.092	0.45	2.8	0.097	0.44	3.9
Benz(a)anthracene	0.001	0.003	0.096	5.1	ERR	6.1	0.86	2.7	6.0	0.002	0.006	0.26	0.018	0.088	0.54	0.018	0.081	0.71
Chrysene	0.002	0.006	0.20	6.2	ERR	7.3	1.1	3.3	7.4	0.003	0.008	0.35	0.029	0.14	0.87	0.030	0.14	1.2
C1-Chrysenes	0.007	0.017	0.60	2.5	ERR	3.0	0.49	1.5	3.4	0.000	0.000	0.000	0.083	0.40	2.5	0.086	0.39	3.4
C2-Chrysenes	0.010	0.024	0.84	0.79	ERR	0.94	0.19	0.58	1.3	0.000	0.000	0.000	0.077	0.38	2.3	0.086	0.39	3.4
C3-Chrysenes	0.006	0.015	0.52	0.25	ERR	0.30	0.06	0.18	0.40	0.000	0.000	0.000	0.044	0.21	1.3	0.052	0.23	2.1
C4-Chrysenes	0.000	0.000	0.000	6.3	ERR	7.5	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.087	0.54	0.020	0.089	0.78
Benzo(b)fluoranthene	0.000	0.000	0.000	5.1	ERR	6.1	1.0	3.2	7.1	0.004	0.010	0.46	0.008	0.039	0.24	0.010	0.046	0.41
Benzo(k)fluoranthene	0.000	0.000	0.000	4.5	ERR	5.3	0.86	2.7	6.0	0.004	0.010	0.44	0.005	0.024	0.15	0.006	0.029	0.25
Benzo(a)pyrene	0.000	0.000	0.000	7.1	ERR	8.4	1.1	3.4	7.7	0.006	0.014	0.62	0.015	0.072	0.44	0.016	0.074	0.65
Benzo(e)pyrene	0.000	0.000	0.000	4.5	ERR	5.3	0.78	2.4	5.4	0.004	0.009	0.40	0.009	0.042	0.26	0.012	0.056	0.49
Perylene	0.002	0.005	0.19	2.0	ERR	2.3	0.33	1.0	2.3	0.000	0.000	0.000	0.004	0.018	0.11	0.004	0.019	0.17
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	6.4	ERR	7.6	1.0	3.2	7.1	0.009	0.023	1.0	0.012	0.056	0.34	0.011	0.050	0.44
Dibenz(a,h)anthracene	0.000	0.000	0.000	1.3	ERR	1.6	0.20	0.6	1.4	0.002	0.005	0.22	0.004	0.020	0.12	0.005	0.023	0.20
Benzo(g,h,i)perylene	0.000	0.000	0.000	5.5	ERR	6.6	0.95	2.9	6.5	0.006	0.015	0.68	0.012	0.057	0.35	0.014	0.062	0.65
Carbazole+Perylene	*0.002*	*0.005*	*0.19*	*2.9*	*ERR*	*5.4*	*0.43*	*1.3*	*3.0*	*0.00*	*0.0*	*0.0*	*0.01*	*0.0*	*0.3*	*0.01*	*0.0*	*0.03*

Notes:

1 Aliphatic UCM represents the unresolved complex mixture.
2 Total PAHs were determined by summation of all target PAH detections.
3 LPAHs represent the two and three ring PAH analytes.
4 HPAHs represent PAH analytes consisting of four or more rings and fluoranthene.
5 ERR (error): division by zero.
6 Italicized data indicates a primary indicator parameter.

POPA0007478
00028

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9802676
Project:	POP/T-4/5624-08	Date Collected:	NA
Sample Matrix:	Misc	Date Received:	4/28/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	MW-14	Units:	ug/mL(ppm)
Lab Code:	K9802676-001	Basis:	Solution Conc.
Test Notes:	5000 ppm site specific diesel standard quantified using a composite alkane mix.		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	NONE	NWTPH-Dx	50	1	NA	5/16/98	4100	
Diesel (after cleanup)	NONE	NWTPH-Dx	50	1	NA	6/3/98	1950	X

Extracts were cleaned using Sulfuric Acid and Silica Gel.

Approved By: _____ Date: 9/25/98

22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9802676
Project:	POP/T-4/5624-08	**Date Collected:**	NA
Sample Matrix:	Misc	**Date Received:**	4/28/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	Pencil Pitch	Units:	ug/mL(ppm)
Lab Code:	K9802676-002	Basis:	Solution Conc.
Test Notes:	5000 ppm site specific pencil pitch standard quantified using a composite alkane mix.		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Pencil Pitch	NONE	NWTPH-Dx	50	1	NA	6/3/98	761	
Pencil Pitch (after cleanup)	NONE	NWTPH-Dx	50	1	NA	6/3/98	442	X

Extracts were cleaned using Sulfuric Acid and Silica Gel.

Approved By: _____ Date: 9/25/98

22/020597p

POPA0007480

02676PHC.LP1 - 9/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9802676
Project:	POP/T-4/5624-08	Date Collected:	NA
Sample Matrix:	Misc	Date Received:	4/28/98

Alkane Hydrocarbons
GC/FID

Sample Name:	MW-14 (Curve (100 D))	Units:	ug/mL(ppm)
Lab Code:	K9802676-003	Basis:	Solution Conc.
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Total Alkanes (F1 Aliphatics)	NONE	GC/FID	50	1	NA	5/27/98	1760	
Total Resolved Alkanes	NONE	GC/FID	5	1	NA	5/27/98	116	
Alkane UCM	NONE	GC/FID	50	1	NA	5/27/98	1640	
Pristane + Phytane	NONE	GC/FID	1	1	NA	5/27/98	52	

UCM Unresolved Complex Mixture

Approved By: _____ Date: 9/25/98

POPA0007481

12/020597p

02676PHC.LP2 - 9/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98

Alkane Hydrocarbons
GC/FID

Sample Name: Pencil Pitch (Curve (100 PP))
Lab Code: K9802676-004
Test Notes:

Units: ug/mL(ppm)
Basis: Solution Conc.

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Total Alkanes (F1 Aliphatics)	NONE	GC/FID	50	1	NA	5/27/98	ND	
Total Resolved Alkanes	NONE	GC/FID	5	1	NA	5/27/98	ND	
Alkane UCM	NONE	GC/FID	50	1	NA	5/27/98	ND	
Pristane + Phytane	NONE	GC/FID	1	1	NA	5/27/98	ND	

CM Unresolved Complex Mixture

Approved By: _____ Date: 9/25/98

2/020597p

02676PHC.LP2 - 1 (2) 9/25/98

POPA0007482

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ient:	Hart Crowser, Inc.	Service Request:	K9802676
Project:	POP/T-4/5624-08	Date Collected:	NA
Sample Matrix:	Misc	Date Received:	4/28/98

Alkane Hydrocarbons
GC/FID

Sample Name:	Curve (90:10 PP/D)	Units:	ug/mL(ppm)
Lab Code:	K9802676-005	Basis:	Solution Conc.
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Total Alkanes (F1 Aliphatics)	NONE	GC/FID	50	1	NA	5/27/98	192	
Total Resolved Alkanes	NONE	GC/FID	5	1	NA	5/27/98	9	
Alkane UCM	NONE	GC/FID	50	1	NA	5/27/98	183	
Pristane + Phytane	NONE	GC/FID	1	1	NA	5/27/98	5	

JCM Unresolved Complex Mixture

Approved By: _____ Date: 9/25/98

POPA0007483

22/020597p

02676PHC.LP2 - TOJ 9/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9802676
Project:	POP/T-4/5624-08	**Date Collected:**	NA
Sample Matrix:	Misc	**Date Received:**	4/28/98

Alkane Hydrocarbons
GC/FID

Sample Name:	Curve (75:25 PP/D)	Units:	ug/mL(ppm)
Lab Code:	K9802676-006	Basis:	Solution Conc.
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Total Alkanes (F1 Aliphatics)	NONE	GC/FID	50	1	NA	5/27/98	430	
Total Resolved Alkanes	NONE	GC/FID	5	1	NA	5/27/98	27	
Alkane UCM	NONE	GC/FID	50	1	NA	5/27/98	403	
Pristane + Phytane	NONE	GC/FID	1	1	NA	5/27/98	13	

ICM Unresolved Complex Mixture

Approved By: _____ Date: 9/25/98

POPA0007484

12/020597p

02676PHC.LP2 - 1(4)5/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9802676
Project:	POP/T-4/5624-08	Date Collected:	NA
Sample Matrix:	Misc	Date Received:	4/28/98

Alkane Hydrocarbons
GC/FID

Sample Name:	Curve (50:50 PP/D)	Units:	ug/mL(ppm)
Lab Code:	K9802676-007	Basis:	Solution Conc.
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Total Alkanes (F1 Aliphatics)	NONE	GC/FID	50	1	NA	5/27/98	792	
Total Resolved Alkanes	NONE	GC/FID	5	1	NA	5/27/98	55	
Alkane UCM	NONE	GC/FID	50	1	NA	5/27/98	737	
Pristane + Phytane	NONE	GC/FID	1	1	NA	5/27/98	27	

UCM Unresolved Complex Mixture

Approved By: _____ Date: 9/25/98

POPA0007485

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9802676
Project:	POP/T-4/5624-08	**Date Collected:**	NA
Sample Matrix:	Misc	**Date Received:**	4/28/98

Alkane Hydrocarbons
GC/FID

Sample Name:	Curve (25:70 PP/D)	Units:	ug/mL(ppm)
Lab Code:	K9802676-008	Basis:	Solution Conc.
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Total Alkanes (F1 Aliphatics)	NONE	GC/FID	50	1	NA	5/27/98	1200	
Total Resolved Alkanes	NONE	GC/FID	5	1	NA	5/27/98	84	
Alkane UCM	NONE	GC/FID	50	1	NA	5/27/98	1110	
Pristane + Phytane	NONE	GC/FID	1	1	NA	5/27/98	37	

CM Unresolved Complex Mixture

pproved By: _____ Date: 9/25/98

2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9802676
Project:	POP/T-4/5624-08	Date Collected:	NA
Sample Matrix:	Misc	Date Received:	4/28/98

Alkane Hydrocarbons
GC/FID

Sample Name:	Curve (10:90 PP/D)	Units:	ug/mL(ppm)
Lab Code:	K9802676-009	Basis:	Solution Conc.
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Total Alkanes (F1 Aliphatics)	NONE	GC/FID	50	1	NA	5/27/98	1540	
Total Resolved Alkanes	NONE	GC/FID	5	1	NA	5/27/98	108	
Alkane UCM	NONE	GC/FID	50	1	NA	5/27/98	1440	
Pristane + Phytane	NONE	GC/FID	1	1	NA	5/27/98	48	

UCM Unresolved Complex Mixture

Approved By: _____ Date: 9/25/98

2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9802676
Project:	POP/T-4/5624-08	**Date Collected:**	NA
Sample Matrix:	Misc	**Date Received:**	4/28/98

Alkane Hydrocarbons
GC/FID

Sample Name:	Fresh Diesel Fuel	Units:	ug/mL(ppm)
Lab Code:	K9802676-LCS1	Basis:	Solution Conc.
Test Notes:	1000 PPM Standard		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Total Alkanes (F1 Aliphatics)	NONE	GC/FID	50	1	NA	5/28/98	405	
Total Resolved Alkanes	NONE	GC/FID	5	1	NA	5/28/98	59	
Alkane UCM	NONE	GC/FID	50	1	NA	5/28/98	346	
Pristane + Phytane	NONE	GC/FID	1	1	NA	5/28/98	8	

UCM Unresolved Complex Mixture

Approved By: _____ Date: 9/25/98

SZ2/020597p

POPA0007488

02676PHC.LP2 - 1 (8) 9/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9802676
Project:	POP/T-4/5624-08	Date Collected:	NA
Sample Matrix:	Misc	Date Received:	4/28/98

Alkane Hydrocarbons
GC/FID

Sample Name:	Commercial Grade Bunker C	Units:	ug/mL(ppm)
Lab Code:	K9802676-LCS2	Basis:	Solution Conc.
Test Notes:	1000 PPM Standard		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Total Alkanes (F1 Aliphatics)	NONE	GC/FID	50	1	NA	5/27/98	205	
Total Resolved Alkanes	NONE	GC/FID	5	1	NA	5/27/98	28	
Alkane UCM	NONE	GC/FID	50	1	NA	5/27/98	177	
Pristane + Phytane	NONE	GC/FID	1	1	NA	5/27/98	2	

UCM Unresolved Complex Mixture

Approved By: _____ Date: 6/5/98

POPA0007489

[illegible]/020597p

02676PHC.LP2 - [illegible] 6/25/98

Page No.: 00039

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9802676
Project:	POP/T-4/5624-08	**Date Collected:**	NA
Sample Matrix:	Misc	**Date Received:**	4/28/98

Alkane Hydrocarbons
GC/FID

Sample Name:	#6 Fuel Oil	Units:	ug/mL(ppm)
Lab Code:	K9802676-LCS3	Basis:	Solution Con
Test Notes:	1000 PPM Standard		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Total Alkanes (F1 Aliphatics)	NONE	GC/FID	50	1	NA	5/27/98	221	
Total Resolved Alkanes	NONE	GC/FID	5	1	NA	5/27/98	22	
Alkane UCM	NONE	GC/FID	50	1	NA	5/27/98	199	
Pristane + Phytane	NONE	GC/FID	1	1	NA	5/27/98	2	

UCM Unresolved Complex Mixture

Approved By: _____ Date: 9/25/98

POPA0007490

ISZ2/020597p

02676PHC.LP2 - 1 (10) 9/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Polynuclear Aromatic Hydrocarbons
EPA Method 3520B in combination with GC/MS SIM Method
Units: ng/ml (ppb)

		MW-14 (Curve	Pencil Pitch	Curve (90:10
Sample Name:		(100 D))	(Curve (100 PP))	PP/D)
Lab Code:		K9802676-003	K9802676-004	K9802676-005
Date Analyzed:		5/29/98	5/29/98	5/29/98
Analyte	**MRL**			
Benzo(a)pyrene	20	ND	54000	55000
Benzo(e)pyrene	20	ND	34000	35000
Perylene	20	93	15000	15000
Indeno(1,2,3-cd)pyrene	20	ND	49000	53000
Dibenz(a,h)anthracene	20	ND	10000	10000
Benzo(g,h,i)perylene	20	ND	42000	45000
Total PAHs (summation)	-	49872	640879	612844
LPAHs	-	47806	49979	50444
HPAHs	-	2066	597600	567200
Carbazole + Perylene	-	93	21700	19800

LPAHs (low molecular weight PAHs) is the sum of the two and three ring structures.
HPAHs (high molecular weight PAHs) is the sum of the PAHs containing four or more aromatic rings.

Approved By: _____ Date: 9/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Polynuclear Aromatic Hydrocarbons
EPA Method 3520B in combination with GC/MS SIM Method
Units: ng/ml (ppb)

		Sample Name:	MW-14 (Curve (100 D))	Pencil Pitch (Curve (100 PP))	Curve (90:10 PP/D)
		Lab Code:	K9802676-003	K9802676-004	K9802676-005
		Date Analyzed:	5/29/98	5/29/98	5/29/98
Analyte	**MRL**				
Naphthalene	20		46	46	21
2-Methylnaphthalene	20		ND	75	53
1-Methylnaphthalene	20		2200	45	190
C2-Naphthalenes	20		8400	51	870
C3-Naphthalenes	20		8100	38	820
C4-Naphthalenes	20		4300	ND	480
Acenaphthylene	20		ND	ND	ND
Acenaphthene	20		160	1900	1700
Dibenzofuran	20		130	720	660
Fluorene	20		740	1600	1600
C1-Fluorenes	20		1600	940	1100
C2-Fluorenes	20		3600	350	750
C3-Fluorenes	20		3500	220	490
Dibenzothiophene	20		260	940	790
C1-Dibenzothiophenes	20		2300	ND	240
C2-Dibenzothiophenes	20		1200	100	180
C3-Dibenzothiophenes	20		670	44	100
Phenanthrene	20		1200	24000	24000
Anthracene	20		ND	4900	4200
C1-Phenanthrenes/Anthracenes	20		2800	4900	4600
C2-Phenanthrenes/Anthracenes	20		2900	1600	1800
C3-Phenanthrenes/Anthracenes	20		2400	650	810
C4-Phenanthrenes/Anthracenes	20		1300	160	190
Carbazole	20		ND	6700	4800
Fluoranthene	20		34	72000	70000
Pyrene	20		81	62000	60000
C1-Fluoranthenes/Pyrenes	20		730	19000	19000
Benz(a)anthracene	20		48	39000	39000
Chrysene	20		100	47000	47000
C1-Chrysenes	20		300	19000	19000
C2-Chrysenes	20		420	6000	6500
C3-Chrysenes	20		260	1900	1900
C4-Chrysenes	20		ND	48000	ND
Benzo(b)fluoranthene	20		ND	39000	47000
Benzo(k)fluoranthene	20		ND	34000	40000

Approved By: _____ Date: 9/25/98

POPA0007492

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Polynuclear Aromatic Hydrocarbons
EPA Method 3520B in combination with GC/MS SIM Method
Units: ng/ml (ppb)

Analyte	MRL	Curve (75:25 PP/D)	Curve (50:50 PP/D)	Curve (25:75 PP/D)
Sample Name:				
Lab Code:		K9802676-006	K9802676-007	K9802676-008
Date Analyzed:		5/29/98	5/29/98	5/29/98
Naphthalene	20	64	ND	39
2-Methylnaphthalene	20	87	38	ND
1-Methylnaphthalene	20	720	850	1700
C2-Naphthalenes	20	2600	4200	5900
C3-Naphthalenes	20	2300	4000	5900
C4-Naphthalenes	20	1200	2200	3900
Acenaphthylene	20	ND	ND	43
Acenaphthene	20	1900	1200	700
Dibenzofuran	20	700	470	300
Fluorene	20	1800	1400	1100
C1-Fluorenes	20	1400	1300	1500
C2-Fluorenes	20	1300	2200	3100
C3-Fluorenes	20	1400	1900	2600
Dibenzothiophene	20	780	710	490
C1-Dibenzothiophenes	20	710	1400	2100
C2-Dibenzothiophenes	20	330	700	980
C3-Dibenzothiophenes	20	200	400	590
Phenanthrene	20	20000	13000	6600
Anthracene	20	4200	2700	1400
C1-Phenanthrenes/Anthracenes	20	4800	4300	4000
C2-Phenanthrenes/Anthracenes	20	2200	2800	3300
C3-Phenanthrenes/Anthracenes	20	1100	1600	2100
C4-Phenanthrenes/Anthracenes	20	380	540	770
Carbazole	20	3800	2500	1700
Fluoranthene	20	57000	36000	17000
Pyrene	20	49000	35000	15000
C1-Fluoranthenes/Pyrenes	20	17000	12000	5800
Benz(a)anthracene	20	32000	21000	10000
Chrysene	20	37000	26000	12000
C1-Chrysenes	20	16000	12000	5900
C2-Chrysenes	20	5200	4600	2800
C3-Chrysenes	20	1800	1400	960
C4-Chrysenes	20	ND	ND	ND
Benzo(b)fluoranthene	20	38000	25000	12000
Benzo(k)fluoranthene	20	32000	21000	9900

Approved By: _____ Date: 9/25/98

POPA0007493

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Polynuclear Aromatic Hydrocarbons
EPA Method 3520B in combination with GC/MS SIM Method
Units: ng/ml (ppb)

		Curve (75:25	Curve (50:50	Curve (25:75
Sample Name:		PP/D)	PP/D)	PP/D)
Lab Code:		K9802676-006	K9802676-007	K9802676-008
Date Analyzed:		5/29/98	5/29/98	5/29/98
Analyte	**MRL**			
Benzo(a)pyrene	20	43000	27000	14000
Benzo(e)pyrene	20	28000	19000	8900
Perylene	20	12000	8000	4900
Indeno(1,2,3-cd)pyrene	20	40000	25000	14000
Dibenz(a,h)anthracene	20	8400	4800	3400
Benzo(g,h,i)perylene	20	35000	23000	12000
Total PAHs (summation)	-	505371	351208	199372
LPAHs	-	53971	50408	50812
HPAHs	-	455200	303300	150260
Carbazole + Perylene	-	15800	10500	6600

LPAHs (low molecular weight PAHs) is the sum of the two and three ring structures.
HPAHs (high molecular weight PAHs) is the sum of the PAHs containing four or more aromatic rings.

Approved By: _____ Date: 9/25/98

POPA0007494

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Polynuclear Aromatic Hydrocarbons
EPA Method 3520B in combination with GC/MS SIM Method
Units: ng/ml (ppb)

		Sample Name:	# 6 Fuel Oil	Method Blank
		Lab Code:	K9802676-LCS3	K980529-MB
		Date Analyzed:	5/29/98	5/29/98
Analyte	MRL			
Naphthalene	20		226	ND
2-Methylnaphthalene	20		1140	ND
1-Methylnaphthalene	20		535	ND
C2-Naphthalenes	20		2150	ND
C3-Naphthalenes	20		1480	ND
C4-Naphthalenes	20		700	ND
Acenaphthylene	20		ND	ND
Acenaphthene	20		52	ND
Dibenzofuran	20		52	ND
Fluorene	20		127	ND
C1-Fluorenes	20		319	ND
C2-Fluorenes	20		861	ND
C3-Fluorenes	20		974	ND
Dibenzothiophene	20		160	ND
C1-Dibenzothiophenes	20		271	ND
C2-Dibenzothiophenes	20		1050	ND
C3-Dibenzothiophenes	20		718	ND
Phenanthrene	20		619	ND
Anthracene	20		54	ND
C1-Phenanthrenes/Anthracenes	20		2200	ND
C2-Phenanthrenes/Anthracenes	20		3360	ND
C3-Phenanthrenes/Anthracenes	20		2100	ND
C4-Phenanthrenes/Anthracenes	20		888	ND
Carbazole	20		40	ND
Fluoranthene	20		56	ND
Pyrene	20		340	ND
C1-Fluoranthenes/Pyrenes	20		971	ND
Benz(a)anthracene	20		179	ND
Chrysene	20		301	ND
C1-Chrysenes	20		856	ND
C2-Chrysenes	20		857	ND
C3-Chrysenes	20		516	ND
C4-Chrysenes	20		197	ND
Benzo(b)fluoranthene	20		102	ND
Benzo(k)fluoranthene	20		63	ND

POPA0007495

Approved By: _____ Date: 9/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Polynuclear Aromatic Hydrocarbons
EPA Method 3520B in combination with GC/MS SIM Method
Units: ng/ml (ppb)

		Sample Name:	# 6 Fuel Oil	Method Blank
		Lab Code:	K9802676-LCS3	K980529-MB
		Date Analyzed:	5/29/98	5/29/98
Analyte	**MRL**			
Benzo(a)pyrene	20		164	ND
Benzo(e)pyrene	20		123	ND
Perylene	20		43	ND
Indeno(1,2,3-cd)pyrene	20		110	ND
Dibenz(a,h)anthracene	20		50	ND
Benzo(g,h,i)perylene	20		138	ND
Total PAHs (summation)	-		25142	-
LPAHs	-		20076	-
HPAHs	-		5106	-
Carbazole + Perylene	-		83	-

LPAHs (low molecular weight PAHs) is the sum of the two and three ring structures.
HPAHs (high molecular weight PAHs) is the sum of the PAHs containing four or more aromatic rings.
Laboratory Control Samples (LCS) @ 1000 ppm solution concentration.

POPA0007496

Approved By: [signature] Date: 9/25/98

3S2P/120594
02676SVM.AY1 - [illegible]

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Polynuclear Aromatic Hydrocarbons
EPA Method 3520B in combination with GC/MS SIM Method
Units: ng/ml (ppb)

Analyte	MRL	Sample Name: Curve (10:90 PP/D) Lab Code: K9802676-009 Date Analyzed: 5/29/98	Fresh Diesel Fuel K980529-LCS1 5/29/98	Commercial Grade Bunker C K980529-LCS2 5/29/98
Naphthalene	20	51	ND	363
2-Methylnaphthalene	20	ND	ND	3150
1-Methylnaphthalene	20	2400	ND	1520
C2-Naphthalenes	20	7800	648	5420
C3-Naphthalenes	20	7600	1060	3200
C4-Naphthalenes	20	4400	747	1320
Acenaphthylene	20	ND	ND	ND
Acenaphthene	20	440	ND	138
Dibenzofuran	20	250	51	112
Fluorene	20	1100	136	273
C1-Fluorenes	20	1900	500	550
C2-Fluorenes	20	4000	1140	1114
C3-Fluorenes	20	4000	1082	1120
Dibenzothiophene	20	470	ND	211
C1-Dibenzothiophenes	20	3000	440	462
C2-Dibenzothiophenes	20	1300	24	694
C3-Dibenzothiophenes	20	790	ND	519
Phenanthrene	20	4400	268	943
Anthracene	20	680	31	94
C1-Phenanthrenes/Anthracenes	20	3900	809	2042
C2-Phenanthrenes/Anthracenes	20	3400	891	2660
C3-Phenanthrenes/Anthracenes	20	2700	539	1860
C4-Phenanthrenes/Anthracenes	20	970	162	876
Carbazole	20	930	ND	55
Fluoranthene	20	6800	ND	53
Pyrene	20	6300	74	334
C1-Fluoranthenes/Pyrenes	20	3700	63	918
Benz(a)anthracene	20	4000	24	181
Chrysene	20	5000	32	291
C1-Chrysenes	20	3500	ND	826
C2-Chrysenes	20	1500	ND	771
C3-Chrysenes	20	790	ND	436
C4-Chrysenes	20	ND	ND	179
Benzo(b)fluoranthene	20	4500	42	80
Benzo(k)fluoranthene	20	4700	40	50

POPA0007497

Approved By: _____ Date: 9/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9802676
Project:	POP/T-4/5624-08	**Date Collected:**	NA
Sample Matrix:	Misc	**Date Received:**	4/28/98
		Date Extracted:	NA

Polynuclear Aromatic Hydrocarbons
EPA Method 3520B in combination with GC/MS SIM Method
Units: ng/ml (ppb)

		Curve (10:90		Commercial
	Sample Name:	PP/D)	Fresh Diesel Fuel	Grade Bunker C
	Lab Code:	K9802676-009	K980529-LCS1	K980529-LCS2
	Date Analyzed:	5/29/98	5/29/98	5/29/98
Analyte	**MRL**			
Benzo(a)pyrene	20	5100	56	147
Benzo(e)pyrene	20	4000	36	87
Perylene	20	2100	ND	37
Indeno(1,2,3-cd)pyrene	20	4800	93	115
Dibenz(a,h)anthracene	20	1500	20	40
Benzo(g,h,i)perylene	20	4400	62	116
Total PAHs (summation)	-	119171	9070	33357
LPAHs	-	56481	8528	28696
HPAHs	-	63620	542	4716
Carbazole + Perylene	-	3030	-	92

LPAHs (low molecular weight PAHs) is the sum of the two and three ring structures.
HPAHs (high molecular weight PAHs) is the sum of the PAHs containing four or more aromatic rings.
Laboratory Control Samples (LCS) @ 1000 ppm solution concentration.

POPA0007498

Approved By: [signature] Date: 9/25/98

3S2P/120594
02676SVMLAY1 - [illegible]

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

Analyte	MRL	Sample Name: Pencil Pitch (BN-Aromatic)	Diesel (BN-Aromatic)	Pencil Pitch (BN-Polar)
		Lab Code: K9802676-011	K9802676-014	K9802676-016
		Date Analyzed: 5/28/98	5/30/98	6/1/98
N-Nitrosodimethylamine	25	ND	ND	ND
Aniline	25	ND	ND	ND
Bis(2-chloroethyl) Ether	10	ND	ND	ND
Phenol	10	ND	ND	ND
2-Chlorophenol	10	ND	ND	ND
1,3-Dichlorobenzene	10	ND	ND	ND
1,2-Dichlorobenzene	10	ND	ND	ND
1,4-Dichlorobenzene	10	ND	ND	ND
Benzyl Alcohol	10	ND	ND	ND
Bis(2-chloroisopropyl) Ether	10	ND	ND	ND
2-Methylphenol	10	ND	ND	ND
Hexachloroethane	10	ND	ND	ND
Nitrosodi-n-propylamine	10	ND	ND	ND
and 4-Methylphenol Coelution	10	ND	ND	ND
Nitrobenzene	10	ND	ND	ND
Isophorone	10	ND	ND	ND
2-Nitrophenol	10	ND	ND	ND
2,4-Dimethylphenol	10	ND	ND	ND
Bis(2-chloroethoxy)methane	10	ND	ND	ND
2,4-Dichlorophenol	10	ND	ND	ND
Benzoic Acid	25	ND	ND	ND
1,2,4-Trichlorobenzene	10	ND	ND	ND
Naphthalene	10	ND	ND	ND
4-Chloroaniline	10	ND	ND	ND
Hexachlorobutadiene	10	ND	ND	ND
4-Chloro-3-methylphenol	10	ND	ND	ND
2-Methylnaphthalene	10	ND	ND	ND
Hexachlorocyclopentadiene	10	ND	ND	ND
2,4,6-Trichlorophenol	10	ND	ND	ND
2,4,5-Trichlorophenol	10	ND	ND	ND
2-Chloronaphthalene	10	ND	ND	ND
2-Nitroaniline	25	ND	ND	ND
Acenaphthylene	10	ND	ND	ND
Dimethyl Phthalate	10	ND	ND	ND
2,6-Dinitrotoluene	10	ND	ND	ND

Approved By: CC Haines Date: 6/4/98

POPA0007499

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

Analyte	MRL	Sample Name: Pencil Pitch (BN-Aromatic)	Diesel (BN-Aromatic)	Pencil Pitch (BN-Polar)
		Lab Code: K9802676-011	K9802676-014	K9802676-016
		Date Analyzed: 5/28/98	5/30/98	6/1/98
Acenaphthene	10	ND	ND	ND
3-Nitroaniline	25	ND	ND	ND
2,4-Dinitrophenol	25	ND	ND	ND
Dibenzofuran	10	ND	ND	ND
4-Nitrophenol	25	ND	ND	ND
2,4-Dinitrotoluene	10	ND	ND	ND
Fluorene	10	ND	ND	ND
4-Chlorophenyl Phenyl Ether	10	ND	ND	ND
Diethyl Phthalate	10	ND	ND	ND
4-Nitroaniline	25	ND	ND	ND
2-Methyl-4,6-dinitrophenol	25	ND	ND	ND
N-Nitrosodiphenylamine	10	ND	ND	ND
4-Bromophenyl Phenyl Ether	10	ND	ND	ND
Hexachlorobenzene	10	ND	ND	ND
Pentachlorophenol (PCP)	25	ND	ND	ND
Phenanthrene	10	18	ND	ND
Anthracene	10	ND	ND	ND
Di-n-butyl Phthalate	10	ND	ND	ND
Fluoranthene	10	41	ND	ND
Pyrene	10	34	ND	ND
Butyl Benzyl Phthalate	10	ND	ND	ND
3,3'-Dichlorobenzidine	25	ND	ND	ND
Benz(a)anthracene	10	23	ND	ND
Chrysene	10	26	ND	ND
Bis(2-ethylhexyl) Phthalate	10	ND	ND	ND
Di-n-octyl Phthalate	10	ND	ND	ND
Benzo(b)fluoranthene	10	26	ND	ND
Benzo(k)fluoranthene	10	22	ND	ND
Benzo(a)pyrene	10	30	ND	ND
Indeno(1,2,3-cd)pyrene	10	23	ND	ND
Dibenz(a,h)anthracene	10	ND	ND	ND
Benzo(g,h,i)perylene	10	22	ND	ND

Approved By: CC Haines Date: 6/4/98

POPA0007500

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

	Sample Name:	Diesel (BN-Polar)	Method Blank
	Lab Code:	K9802676-017	K9802676-MB
	Date Analyzed:	6/2/98	5/28/98
Analyte	MRL		
N-Nitrosodimethylamine	25	ND	ND
Aniline	25	ND	ND
Bis(2-chloroethyl) Ether	10	ND	ND
Phenol	10	ND	ND
2-Chlorophenol	10	ND	ND
1,3-Dichlorobenzene	10	ND	ND
1,2-Dichlorobenzene	10	ND	ND
1,4-Dichlorobenzene	10	ND	ND
Benzyl Alcohol	10	ND	ND
Bis(2-chloroisopropyl) Ether	10	ND	ND
2-Methylphenol	10	ND	ND
Hexachloroethane	10	ND	ND
N-Nitrosodi-n-propylamine	10	ND	ND
3- and 4-Methylphenol Coelution	10	ND	ND
Nitrobenzene	10	ND	ND
Isophorone	10	ND	ND
2-Nitrophenol	10	ND	ND
2,4-Dimethylphenol	10	ND	ND
Bis(2-chloroethoxy)methane	10	ND	ND
2,4-Dichlorophenol	10	ND	ND
Benzoic Acid	25	ND	ND
1,2,4-Trichlorobenzene	10	ND	ND
Naphthalene	10	ND	ND
4-Chloroaniline	10	ND	ND
Hexachlorobutadiene	10	ND	ND
4-Chloro-3-methylphenol	10	ND	ND
2-Methylnaphthalene	10	ND	ND
Hexachlorocyclopentadiene	10	ND	ND
2,4,6-Trichlorophenol	10	ND	ND
2,4,5-Trichlorophenol	10	ND	ND
2-Chloronaphthalene	10	ND	ND
2-Nitroaniline	25	ND	ND
Acenaphthylene	10	ND	ND
Dimethyl Phthalate	10	ND	ND
2,6-Dinitrotoluene	10	ND	ND

Approved By: CC Hobbins Date: 6/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

	Sample Name:	Diesel (BN-Polar)	Method Blank
	Lab Code:	K9802676-017	K9802676-MB
	Date Analyzed:	6/2/98	5/28/98
Analyte	**MRL**		
Acenaphthene	10	ND	ND
3-Nitroaniline	25	ND	ND
2,4-Dinitrophenol	25	ND	ND
Dibenzofuran	10	ND	ND
4-Nitrophenol	25	ND	ND
2,4-Dinitrotoluene	10	ND	ND
Fluorene	10	ND	ND
4-Chlorophenyl Phenyl Ether	10	ND	ND
Diethyl Phthalate	10	ND	ND
4-Nitroaniline	25	ND	ND
2-Methyl-4,6-dinitrophenol	25	ND	ND
N-Nitrosodiphenylamine	10	ND	ND
4-Bromophenyl Phenyl Ether	10	ND	ND
Hexachlorobenzene	10	ND	ND
Pentachlorophenol (PCP)	25	ND	ND
Phenanthrene	10	ND	ND
Anthracene	10	ND	ND
Di-n-butyl Phthalate	10	ND	ND
Fluoranthene	10	ND	ND
Pyrene	10	ND	ND
Butyl Benzyl Phthalate	10	ND	ND
3,3'-Dichlorobenzidine	25	ND	ND
Benz(a)anthracene	10	ND	ND
Chrysene	10	ND	ND
Bis(2-ethylhexyl) Phthalate	10	ND	ND
Di-n-octyl Phthalate	10	ND	ND
Benzo(b)fluoranthene	10	ND	ND
Benzo(k)fluoranthene	10	ND	ND
Benzo(a)pyrene	10	ND	ND
Indeno(1,2,3-cd)pyrene	10	ND	ND
Dibenz(a,h)anthracene	10	ND	ND
Benzo(g,h,i)perylene	10	ND	ND

Approved By: CC Loomis Date: 6/4/98

POPA0007502

ZP/120594
02676SVM.AY2 - 2-6/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

		Pencil Pitch	
Sample Name:		(ACID)	Diesel (ACID)
Lab Code:		K9802676-012	K9802676-015
Date Analyzed:		5/29/98	5/31/98
Analyte	MRL		
N-Nitrosodimethylamine	2.5	ND	ND
Aniline	2.5	ND	ND
Bis(2-chloroethyl) Ether	1.0	ND	ND
Phenol	1.0	ND	ND
2-Chlorophenol	1.0	ND	ND
1,3-Dichlorobenzene	1.0	ND	ND
1,2-Dichlorobenzene	1.0	ND	ND
1,4-Dichlorobenzene	1.0	ND	ND
Benzyl Alcohol	1.0	ND	ND
Bis(2-chloroisopropyl) Ether	1.0	ND	ND
2-Methylphenol	1.0	ND	ND
Hexachloroethane	1.0	ND	ND
N-Nitrosodi-n-propylamine	1.0	ND	ND
3 and 4-Methylphenol Coelution	1.0	ND	ND
Nitrobenzene	1.0	ND	ND
Isophorone	1.0	ND	ND
2-Nitrophenol	1.0	ND	ND
2,4-Dimethylphenol	1.0	ND	ND
Bis(2-chloroethoxy)methane	1.0	ND	ND
2,4-Dichlorophenol	1.0	ND	ND
Benzoic Acid	2.5	ND	ND
1,2,4-Trichlorobenzene	1.0	ND	ND
Naphthalene	1.0	ND	ND
4-Chloroaniline	1.0	ND	ND
Hexachlorobutadiene	1.0	ND	ND
4-Chloro-3-methylphenol	1.0	ND	ND
2-Methylnaphthalene	1.0	ND	ND
Hexachlorocyclopentadiene	1.0	ND	ND
2,4,6-Trichlorophenol	1.0	ND	ND
2,4,5-Trichlorophenol	1.0	ND	ND
2-Chloronaphthalene	1.0	ND	ND
2-Nitroaniline	2.5	ND	ND
Acenaphthylene	1.0	ND	ND
Dimethyl Phthalate	1.0	ND	ND
2,6-Dinitrotoluene	1.0	ND	ND

Approved By: C C Haines Date: 6/4/98

POPA0007503

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

Analyte	MRL	Sample Name: Pencil Pitch (ACID) Lab Code: K9802676-012 Date Analyzed: 5/29/98	Diesel (ACID) K9802676-015 5/31/98
Acenaphthene	1.0	ND	ND
3-Nitroaniline	2.5	ND	ND
2,4-Dinitrophenol	2.5	ND	ND
Dibenzofuran	1.0	ND	ND
4-Nitrophenol	2.5	ND	ND
2,4-Dinitrotoluene	1.0	ND	ND
Fluorene	1.0	ND	ND
4-Chlorophenyl Phenyl Ether	1.0	ND	ND
Diethyl Phthalate	1.0	ND	ND
4-Nitroaniline	2.5	ND	ND
2-Methyl-4,6-dinitrophenol	2.5	ND	ND
N-Nitrosodiphenylamine	1.0	ND	ND
4-Bromophenyl Phenyl Ether	1.0	ND	ND
Hexachlorobenzene	1.0	ND	ND
Pentachlorophenol (PCP)	2.5	ND	ND
Phenanthrene	1.0	1.8	ND
Anthracene	1.0	ND	ND
Di-n-butyl Phthalate	1.0	ND	ND
Fluoranthene	1.0	4.4	ND
Pyrene	1.0	3.9	ND
Butyl Benzyl Phthalate	1.0	ND	ND
3,3'-Dichlorobenzidine	2.5	ND	ND
Benz(a)anthracene	1.0	2.6	ND
Chrysene	1.0	2.9	ND
Bis(2-ethylhexyl) Phthalate	1.0	ND	ND
Di-n-octyl Phthalate	1.0	ND	ND
Benzo(b)fluoranthene	1.0	3.2	ND
Benzo(k)fluoranthene	1.0	2.7	ND
Benzo(a)pyrene	1.0	3.8	ND
Indeno(1,2,3-cd)pyrene	1.0	3.0	ND
Dibenz(a,h)anthracene	1.0	ND	ND
Benzo(g,h,i)perylene	1.0	2.8	ND

Approved By: CCdeines Date: 6/4/98

POPA0007504

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA
Date Analyzed: 5/28/98

Tentatively Identified Compounds (TIC)
Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

Sample Name: Pencil Pitch (BN-Aromatic)
Lab Code: K9802676-011

CAS Number	TIC	Retention Time (minutes)	Estimated Concentration
	11H-Benzo [b] fluorene isomer	23.31	6
	11H-Benzo [b] fluorene isomer	23.43	4
	Unknown PAH	25.22	4
205-82-3	Benzo [j] fluoranthene	28.32	6
192-97-2	Benzo [e] pyrene	28.95	25
[redacted]5-0	Perylene	29.36	7
	Unknown(possible aromatic ketone) at MRL	29.74	4
	Unknown PAH	29.82	9
	Substituted aromatic	30.00	4
	Unknown PAH	30.08	4
	Unknown	30.39	7
	Substituted Benzperylene	31.74	7
	Dibenzanthracene isomer	32.48	4
	Benzoperylene isomer	33.15	9

Approved By: CC Haines Date: 6/4/98

POPA0007505

20594
02676SVM.AY2 - TIC11 6/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9802676
Project:	POP/T-4/5624-08	Date Collected:	NA
Sample Matrix:	Misc	Date Received:	4/28/98
		Date Extracted:	NA
		Date Analyzed:	6/1/98

Tentatively Identified Compounds (TIC)
Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

Sample Name:	**Pencil Pitch (BN-Polar)**
Lab Code:	K9802676-016

CAS Number	TIC	Retention Time (minutes)	Estimated Concentration
	Unknown hydrocarbon	7.75	18
06-49-5	Acenaphtho(1,2-B) pyridine	22.98	4

Approved By: CC Haines Date: 6/4/98

POPA0007506

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

...nt:	Hart Crowser, Inc.	Service Request:	K9802676
...oject:	POP/T-4/5624-08	Date Collected:	NA
Sample Matrix:	Misc	Date Received:	4/28/98
		Date Extracted:	NA
		Date Analyzed:	5/29/98

Tentatively Identified Compounds (TIC)
Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

Sample Name: Pencil Pitch (ACID)
Lab Code: K9802676-012

...AS Number	TIC	Retention Time (minutes)	Estimated Concentration
-	Unknown PAH	21.08	0.5
	Pyrene, methyl isomer	23.32	1
	Pyrene, methyl isomer	23.42	0.8
84-15-1	o-Terphenyl	24.10	0.7
	Benzo-naphtho-thiophene isomer	24.44	0.5
	Unknown PAH	24.51	1
	Unknown	24.58	0.6
	Benzo-naphtho-thiophene isomer	24.78	0.5
	Unknown PAH	25.21	0.9
	Benzocarbazole isomer	25.43	0.8
	Benzocarbazole isomer	25.56	0.8
	Chrysene, methyl isomer	25.94	0.5
	Unknown	26.20	0.5
	Substituted PAH	26.36	0.5
...05-82-3	Benzo [j] fluoranthene	28.31	0.7
...92-97-2	Benzo [e] pyrene	28.95	3
...198-55-0	Perylene	29.35	1
	Unknown PAH	29.74	0.6
	Unknown PAH	29.82	1
	Unknown aromatic ketone	30.00	0.7
	Unknown PAH	30.07	0.7
	Unknown	30.38	1

...proved By: CC Haines Date: 6/4/98

POPA0007507

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9802676
Project:	POP/T-4/5624-08	**Date Collected:**	NA
Sample Matrix:	Misc	**Date Received:**	4/28/98
		Date Extracted:	NA
		Date Analyzed:	5/29/98

Tentatively Identified Compounds (TIC)
Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

Sample Name: **Pencil Pitch (ACID)**
Lab Code: K9802676-012

CAS Number	TIC	Retention Time (minutes)	Estimated Concentration
-	Unknown	31.53	0.5
-	Dibenzanthracene isomer	31.72	1
-	Dibenzanthracene isomer	32.37	0.6
-	Dibenzanthracene isomer	32.47	0.7
-	Unknown PAH	32.91	0.6
-	Benzoperylene isomer	33.15	1

pproved By: CC Haines Date: 6/4/98

POPA0007508

7120594
02676SVMLAY2 TIC12 (2)6/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: 4/28/98
Date Extracted: NA
Date Analyzed: 5/30/98

Tentatively Identified Compounds (TIC)
Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

Sample Name: Diesel (BN-Aromatic)
Lab Code: K9802676-014

CAS Number	TIC	Retention Time (minutes)	Estimated Concentration
	Naphthalene, dimethyl isomer	14.43	5
	Naphthalene, dimethyl isomer	14.62	5
	Naphthalene, dimethyl isomer	14.67	5
	Naphthalene, trimethyl isomer	16.03	4

Approved By: CCHaines Date: 6/4/98

POPA0007509

2/120594
02676SVM.AY2 - TIC14 6/3/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: POP/T-4/5624-08
Sample Matrix: Misc

Service Request: K9802676
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 5/28/98

Tentatively Identified Compounds (TIC)
Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

Sample Name: Diesel (BN-Polar)
Lab Code: K9802676-017

CAS Number	TIC	Retention Time (minutes)	Estimated Concentration
	No Tentatively Identified Compounds Present		

Approved By: CCHaines Date: 6/4/98

POPA0007510

7120594
02676SVMAY2 TIC-MB 6/4/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ent:	Hart Crowser, Inc.	Service Request:	K9802676
oject:	POP/T-4/5624-08	Date Collected:	NA
Sample Matrix:	Misc	Date Received:	4/28/98
		Date Extracted:	NA
		Date Analyzed:	5/31/98

Tentatively Identified Compounds (TIC)
Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520B/8270B
Units: ug/ml (ppm)
Solution Concentration

Sample Name: **Diesel (ACID)**
Lab Code: K9802676-015

CAS Number	TIC	Retention Time (minutes)	Estimated Concentration
-	Unknown alkane	13.43	0.6
629-62-9	Pentadecane	13.84	0.8
	Naphthalene, dimethyl isomer	14.66	0.4
544-76-3	Hexadecane	14.91	1
	Unknown alkane (C17)	17.68	2
	Unknown alkane(C19)	18.49	3
	Unknown cycloalkane (C20)	18.96	0.6
	Unknown alkane(C18-24)	20.53	0.8
	Unknown alkane(C18-24)	22.02	0.5

proved By: CC Haines Date: 6/4/98

POPA0007511

120594
02676SVM.AY2(TIC13 6/4/98

Appendix A

Product Identification Model

Model for Identifying Pencil Pitch versus Fuel Oil Products:
Evaluation of Key Indicator Paratmeters

Parameter	Diesel				Pencil Pitch				Heavy Fuel Oil			
	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]
Total Aliphatics (F1 Hydrocarbons)	43	-	-	1	43	-	-	0	43	-	-	0
Aliphatic UCM	-	93	-	1	-	93	-	0	-	93	-	1
Pristane + Phytane	-	3.0	-	1	-	3.0	-	0	-	3.0	-	0
Total PAHs	1.2	-	-	1	1.2	-	-	0	1.2	-	-	0
LPAHs	-	-	96	1	-	-	96	0	-	-	96	0
HPAHs	-	-	4.2	1	-	-	4.2	0	-	-	4.2	0
Carbazole + Perylene	-	-	0.19	1	-	-	0.19	0	-	-	0.19	1
Fluoranthene	0.00	-	-	1	0.00	-	-	0	0.00	-	-	1
Summary Evaluation	**100% Match**				**Poor Match**				**Poor Match**			
Identification	**Diesel**											

1. Evaluation criteria based on Pass (1)/Fail (0). Each criteria receives equal weighting in overall evaluation.

Sample Data

	Sample ID: MW-14
TPH as n-Alkanes	4100
Total Aliphatics (F1 Hydrocarbons)	1760
Aliphatic UCM	1640
Pristane + Phytane	52
Total PAHs	49.9
LPAHs	48
HPAHs	2.1
Carbazole + Perylene	0.093
Fluoranthene	0.034

Evaluation Criteria

	Diesel	Pencil Pitch	Heavy Fuel Oil
Total Aliphatics (F1 Hydrocarbons)	> 35% of TPH	< 1% of TPH	15% - 35% of TPH
Aliphatic UCM	> 80% of F1	< 1% of F1	> 80% of F1
Pristane + Phytane	> 1.5% of F1	= 0% of F1	0.5% - 2% of F1
Total PAHs	< 1.5% of TPH	> 80% of TPH	1.5% - 10% of TPH
LPAHs	> 90% of PAH	< 12% of PAH	65% - 90% of PAH
HPAHs	< 10% of PAH	> 85% of PAH	10% - 35% of PAH
Carbazole + Perylene	< 0.5% of PAH	> 2% of PAH	< 0.5% of PAH
Fluoranthene	< 0.01% of TPH	> 5% of TPH	< 0.01% of TPH

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Model for Identifying Pencil Pitch versus Fuel Oil Products:
Evaluation of Key Indicator Paratmeters

Parameter	Diesel				Pencil Pitch				Heavy Fuel Oil			
	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]
Total Aliphatics (F1 Hydrocarbons)	0	-	-	0	0	-	-	1	0	-	-	0
Aliphatic UCM	-	0	-	0	-	0	-	1	-	0	-	0
Pristane + Phytane	-	0.0	-	0	-	0.0	-	1	-	0.0	-	0
Total PAHs	84.2	-	-	0	84.2	-	-	1	84.2	-	-	0
LPAHs	-	-	8	0	-	-	8	1	-	-	8	0
HPAHs	-	-	92.2	0	-	-	92.2	1	-	-	92.2	0
Carbazole + Perylene	-	-	3.39	0	-	-	3.39	1	-	-	3.39	0
Fluoranthene	9.46	-	-	0	9.46	-	-	1	9.46	-	-	0
Summary Evaluation	**Poor Match**				**100% Match**				**Poor Match**			
Identification	**Pencil Pitch**											

1. Evaluation criteria based on Pass (1)/Fail (0). Each criteria receives equal weighting in overall evaluation.

Sample Data

	Sample ID: Pencil Pitch
TPH as n-Alkanes	761
Total Aliphatics (F1 Hydrocarbons)	ND
Aliphatic UCM	ND
Pristane + Phytane	ND
Total PAHs	640.9
LPAHs	50
HPAHs	590.9
Carbazole + Perylene	21.7
Fluoranthene	72

Evaluation Criteria

	Diesel	Pencil Pitch	Heavy Fuel Oil
Total Aliphatics (F1 Hydrocarbons)	> 35% of TPH	< 1% of TPH	15% - 35% of TPH
Aliphatic UCM	> 80% of F1	< 1% of F1	> 80% of F1
Pristane + Phytane	> 1.5% of F1	= 0% of F1	0.5% - 2% of F1
Total PAHs	< 1.5% of TPH	> 80% of TPH	1.5% - 10% of TPH
LPAHs	> 90% of PAH	< 12% of PAH	65% - 90% of PAH
HPAHs	< 10% of PAH	> 85% of PAH	10% - 35% of PAH
Carbazole + Perylene	< 0.5% of PAH	> 2% of PAH	< 0.5% of PAH
Fluoranthene	< 0.01% of TPH	> 5% of TPH	< 0.01% of TPH

POPA007514

00064

Model for Identifying Pen[redacted]itch versus Fuel Oil Products: Evaluation of Key Indicator Paratmeters

Parameter	Diesel				Pencil Pitch				Heavy Fuel Oil			
	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]
Total Aliphatics (F1 Hydrocarbons)	41	-	-	1	41	-	-	0	41	-	-	0
Aliphatic UCM	-	94	-	1	-	94	-	0	-	94	-	1
Pristane + Phytane	-	3.1	-	1	-	3.1	-	0	-	3.1	-	0
Total PAHs	3.2	-	-	0	3.2	-	-	0	3.2	-	-	1
LPAHs	-	-	47	0	-	-	47	0	-	-	47	0
HPAHs	-	-	52.6	0	-	-	52.6	0	-	-	52.6	0
Carbazole + Perylene	-	-	2.54	0	-	-	2.54	1	-	-	2.54	0
Fluoranthene	0.18	-	-	0	0.18	-	-	0	0.18	-	-	0
Summary Evaluation	**Poor Match**				**Poor Match**				**Poor Match**			
Identification	**Mixture or Unidentified Product**											

1. Evaluation criteria based on Pass (1)/Fail (0). Each criteria receives equal weighting in overall evaluation.

Sample Data

	Sample ID: Curve (10:90 PP/D)
TPH as n-Alkanes	3766.1
Total Aliphatics (F1 Hydrocarbons)	1540
Aliphatic UCM	1440
Pristane + Phytane	48
Total PAHs	119.2
LPAHs	57
HPAHs	62.7
Carbazole + Perylene	3.03
Fluoranthene	6.8

Evaluation Criteria

	Diesel	Pencil Pitch	Heavy Fuel Oil
Total Aliphatics (F1 Hydrocarbons)	> 35% of TPH	< 1% of TPH	15% - 35% of TPH
Aliphatic UCM	> 80% of F1	< 1% of F1	> 80% of F1
Pristane + Phytane	> 1.5% of F1	= 0% of F1	0.5% - 2% of F1
Total PAHs	< 1.5% of TPH	> 80% of TPH	1.5% - 10% of TPH
LPAHs	> 90% of PAH	< 12% of PAH	65% - 90% of PAH
HPAHs	< 10% of PAH	> 85% of PAH	10% - 35% of PAH
Carbazole + Perylene	< 0.5% of PAH	> 2% of PAH	< 0.5% of PAH
Fluoranthene	< 0.01% of TPH	> 5% of TPH	< 0.01% of TPH

Model for Identifying Pencil Pitch versus Fuel Oil Products:
Evaluation of Key Indicator Paratmeters

Parameter	Diesel				Pencil Pitch				Heavy Fuel Oil			
	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]
Total Aliphatics (F1 Hydrocarbons)	33	-	-	0	33	-	-	0	33	-	-	1
Aliphatic UCM	-	93	-	1	-	93	-	0	-	93	-	1
Pristane + Phytane	-	3.4	-	1	-	3.4	-	0	-	3.4	-	0
Total PAHs	14.4	-	-	0	14.4	-	-	0	14.4	-	-	0
LPAHs	-	-	14	0	-	-	14	0	-	-	14	0
HPAHs	-	-	85.6	0	-	-	85.6	1	-	-	85.6	0
Carbazole + Perylene	-	-	2.99	0	-	-	2.99	1	-	-	2.99	0
Fluoranthene	1.48	-	-	0	1.48	-	-	0	1.48	-	-	0
Summary Evaluation	**Poor Match**				**Poor Match**				**Poor Match**			
Identification	**Mixture or Unidentified Product**											

1. Evaluation criteria based on Pass (1)/Fail (0). Each criteria receives equal weighting in overall evaluation.

Sample Data

	Sample ID: Curve (50:50 PP/D)
TPH as n-Alkanes	2430.5
Total Aliphatics (F1 Hydrocarbons)	792
Aliphatic UCM	737
Pristane + Phytane	27
Total PAHs	351.2
LPAHs	50.4
HPAHs	300.8
Carbazole + Perylene	10.5
Fluoranthene	36

Evaluation Criteria

	Diesel	Pencil Pitch	Heavy Fuel Oil
Total Aliphatics (F1 Hydrocarbons)	> 35% of TPH	< 1% of TPH	15% - 35% of TPH
Aliphatic UCM	> 80% of F1	< 1% of F1	> 80% of F1
Pristane + Phytane	> 1.5% of F1	= 0% of F1	0.5% - 2% of F1
Total PAHs	< 1.5% of TPH	> 80% of TPH	1.5% - 10% of TPH
LPAHs	> 90% of PAH	< 12% of PAH	65% - 90% of PAH
HPAHs	< 10% of PAH	> 85% of PAH	10% - 35% of PAH
Carbazole + Perylene	< 0.5% of PAH	> 2% of PAH	< 0.5% of PAH
Fluoranthene	< 0.01% of TPH	> 5% of TPH	< 0.01% of TPH

Model for Identifying Pencil Pitch versus Fuel Oil Products:
Evaluation of Key Indicator Paratmeters

Parameter	Diesel				Pencil Pitch				Heavy Fuel Oil			
	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]
Total Aliphatics (F1 Hydrocarbons)	18	-	-	0	18	-	-	0	18	-	-	1
Aliphatic UCM	-	95	-	1	-	95	-	0	-	95	-	1
Pristane + Phytane	-	2.6	-	1	-	2.6	-	0	-	2.6	-	0
Total PAHs	56.0	-	-	0	56.0	-	-	0	56.0	-	-	0
LPAHs	-	-	8	0	-	-	8	1	-	-	8	0
HPAHs	-	-	91.8	0	-	-	91.8	1	-	-	91.8	0
Carbazole + Perylene	-	-	3.23	0	-	-	3.23	1	-	-	3.23	0
Fluoranthene	6.39	-	-	0	6.39	-	-	1	6.39	-	-	0
Summary Evaluation	**Poor Match**				**Poor Match**				**Poor Match**			
Identification	**Mixture or Unidentified Product**											

1. Evaluation criteria based on Pass (1)/Fail (0). Each criteria receives equal weighting in overall evaluation.

Sample Data

	Sample ID: Curve (90:10 PP/D)
TPH as n-Alkanes	1094.9
Total Aliphatics (F1 Hydrocarbons)	192
Aliphatic UCM	183
Pristane + Phytane	5.0
Total PAHs	612.8
LPAHs	50.4
HPAHs	562.4
Carbazole + Perylene	19.8
Fluoranthene	70

Evaluation Criteria

	Diesel	Pencil Pitch	Heavy Fuel Oil
Total Aliphatics (F1 Hydrocarbons)	> 35% of TPH	< 1% of TPH	15% - 35% of TPH
Aliphatic UCM	> 80% of F1	< 1% of F1	> 80% of F1
Pristane + Phytane	> 1.5% of F1	= 0% of F1	0.5% - 2% of F1
Total PAHs	< 1.5% of TPH	> 80% of TPH	1.5% - 10% of TPH
LPAHs	> 90% of PAH	< 12% of PAH	65% - 90% of PAH
HPAHs	< 10% of PAH	> 85% of PAH	10% - 35% of PAH
Carbazole + Perylene	< 0.5% of PAH	> 2% of PAH	< 0.5% of PAH
Fluoranthene	< 0.01% of TPH	> 5% of TPH	< 0.01% of TPH

Model for Identifying Pencil Pitch versus Fuel Oil Products:
Evaluation of Key Indicator Paratmeters

Parameter	Diesel				Pencil Pitch				Heavy Fuel Oil			
	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]
Total Aliphatics (F1 Hydrocarbons)	41	-	-	1	41	-	-	0	41	-	-	0
Aliphatic UCM	-	85	-	1	-	85	-	0	-	85	-	1
Pristane + Phytane	-	2.0	-	1	-	2.0	-	0	-	2.0	-	1
Total PAHs	0.9	-	-	1	0.9	-	-	0	0.9	-	-	0
LPAHs	-	-	93	1	-	-	93	0	-	-	93	0
HPAHs	-	-	5.5	1	-	-	5.5	0	-	-	5.5	0
Carbazole + Perylene	-	-	0.00	1	-	-	0.00	0	-	-	0.00	1
Fluoranthene	0.00	-	-	1	0.00	-	-	0	0.00	-	-	1
Summary Evaluation	100% Match				Poor Match				Poor Match			
Identification	Diesel											

1. Evaluation criteria based on Pass (1)/Fail (0). Each criteria receives equal weighting in overall evaluation.

Sample Data

	Sample ID: Fresh Diesel
TPH as n-Alkanes	1000
Total Aliphatics (F1 Hydrocarbons)	405
Aliphatic UCM	346
Pristane + Phytane	8
Total PAHs	9.1
LPAHs	9
HPAHs	0.5
Carbazole + Perylene	ND
Fluoranthene	ND

Evaluation Criteria

	Diesel	Pencil Pitch	Heavy Fuel Oil
Total Aliphatics (F1 Hydrocarbons)	> 35% of TPH	< 1% of TPH	15% - 35% of TPH
Aliphatic UCM	> 80% of F1	< 1% of F1	> 80% of F1
Pristane + Phytane	> 1.5% of F1	= 0% of F1	0.5% - 2% of F1
Total PAHs	< 1.5% of TPH	> 80% of TPH	1.5% - 10% of TPH
LPAHs	> 90% of PAH	< 12% of PAH	65% - 90% of PAH
HPAHs	< 10% of PAH	> 85% of PAH	10% - 35% of PAH
Carbazole + Perylene	< 0.5% of PAH	> 2% of PAH	< 0.5% of PAH
Fluoranthene	< 0.01% of TPH	> 5% of TPH	< 0.01% of TPH

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Model for Identifying Pe[redacted]Pitch versus Fuel Oil Products:
Evaluation of Key Indicator Paratmeters

Parameter	Diesel				Pencil Pitch				Heavy Fuel Oil			
	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]
Total Aliphatics (F1 Hydrocarbons)	21	-	-	0	21	-	-	0	21	-	-	1
Aliphatic UCM	-	86	-	1	-	86	-	0	-	86	-	1
Pristane + Phytane	-	1.0	-	0	-	1.0	-	0	-	1.0	-	1
Total PAHs	3.3	-	-	0	3.3	-	-	0	3.3	-	-	1
LPAHs	-	-	86	0	-	-	86	0	-	-	86	1
HPAHs	-	-	14.1	0	-	-	14.1	0	-	-	14.1	1
Carbazole + Perylene	-	-	0.28	1	-	-	0.28	0	-	-	0.28	1
Fluoranthene	0.01	-	-	1	0.01	-	-	0	0.01	-	-	1
Summary Evaluation	**Poor Match**				**Poor Match**				**100% Match**			
Identification	**Heavy Fuel Oil**											

1. Evaluation criteria based on Pass (1)/Fail (0). Each criteria receives equal weighting in overall evaluation.

Sample Data

Sample ID: Commercial Grade Bunker C

TPH as n-Alkanes	1000
Total Aliphatics (F1 Hydrocarbons)	205
Aliphatic UCM	177
Pristane + Phytane	2
Total PAHs	33.4
LPAHs	29
HPAHs	4.7
Carbazole + Perylene	0.092
Fluoranthene	0.053

Evaluation Criteria

	Diesel	Pencil Pitch	Heavy Fuel Oil
Total Aliphatics (F1 Hydrocarbons)	> 35% of TPH	< 1% of TPH	15% - 35% of TPH
Aliphatic UCM	> 80% of F1	< 1% of F1	> 80% of F1
Pristane + Phytane	> 1.5% of F1	= 0% of F1	0.5% - 2% of F1
Total PAHs	< 1.5% of TPH	> 80% of TPH	1.5% - 10% of TPH
LPAHs	> 90% of PAH	< 12% of PAH	65% - 90% of PAH
HPAHs	< 10% of PAH	> 85% of PAH	10% - 35% of PAH
Carbazole + Perylene	< 0.5% of PAH	> 2% of PAH	< 0.5% of PAH
Fluoranthene	< 0.01% of TPH	> 5% of TPH	< 0.01% of TPH

Model for Identifying Pencil Pitch versus Fuel Oil Products: Evaluation of Key Indicator Paratmeters

Parameter	Diesel				Pencil Pitch				Heavy Fuel Oil			
	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]	% TPH	% F1	% PAH	Meets Criteria[1]
Total Aliphatics (F1 Hydrocarbons)	22	-	-	0	22	-	-	0	22	-	-	1
Aliphatic UCM	-	90	-	1	-	90	-	0	-	90	-	1
Pristane + Phytane	-	0.9	-	0	-	0.9	-	0	-	0.9	-	1
Total PAHs	2.5	-	-	0	2.5	-	-	0	2.5	-	-	1
LPAHs	-	-	80	0	-	-	80	0	-	-	80	1
HPAHs	-	-	20.3	0	-	-	20.3	0	-	-	20.3	1
Carbazole + Perylene	-	-	0.33	1	-	-	0.33	0	-	-	0.33	1
Fluoranthene	0.01	-	-	1	0.01	-	-	0	0.01	-	-	1
Summary Evaluation	**Poor Match**				**Poor Match**				**100% Match**			
Identification	**Heavy Fuel Oil**											

1. Evaluation criteria based on Pass (1)/Fail (0). Each criteria receives equal weighting in overall evaluation.

Sample Data

	Sample ID: #6 Fuel Oil
TPH as n-Alkanes	1000
Total Aliphatics (F1 Hydrocarbons)	221
Aliphatic UCM	199
Pristane + Phytane	2
Total PAHs	25.1
LPAHs	20
HPAHs	5.1
Carbazole + Perylene	0.083
Fluoranthene	0.056

Evaluation Criteria

	Diesel	Pencil Pitch	Heavy Fuel Oil
Total Aliphatics (F1 Hydrocarbons)	> 35% of TPH	< 1% of TPH	15% - 35% of TPH
Aliphatic UCM	> 80% of F1	< 1% of F1	> 80% of F1
Pristane + Phytane	> 1.5% of F1	≈ 0% of F1	0.5% - 2% of F1
Total PAHs	< 1.5% of TPH	> 80% of TPH	1.5% - 10% of TPH
LPAHs	> 90% of PAH	< 12% of PAH	65% - 90% of PAH
HPAHs	< 10% of PAH	> 85% of PAH	10% - 35% of PAH
Carbazole + Perylene	< 0.5% of PAH	> 2% of PAH	< 0.5% of PAH
Fluoranthene	< 0.01% of TPH	> 5% of TPH	< 0.01% of TPH

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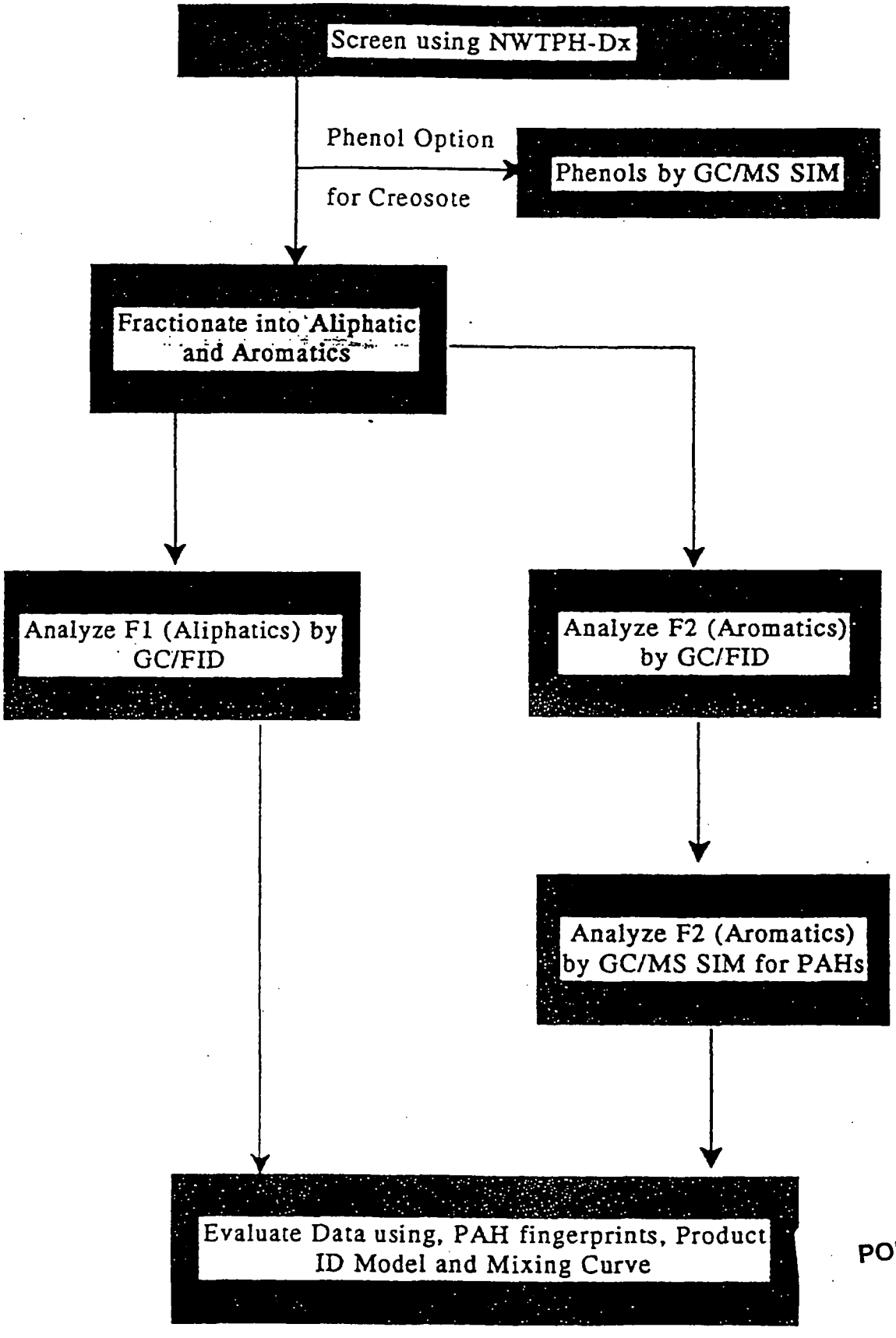
Appendix B

PAH Fingerprints

Appendix D

Suggested Analytical Approach

Suggested Analytical Approach



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MW-14 and Pencil Pitch

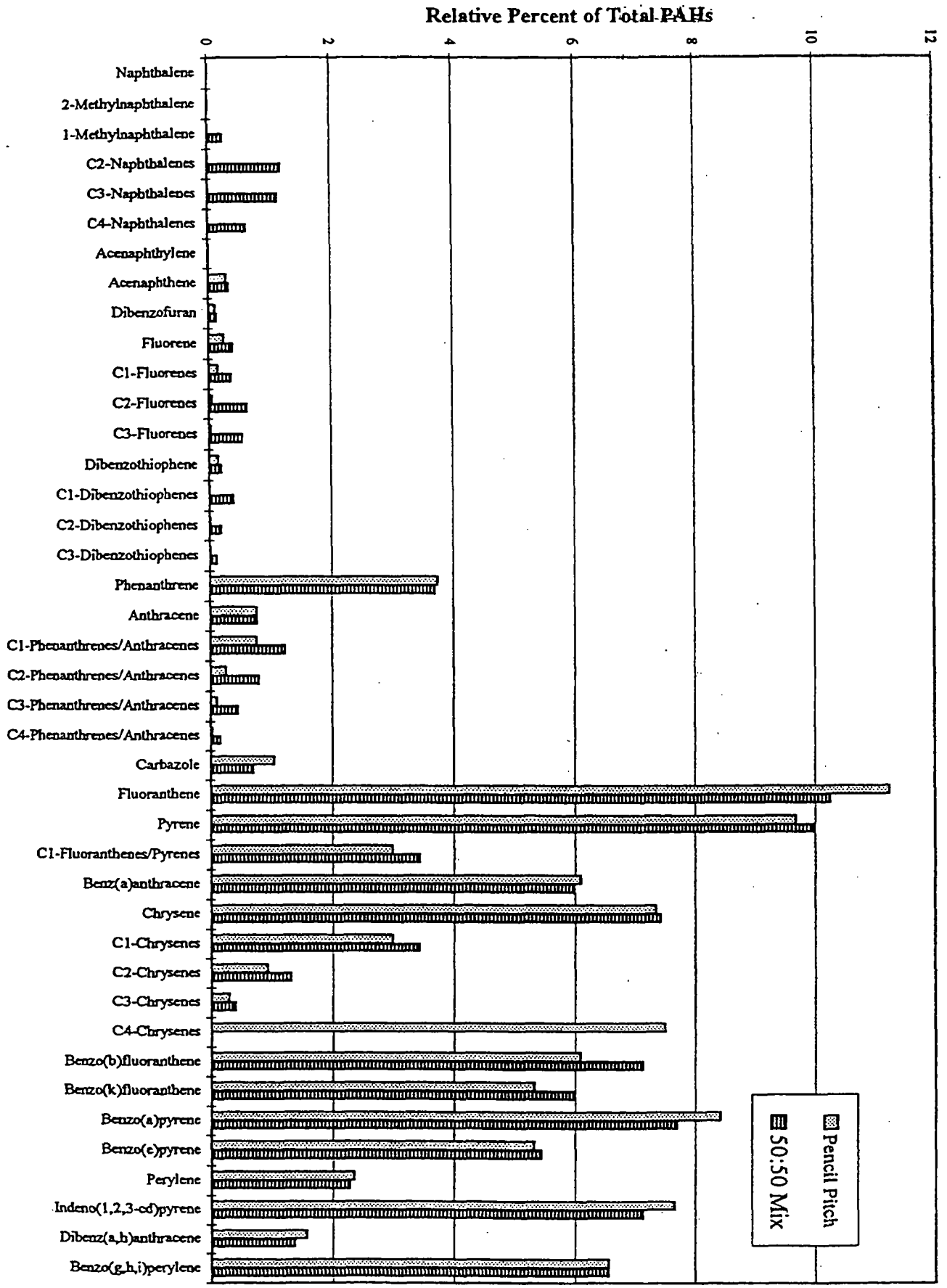
PAH Fingerprint of POP/T-4 Standards

MW-14 and C[illegible] (50:50 PP/D)

PAH Fingerprint of POP/T-4 Standards

Pencil Pitch and Curve (50:50 PP/D)

PAH Fingerprint of POP/T-4 Standards



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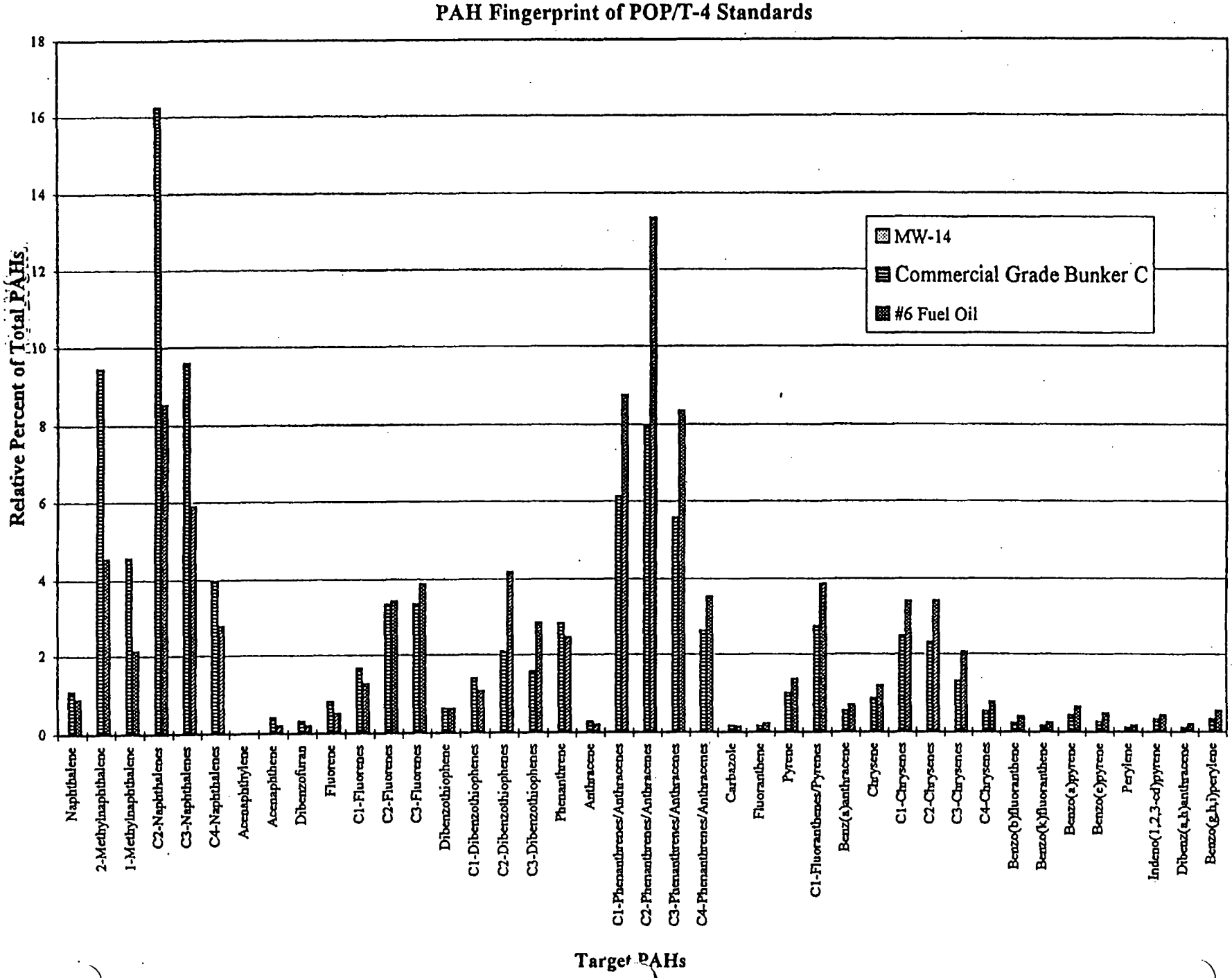
MW-14, Commercial Grade Bunker C and # 6 Fuel Oil



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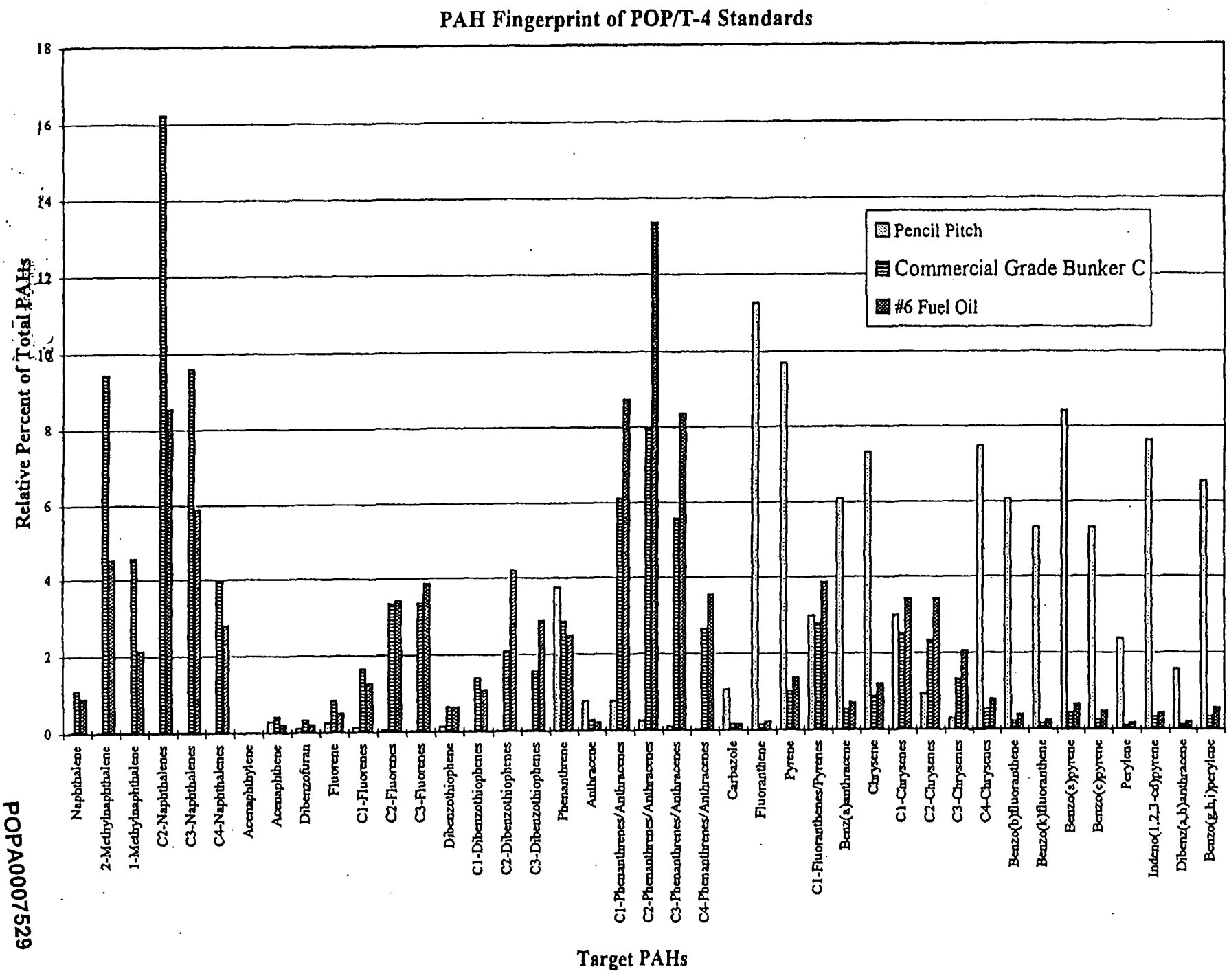
Pencil Pitch, Commercial G[illegible]e Bunker C and # 6 Fuel Oil



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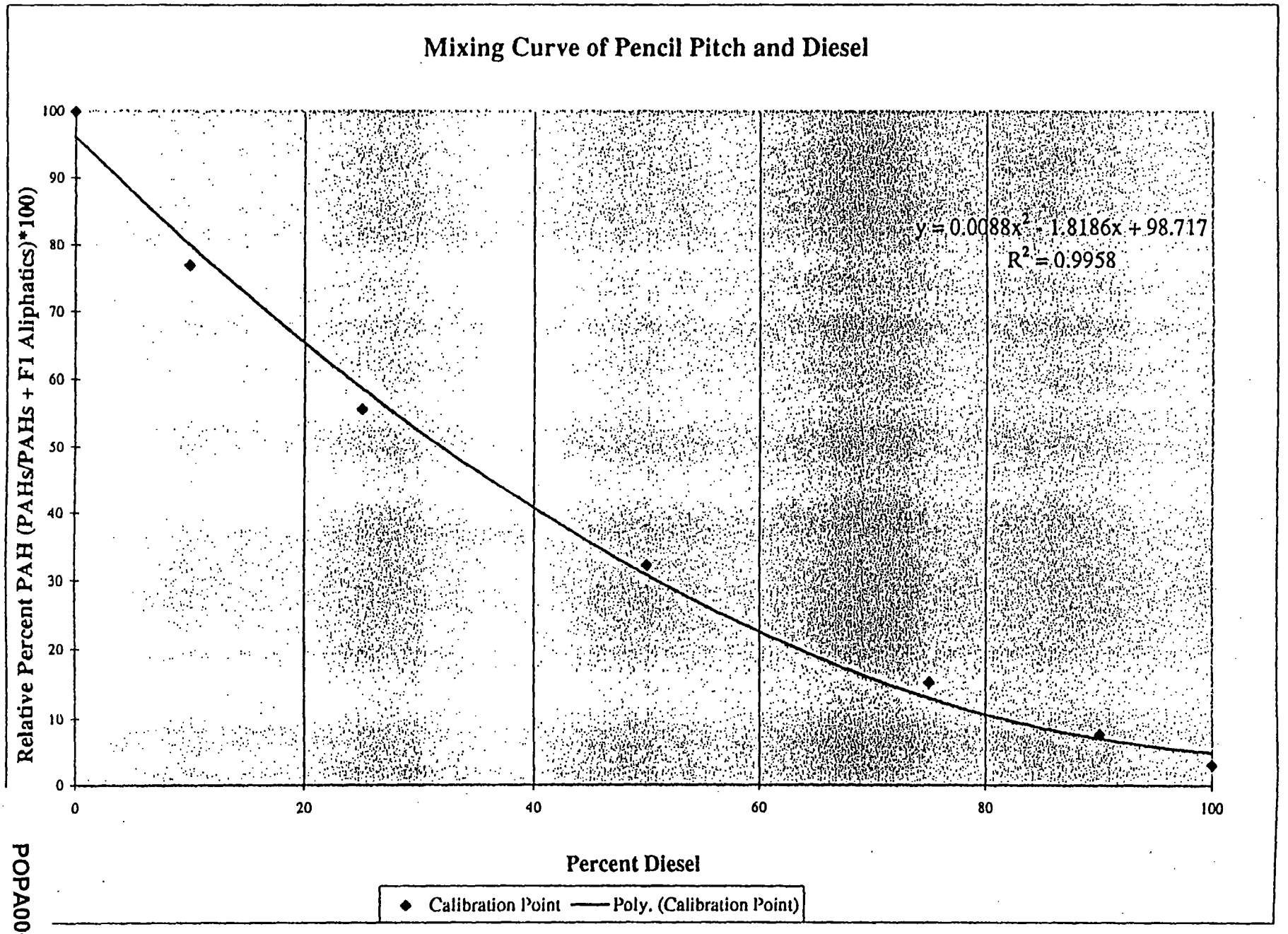
Appendix C

Mixing Curve Evaluation


Mixing Curve of Pencil Pitch and Diesel
Relative Percent PAH (PAHs/PAHs + F1 Aliphatics)*100)
Percent Diesel
y = 0.0088x² - 1.8186x + 98.717
R² = 0.9958
Calibration Point
Poly. (Calibration Point)
0
10
20
30
40
50
60
70
80
90
100
0
20
40
60
80
100

Evaluation of the Mixing Curve: Summary of Calibration Points and Miscellaneous Fuel Standards

Sample ID	Relative % PAH	% Diesel (Predicted)	% Diesel (Actual)	Comment
Curve (100% Diesel)	3	ERR	100	Not a Mixture (not calculated)
Curve (90:10 D/PP)	7	87	90	Curve Predicts 3 % Low
Curve (75:25 D/PP)	14	70	75	Curve Predicts 5 % Low
Curve (50:50 D/PP)	31	49	50	Curve Predicts 1 % Low
Curve (25:75 D/PP)	54	29	25	Curve Predicts 4% High
Curve (10:90 D/PP)	83	9	10	Curve Predicts 1% Low
Curve (100% Pencil Pitch)	100	-1	0	Not a Mixture (predicts less than 0%)
Fresh Diesel	2	ERR	100	Not a Mixture (not calculated)
Commercial Grade Bunker C	14	71	NA	Heavy Fuel Oil (curve predicts 29% Pencil Pitch due to PAH content)
# 6 Fuel Oil	10	79	NA	Heavy Fuel Oil (curve predicts 21 % Pencil Pitch due to PAH content)

ERR = Can not be calculated from the calibration curve.

Evaluation of the Mixing Curve: Predicted[1] versus Calculated[2] Diesel Content (%)

Sample ID	% Diesel (Predicted)	Percent Diesel (Calculated: PAHs as C+P)	Percent Diesel (Calculated: PAHs as HPAHs)	Percent Diesel (Calculated: PAHs as Fluoranthene)	Standard Deviation
Curve (100% Diesel)	100 (ERR)	100	100	100	0.2
Curve (90:10 D/PP)	87	87	91	92	2.6
Curve (75:25 D/PP)	70	70	77	77	4.1
Curve (50:50 D/PP)	49	52	54	54	2.4
Curve (25:75 D/PP)	29	25	27	26	1.5
Curve (10:90 D/PP)	9	9	10	10	0.6
Curve (100% Pencil Pitch)	0 (-1)	0	0	0	0
Fresh Diesel	100 (ERR)	100	100	100	0.2
Commercial Grade Bunker C	71	90	,85	98	11.5
# 6 Fuel Oil	79	91	84	98	8.4

Notes

1. Percent Diesel predicted from the mixing curve.
2. Percent Diesel calculated using indicator compounds present in pencil pitch and diesel.

Evaluation of the Mixing Curve: Predicted versus Calculated Results (PAHs as C + P)

Sample ID	TPH (PPM)[1]	% Diesel (Predicted[2])	Pristane + Phytane (PPM)	Diesel[3] (PPM)	Carbazole + Perylene (PPM)	Pencil Pitch[4] (PPM)	Percent Diesel (Calculated)
Curve (100% Diesel)	4100	100 (ERR)	52	4878	0.093	21	100
Curve (90:10 D/PP)	-	87	48	4503	3.03	686	87
Curve (75:25 D/PP)	-	70	37	3471	6.6	1495	70
Curve (50:50 D/PP)	-	49	27	2533	10.5	2379	52
Curve (25:75 D/PP)	-	29	13	1220	15.8	3580	25
Curve (10:90 D/PP)	-	9	5	469	19.8	4486	9
Curve (100% Pencil Pitch)	761	0 (-1)	ND	0	21.7	4916	0
Fresh Diesel	-	100 (ERR)	8	750	ND	0	100
Commercial Grade Bunker C	-	71	2	188	0.092	21	90
# 6 Fuel Oil	-	79	2	188	0.083	19	91

Correction Factors (Based on TPH as n-Alkane Data)

Product	True Value (PPM)	TPH	Pristane + Phytane	Carbazole + Perylene
Diesel	5000	0.82	0.013	-
Pencil Pitch	5000	0.1522	-	0.029

Notes

1. TPH: Total Petroleum Hydrocarbons as n-Alkanes.
2. Percent Diesel predicted from the mixing curve.
3. Diesel calculated using the Pristane + Phytane correction factor normalized to 100% TPH.
4. Pencil Pitch calculated using Carbazole + Perylene correction factor normalized to 100% TPH.

Evaluation of the Mixing Curve: Predicted versus Calculated Results (PAHs as Fluoranthene)

Sample ID	TPH (PPM)[1]	% Diesel (Predicted[2])	Pristane + Phytane (PPM)	Diesel[3] (PPM)	Fluoranthene (PPM)	Pencil Pitch[4] (PPM)	Percent Diesel (Calculated)
Curve (100% Diesel)	4100	100 (ERR)	52	4878	0.034	2	100
Curve (90:10 D/PP)	-	87	48	4503	6.8	406	92
Curve (75:25 D/PP)	-	70	37	3471	17	1015	77
Curve (50:50 D/PP)	-	49	27	2533	36	2150	54
Curve (25:75 D/PP)	-	29	13	1220	57	3405	26
Curve (10:90 D/PP)	-	9	5	469	70	4181	10
Curve (100% Pencil Pitch)	761	0 (-1)	ND	0	72	4301	0
Fresh Diesel	-	100 (ERR)	8	750	ND	0	100
Commercial Grade Bunker C	-	71	2	188	0.053	3	98
# 6 Fuel Oil	-	79	2	188	0.056	3	98

Correction Factors (Based on TPH as n-Alkane Data)

Product	True Value (PPM)	TPH	Pristane + Phytane	Fluoranthene
Diesel	5000	0.82	0.013	-
Pencil Pitch	5000	0.1522	-	0.11

Notes

1. TPH: Total Petroleum Hydrocarbons as n-Alkanes.
2. Percent Diesel predicted from the mixing curve.
3. Diesel calculated using the Pristane + Phytane correction factor normalized to 100% TPH.
4. Pencil Pitch calculated using Fluoranthene correction factor normalized to 100% TPH.

Evaluation of the Mixing Curve: Predicted versus Calculated Results (PAHs as HPAHs)

Sample ID	TPH (PPM)[1]	% Diesel (Predicted[2])	Pristane + Phytane (PPM)	Diesel[3] (PPM)	HPAHs (PPM)	Pencil Pitch[4] (PPM)	Percent Diesel (Calculated)
Curve (100% Diesel)	4100	100 (ERR)	52	4878	2.1	15	100
Curve (90:10 D/PP)	-	87	48	4503	62.7	448	91
Curve (75:25 D/PP)	-	70	37	3471	148.6	1061	77
Curve (50:50 D/PP)	-	49	27	2533	300.8	2148	54
Curve (25:75 D/PP)	-	29	13	1220	451.4	3224	27
Curve (10:90 D/PP)	-	9	5	469	562.4	4016	10
Curve (100% Pencil Pitch)	761	0 (-1)	ND	0	590.9	4220	0
Fresh Diesel	-	100 (ERR)	8	750	0.5	4	100
Commercial Grade Bunker C	-	71	2	188	4.7	34	85
# 6 Fuel Oil	-	79	2	188	5.1	36	84

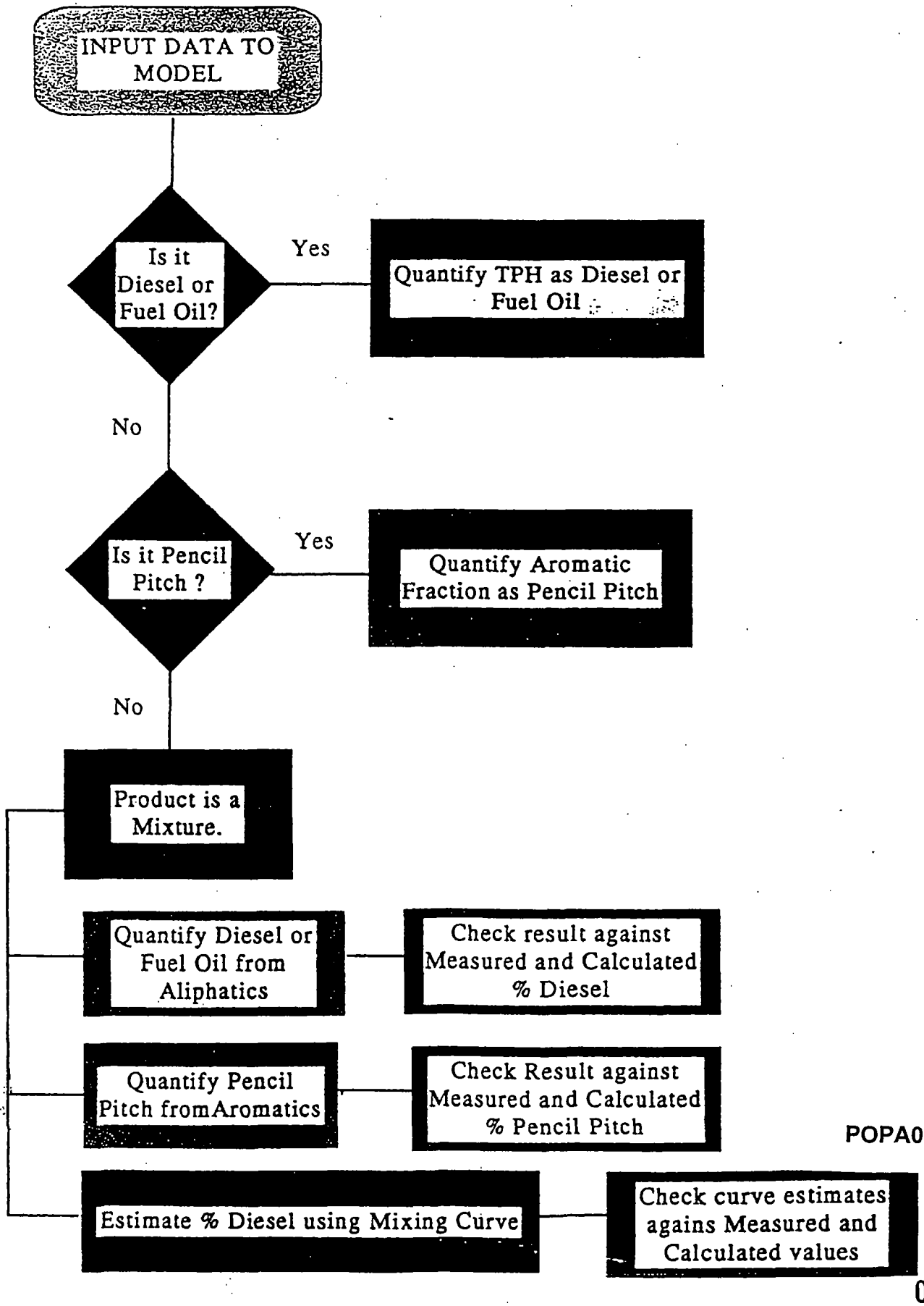
Correction Factors (Based on TPH as n-Alkane Data)

Product	True Value (PPM)	TPH	Pristane + Phytane	HPAHs
Diesel	5000	0.82	0.013	-
Pencil Pitch	5000	0.1522	-	0.92

Notes

1. TPH: Total Petroleum Hydrocarbons as n-Alkanes.
2. Percent Diesel predicted from the mixing curve.
3. Diesel calculated using the Pristane + Phytane correction factor normalized to 100% TPH.
4. Pencil Pitch calculated using total HPAHs correction factor normalized to 100% TPH.

Flow Diagram for Quantification of Sediment Samples



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Site Investigation

Differentiation of Pencil Pitch and Diesel Fuel at Terminal 4, Port of Portland, Portland Oregon: Site Investigation

Abstract:

Characterization analyses were performed on sediment samples collected at Terminal 4, Port of Portland, Portland Oregon. The goal of the investigation was to differentiate between pencil pitch and diesel fuel in the sediments and to determine relative percentages of each product. A series of analyses was performed that included initial screening by GC/FID and subsequent confirmation analyses on a selected subset of samples. Confirmation analyses included aliphatic and aromatic separation using silica gel, GC/FID analysis for alkane hydrocarbons, GC/FID analysis for pencil pitch, and GC/MS SIM analysis for PAHs. The data was evaluated against site specific pencil pitch and diesel standards in order to fingerprint the hydrocarbon content in the sediment. Relative percentages of each constituent were calculated from the results. The data was plotted against a mixing curve of the two products and deviations from the predicted results are explained.

Analytical Testing:

The analytical protocols used in the study were proposed based on an initial investigation of site specific pencil pitch and diesel standard performed in 1998. Based on results of this study, an analytical approach was suggested that included screening of sediment samples using NWTPH-Dx for pencil pitch, diesel, and the key indicator compounds pristane, phytane and fluoranthene.

Twenty grams wet weight of sediment was extracted using EPA Method 3550B. The extracts were concentrated to 10 ml in methylene chloride and analyzed by NWTPH-Dx. Summary analytical reports of the screen analyses have been included in Appendix A. From this screen, approximately 20 samples were selected for confirmation analysis.

The extracts of the samples chosen for confirmation were solvent exchanged into hexane and fractionated into aliphatic and aromatic hydrocarbons using a silica gel column. A stock diesel standard was prepared in the same manner. The alkane fraction (F1) of this diesel standard was used to quantify diesel content in the field samples using the F1 portion of the sediment extracts.

The aliphatic fractions were analyzed by GC/FID for a variety of parameters including Total Petroleum Hydrocarbons (TPH) as Alkane Hydrocarbons, individual normal alkanes (nC10 - nC36), pristane, phytane, four unknown isoprenoids eluting in the range of C12 - C16, and diesel fuel. A determination of the unresolved complex alkane mixture (UCM) was made by subtracting the sum of discrete alkanes from the TPH value. This data was used in the following manner:

- to evaluate chromatographic fingerprints against the site specific diesel standard
- to determine the TPH as Diesel concentration in the sediments
- to estimate the amount of diesel based on pristane + phytane concentrations for comparison to the measured diesel in the sediments
- to estimate the amount of non-diesel petroleum hydrocarbon based on the sum of nC25, nC27, nC29 and nC31 concentrations in the sediment

The aromatic fractions were analyzed by GC/FID for pencil pitch. The data was used to evaluate the chromatographic fingerprints against the site specific pencil pitch standard.

The aromatic fractions were also analyzed by GC/MS SIM for PAHs and alkylated homologs. The data was used in the following manner:

- to evaluate the key indicator PAHs for diesel and pencil pitch PAH signatures
- to calculate the amount of pencil pitch based on the HPAH concentrations in the sediments
- to calculate the amount of pencil pitch based on the fluoranthene concentration in the sediments
- to determine the percent total PAHs relative to the aliphatic hydrocarbons present in the sediments (used to plot sample results against a mixing curve of pencil pitch and diesel)

Summary analytical reports for these analyses have been included in Appendix A.

Data Analysis:

Data analysis involved six evaluations:

1. GC/FID chromatograms were evaluated for diesel and pencil pitch fingerprints. The evaluation was performed against chromatograms of site specific standards.
2. A qualitative determination of the possible impact of a non-diesel, non-pencil pitch hydrocarbon component was made by a review of the GC/FID chromatograms. This component is hereafter called "TPH Background" in this report.
3. Key indicator compounds for diesel, pencil pitch and the TPH Background were identified. These indicators were used qualitatively by plotting the relative percentages in bar charts to create signature fingerprints for site specific standards (diesel and pencil pitch) and field samples. They were used to quantify the amount of diesel, pencil

pitch and TPH Background by determining the amount of each indicator compound present in the standards. Correlation factors were then developed that were used to calculate the amount of each component present in the samples.

4. Measured concentrations of diesel and pencil pitch using GC/FID were compared to expected concentrations based on the amounts of key indicator compounds detected in the samples.
5. A determination of the percent diesel was calculated from the data. The results were adjusted for the contribution of TPH Background to provide a value that is representative of the site specific diesel present in the sediments.
6. The results of the percent diesel calculation were plotted against a mixing curve of pencil pitch and diesel to show the effect of the TPH Background on the determination.

Results:

The GC/FID chromatograms were reviewed for hydrocarbon patterns resembling the site specific Diesel and Pencil Pitch standards. Strong correlations with Diesel standard were observed in Samples HC-S-01, HC-S-25, HC-S-34 and HC-S-36. All samples showed at least some contribution from the TPH Background. However, in these four samples the diesel pattern was clearly recognizable. Sample HC-S-25 was the most highly impacted sample.

Aliphatic data has been plotted in bar graphs to show the ratios of key alkane indicator compounds compared to the site specific diesel standard. All of the samples exhibited a higher percentage of Total Resolved Alkanes as compared to the standard. This is one of the characteristics resulting from contribution from the TPH Background. Specifically, the odd numbered n-alkanes ranging from C25 - C31 have a significant impact on this value. A pattern consistent with the diesel standard is recognized by an increasing percentage of Isoprenoids U2 - U4, an obvious peak at Pristane and Phytane, the absence of nC17 and nC18, and lower C25 - C31 alkane percentages compared to the Pristane and Phytane levels. The latter characteristic is not seen in the site diesel standard. It is an artifact from the TPH Background.

It should be noted that the peaks being referred to odd numbered n-alkanes in the C25 - C31 range are most probably waxes from the biological degradation of plant debris. A GC/MS analysis was performed on selected aliphatic extracts. The presence of nC25, nC27 and nC29 were confirmed. The presence of nC31 was not confirmed, although this may be a function of the relative low concentrations of the compound in the extracts. There was ~~insignificant~~ data from these confirmation analyses to determine if the TPH Background was entirely due to natural sources, or if it was a combination of biogenic material and petroleum. The presence of hopanes in the extract (common indicator compounds for bunker C fuel oils) was not confirmed, possibly because the concentration of the TPH Background was relatively low in the samples.

PAH fingerprints were generated using relative percentages of the primary PAH compounds detected in the samples. All of the samples analyzed indicate at least some

influence from pencil pitch. Even the samples dominated by diesel fuel showed some indication of a Pencil Pitch fingerprint. This is explainable in that Pencil Pitch has such a high percentage of high molecular weight PAHs that very small amounts of the material will dominate the fingerprint profile.

Table 1 is a data summary showing the concentrations and relative percentages of pencil pitch, TPH as Diesel and the TPH background (non-diesel). TPH was calculated as the sum of these three components. The percent TPH as Diesel has been highlighted in yellow. This value represents the amount of hydrocarbon contamination that is attributable to the site specific diesel component. It has been adjusted for the TPH Background present in the sediments. The percent of TPH as Diesel + the percent of TPH Background was calculated and included in the table. This value was used in plotting the sample results against a mixing curve of pencil pitch and diesel (Figures 1 - 3).

The last column in Table 1 shows the result of using the mixing curve of diesel and pencil pitch to calculate the percent diesel present in the samples. This is graphically presented in Figures 1 - 3. In generating these plots, an attempt was made to factor out the effects of the TPH Background. This was done by quantifying the amount of TPH Background that was contributed to the total F1 aliphatic. The correlation factor for this calculation was based on the amount of TPH Background detected in Samples HC-S-40, HC-S-39 and HC-S-38. These samples were selected because there was no indication of site specific diesel in the sediment. The correlation factor derived from averaging the TPH Background at these locations was applied to the F1 aliphatic results for all samples. This adjusted F1 aliphatic value was used in determining the relative percent PAH present in the sediments. The relative percent PAH is plugged into the calibration curve and the percent diesel present in the samples is generated using a quadratic fit of the calibration data. It was assumed that if the percent diesel determined from the mixing curve and the percent diesel + TPH Background determinations varied by more than 35%, the samples contained too low a concentration of site specific diesel to accurately determine if it was present in the sediment.

Tables 2 and 3 are summaries of the aliphatic and aromatic respectively. Comparisons of the various techniques used to assess concentrations of diesel and pencil pitch are presented in these tables.

In Table 2 (aliphatic data), diesel as a function of pristane + phytane is compared to the TPH as Diesel measured by GC/FID. In most samples, a high bias can be observed in the GC/FID values resulting from the addition of the TPH Background to the diesel fraction. Since the TPH Background does not contain significant concentrations of pristane and phytane, the results calculated using correlation factors are considered more representative of the contribution of site specific diesel to the sediments. Samples HC-S-01, HC-S-25 and HC-S-34 show the reverse pattern. That is, the calculated diesel concentrations are greater than the measured amounts. This indicates no significant bias associated with the TPH Background.

This approach of using correlation factors to determine concentrations of each component in the TPH mixture was considered a more accurate method than direct measurement from the GC/FID. Correlation factors are summarized in Table 4.

Aromatic hydrocarbons have been summarized in Table 3. The highest concentration of total PAHs was observed in sample HC-S-19. All of the samples exhibited a fingerprint that was characteristic of pencil pitch. The pencil pitch component was quantified using two separate correlation factors (pencil pitch as fluoranthene and pencil pitch as HPAHs). Results of these calculations showed good agreement in all samples except HC-S-24. It is assumed that the pencil pitch as HPAHs is less prone to significant deviations due to experimental error and this technique was selected as the primary quantitation approach. Table 3 also shows the relative percent PAH that was used in determining percent diesel via the mixing curve.

A comparison of three different methods of determining pencil pitch concentrations in the samples is presented in Table 3. The results of this comparison show that using HPAH and Fluoranthene correlation factors to calculate the amount of pencil pitch produces similar results. The only significant outlier was observed with sample HC-S-24. However, the GC/FID measurements of pencil pitch are prone to a high bias ranging from 30 - 100 percent relative to the calculated values. This high bias is predictable since the use of GC/FID as prescribed by NWTPH-Dx is not specific and will not differentiate between pencil pitch hydrocarbons, diesel hydrocarbons, and background hydrocarbons in the sample.

Discussion

The techniques used to evaluate the samples for the presence of diesel fuel, to determine if this fuel can reasonably be linked to diesel collected at the site, and to estimate the percent of the TPH contamination that may be attributed to this diesel were formulated during a preliminary investigation in April, 1998. This investigation included analysis of site specific diesel and pencil pitch standards, the creation of a mixing curve containing these two components, and the identification of key indicator compounds to be used in evaluating sediment data.

Sediment samples were delivered to the lab in October, 1999. Upon preliminary evaluation of screening data, a subset of samples were selected for full characterization. Shortly into this evaluation, it became apparent that the evaluation techniques developed using site specific standards would require refinement due to a ubiquitous TPH Background present in the samples. Upon further analysis, three distinct TPH components were identified: pencil pitch, weathered diesel fuel, and the TPH Background. The TPH Background is most probably a mixture of biogenic material and, possibly to a lesser degree, oil range petroleum hydrocarbons.

The presence of a TPH Background required the evaluation to include an estimate of the contribution of this component to the TPH at the site. This was performed by using three samples that did not show any impact from the site specific diesel fuel. The F1 aliphatic fraction from samples HC-S-38, HC-S-39 and HC-S-40 was used to establish a correlation factor for estimating the amount of TPH Background present in the samples. This was done by summing the amount of nC25, nC27, nC29 and nC31 in each sample. The amount of these compounds was compared to the total aliphatics and an average correlation factor was calculated for computing the amount of TPH that could be

attributed to the THP Background in samples that contained a mixture of both and TPH Background. Determining the contribution of TPH Background in the samples allowed for the continued use of the mixing curve developed during the preliminary evaluation of site specific standards.

A similar technique was used to determine the amount of diesel and pencil pitch present in the samples. In this case, the correlation factor was based on pristane + phytane concentrations in the site specific diesel standard. Since these compounds are not present in the TPH Background, but are significant components in the diesel fuel, it is assumed that this technique is a more accurate determination of diesel fuel in the sediments than attempting to factor out the TPH Background from the TPH as Diesel value measured using GC/FID. Pencil pitch was calculated using a correlation factor based on the sum of high molecular weight PAHs in the samples. These factors were developed during the preliminary investigation on the site specific standards.

The results of these calculations have been summarized as a concentration (PPM) and as a percentage of TPH in Table 1. A detection limit of 50 ppm was used for the concentration data. This level was selected because it represented a concentration that could easily be determined from the analytical data, could be supported by instrument detection limits of indicator compound used in the calculations, and was high enough to allow a visual inspection of GC chromatograms to confirm the presence of each TPH component.

Concentrations of each TPH component were calculated from the data. These values were summed to determine a TPH concentration. The percentage of each component was determined relative to the TPH in the sediment. The percent diesel reported in Table 1 indicates the amount of TPH that is attributed to the site specific diesel.

Table 5 summarizes two evaluations that were performed in order to assess the quality of the findings. First, the ratio of nC17 to Pristane was calculated for each sample. The site specific diesel standard did not contain any measurable nC17. Therefore, the ratio of these compounds should be zero (or very close to zero). It is expected that the TPH Background may be contributing very small amounts of nC17 to the hydrocarbon in the sediments. To evaluate the quality of the fingerprint match to site specific diesel, a threshold value of 0.1 was applied to this ratio. That is, if the ratio exceeded 0.1, the match quality was determined to be weak with a high degree of uncertainty associated with the percent diesel determination.

The second evaluation involved comparing the calculated percent diesel (including the TPH Background) to the percent diesel predicted by the mixing curve. If relative percent difference between these two values exceeded 30%, the result was flagged (*) to indicate a potential bias resulting from the TPH Background. That is, contribution from the site specific diesel may not be accurately differentiated from the TPH Background.

Evaluations of match quality were not performed on samples that contained less than 5% diesel. At such low percentages it is not possible to accurately differentiate between diesel and the TPH Background.

The results of these evaluations indicate that the most significant impacts of site specific diesel are localized in the areas of HC-S-01, HC-S-25, and HC-S-34. Samples HC-S-33

and HC-S-36 also show impact of diesel fuel closely matching the site specific diesel. However, the presence of low concentrations of n-C17 in the samples may indicate petroleum contribution from other sources in addition to the seep at HC-S-25.

Fingerprint matches were also observed at samples HC-S-04, HC-S-05, HC-S-06, and HC-S-07. Based on comparison of calculated and predicted amounts of diesel in these samples, it appears the TPH Background is significantly biasing the calculated results.

Samples HC-S-02 and HC-S-03 also showed some indication of a diesel fingerprint. However, the amount of diesel in the samples was too low for differentiated from the TPH Background.

Conclusions

The following conclusions are made from the data evaluated in this study:

1. The techniques used to evaluate the sediment samples successfully differentiated diesel from other hydrocarbon constituents at the site. Furthermore, the diesel contamination could be quantified in the samples that were subjected to confirmation analyses.
2. Pencil pitch is widely distributed at the site. High concentrations of methylene chloride extractable PAHs from pencil pitch result in GC chromatograms that are dominated by a pencil pitch fingerprint. This is particularly evident from analysis of the aromatic fraction of the NWTPH-Dx extract.
3. There is a ubiquitous TPH background at the site. This background appears to be mostly comprised of biogenic material originating from degradation of plant material in the sediments.
4. Sample HC-S-25 showed a good match to the T4 Diesel standard. Sample HC-S-34 also has a diesel fingerprint that matches the site specific diesel. Samples HC-S-33 and HC-S-36 show a low concentration diesel component. However, due to the low concentration of diesel and the presence of n-alkane hydrocarbons not detected in the T4 diesel standard, it is not possible to differentiate the sources of diesel range hydrocarbons at these locations.
5. There is a good diesel fingerprint at sample HC-S-01. The weathering characteristics are consistent with those observed in the T4 diesel standard.
6. The general area around samples HC-S-04, HC-S-06 and HC-S-07 show a distinct, albeit low concentration diesel component. The samples have very similar alkane hydrocarbon fingerprints, so it is assumed the diesel observed at these locations is from a common source.
7. A determination of pencil pitch in sediment is most accurately performed by measuring key indicator compounds (HPAHs or Fluoranthene) and applying a correlation factor to compute the amount of pencil pitch in the sample. GC/FID measurements are prone to high biases resulting from non pencil pitch hydrocarbon content in the sediments.

Table 1: Data Summary

Sample Name	Lab Code	Concentration (PPM)				% of TPH				
		Pencil Pitch[1]	Diesel[2]	TPH Background[3]	TPH[4]	Pencil Pitch	Diesel	TPH Background	Diesel + Background	Diesel (predicted)[5]
HC-S-01	K9807097-031	5020	779	97	5896	85	13	2	15	24
HC-S-02	K9807097-032	3060	88	<50	3148	97	3	<5	3	NC
HC-S-03	K9807097-033	2060	<50	<50	2060	100	<5	<5	<5	NC
HC-S-04	K9807097-034	979	183	88	1250	78	15	7	22	35
HC-S-05	K9807097-035	772	115	81	968	80	12	8	20	37
HC-S-06	K9807097-036	678	135	94	907	75	15	10	25	38
HC-S-07	K9807097-037	779	106	77	962	81	11	8	19	23
HC-S-12	K9807115-003	647	75	81	803	81	9	10	19	25
HC-S-16	K9807115-007	1070	115	108	1293	83	9	8	17	17
HC-S-23	K9807115-010	572	60	107	739	77	8	14	23	21
HC-S-24	K9807115-011	3200	74	67	3341	96	2	2	4	NC
HC-S-25	K9807115-013	<50	962	<50	962	<5	100	<5	100	100
HC-S-33	K9807115-021	131	212	82	425	31	50	19	69	88
HC-S-36	K9807169-001	<50	92	22	114	<15	81	19	100	100
HC-S-34	K9807169-002	74.7	375	<50	450	17	83	<5	85	100
HC-S-40	K9807169-003	195	<50	85	280	70	<5	30	34	NC
HC-S-39	K9807169-004	459	<50	122	581	79	<5	21	24	NC
HC-S-38	K9807169-005	1300	<50	106	1406	92	<5	8	9	NC
HC-S-19	K9807169-013	8430	<50	<50	8430	100	<5	<5	<5	NC
HC-S-31	K9807169-016	57.6	<50	79	137	42	<5	58	61	NC
HC-S-30	K9807169-017	311	<50	62	373	83	<5	17	19	NC

Notes:

1. Calculated from the sum of LCRMA HPAHs
2. Calculated from the sum of Pristane + Phytane.
3. Calculated from the sum of nC25 - nC31 odd alkanes.
4. Total Petroleum Hydrocarbons (TPH) calculated as the sum of Pencil Pitch, Diesel and TPH Background.
5. Percent diesel predicted from the pencil pitch:diesel mixing curve.

NC Not Calculated because the TPH concentration was too low to accurately differentiate Diesel from the TPH Background.

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Table 2: Aliphatic Hydrocarbons (PPM)

Sample Name	Lab Code	TPH as Alkane HC[1]	Total Aliphatics (F1 HC)	Total Resolved Alkanes	Unresolved Complex Alkane Mixture	Sum of nC25 - nC31 Odd Alkanes	Pristane + Phytane	Diesel as Pristane + Phytane[2]	TPH as Diesel (measured)[3]	TPH Background as Diesel[4]
HC-S-01	K9807097-031	3800	580	16	564	3.92	8.1	779	640	97
HC-S-02	K9807097-032	1600	140	3.2	136.8	1.42	0.91	88	130	35
HC-S-03	K9807097-033	1100	110	2.9	107.1	1.84	0.45	43	110	46
HC-S-04	K9807097-034	920	270	7.8	262.2	3.54	1.9	183	360	88
HC-S-05	K9807097-035	720	240	8.1	231.9	3.26	1.2	115	320	81
HC-S-06	K9807097-036	760	250	7.1	242.9	3.78	1.4	135	270	94
HC-S-07	K9807097-037	690	170	5.7	164.3	3.09	1.1	106	180	77
HC-S-12	K9807115-003	600	170	6.1	163.9	3.25	0.78	75	160	81
HC-S-16	K9807115-007	650	210	8.1	201.9	4.34	1.2	115	190	108
HC-S-23	K9807115-010	620	190	6.7	183.3	4.33	0.62	60	160	107
HC-S-24	K9807115-011	1600	140	6.2	133.8	2.71	0.77	74	130	67
HC-S-25	K9807115-013	1200	650	18	632	1.37	10	962	660	34
HC-S-33	K9807115-021	380	230	8.2	221.8	3.3	2.2	212	210	82
HC-S-36	K9807169-001	150	97	2.8	94.2	0.87	0.96	92	100	22
HC-S-34	K9807169-002	670	370	7.7	362.3	1.02	3.9	375	360	25
HC-S-40	K9807169-003	290	130	4.8	125.2	3.42	0.1	0	99	85
HC-S-39	K9807169-004	420	150	6.5	143.5	4.9	0.15	0	120	122
HC-S-38	K9807169-005	660	140	5.7	134.3	4.27	0.14	0	110	106
HC-S-19	K9807169-013	4000	160	1.7	158.3	1.09	0.33	32	110	27
HC-S-31	K9807169-016	260	140	4.5	135.5	3.19	0.22	21	120	79
HC-S-30	K9807169-017	340	130	3.7	126.3	2.51	0.23	22	110	62

Notes:

1. TPH as Alkane HC includes both aliphatic and aromatic hydrocarbons quantified using a normal alkane composite standard (nC10 - nC40, pristane and phytane). The data is included because correlation factors were generated using data normalized to this measurement
2. Calculated from the pristane + phytane concentration. Correlation factor: multiply by 96.2.
3. Measured by GC/FID. Includes carbon range nC12 - nC24.
4. Calculated from the sum of nC25 + nC27 + nC29 + nC31. Correlation factor: multiply by 24.8. Includes carbon range nC12 - nC24.

Table 3: Aromatic Hydrocarbon Values (PPM)

Sample Name	Lab Code	Total PAHs[1]	LCRMA LPAHs	LCRMA HPAHs	Fluoranthene	Pencil Pitch[2]	Pencil Pitch as HPAHs (PPM)[3]	Pencil Pitch as Fluoranthene (PPM)[4]	F1 Alkanes[4]	% PAH (relative to F1 Alkanes)[6]
HC-S-01	K9807097-031	688.1	50	497	70	4300	5020	4858	448	61
HC-S-02	K9807097-032	423.5	33.7	303	44	3400	3060	3054	92	82
HC-S-03	K9807097-033	276.9	12	204	28	3300	2060	1943	48	85
HC-S-04	K9807097-034	129.6	7.9	96.9	13	1500	979	902	150	46
HC-S-05	K9807097-035	102.1	6.6	76.4	12	890	772	833	130	44
HC-S-06	K9807097-036	89.7	5.3	67.1	9.4	940	678	652	122	42
HC-S-07	K9807097-037	103.3	6.5	77.1	11	970	779	763	66	61
HC-S-12	K9807115-003	85.2	5.6	64.1	8.9	1300	647	618	60	59
HC-S-16	K9807115-007	145.4	14.1	106	17	1400	1071	1180	63	70
HC-S-23	K9807115-010	78.9	5.6	56.6	6.5	1200	572	451	44	64
HC-S-24	K9807115-011	418.4	24.8	317	70	2800	3202	4858	48	90
HC-S-25	K9807115-013	2.6	2.01	1.7	0.3	960	17	21	604	0
HC-S-33	K9807115-021	8.6	1.4	13	1.8	570	131	125	118	7
HC-S-36	K9807169-001	3.1	0.4	1.2	0.28	100	12	19	68	4
HC-S-34	K9807169-002	13.3	0.8	7.4	1.3	430	74.7	90	336	4
HC-S-40	K9807169-003	27	2.5	19.3	2.9	310	195	201	14	65
HC-S-39	K9807169-004	63.2	5.9	45.4	7.5	610	459	521	0	100
HC-S-38	K9807169-005	181.1	17.8	129	20	1500	1303	1388	0	100
HC-S-19	K9807169-013	1185.5	112.1	835	130	11000	8434	9022	123	91
HC-S-31	K9807169-016	7.7	0.5	5.7	0.83	250	57.6	58	32	19
HC-S-30	K9807169-017	42.6	3.4	30.8	4.7	780	311	326	45	49

Notes:

1. Total PAHs including alkylated homologs.
2. Analyzed using NWTPH-Dx (GC/FID) and quantified against a pencil pitch curve.
3. Calculated from the sum of the LCRMA HPAHs. Correlation factor: multiply by 10.1.
4. Calculated from the fluoranthene concentration. Correlation factor: multiply by 69.4.
5. F1 Aliphatics have been adjusted for TPH Background contribution to eliminate bias in calculating relative percent PAH content.
6. This value was used to calculate the percent diesel from the mixing curve.

Table 4: Summary of Correlation Factors used to Calculate TPH Component Concentrations

TPH Component	Determinant	Correlation Factor	Function	Comment
Pencil Pitch	HPAHs (including homologs)	8.4	Multiply	Pencil pitch calculated as a function of the sum of HPAHs including alkylated homologs
Penicl Pitch	HPAHs (LCRMA only)	10.1	Multiply	Pencil Pitch calculated as a function of the sum of LCRMA HPAHs
Pencil Pitch	Fluoranthene	69.4	Multiply	Pencil Pitch calculated as a function of fluoranthene
Diesel	Pristane + Phytane	96.2	Multiply	Diesel calculated as a function of pristane and phytane
TPH Background (Diesel Range)	nC25 + nC27 + nC29 + nC31	24.8	Multiply	TPH background calculated as the sum of nC25 - nC31 odd alkanes and adjusted for diesel range organics
TPH Background (F1 Aliphatics: nC10 - nC36)	nC25 + nC27 + nC29 + nC31	33.8	Multiply	TPH background calculated as the sum of nC25 - nC31 odd alkanes; the calculation estimates the TPH background contributing the the total F1 Aliphatic response

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Table 5: Evaluation of the Match Quality for Diesel Detected in the Samples

Sample Name	Lab Code	Diesel	Diesel + TPH Background	Diesel (predicted)	nC17/Pristane Ratio	Match Quality[1]
HC-S-01	K9807097-031	13%	15%	24%	0	Strong*
HC-S-02	K9807097-032	3%	3%	NC	0	NA
HC-S-03	K9807097-033	<5%	<5%	NC	0	NA
HC-S-04	K9807097-034	15%	22%	35%	0	Strong*
HC-S-05	K9807097-035	12%	20%	37%	0.24	Weak*
HC-S-06	K9807097-036	15%	25%	38%	0	Strong*
HC-S-07	K9807097-037	11%	19%	23%	0	Strong
HC-S-12	K9807115-003	9%	19%	25%	0.35	Weak
HC-S-16	K9807115-007	9%	17%	17%	0.21	Weak
HC-S-23	K9807115-010	8%	23%	21%	0.45	Weak
HC-S-24	K9807115-011	2%	4%	NC	0.54	NA
HC-S-25	K9807115-013	100%	100%	100%	0	Strong
HC-S-33	K9807115-021	50%	69%	88%	0.13	Weak
HC-S-36	K9807169-001	81%	100%	100%	0.14	Weak
HC-S-34	K9807169-002	83%	85%	100%	0	Strong
HC-S-40	K9807169-003	<5%	34%	20%	2.2	NA
HC-S-39	K9807169-004	<5%	24%	0%	1.8	NA
HC-S-38	K9807169-005	<5%	9%	NC	1.8	NA
HC-S-19	K9807169-013	<5%	<5%	NC	0.37	NA
HC-S-31	K9807169-016	<5%	61%	63%	0.92	NA
HC-S-30	K9807169-017	<5%	19%	33%	1.2	NA

Notes:

1. Match quality is an evaluation of how close the diesel in the sediment matches the site specific diesel standard collected at T4. A strong match is indicated by a n-C17/Pristane ratio of zero. A weak match indicates the presence of diesel range hydrocarbons from sources other than T4 diesel. A weak match does not rule out contribution of T4 diesel but does suggest that differentiation from other sources is not possible.

* Indicates a possible bias with the estimate of the percent diesel based on uncertainty associated with differentiation of the TPH Background in the sample.

NA Evaluation of the match quality is not applicable because the diesel concentration is not a significant part of the TPH.

Figure 1: Percent Diesel in Field Samples Plotted on the Mixing Curve After Adjustments for TPH Background

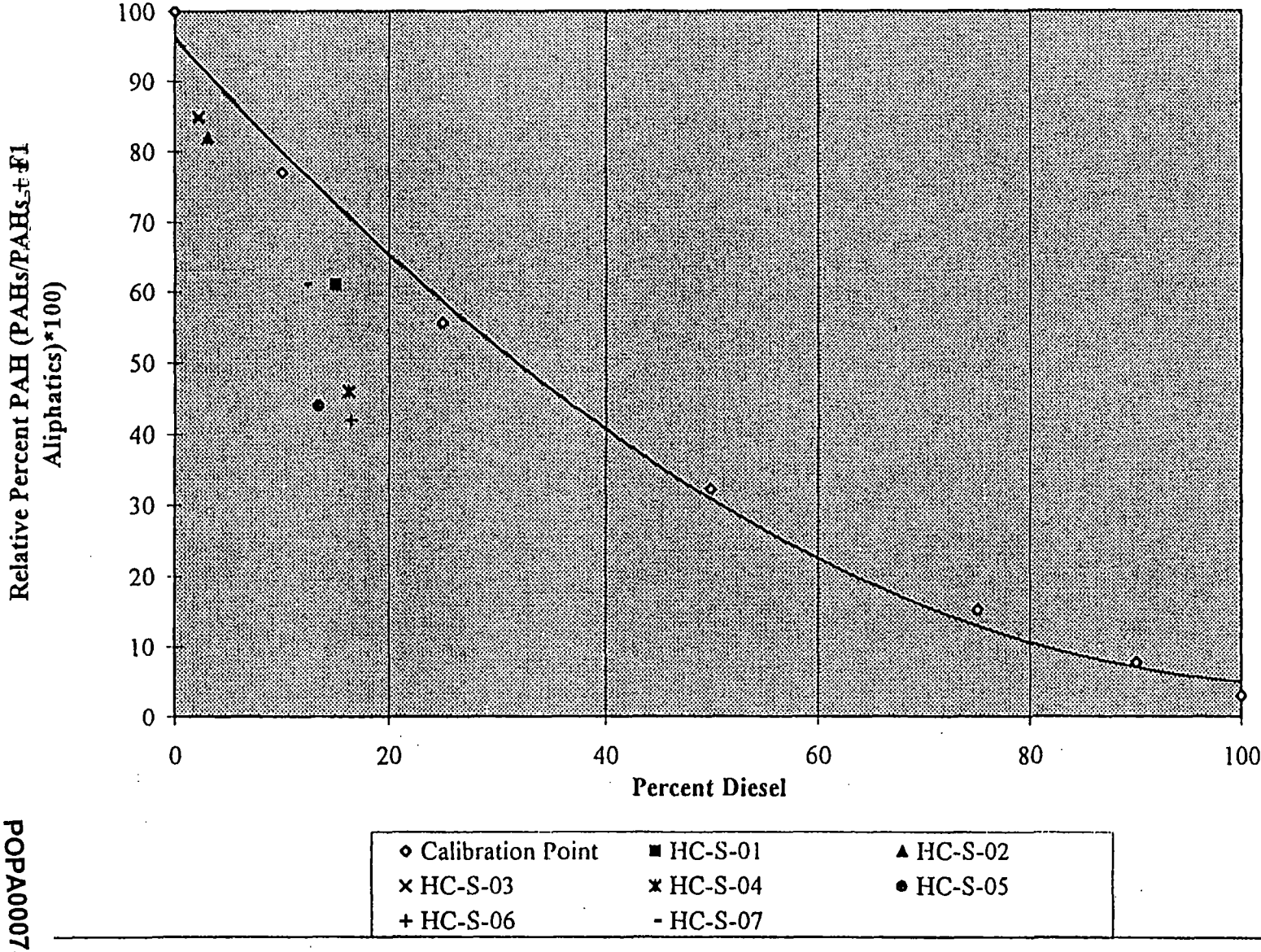

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Figure 2: Percent Diesel in Field Samples Plotted on the Mixing Curve After Adjustments for TPH Background

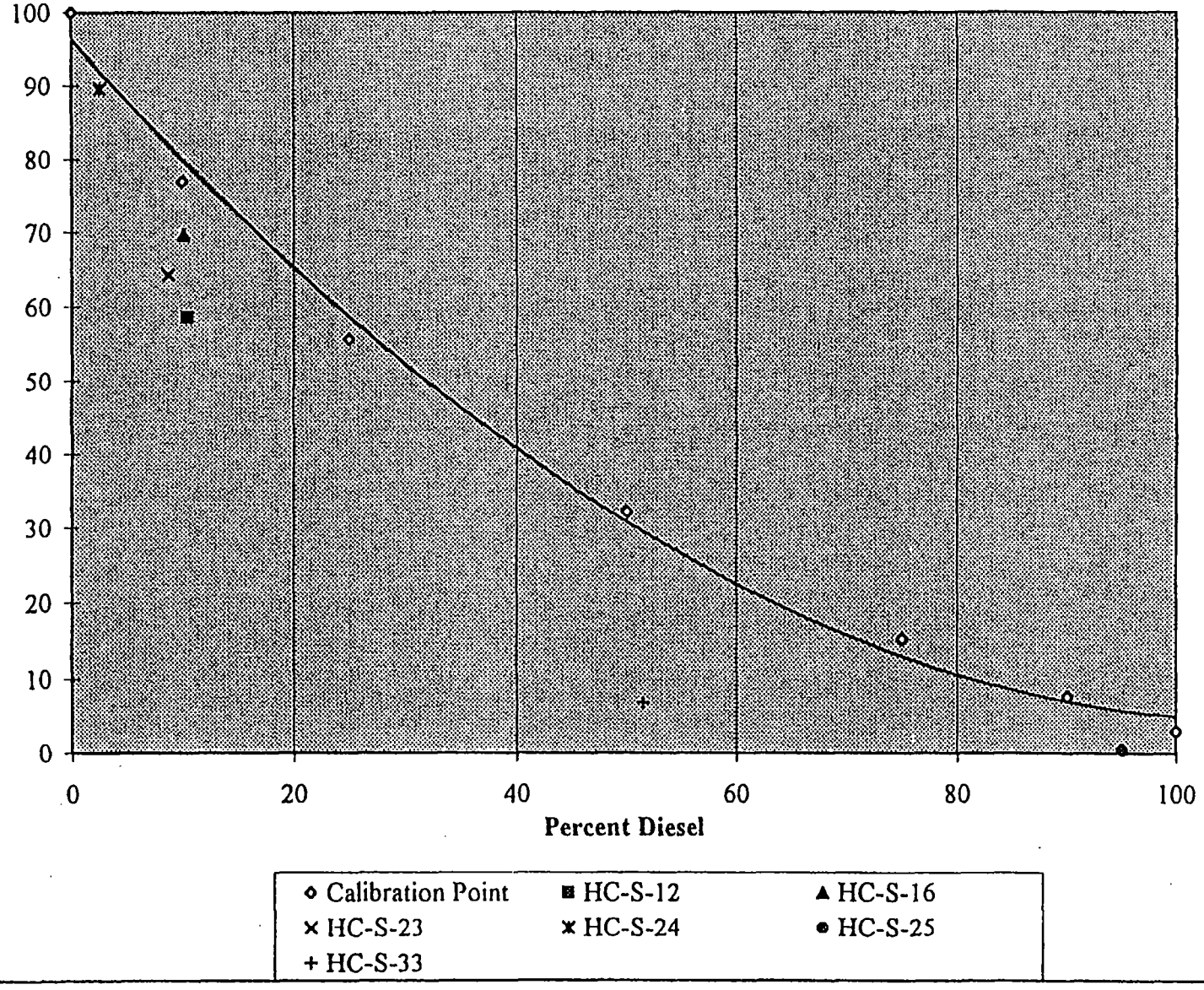

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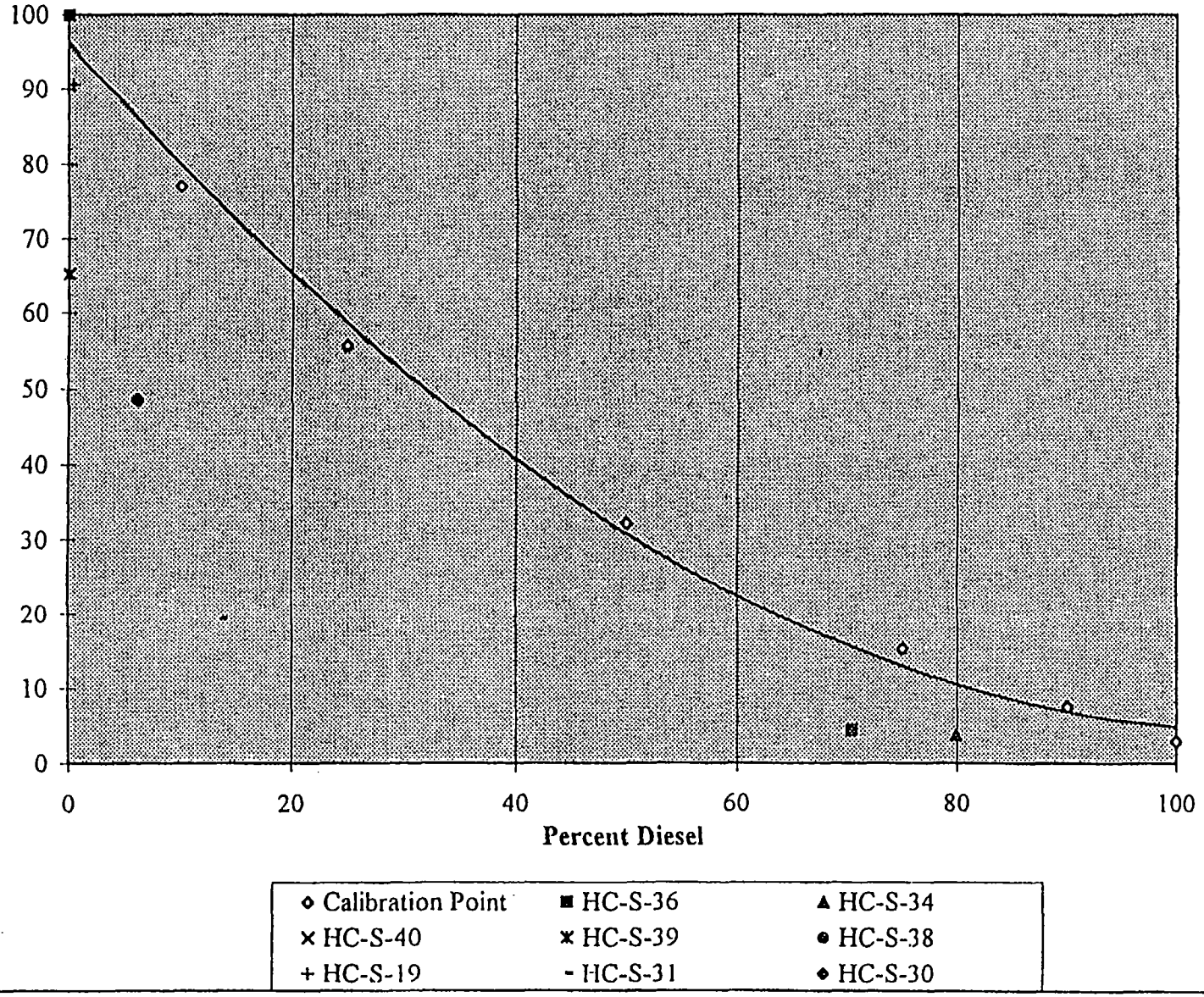
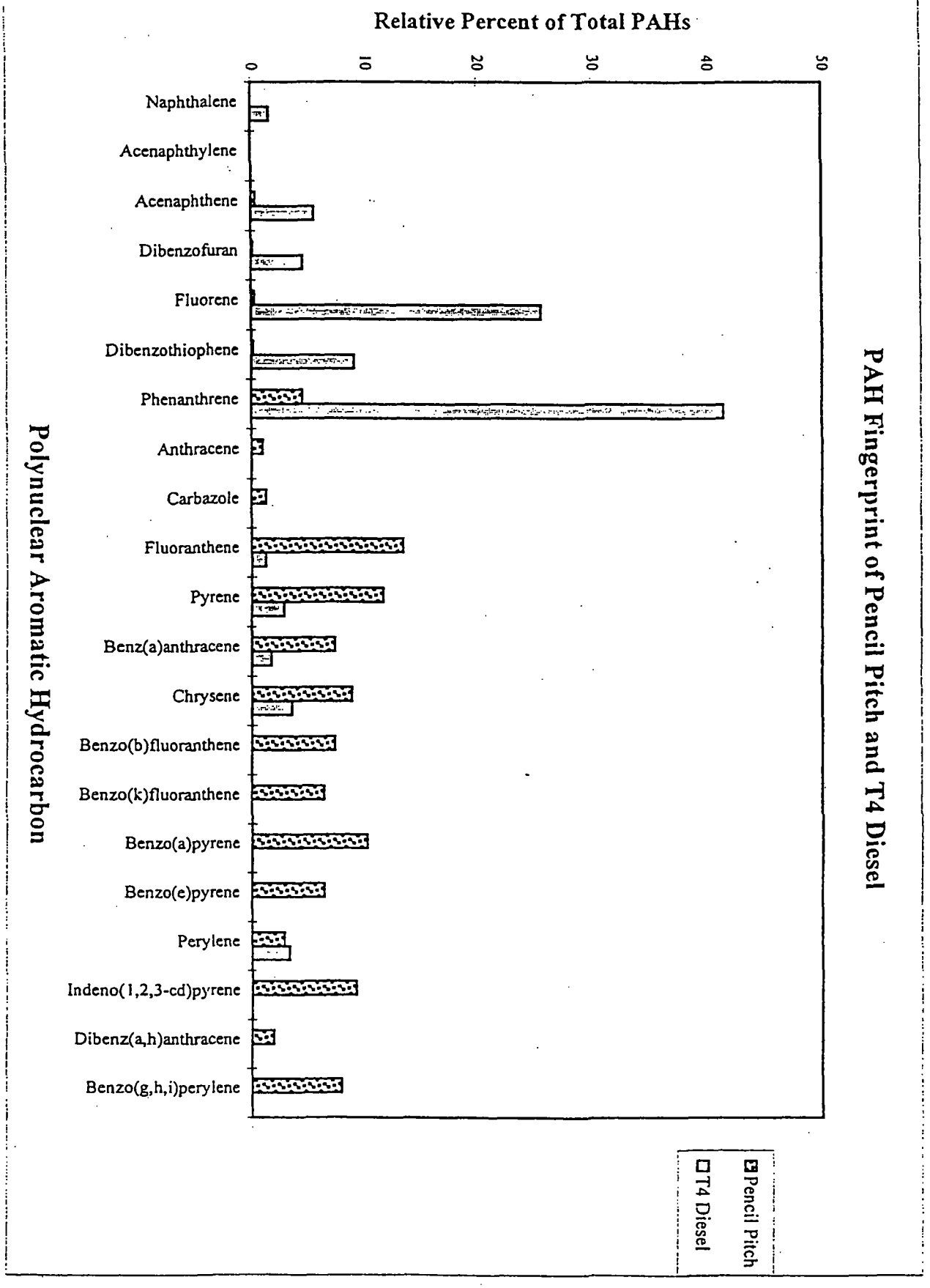
Figure 3: Percent Diesel in Field Samples Plotted on the Mixing Curve After Adjustments for TPH Background



Appendix A

Aromatic Fingerprints and Chromatograms


PAH Fingerprint of Pencil Pitch and T4 Diesel
Relative Percent of Total PAHs
0
10
20
30
40
50
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
Polynuclear Aromatic Hydrocarbon
Pencil Pitch
T4 Diesel

Quantitation Report

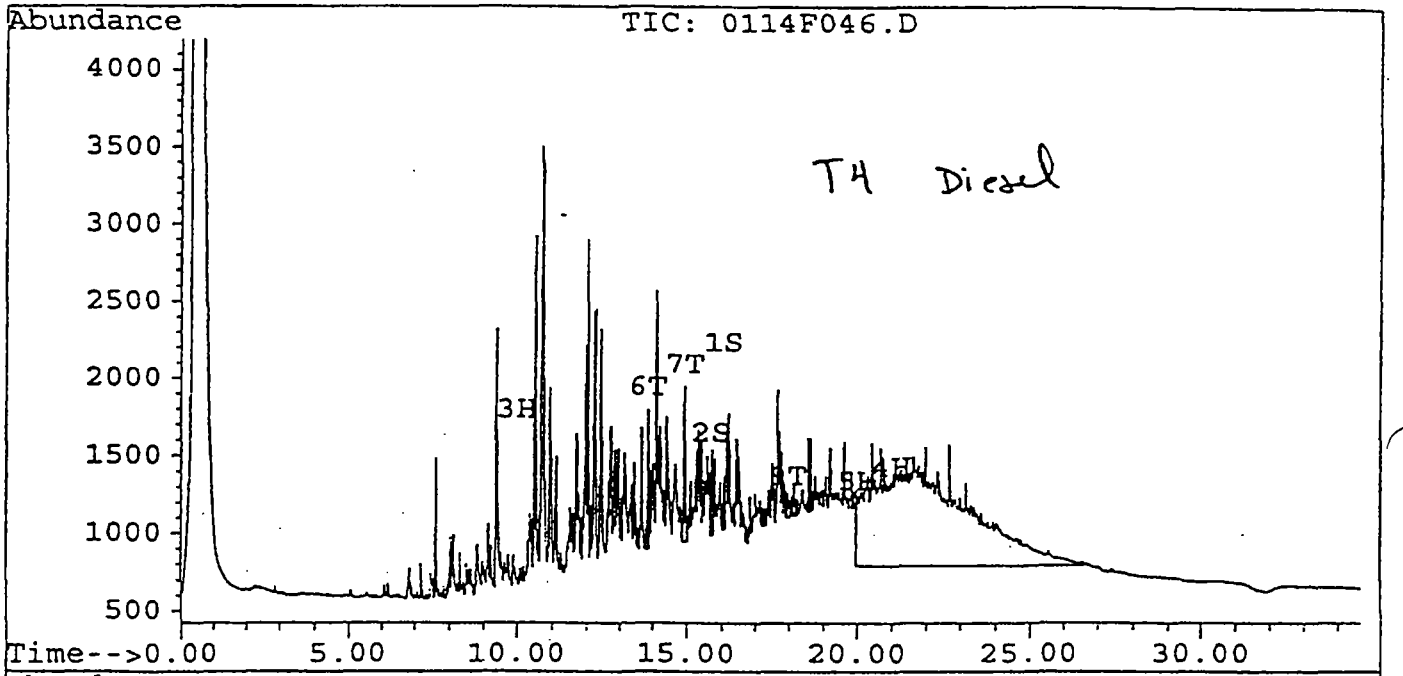
Signal #1 : J:\GC15\DATA\011499\0114F046.D
Signal #2 : J:\GC15\DATA\011499\0114F046.D\0114R046.D
Acq On : 16 Jan 99 00:44 AM
Sample : K981222-LCS DSL STD AROM
Misc : F=4 D=1 A=
Quant Time: Jan 26 11:03 1999

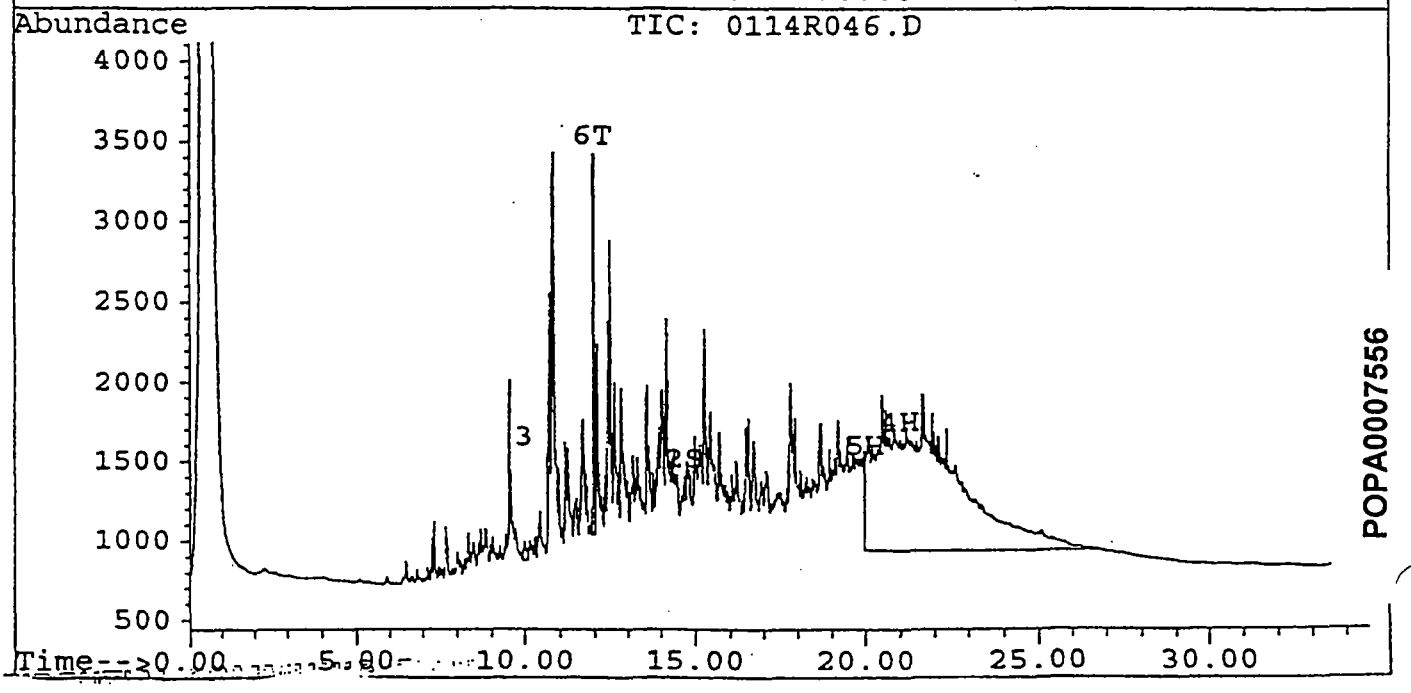
Vial: 37
Operator: LLANDAU
Inst : GC15
Multiplr: 1.00

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5
Signal #1 Info : 0.53 mm

Signal #2 Phase: RTX 200
Signal #2 Info : 0.53 mm





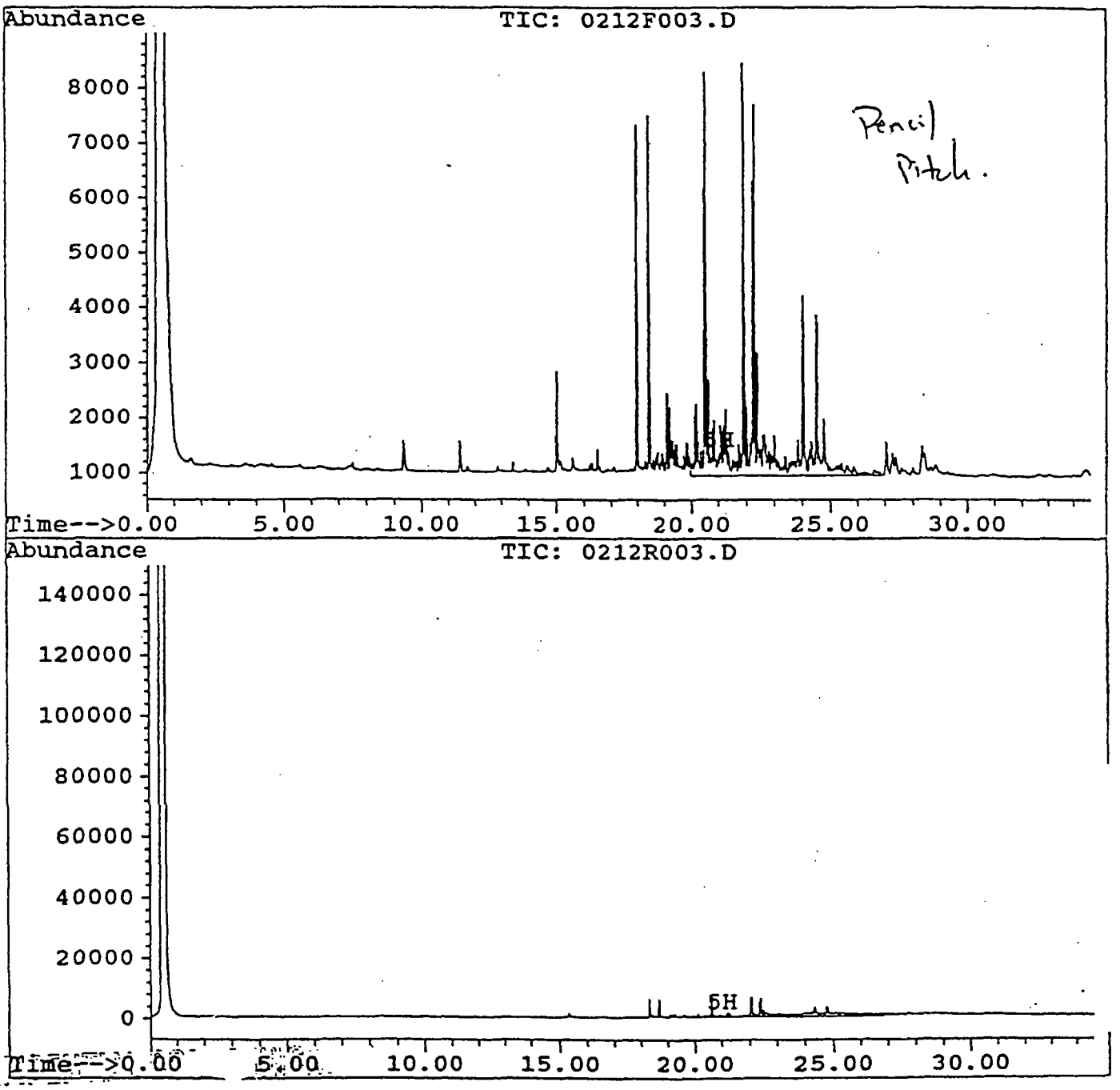
POPA0007556

Quantitation Report

Signal #1 : J:\GC15\DATA\021299\0212F003.D Vial: 3
Signal #2 : J:\GC15\DATA\021299\0212F003.D\0212R003.D
Acq On : 12 Feb 99 04:40 PM Operator: LLANDAU
Sample : PENCIL PITCH 264 PPM 45S Inst : GC15
Misc : F=2 D=1 A=10.5 Multiplr: 1.00
Quant Time: Feb 16 7:59 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



001 77

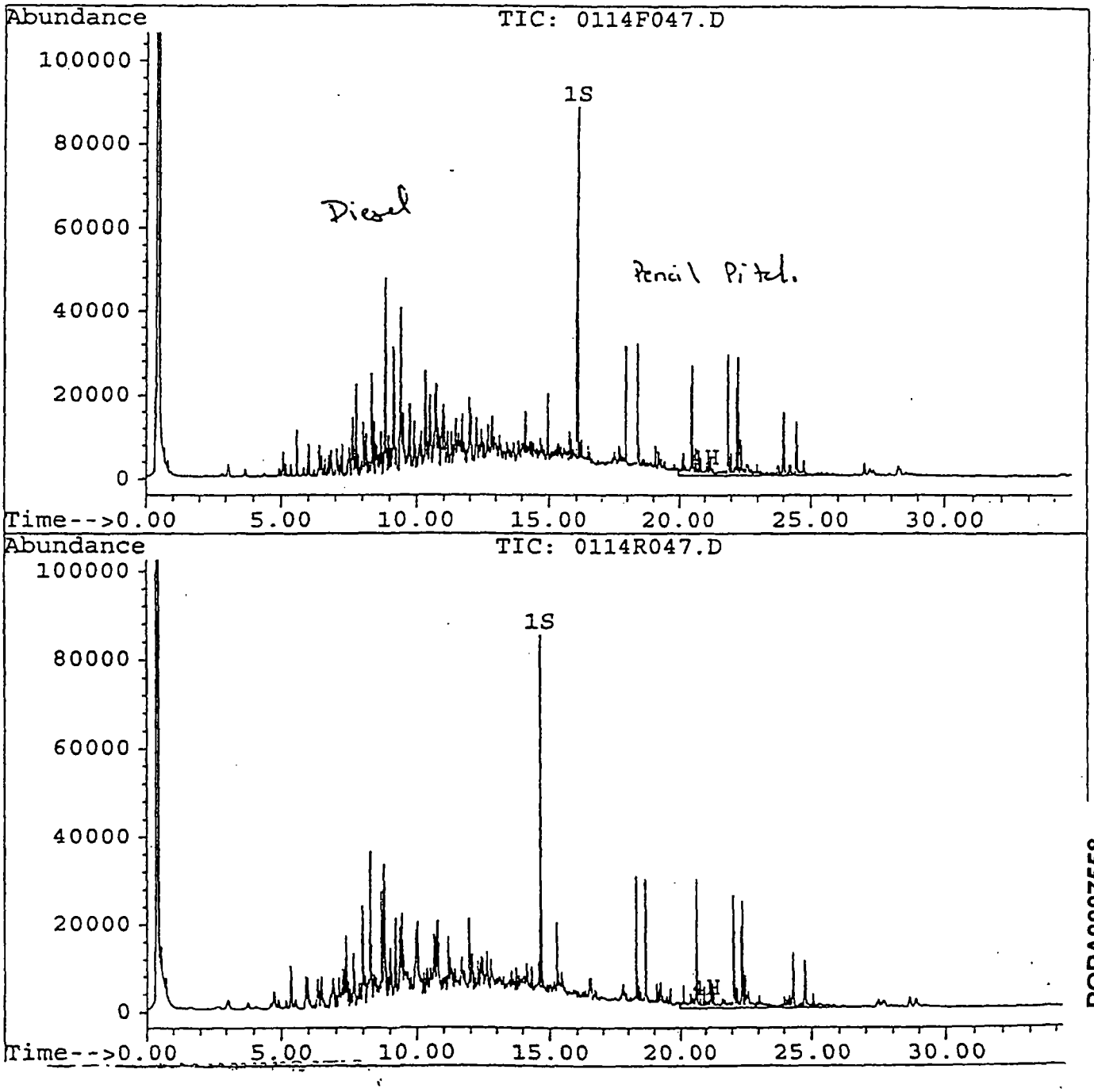
POPA0007557

Quantitation Report

Signal #1 : J:\GC15\DATA\011499\0114F047.D Vial: 38
Signal #2 : J:\GC15\DATA\011499\0114F047.D\0114R047.D
Acq On : 16 Jan 99 01:26 AM Operator: LLANDAUE
Sample : K981028-LCS3 AROM Inst : GC15
Misc : F=5 D=1 A=20.5 Multiplr: 1.00
Quant Time: Jan 26 11:04 1999

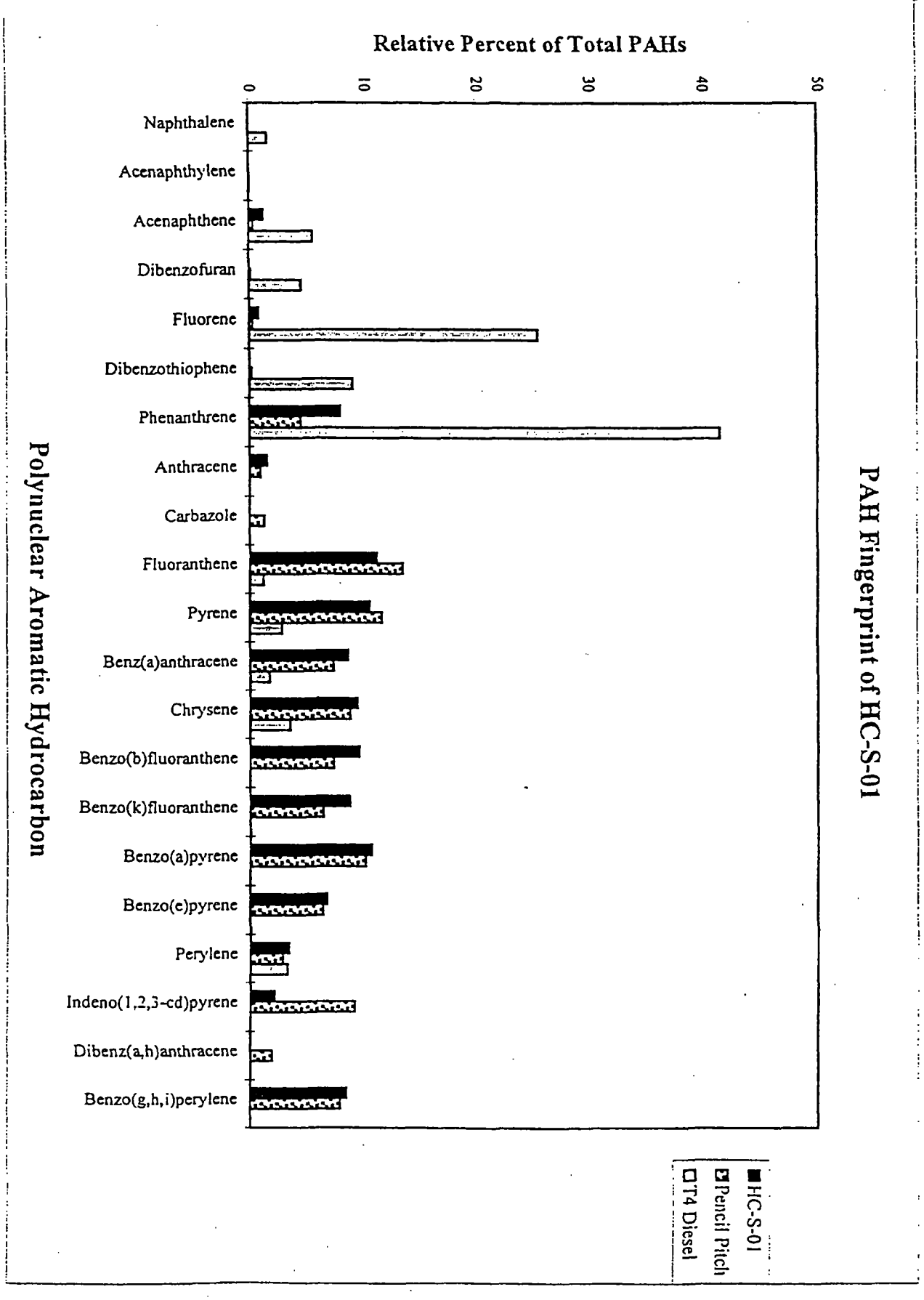
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



POPA0007558

0018

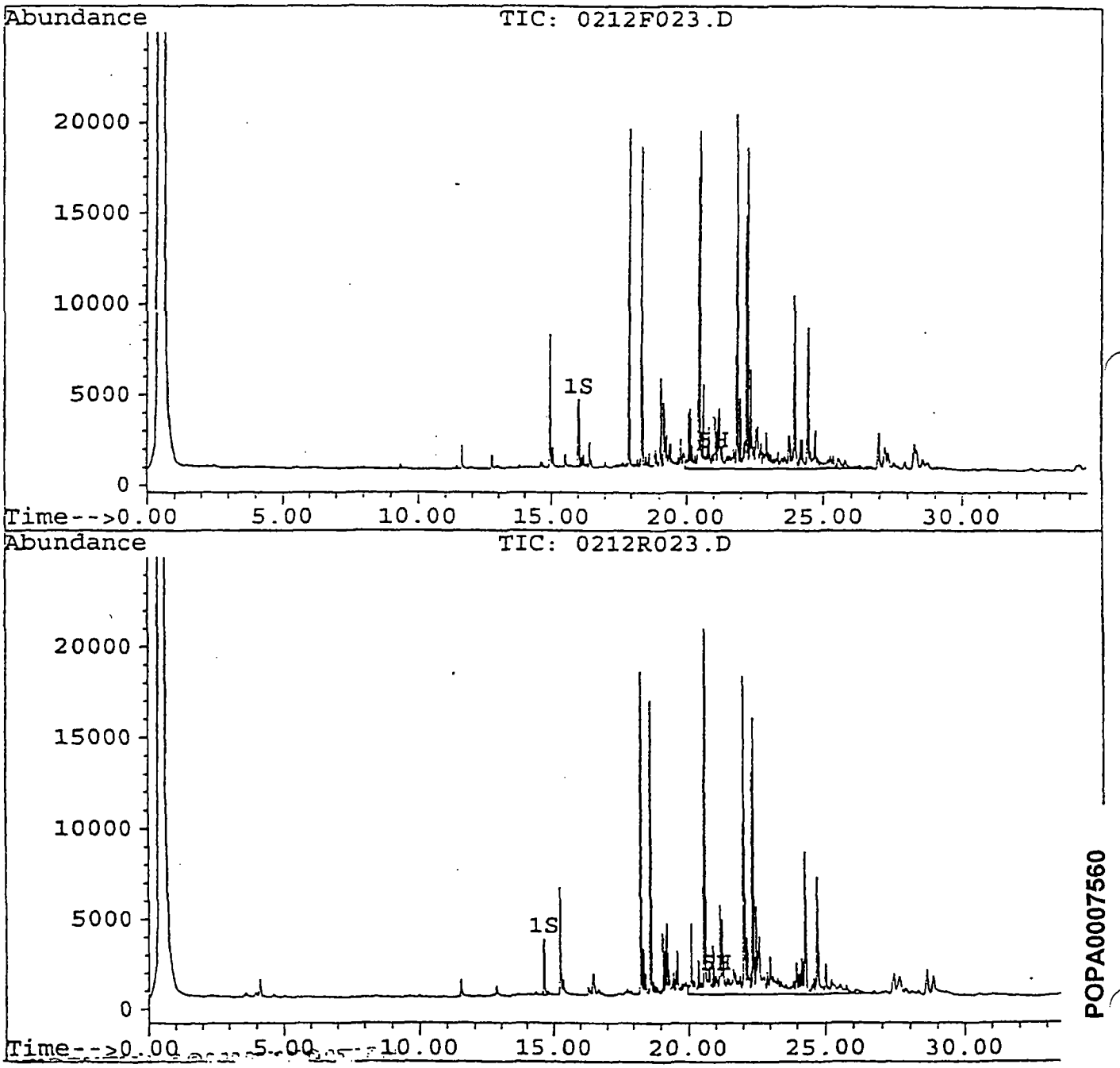

PAH Fingerprint of HC-S-01
Relative Percent of Total PAHs
0
10
20
30
40
50
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
Polynuclear Aromatic Hydrocarbon
HC-S-01
Pencil Pitch
T4 Diesel

Quantitation Report

Signal #1 : J:\GC15\DATA\021299\0212F023.D Vial: 14
Signal #2 : J:\GC15\DATA\021299\0212F023.D\0212R023.D
Acq On : 13 Feb 99 04:51 PM Operator: LLANDAU
Sample : K9807097-031 10X Inst : GC15
Misc : F=10 D=10 A=8.01 Multiplr: 1.00
Quant Time: Feb 16 7:54 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



POPA0007560

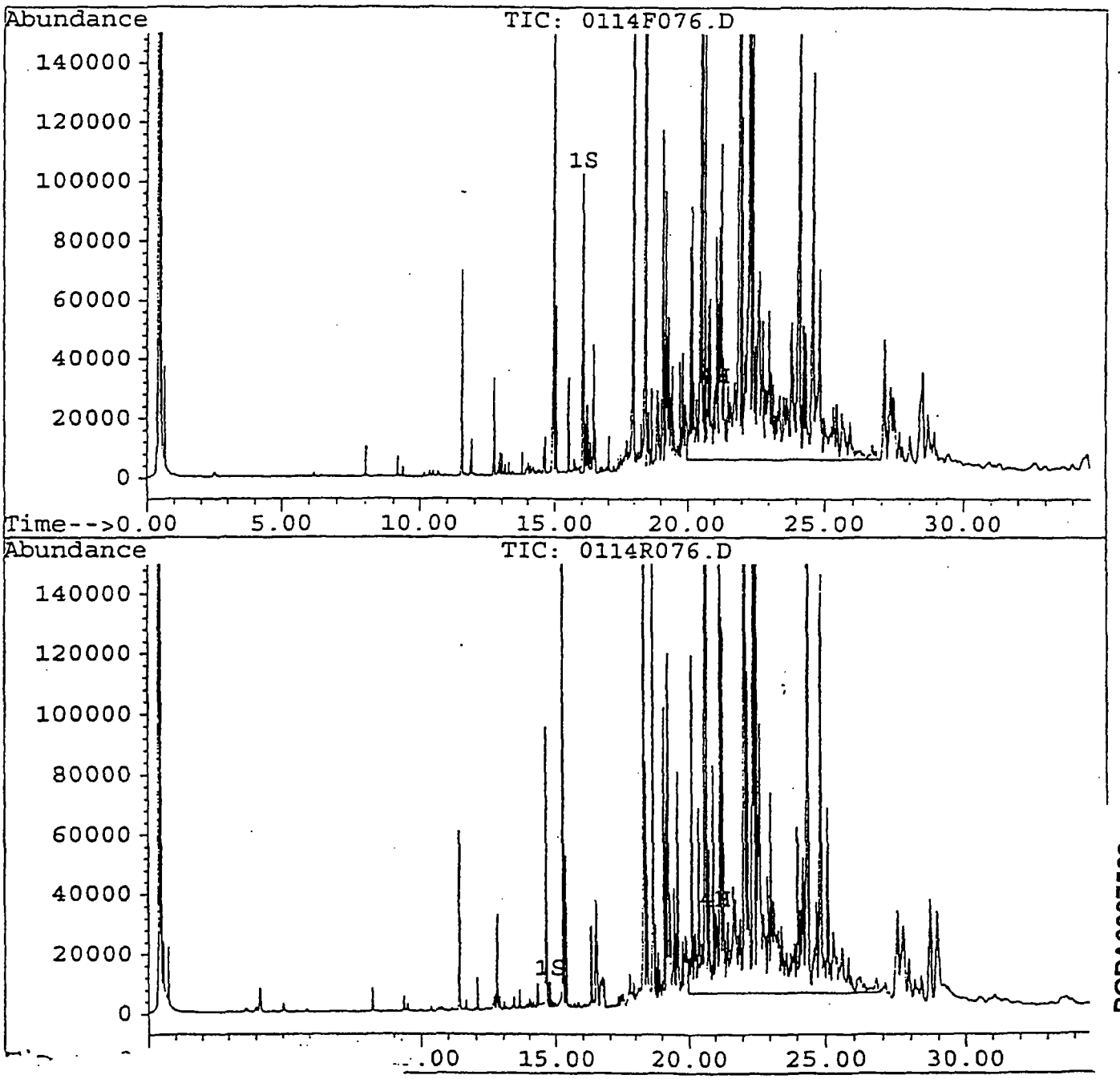
00110

Relative Percent of Total PAHs
0
10
20
30
40
50
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-02
Pencil Pitch
T4 Diesel
Polynuclear Aromatic Hydrocarbon
PAH Fingerprint of HC-S-02

Signal #1 : J:\GC15\DATA\011499\0114F076.D Vial: 59
Signal #2 : J:\GC15\DATA\011499\0114F076.D\0114R076.D
Acq On : 16 Jan 99 09:36 PM Operator: LLANDAUE
Sample : K9807097-032 AROM Inst : GC15
Misc : F=2 D=1 A=11.3 Multiplr: 1.00
Quant Time: Jan 26 10:35 1999

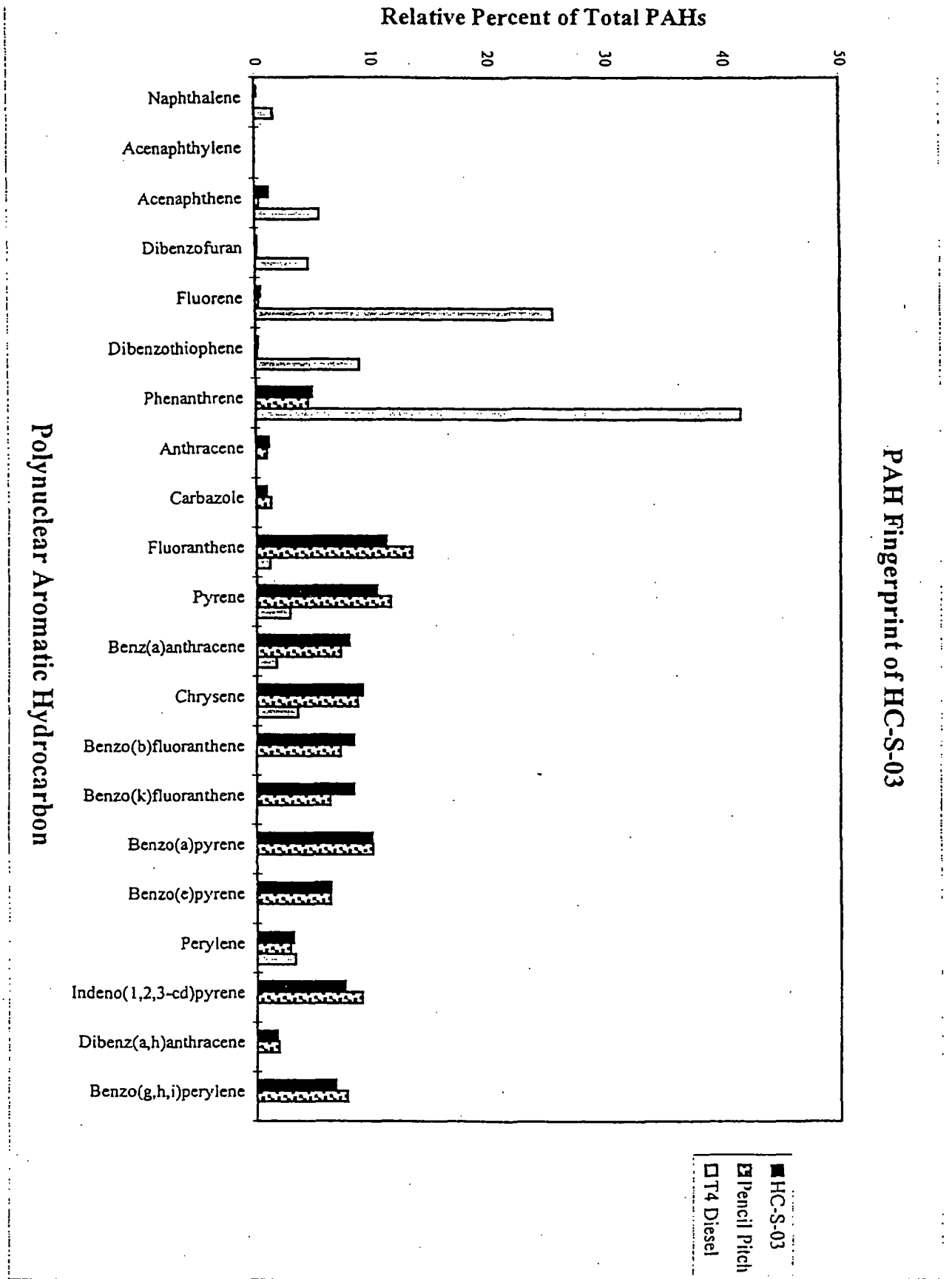
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



POPA0007562

00112A
POPA0007563



Quantitation Report

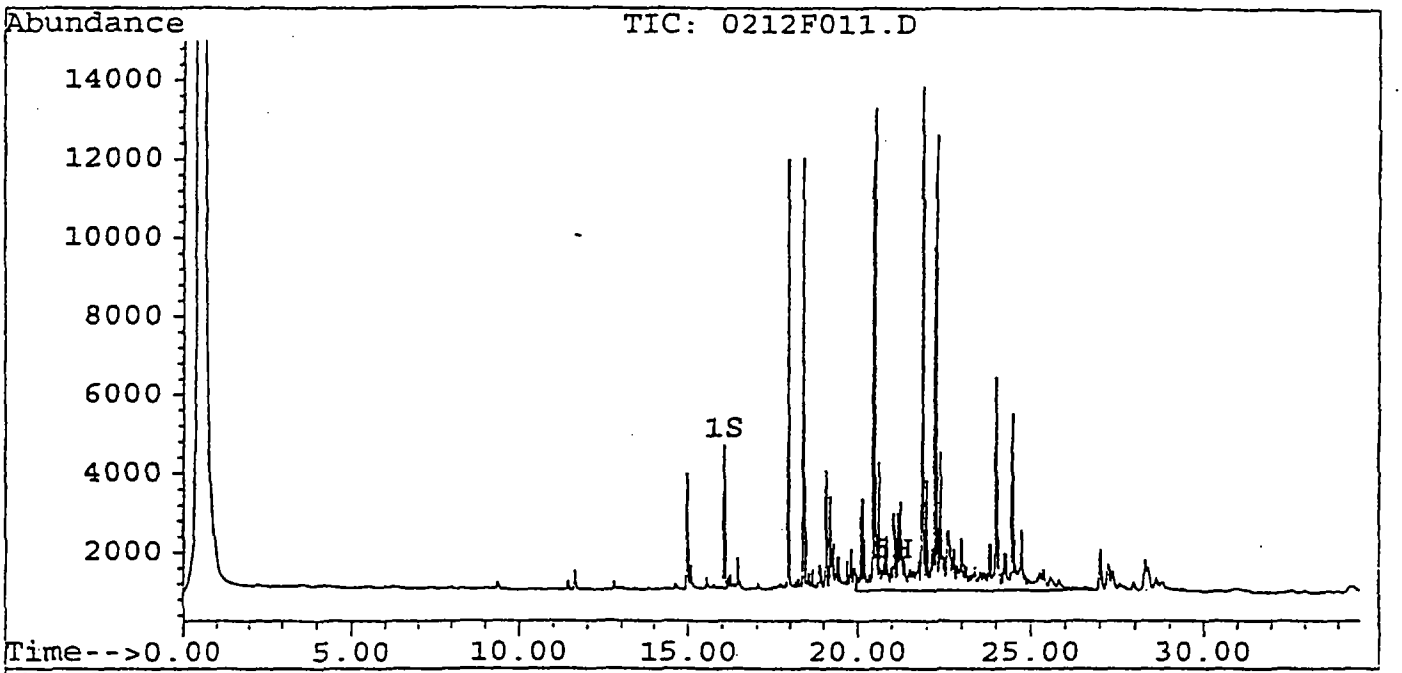
Signal #1 : J:\GC15\DATA\021299\0212F011.D
Signal #2 : J:\GC15\DATA\021299\0212F011.D\0212R011.D
Acq On : 12 Feb 99 10:13 PM
Sample : K9807097-033 40X
Misc : F=2 D=40 A=11.4
Quant Time: Feb 16 7:46 1999

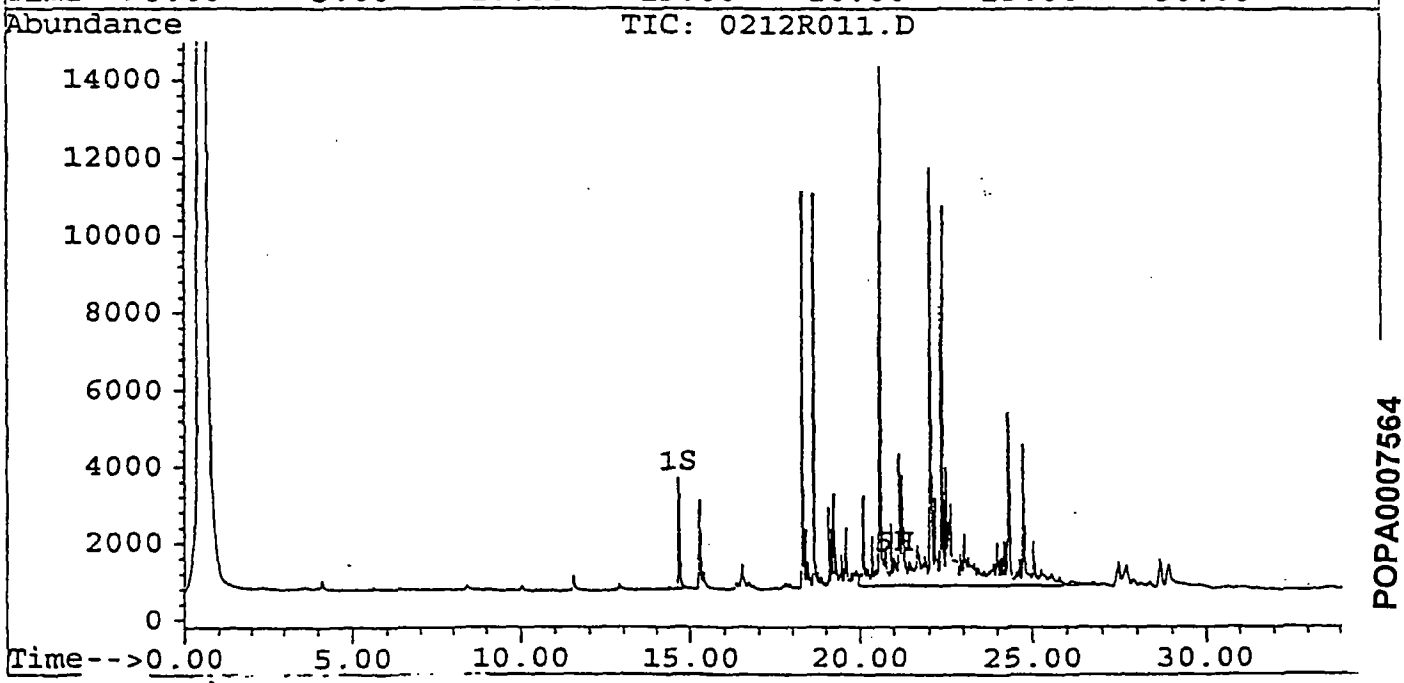
Vial: 10
Operator: LLANDAUE
Inst : GC15
Multiplr: 1.00

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

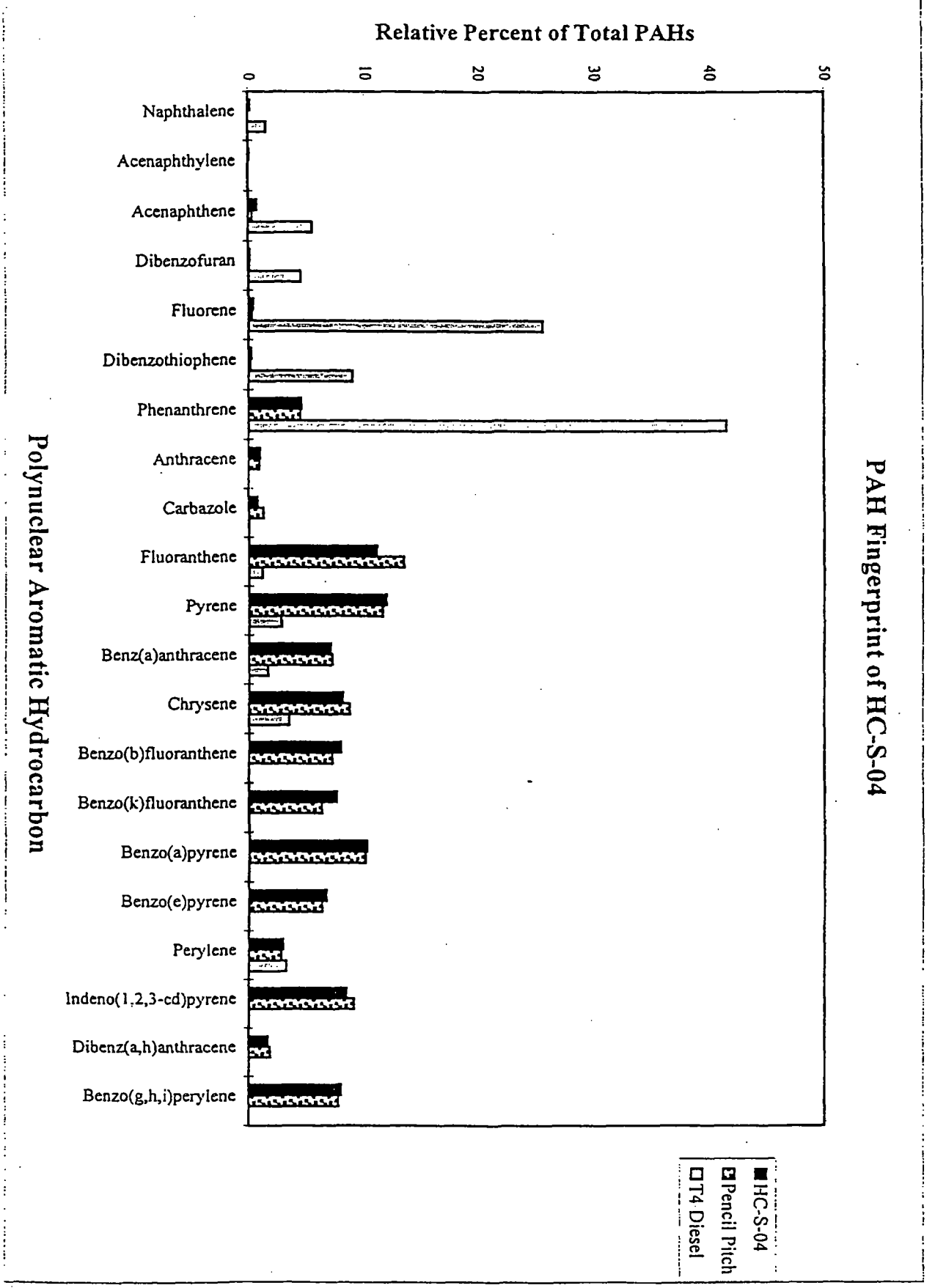
Volume Inj. : 2 ul
Signal #1 Phase : RTX 5
Signal #1 Info : 0.53 mm

Signal #2 Phase: RTX 200
Signal #2 Info : 0.53 mm





POPA0007564

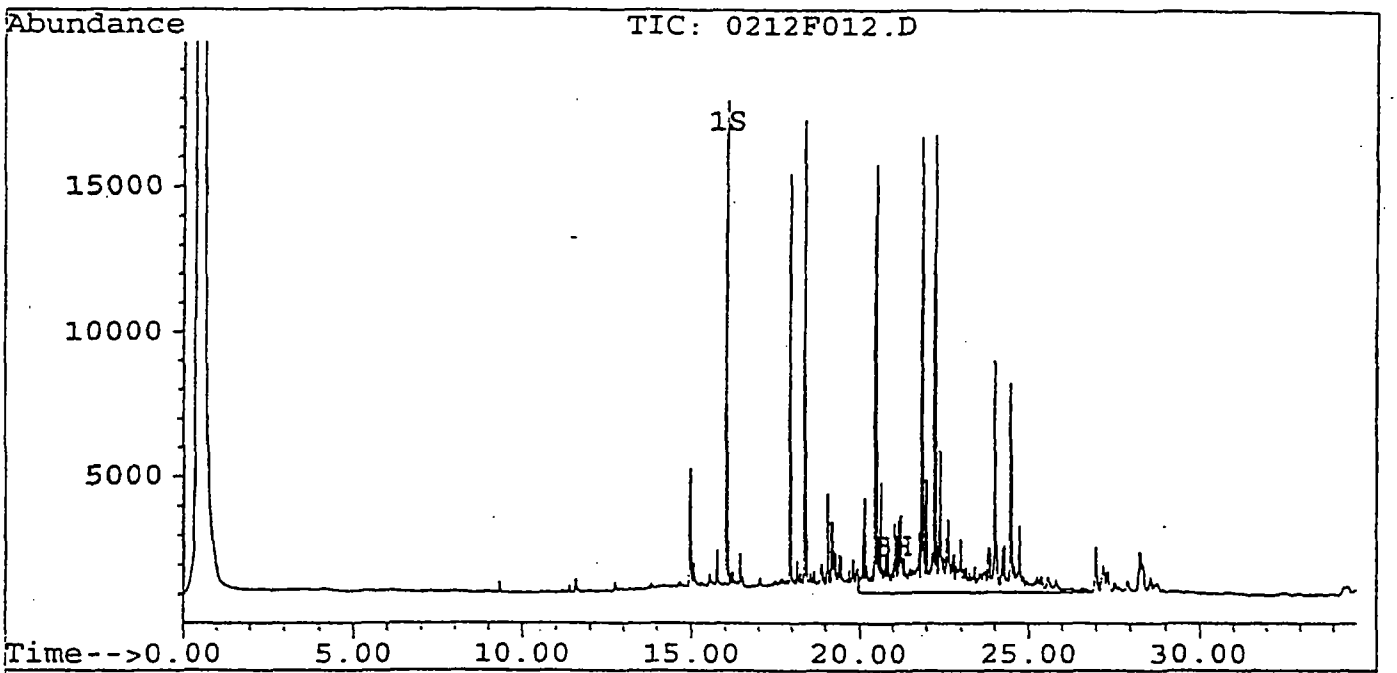

PAH Fingerprint of HC-S-04
Polynuclear Aromatic Hydrocarbon
Relative Percent of Total PAHs
0
10
20
30
40
50
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-04
Pencil Pitch
T4 Diesel

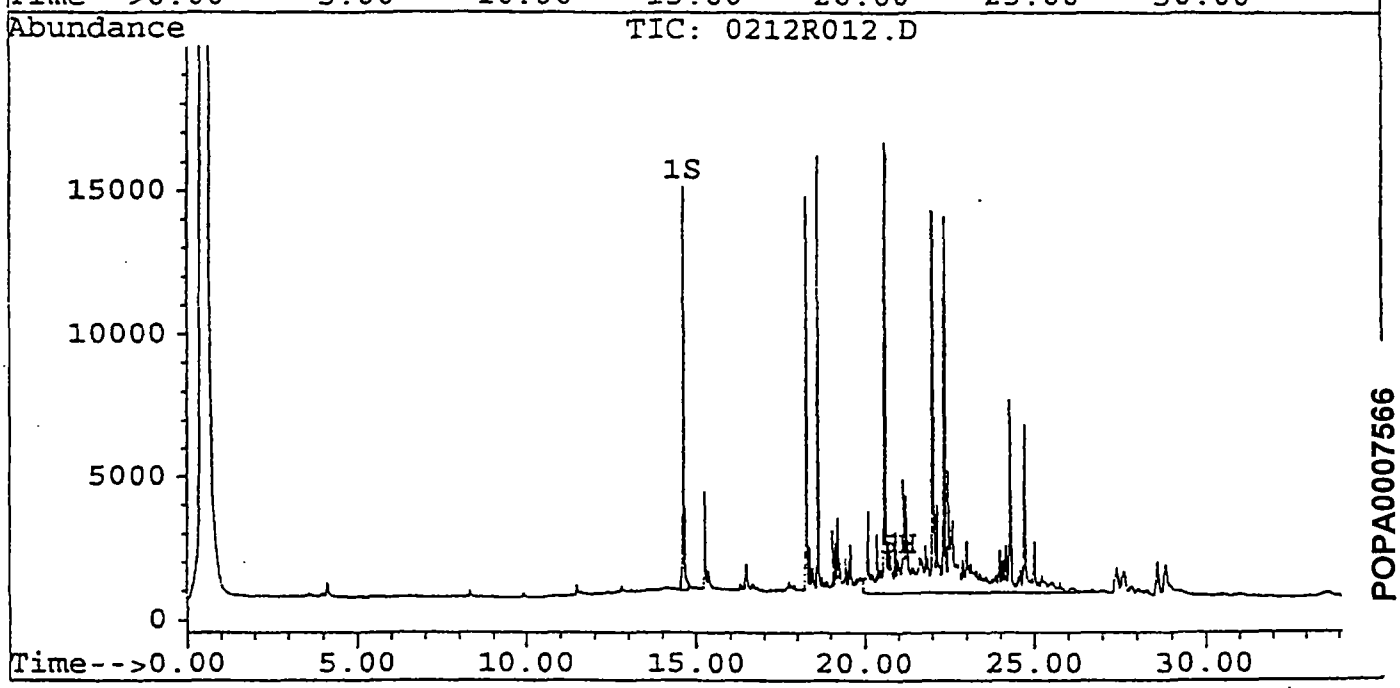
Quantitation Report

Signal #1 : J:\GC15\DATA\021299\0212F012.D Vial: 11
Signal #2 : J:\GC15\DATA\021299\0212F012.D\0212R012.D
Acq On : 12 Feb 99 10:54 PM Operator: LLANDAU
Sample : K9807097-034R 10X Inst : GC15
Misc : F=2 D=10 A=8.40 Multiplr: 1.00
Quant Time: Feb 16 7:46 1999

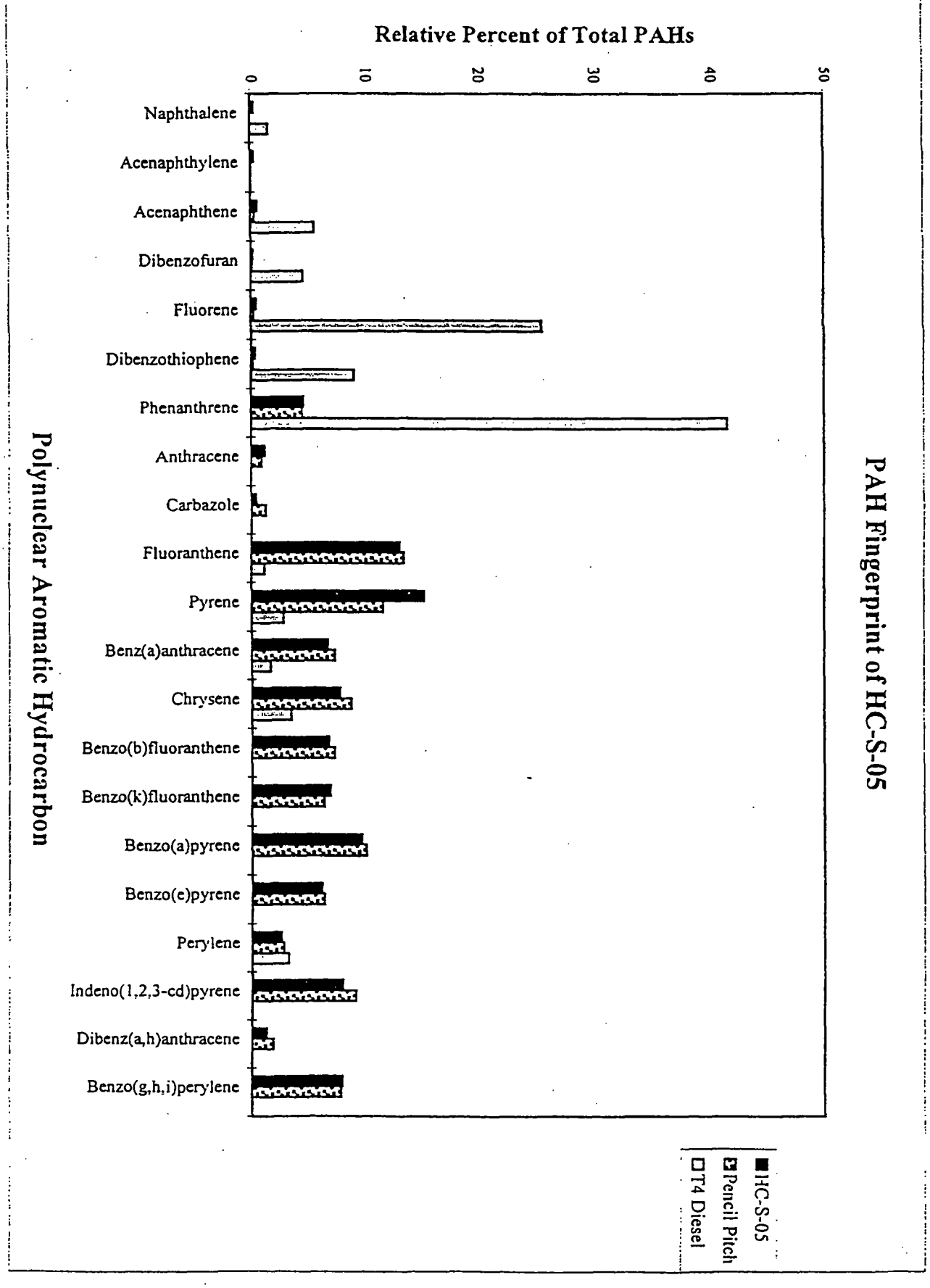
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





POPA0007566

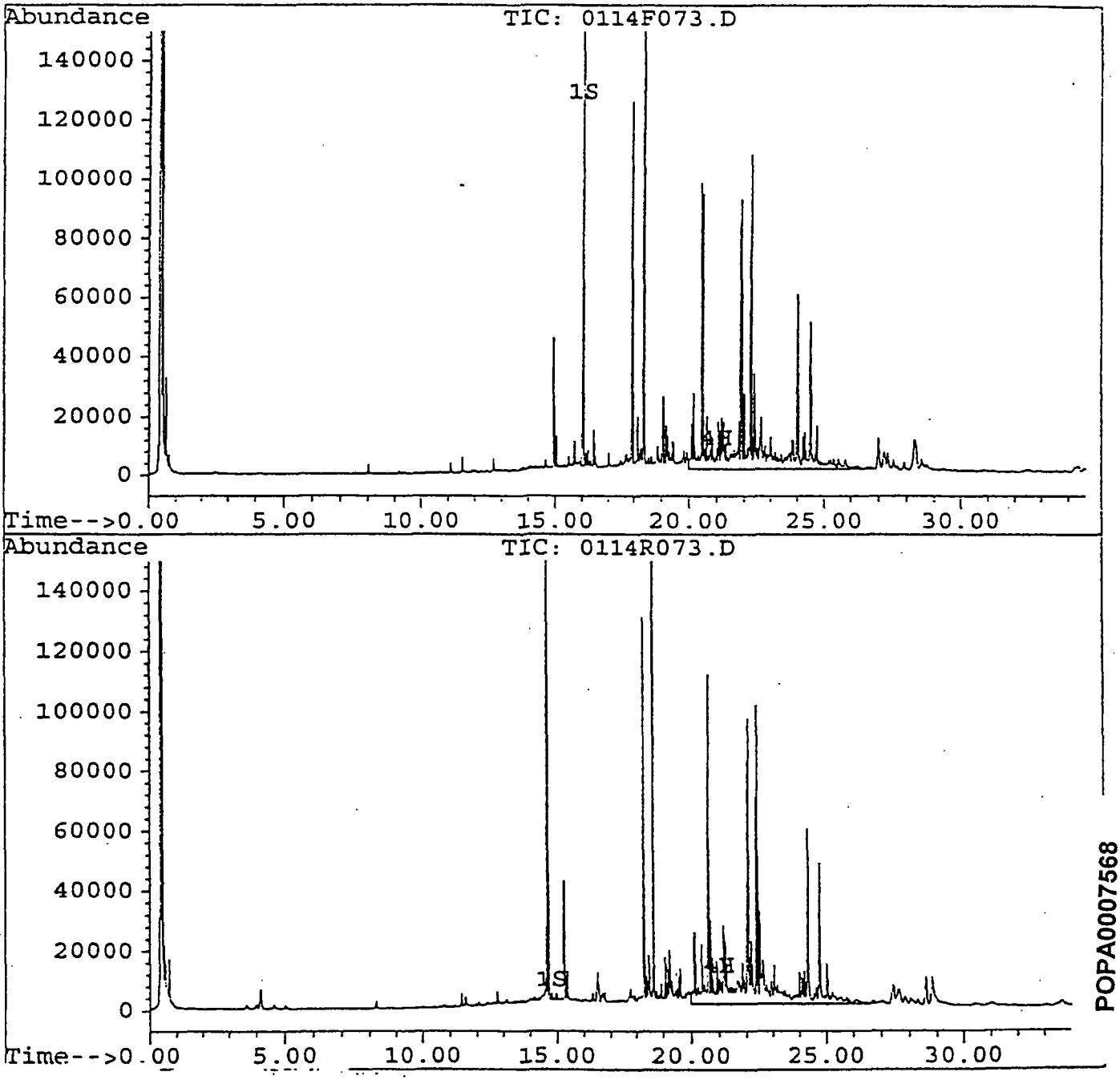

PAH Fingerprint of HC-S-05
Polynuclear Aromatic Hydrocarbon
Relative Percent of Total PAHs
0
10
20
30
40
50
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-05
Pencil Pitch
T4 Diesel

Quantitation Report

Signal #1 : J:\GC15\DATA\011499\0114F073.D Vial: 56
Signal #2 : J:\GC15\DATA\011499\0114F073.D\0114R073.D
Acq On : 16 Jan 99 07:31 PM Operator: LLANDAUE
Sample : K9807097-035 AROM Inst : GC15
Misc : F=2 D=1 A=9.58 Multiplr: 1.00
Quant Time: Jan 26 10:33 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



POPA0007568

Polynuclear Aromatic Hydrocarbon

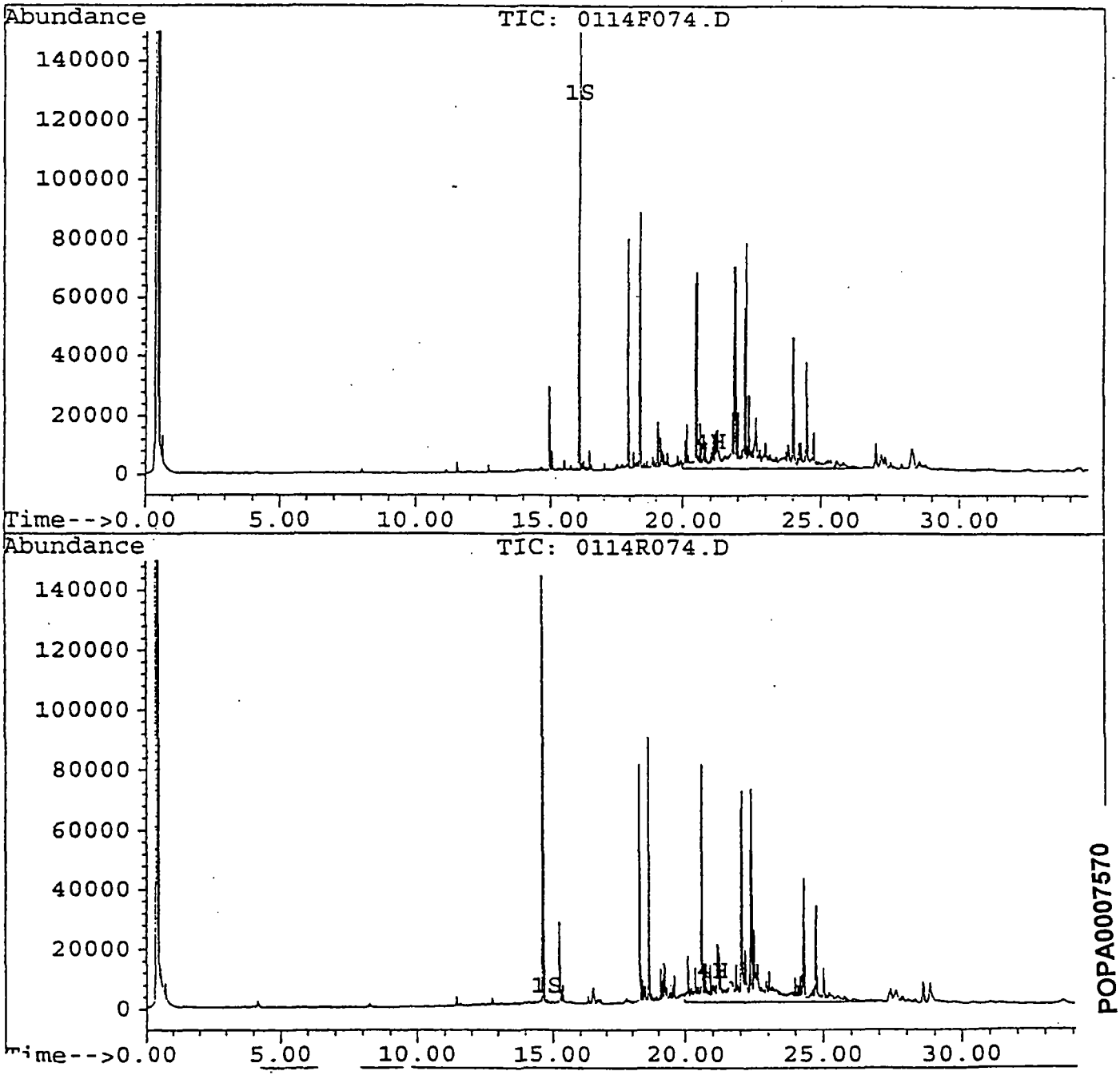
PAH Fingerprint of HC-S-06

Quantitation Report

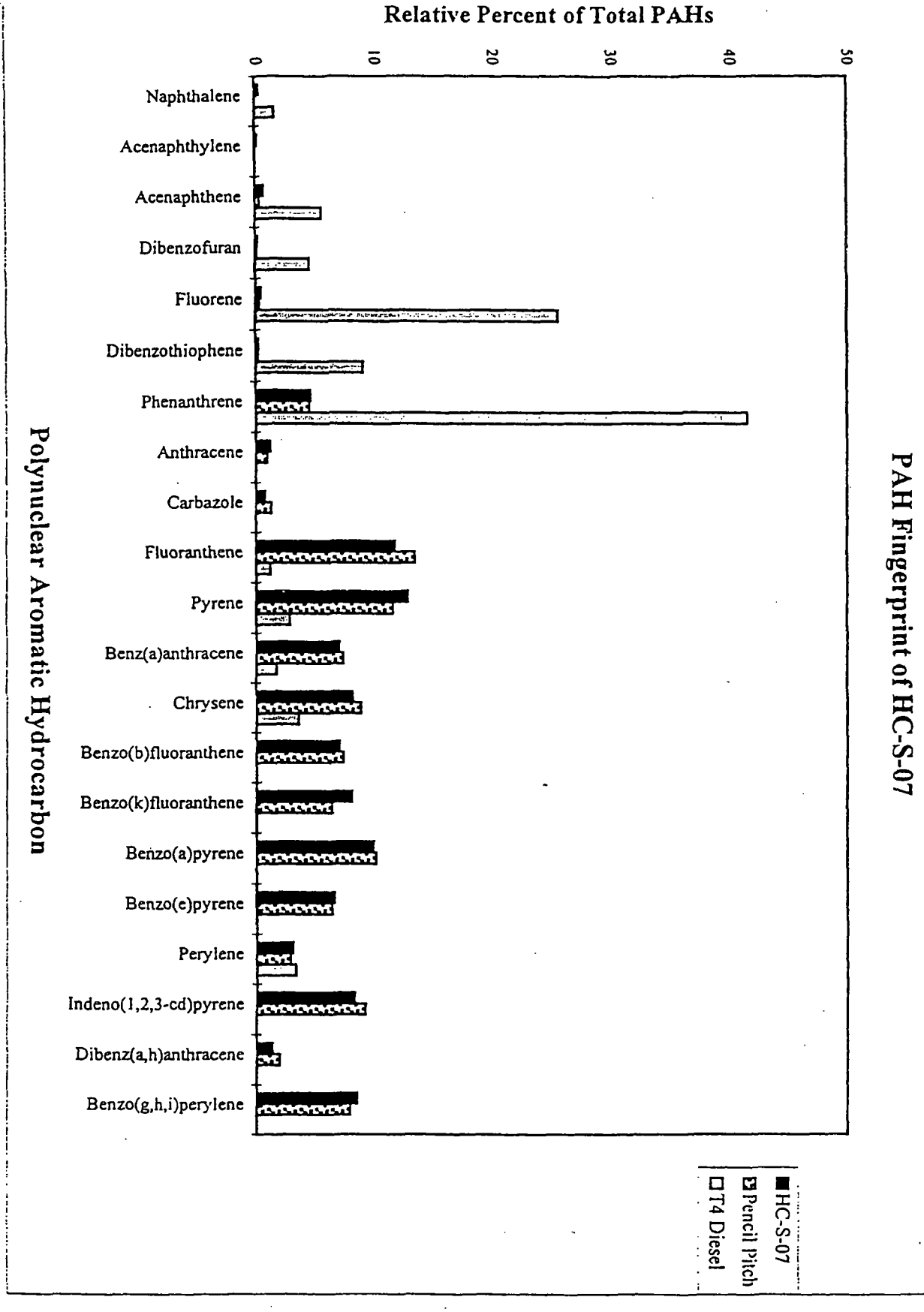
Signal #1 : J:\GC15\DATA\011499\0114F074.D Vial: 57
Signal #2 : J:\GC15\DATA\011499\0114F074.D\0114R074.D
Acq On : 16 Jan 99 08:13 PM Operator: LLANDAU
Sample : K9807097-036 AROM Inst : GC15
Misc : F=2 D=1 A=7.13 Multiplr: 1.00
Quant Time: Jan 26 10:34 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



POPA0007570

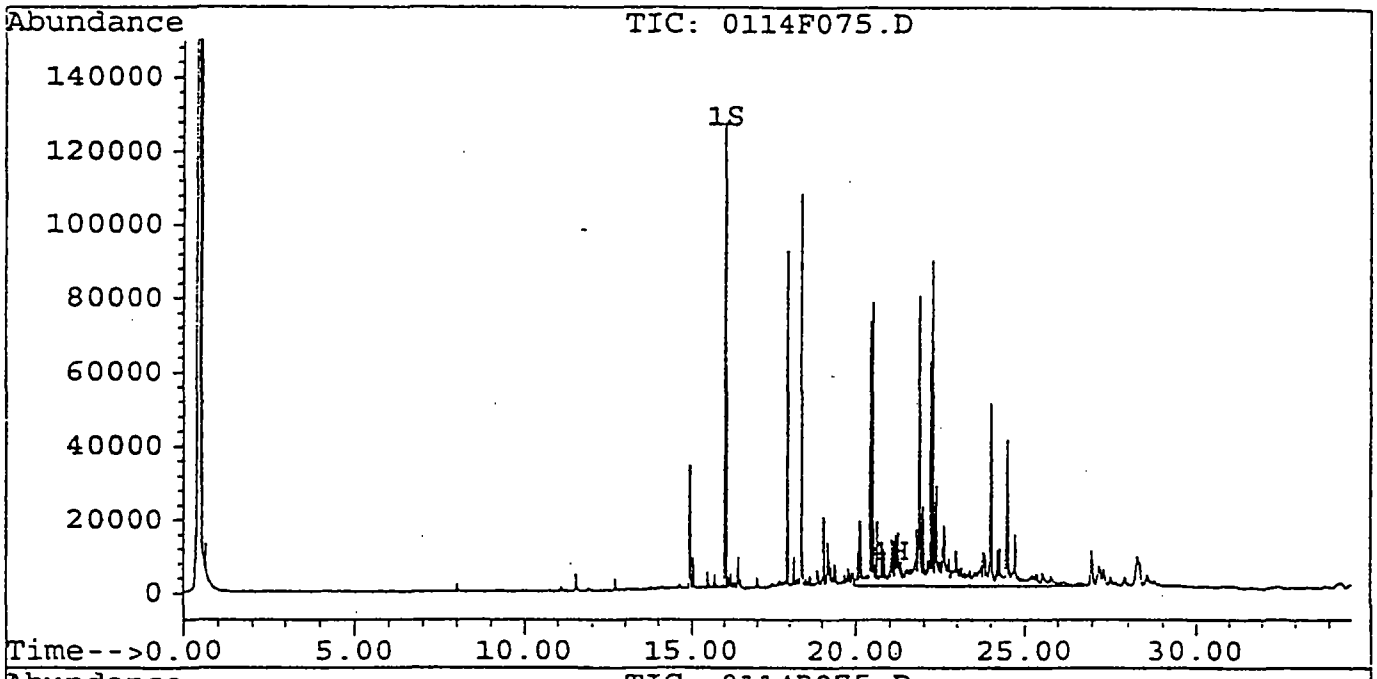

PAH Fingerprint of HC-S-07
Relative Percent of Total PAHs
0
10
20
30
40
50
Polynuclear Aromatic Hydrocarbon
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-07
Pencil Pitch
T4 Diesel

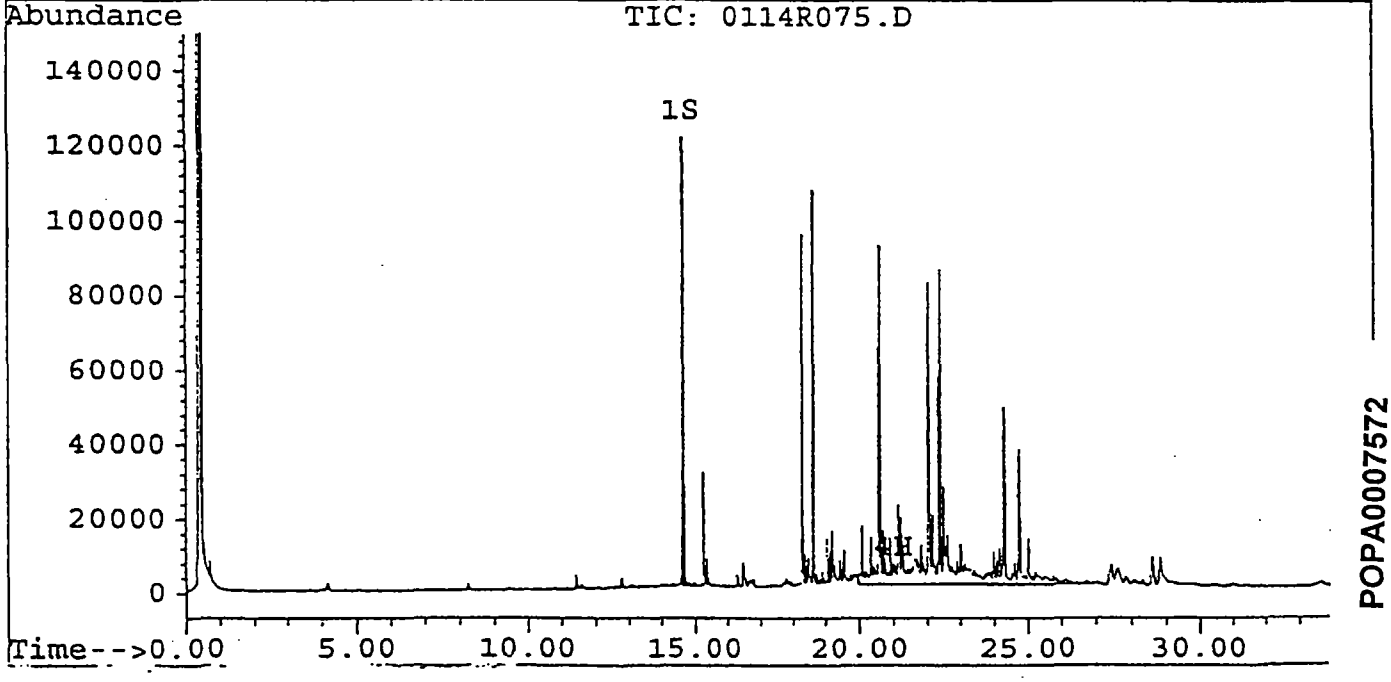
Quantitation Report

Signal #1 : J:\GC15\DATA\011499\0114F075.D Vial: 58
Signal #2 : J:\GC15\DATA\011499\0114F075.D\0114R075.D
Acq On : 16 Jan 99 08:54 PM Operator: LLANDAUER
Sample : K9807097-037 AROM Inst : GC15
Misc : F=2 D=1 A=7.29 Multiplr: 1.00
Quant Time: Jan 26 10:34 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

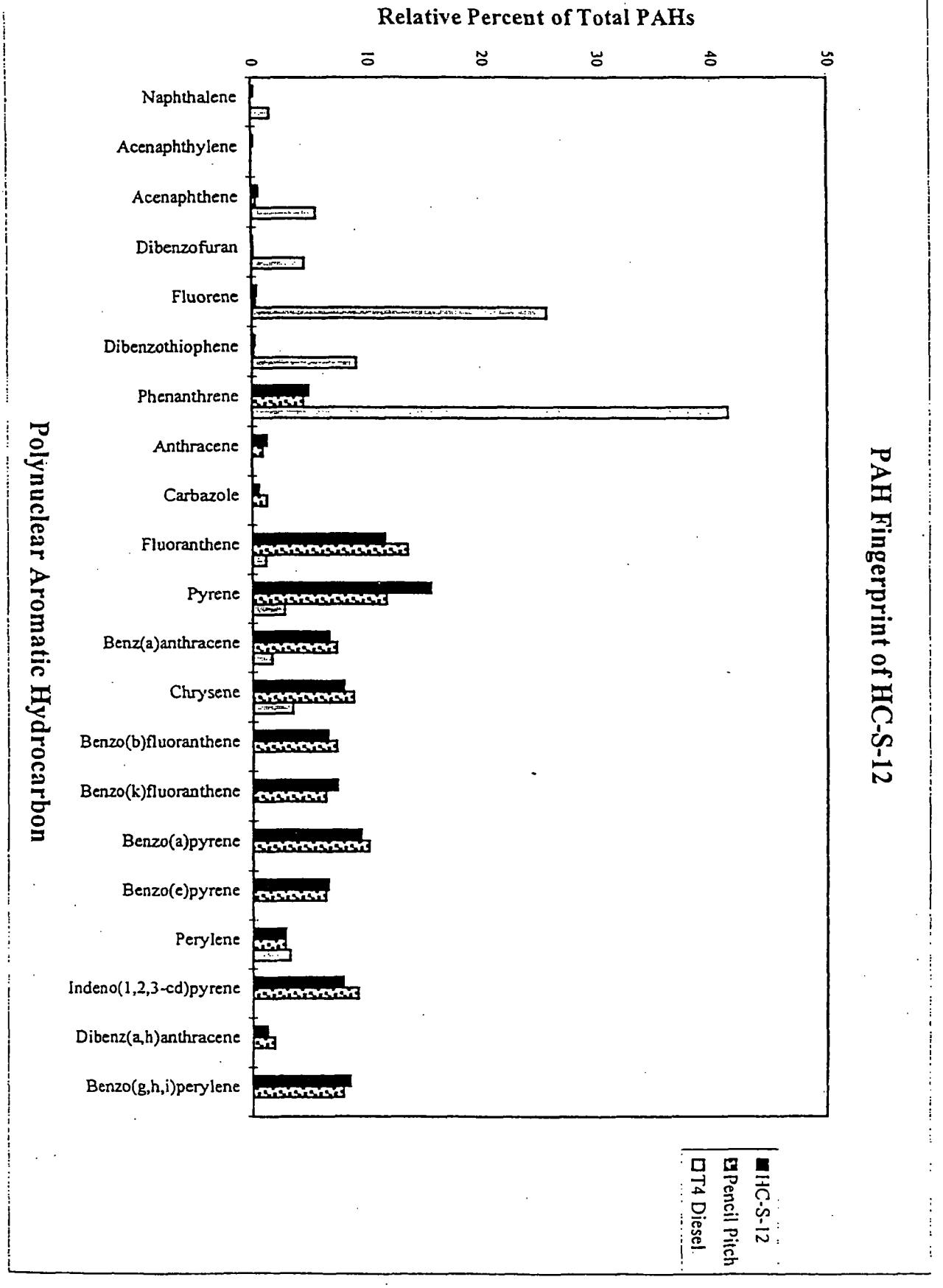
Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





POPA0007572

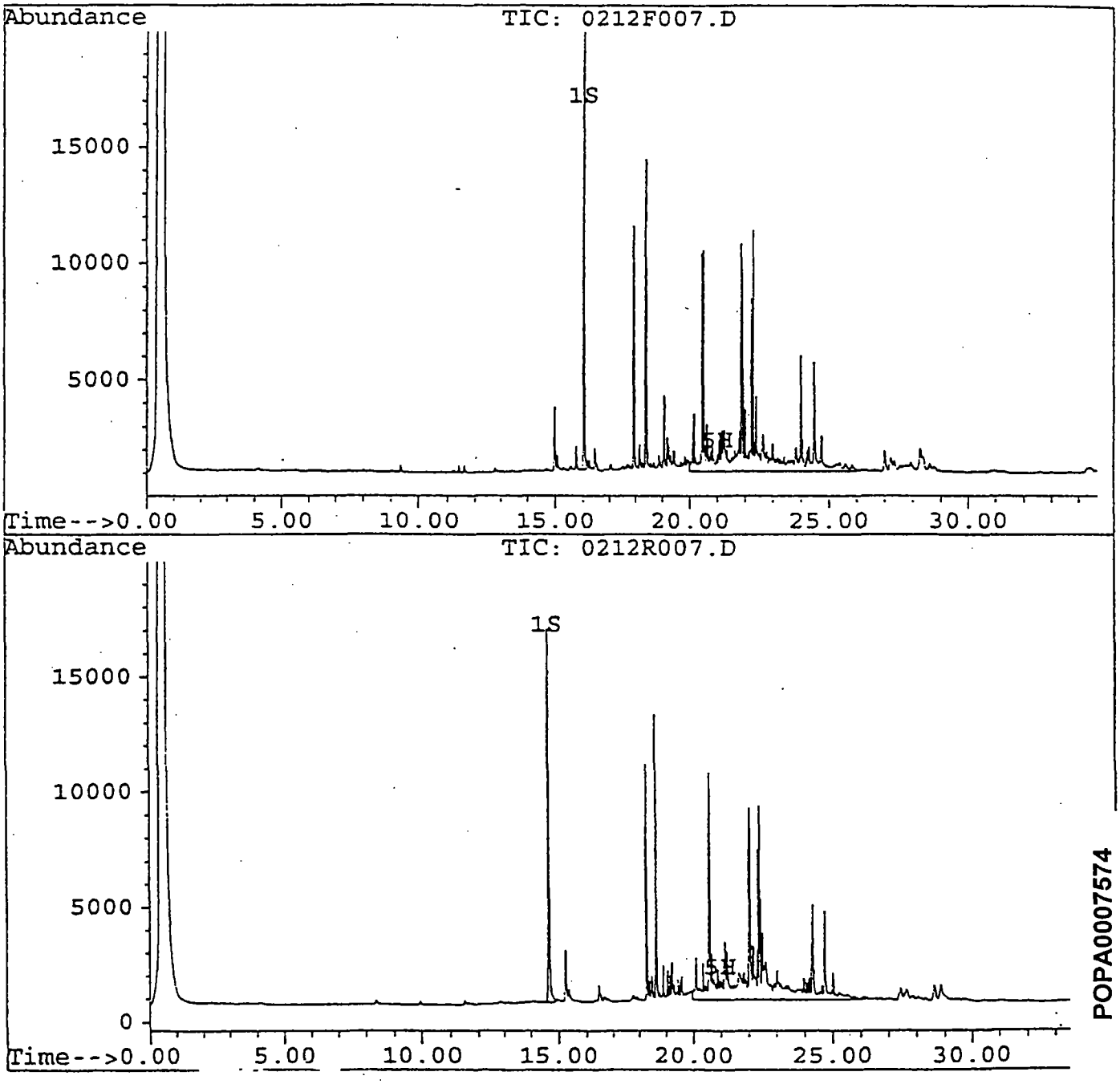
00121


PAH Fingerprint of HC-S-12
Relative Percent of Total PAHs
0
10
20
30
40
50
Polynuclear Aromatic Hydrocarbon
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-12
Pencil Pitch
T4 Diesel

Signal #1 : J:\GC15\DATA\021299\0212F007.D Vial: 6
Signal #2 : J:\GC15\DATA\021299\0212F007.D\0212R007.D
Acq On : 12 Feb 99 07:26 PM Operator: LLANDAU
Sample : K9807115-003 10X Inst : GC15
Misc : F=2 D=10 A=7.19 Multiplr: 1.00
Quant Time: Feb 16 7:45 1999

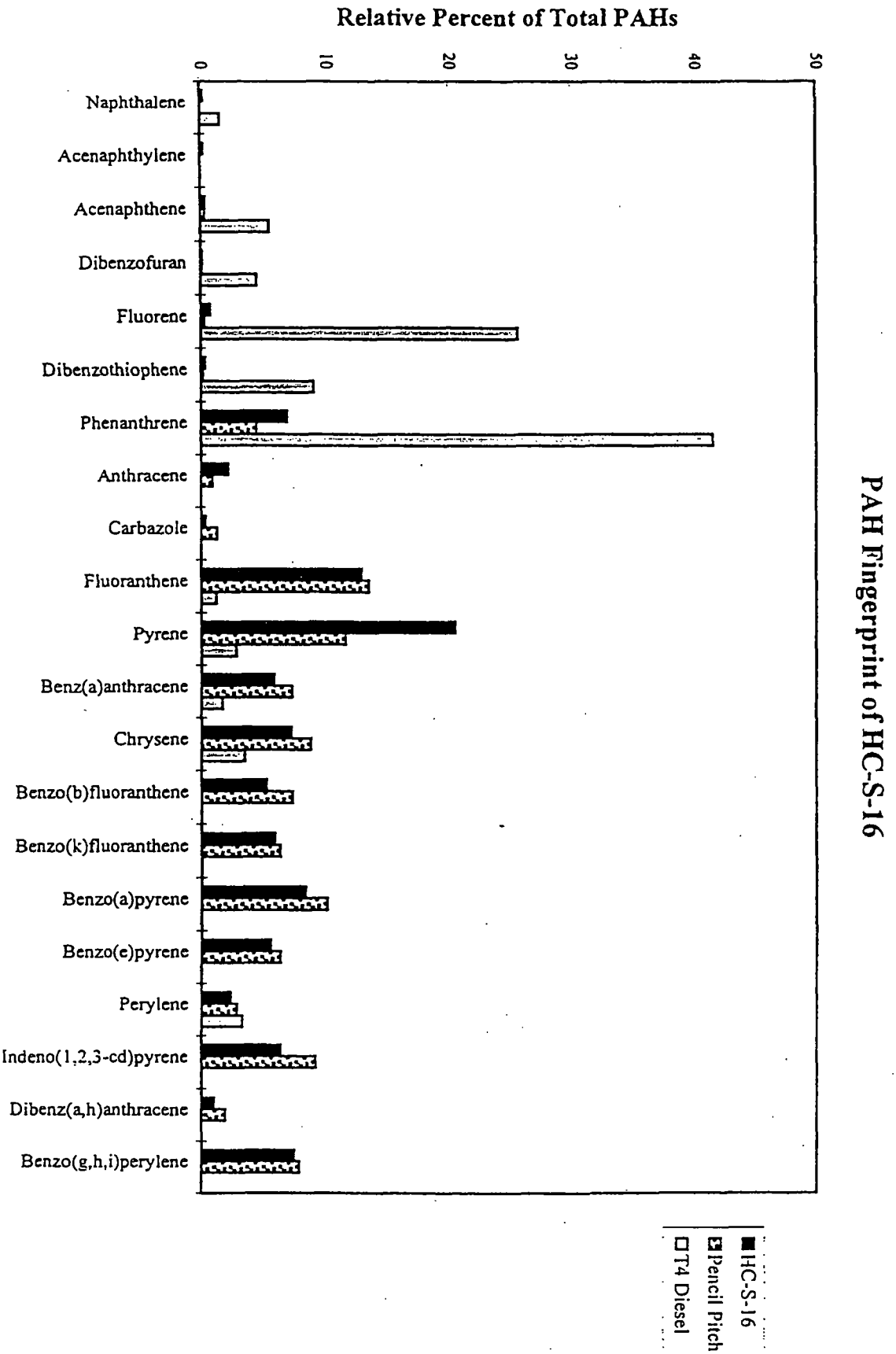
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



POPA0007574

00123

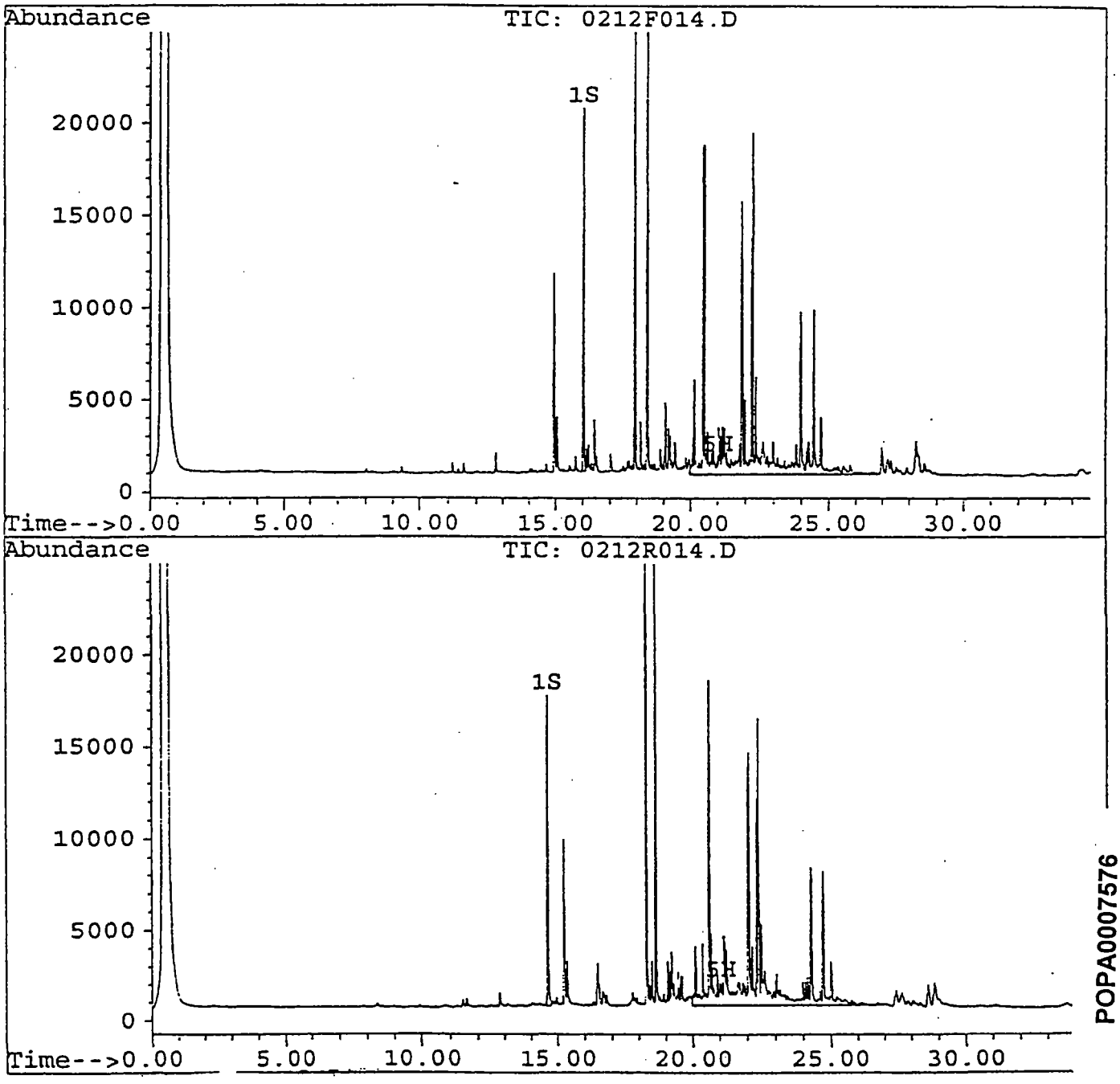

PAH Fingerprint of HC-S-16
Relative Percent of Total PAHs
0
10
20
30
40
50
Polynuclear Aromatic Hydrocarbon
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-16
Pencil Pitch
T4 Diesel

Quantitation Report

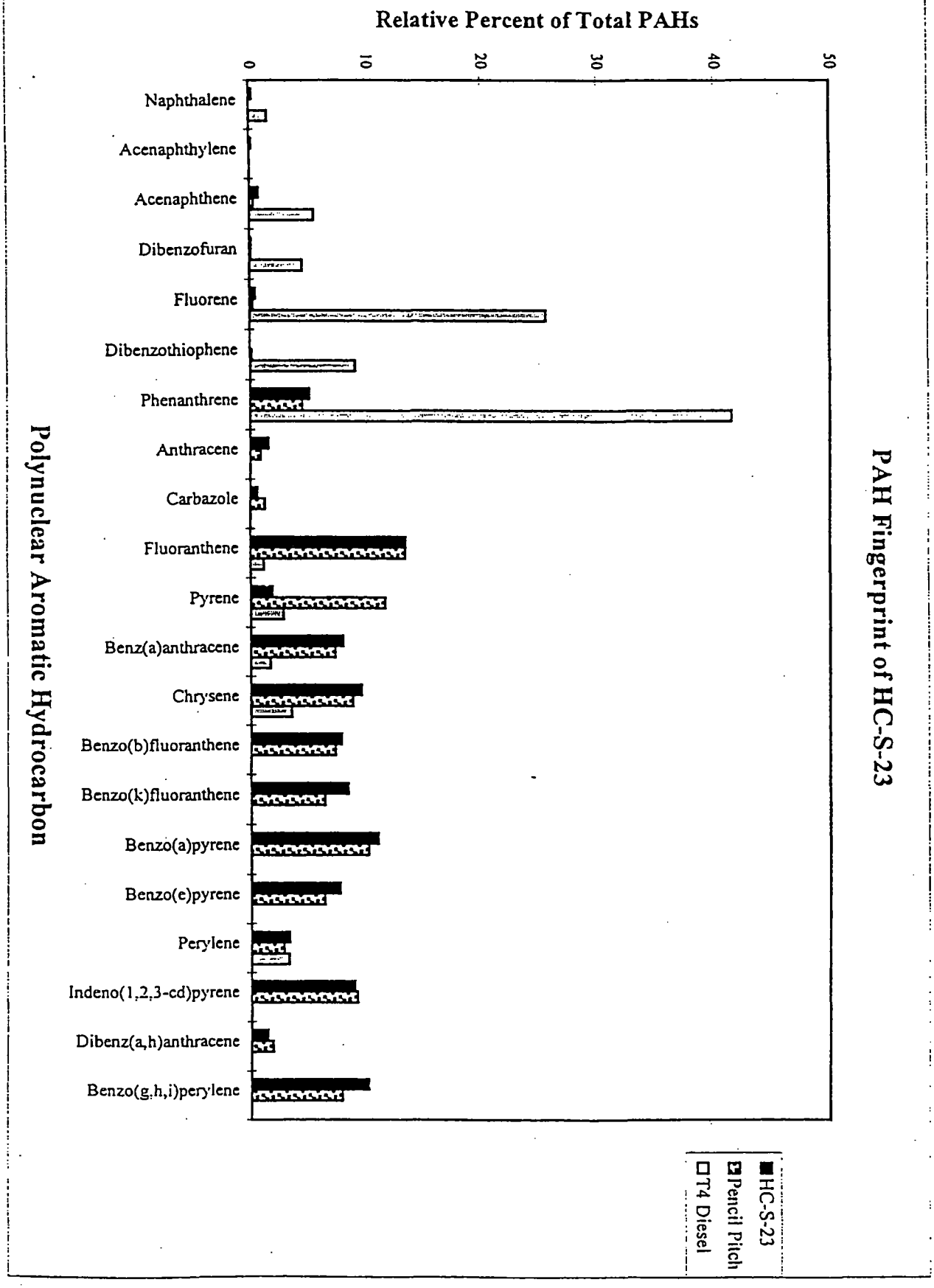
Signal #1 : J:\GC15\DATA\021299\0212F014.D Vial: 12
Signal #2 : J:\GC15\DATA\021299\0212F014.D\0212R014.D
Acq On : 13 Feb 99 00:17 AM Operator: LLANDAUE
Sample : K9807115-007 10X Inst : GC15
Misc : F=2 D=10 A=9.01 Multiplr: 1.00
Quant Time: Feb 16 7:47 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



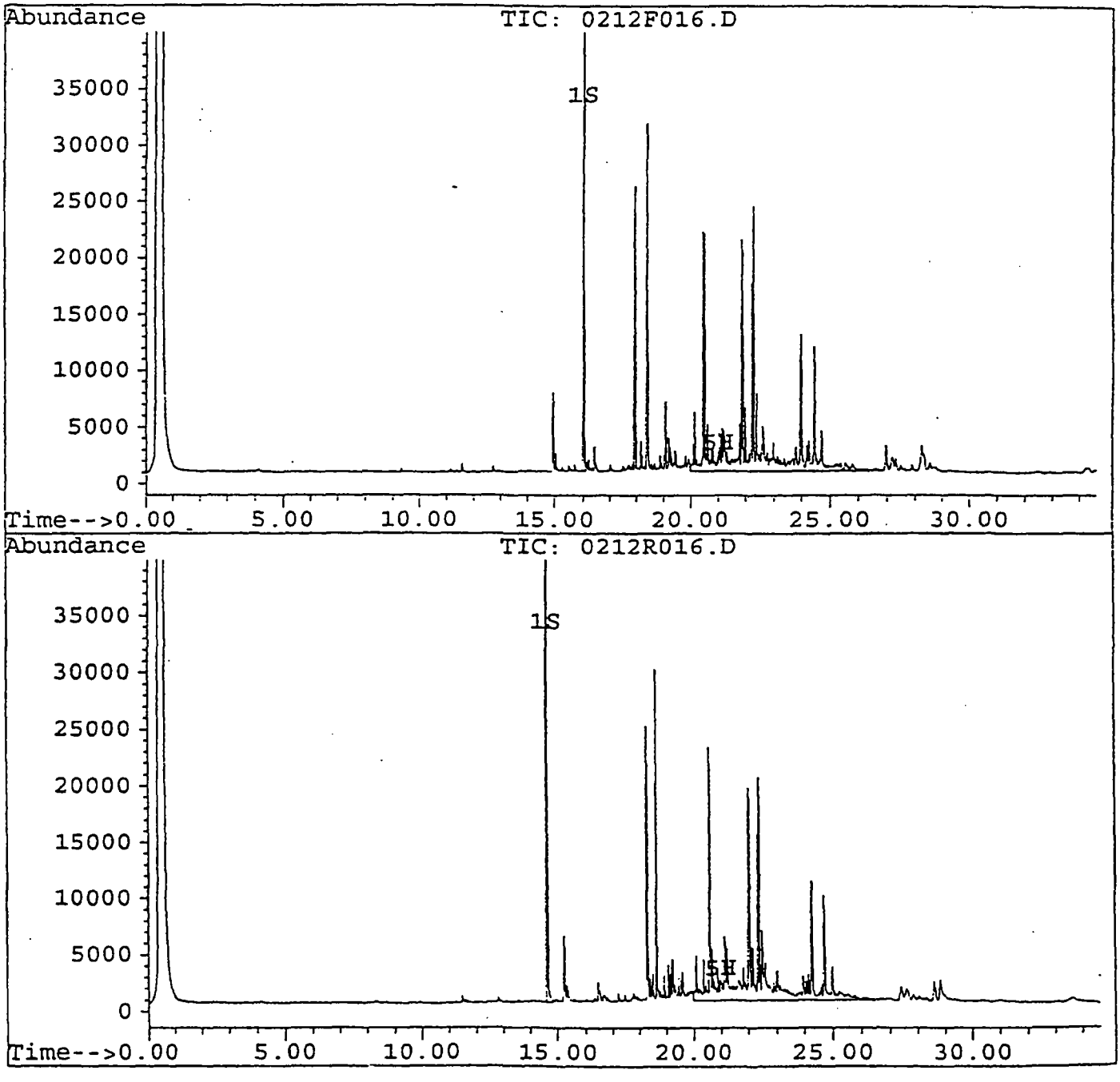
POPA0007576


Relative Percent of Total PAHs
0
10
20
30
40
50
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
Polynuclear Aromatic Hydrocarbon
PAH Fingerprint of HC-S-23
HC-S-23
Pencil Pitch
T4 Diesel

Signal #1 : J:\GC15\DATA\021299\0212F016.D Vial: 13
Signal #2 : J:\GC15\DATA\021299\0212F016.D\0212R016.D
Acq On : 13 Feb 99 01:40 AM Operator: LLANDAU
Sample : K9807115-010 10X Inst : GC15
Misc : F=1 D=10 A=7.40 Multiplr: 1.00
Quant Time: Feb 16 7:47 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00127

POPA0007578

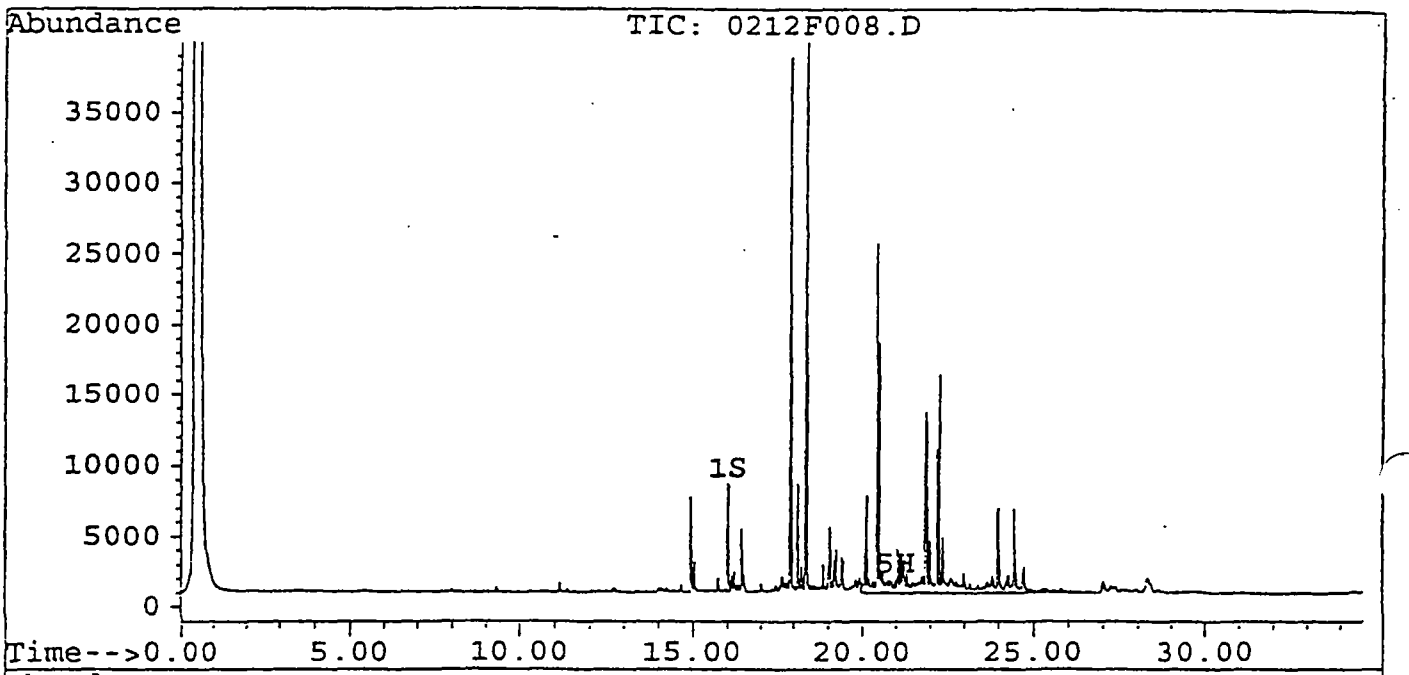
PAH Fingerprint of HC-S-24
Relative Percent of Total PAHs
0
10
20
30
40
50
Polynuclear Aromatic Hydrocarbon
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-24
Pencil Pitch
T4 Diesel

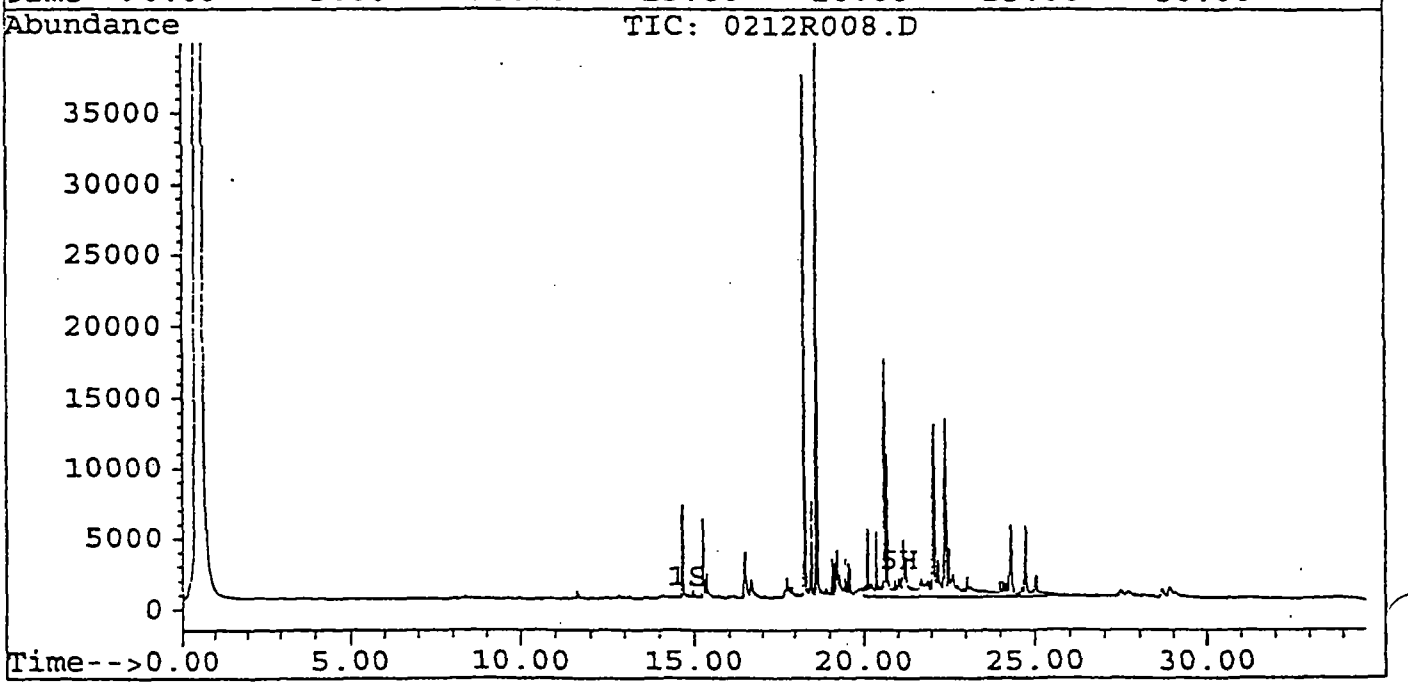
Quantitation Report

Signal #1 : J:\GC15\DATA\021299\0212F008.D Vial: 7
Signal #2 : J:\GC15\DATA\021299\0212F008.D\0212R008.D
Acq On : 12 Feb 99 08:08 PM Operator: LLANDA
Sample : K9807115-011 50X Inst : GC15
Misc : F=1 D=50 A=10.4 Multiplr: 1.00
Quant Time: Feb 16 7:45 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





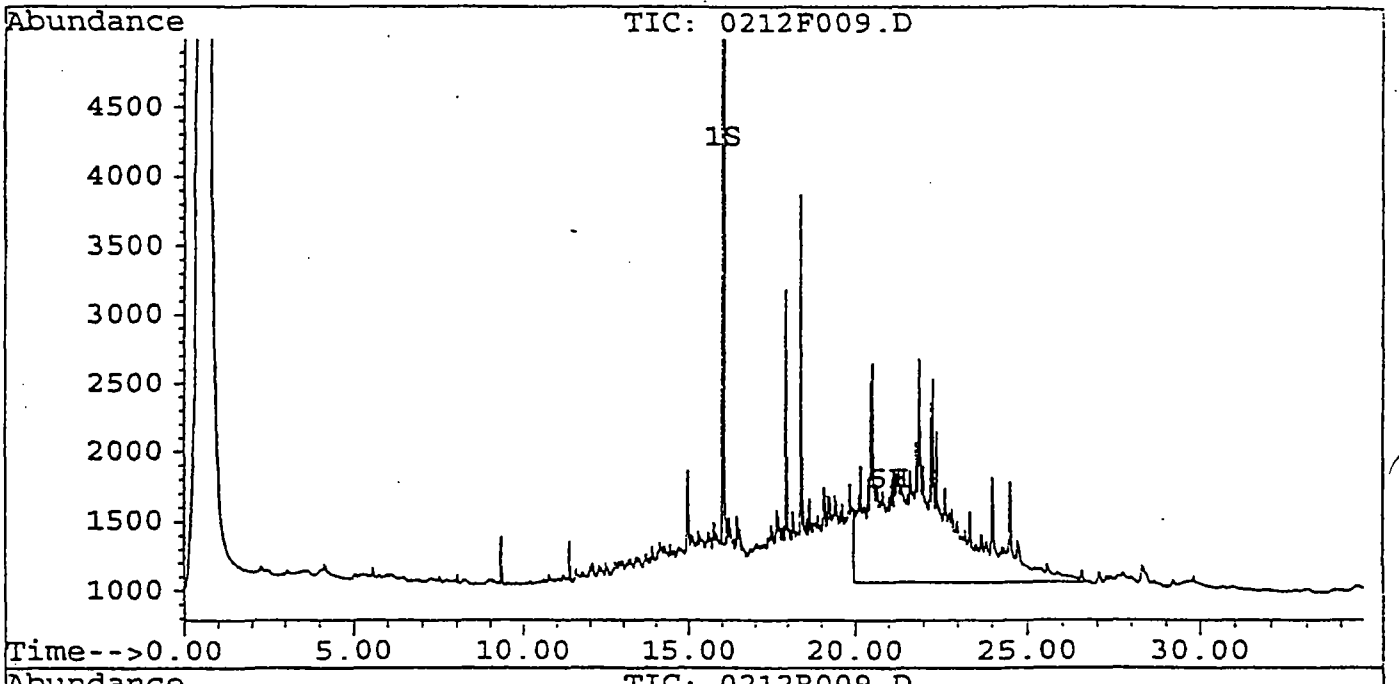
Relative Percent of Total PAHs
0
10
20
30
40
50
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
Polynuclear Aromatic Hydrocarbon
HC-S-25
Pencil Pitch
T4 Diesel
PAH Fingerprint of HC-S-25

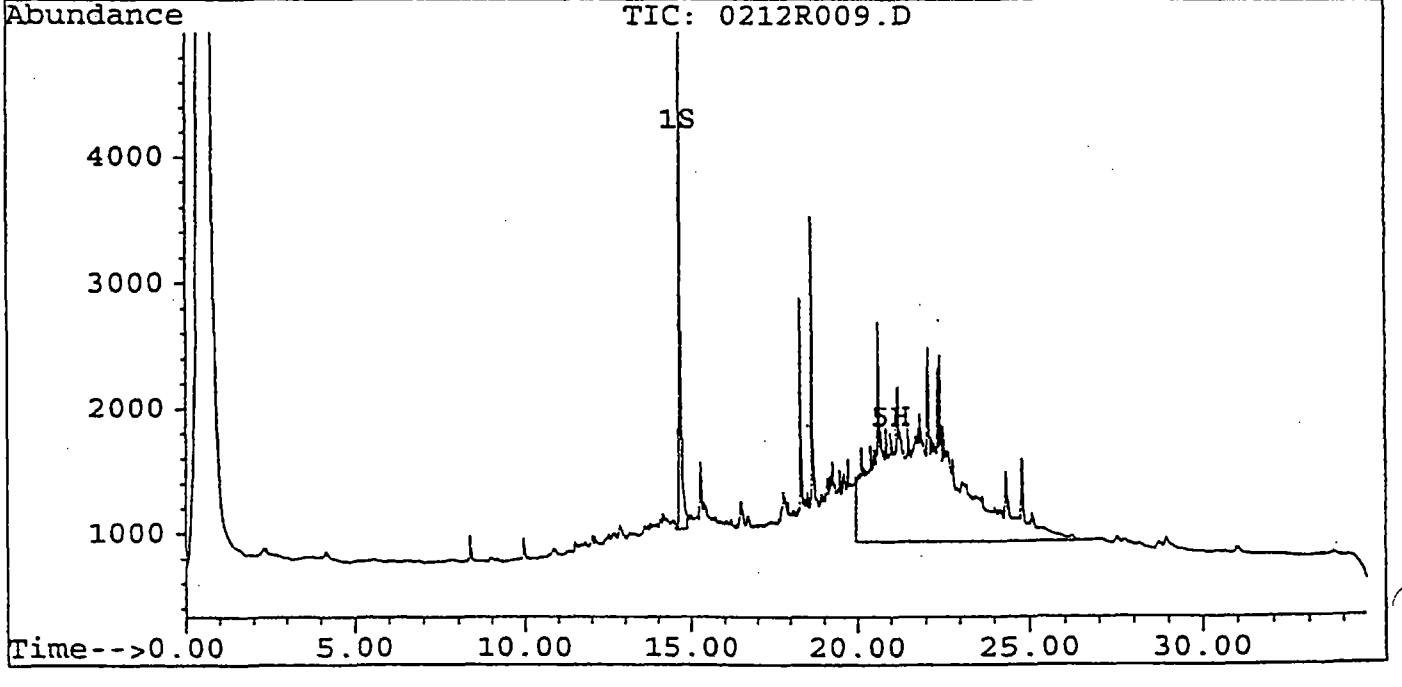
Quantitation Report

Signal #1 : J:\GC15\DATA\021299\0212F009.D Vial: 8
Signal #2 : J:\GC15\DATA\021299\0212F009.D\0212R009.D
Acq On : 12 Feb 99 08:49 PM Operator: LLANDAU
Sample : K9807115-013 4X Inst : GC15
Misc : F=10 D=4 A=10.4 Multiplr: 1.00
Quant Time: Feb 16 7:45 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





00131

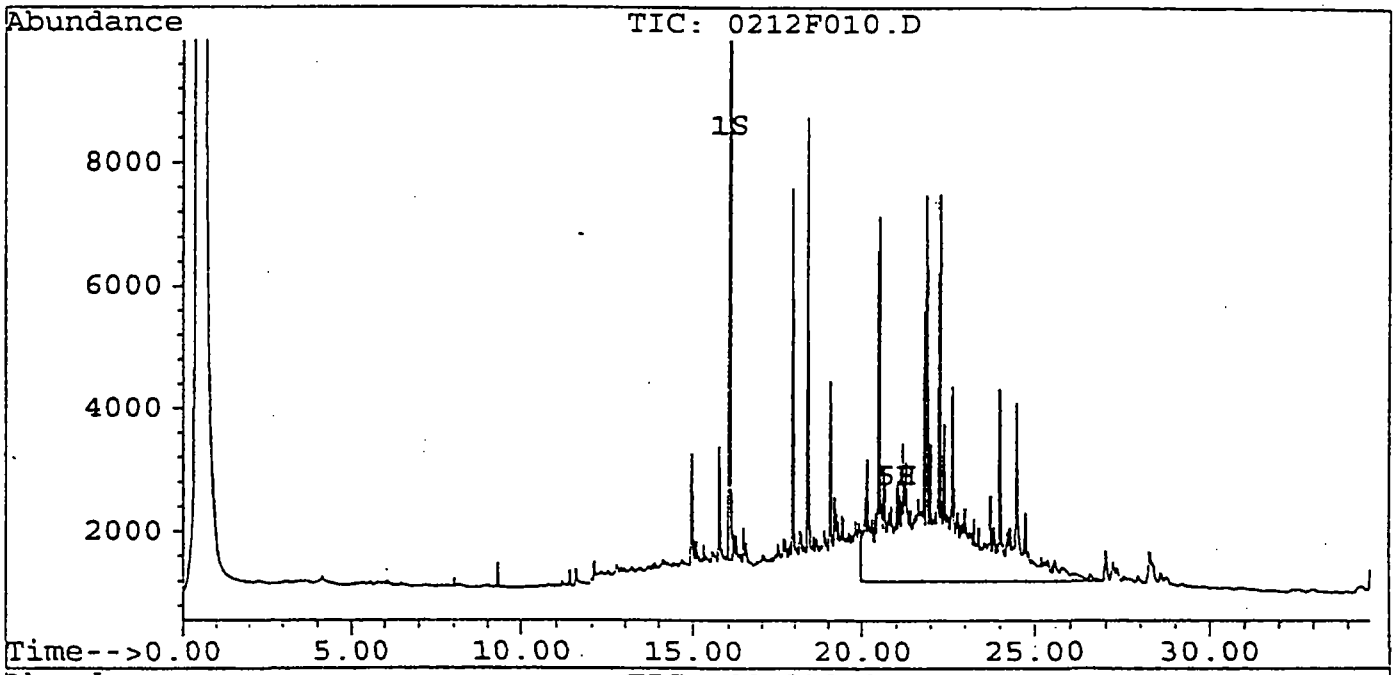
POPA0007582

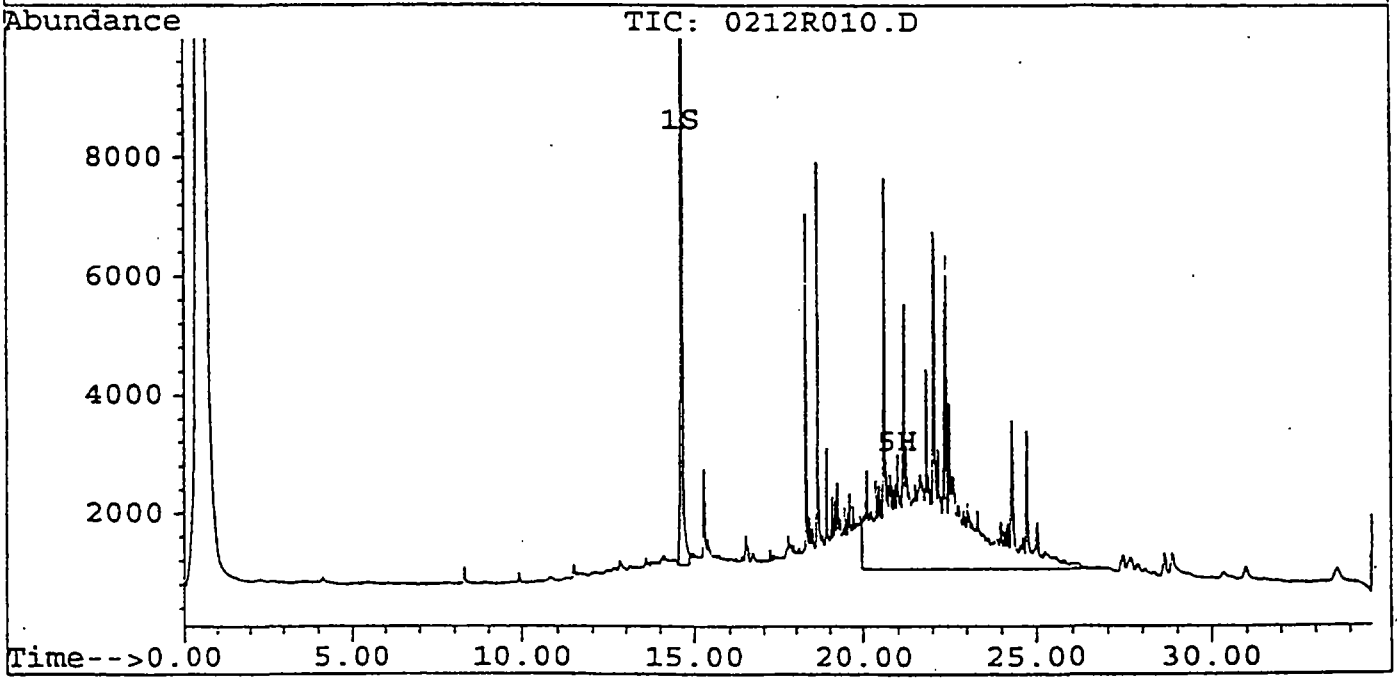
Relative Percent of Total PAHs
0
10
20
30
40
50
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
Polynuclear Aromatic Hydrocarbon
PAH Fingerprint of HC-S-33
HC-S-33
Pencil Pitch
T4 Diesel

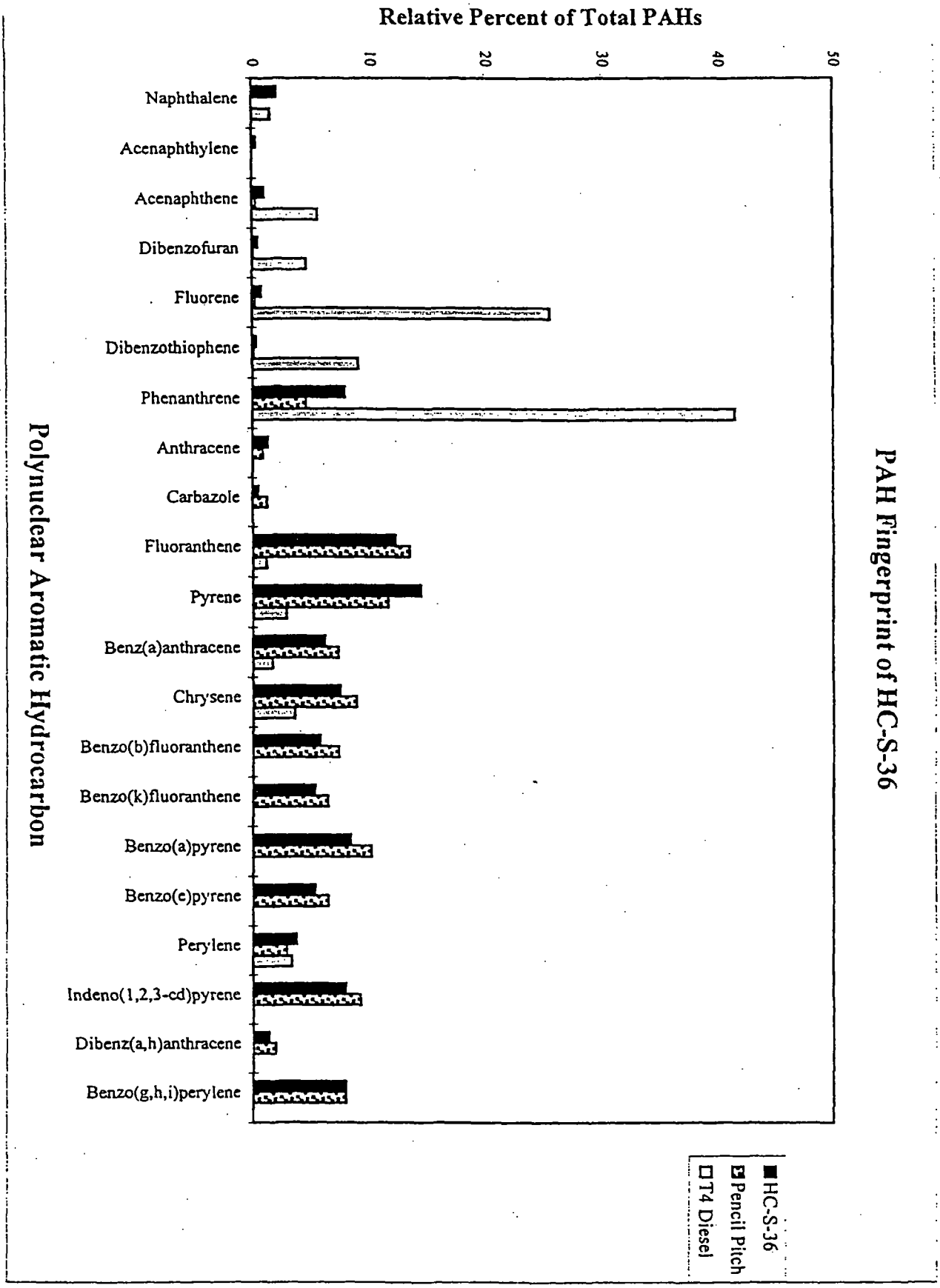
Signal #1 : J:\GC15\DATA\021299\0212F010.D Vial: 9
Signal #2 : J:\GC15\DATA\021299\0212F010.D\0212R010.D
Acq On : 12 Feb 99 09:31 PM Operator: LLANDAUF
Sample : K9807115-021 10X Inst : GC15
Misc : F=1 D=10 A=9.65 Multiplr: 1.00
Quant Time: Feb 16 7:46 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm






PAH Fingerprint of HC-S-36
Relative Percent of Total PAHs
0
10
20
30
40
50
Polynuclear Aromatic Hydrocarbon
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-36
Pencil Pitch
T4 Diesel

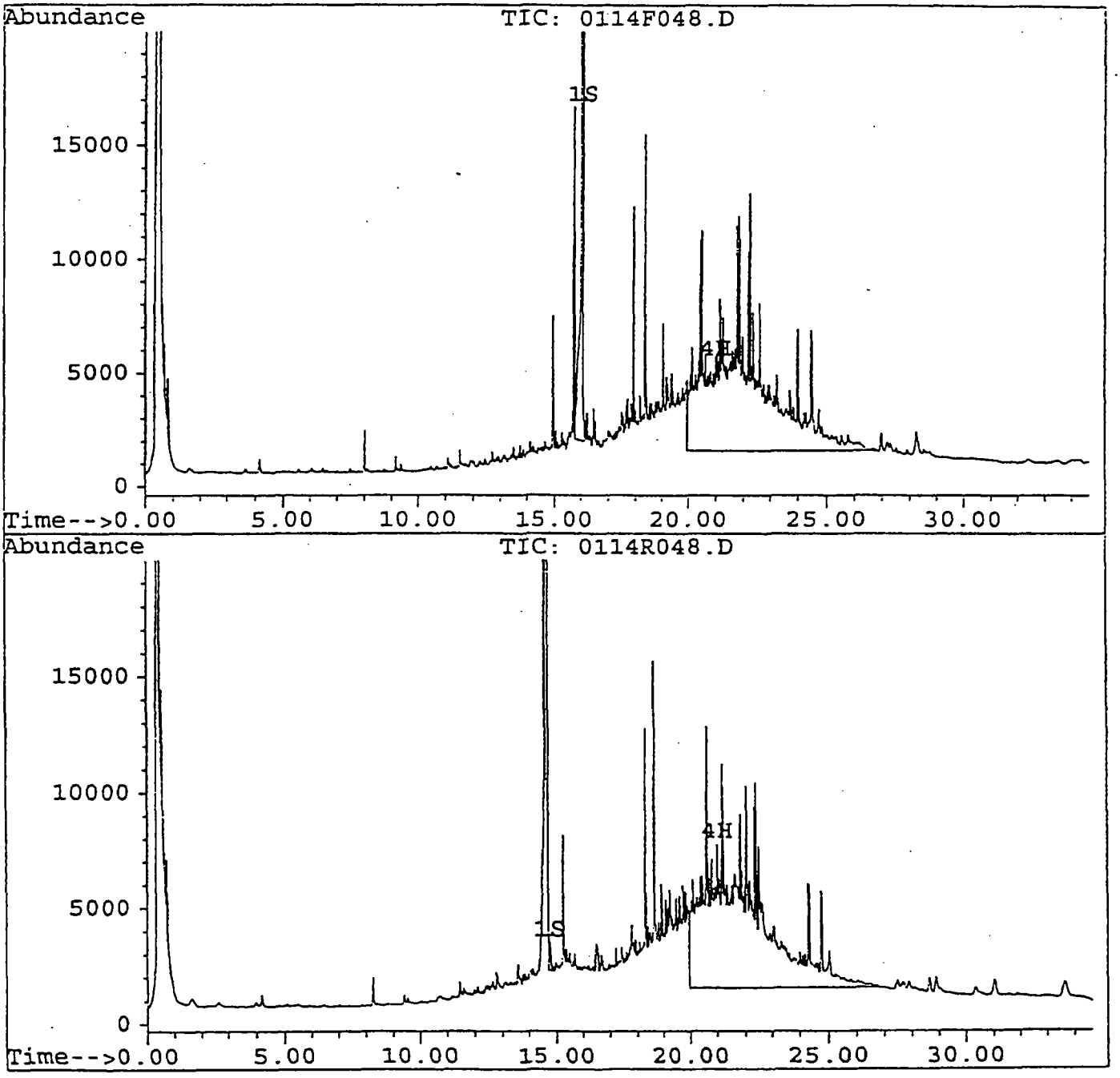
Quantitation Report

Signal #1 : J:\GC15\DATA\011499\0114F048.D
Signal #2 : J:\GC15\DATA\011499\0114F048.D\0114R048.D
Acq On : 16 Jan 99 02:08 AM
Sample : K9807169-001 AROM
Misc : F=1 D=1 A=13.8
Quant Time: Jan 26 10:21 1999

Vial: 39
Operator: LLANDAU
Inst : GC15
Multiplr: 1.00

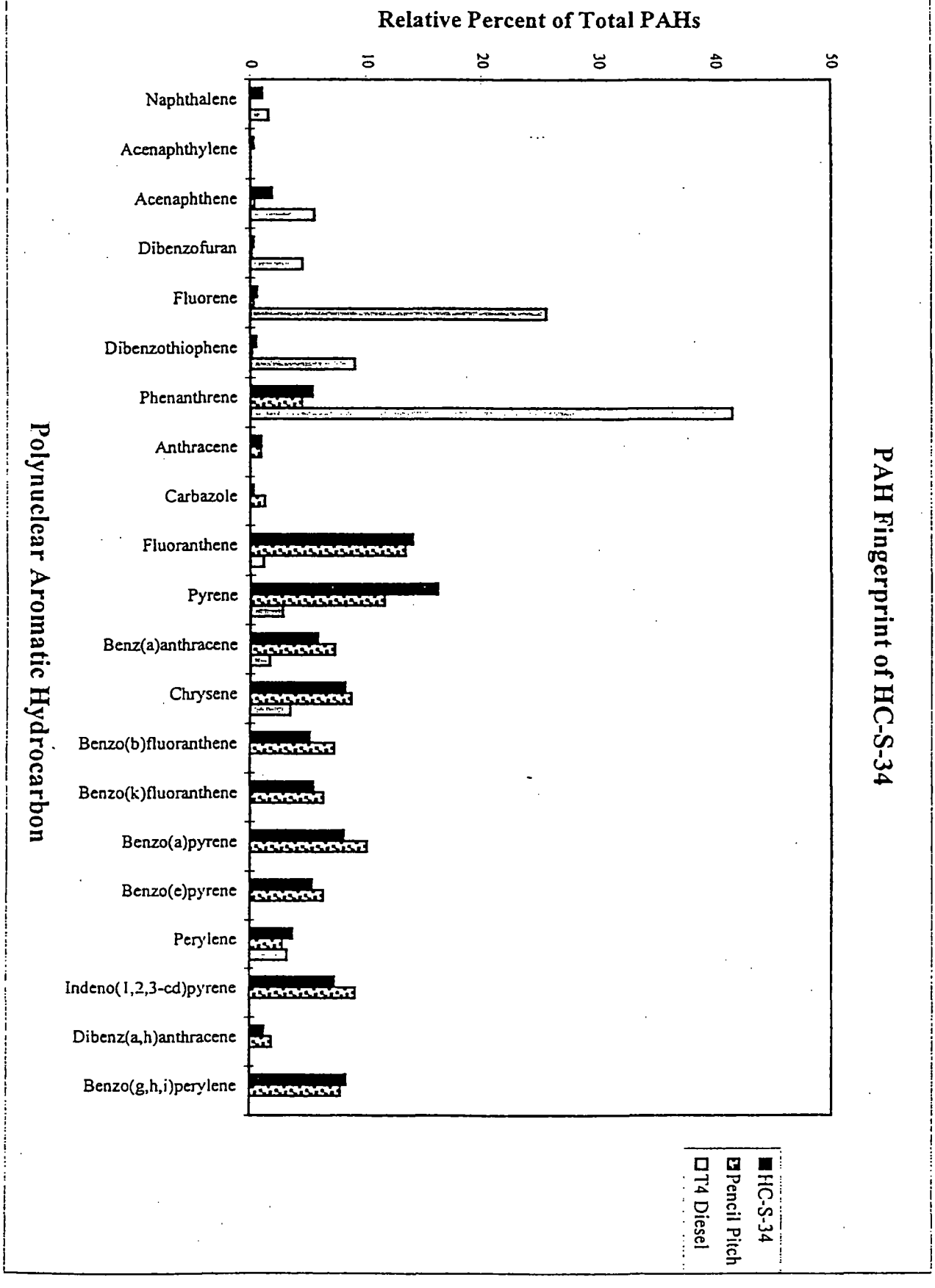
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5
Signal #1 Info : 0.53 mm
Signal #2 Phase: RTX 200
Signal #2 Info : 0.53 mm



00135

POPA0007586


PAH Fingerprint of HC-S-34
Relative Percent of Total PAHs
0
10
20
30
40
50
Polynuclear Aromatic Hydrocarbon
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-34
Pencil Pitch
T4 Diesel

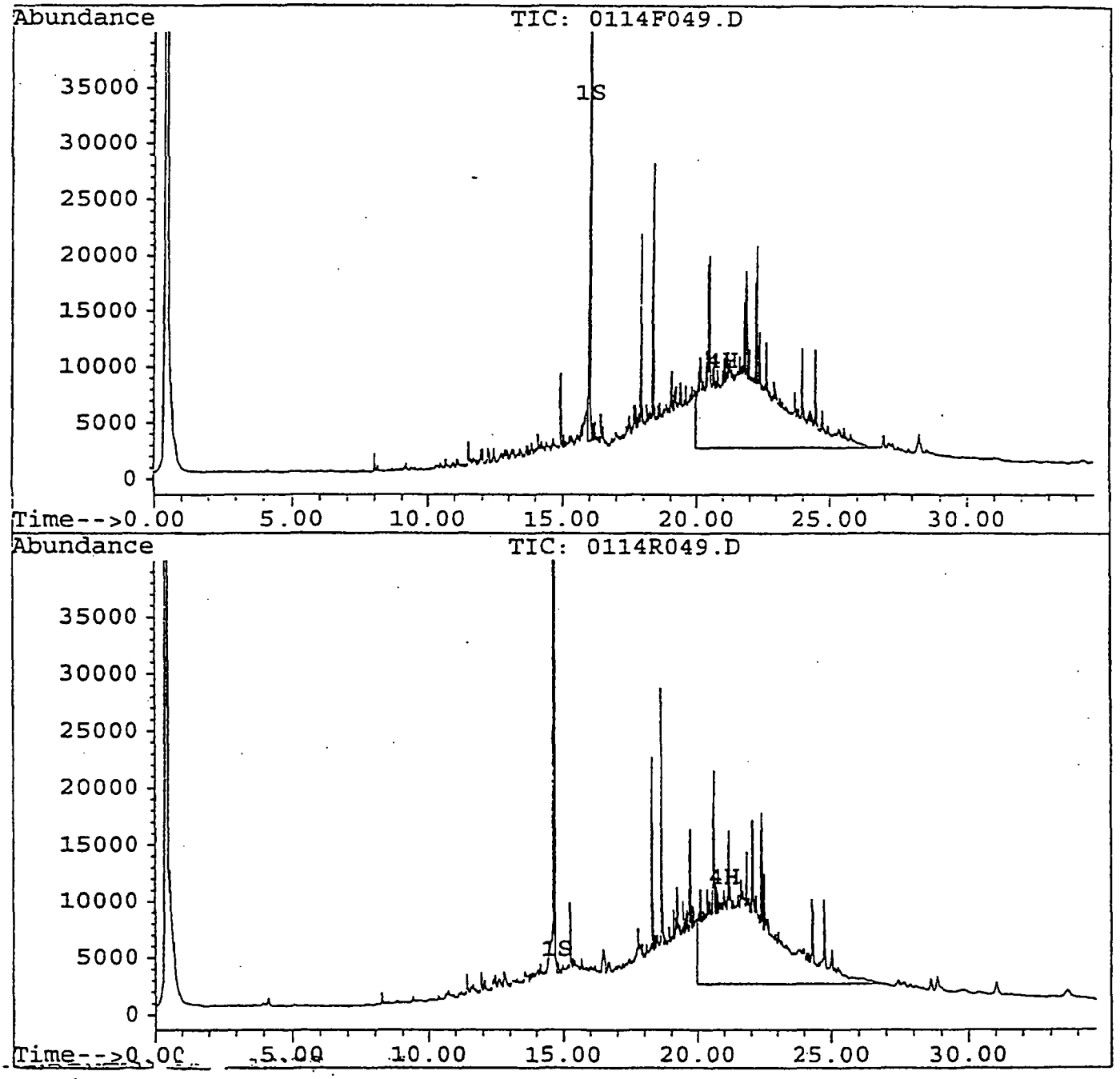
Quantitation Report

Signal #1 : J:\GC15\DATA\011499\0114F049.D
Signal #2 : J:\GC15\DATA\011499\0114F049.D\0114R049.D
Acq On : 16 Jan 99 02:49 AM
Sample : K9807169-002 AROM
Misc : F=2 D=1 A=12.2
Quant Time: Jan 26 10:22 1999

Vial: 40
Operator: LLANDAUE
Inst : GC15
Multiplr: 1.00

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5
Signal #1 Info : 0.53 mm
Signal #2 Phase: RTX 200
Signal #2 Info : 0.53 mm



00137

POPA0007588

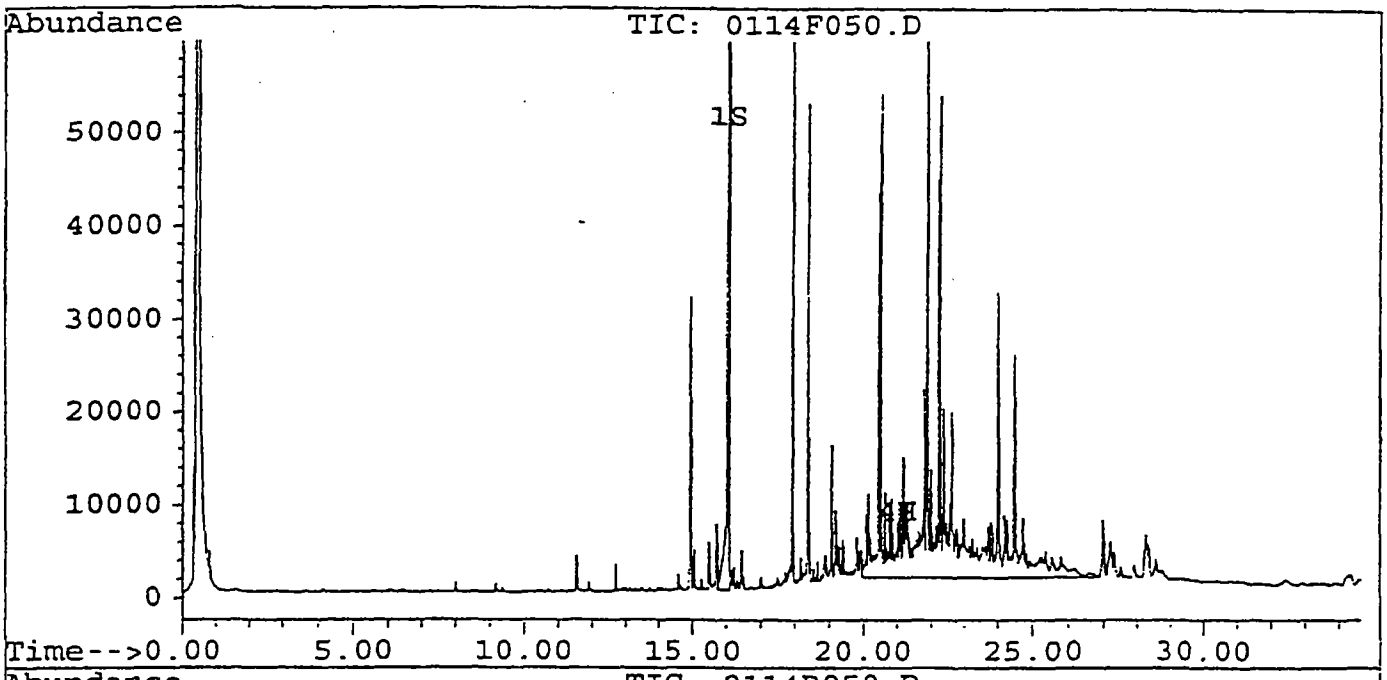
Relative Percent of Total PAHs
0
10
20
30
40
50
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-40
Pencil Pitch
T4 Diesel
Polynuclear Aromatic Hydrocarbon
PAH Fingerprint of HC-S-40

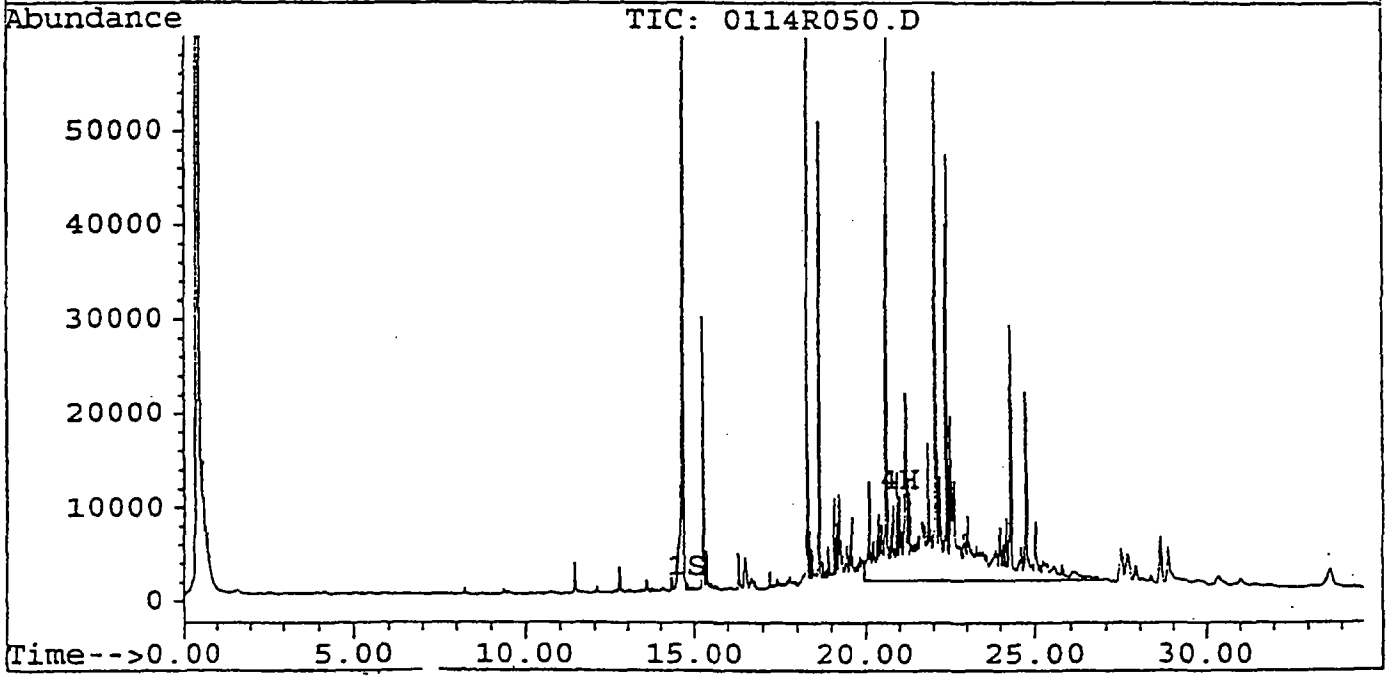
Quantitation Report

Signal #1 : J:\GC15\DATA\011499\0114F050.D Vial: 41
Signal #2 : J:\GC15\DATA\011499\0114F050.D\0114R050.D
Acq On : 16 Jan 99 03:31 AM Operator: LLANDAUE
Sample : K9807169-003 AROM Inst : GC15
Misc : F=1 D=1 A=8.6 Multiplr: 1.00
Quant Time: Jan 26 10:23 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





POPA0007590 00139

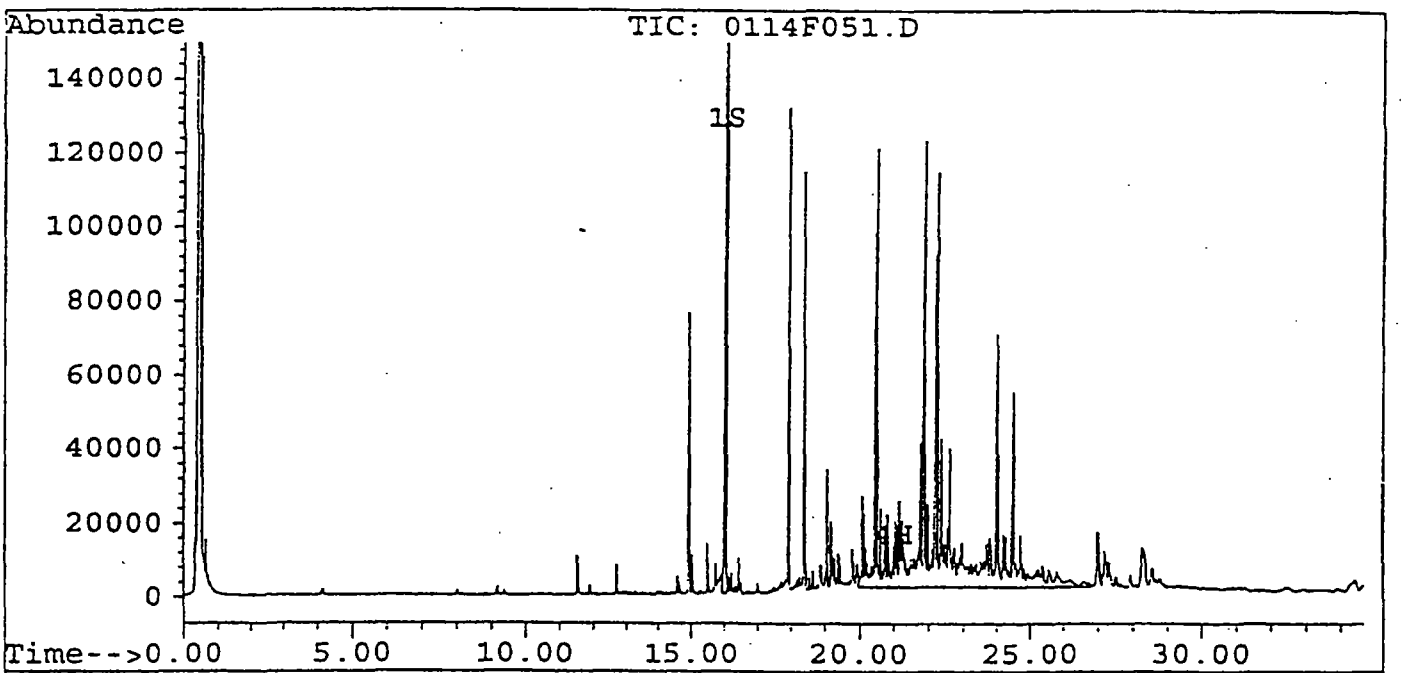
Relative Percent of Total PAHs
0
10
20
30
40
50
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
Polynuclear Aromatic Hydrocarbon
PAH Fingerprint of HC-S-39
HC-S-39
Pencil Pitch
T4 Diesel

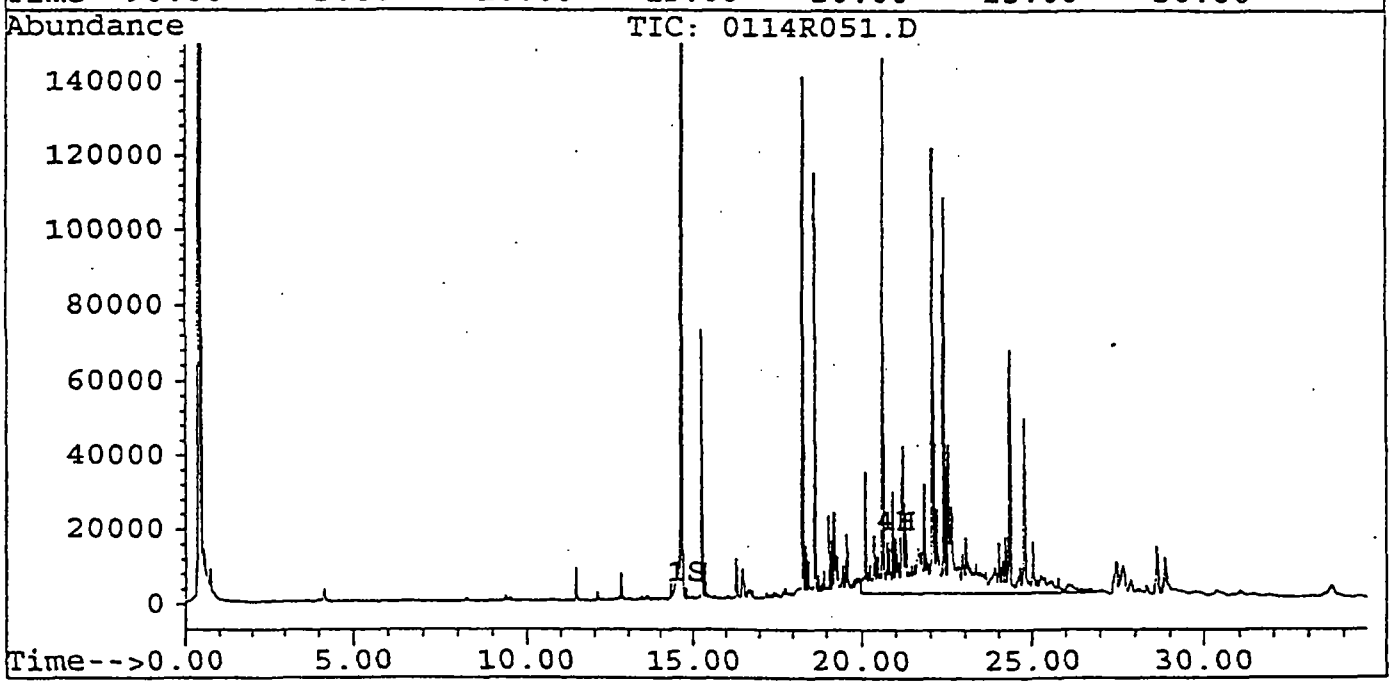
Quantitation Report

Signal #1 : J:\GC15\DATA\011499\0114F051.D Vial: 42
Signal #2 : J:\GC15\DATA\011499\0114F051.D\0114R051.D
Acq On : 16 Jan 99 04:13 AM Operator: LLANDAUE
Sample : K9807169-004 AROM Inst : GC15
Misc : F=1 D=1 A=8.9 Multiplr: 1.00
Quant Time: Jan 26 10:23 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

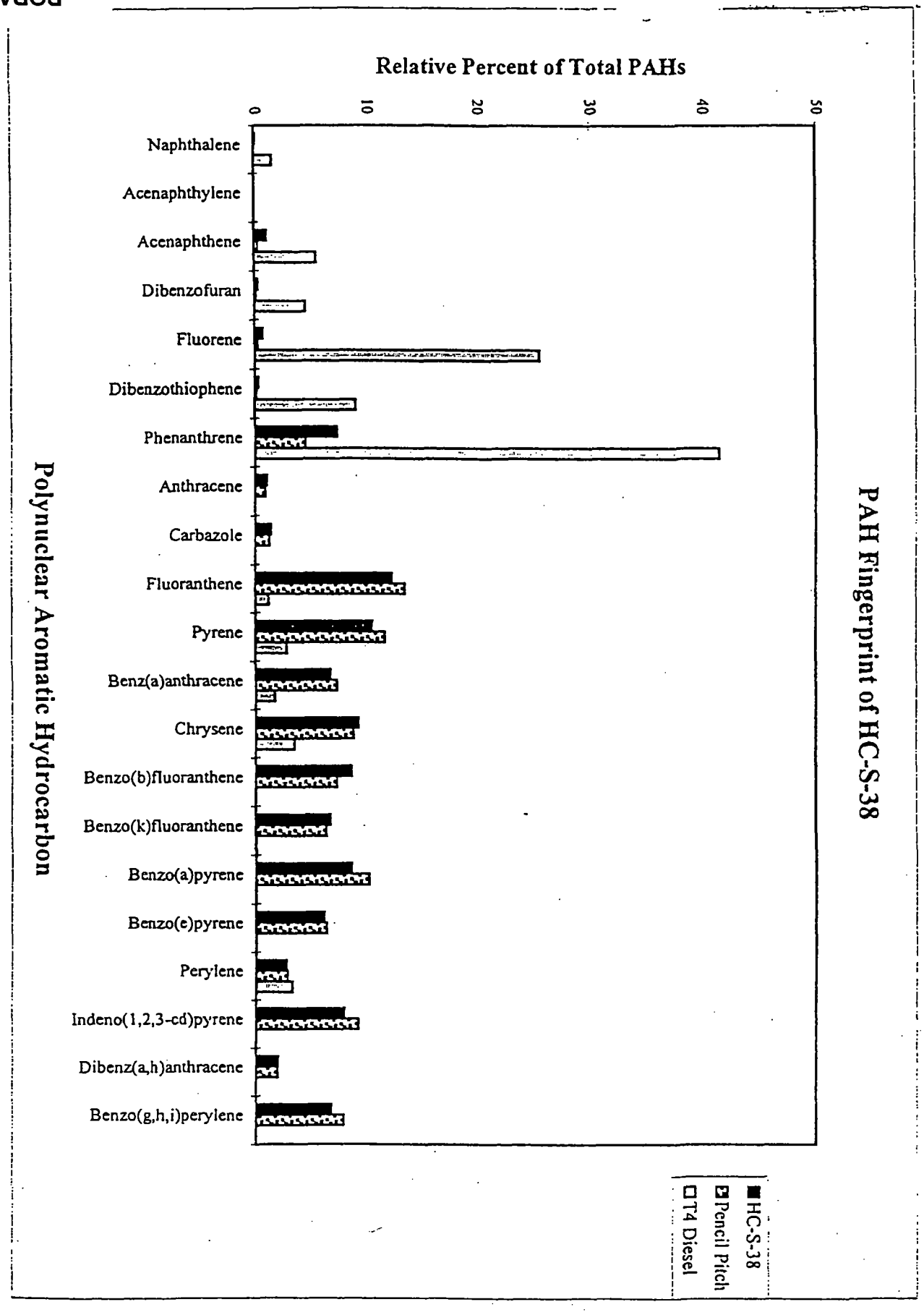
Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





00141

POPA0007592


PAH Fingerprint of HC-S-38
Relative Percent of Total PAHs
0
10
20
30
40
50
Polynuclear Aromatic Hydrocarbon
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-38
Pencil Pitch
T4 Diesel

Quantitation Report

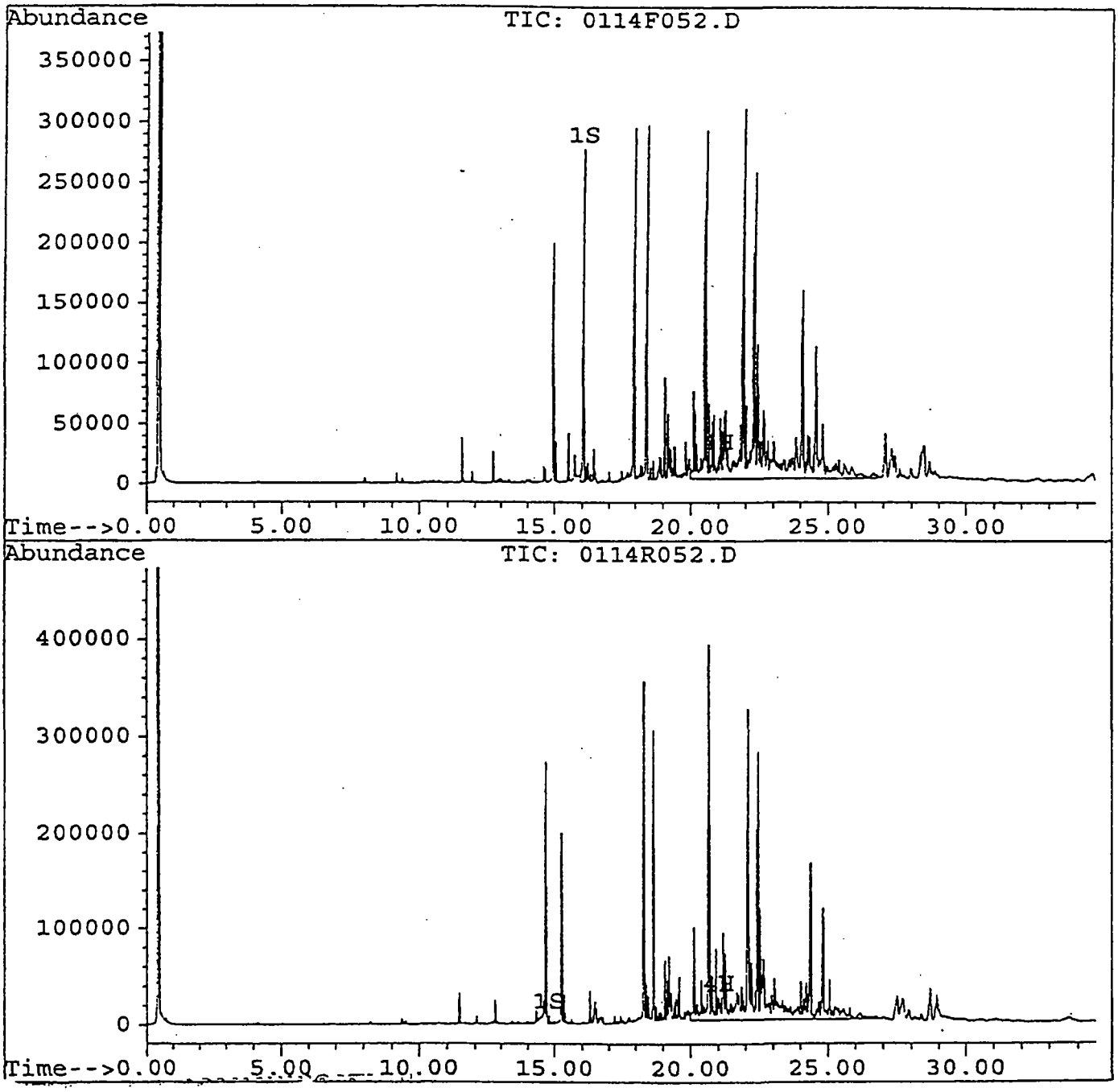
Signal #1 : J:\GC15\DATA\011499\0114F052.D
Signal #2 : J:\GC15\DATA\011499\0114F052.D\0114R052.D
Acq On : 16 Jan 99 04:55 AM
Sample : K9807169-005 AROM
Misc : F=1 D=1 A=9.3
Quant Time: Jan 26 10:24 1999

Vial: 43
Operator: LLANDAUE
Inst : GC15
Multiplr: 1.00

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

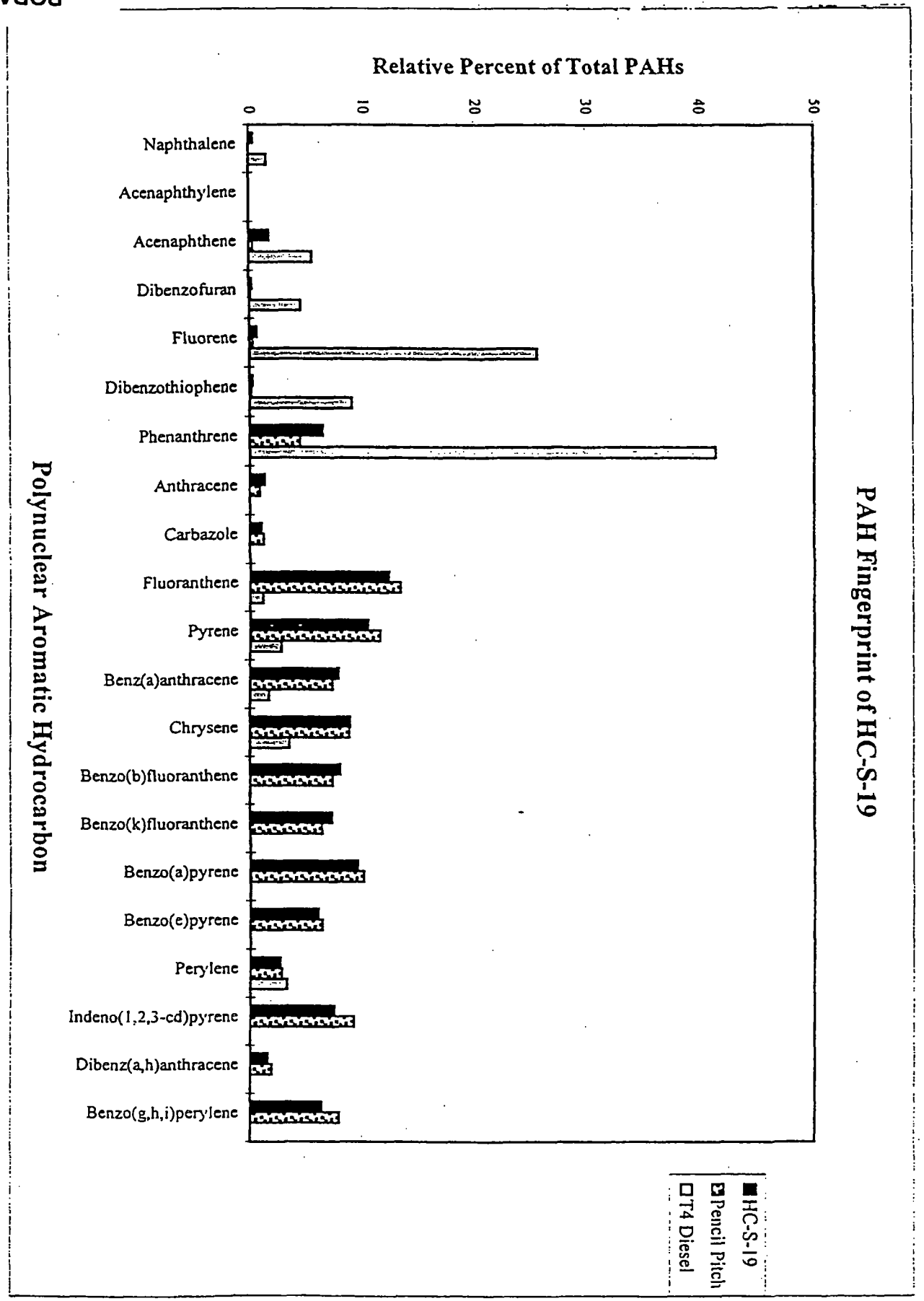
Volume Inj. : 2 ul
Signal #1 Phase : RTX 5
Signal #1 Info : 0.53 mm

Signal #2 Phase: RTX 200
Signal #2 Info : 0.53 mm



POPA0007594 00143

POPA0007595

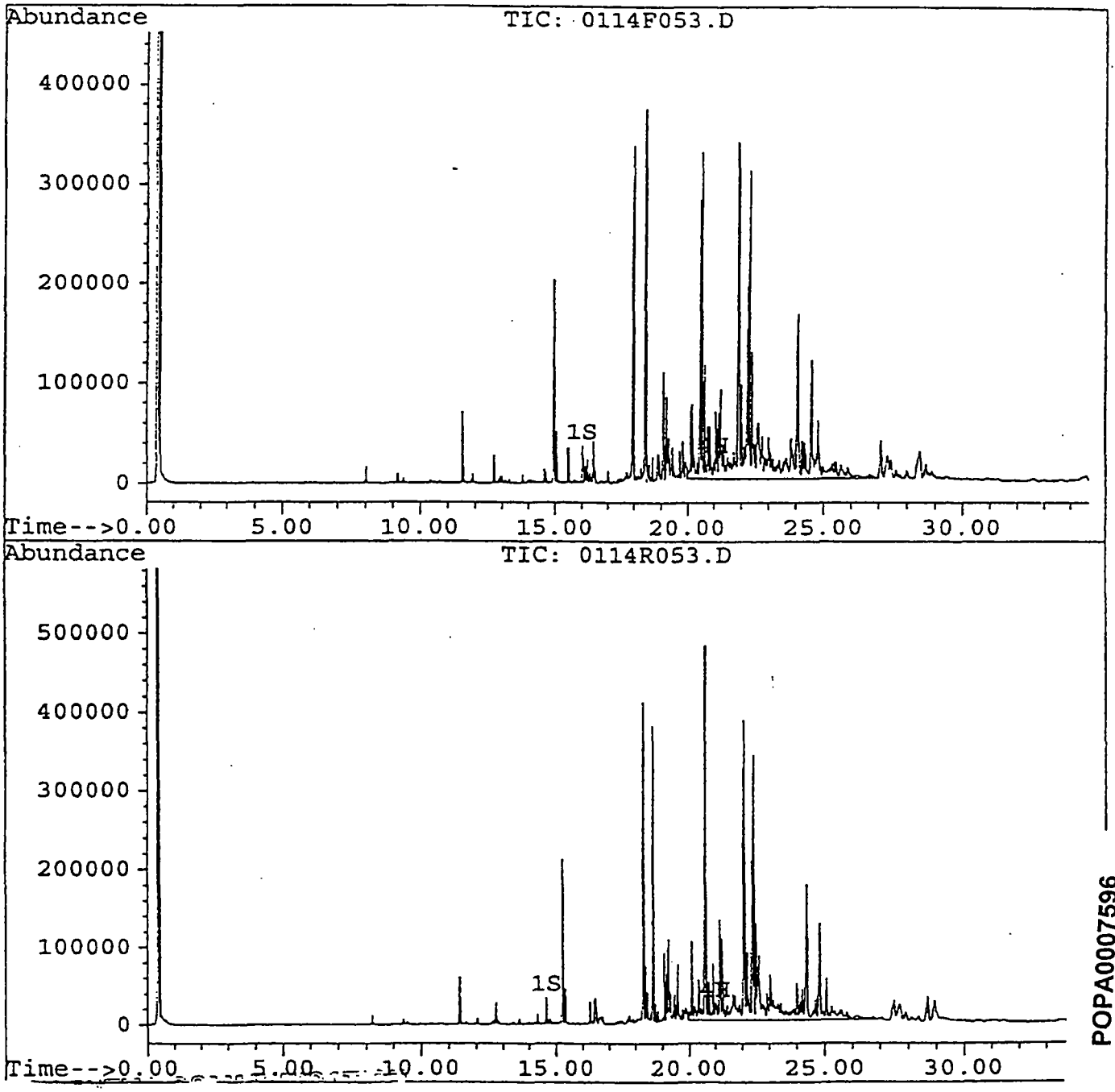


Quantitation Report

Signal #1 : J:\GC15\DATA\011499\0114F053.D Vial: 44
Signal #2 : J:\GC15\DATA\011499\0114F053.D\0114R053.D
Acq On : 16 Jan 99 05:36 AM Operator: LLANDAU
Sample : K9807169-013 AROM Inst : GC15
Misc : F=10 D=1 A=15.8 Multiplr: 1.00
Quant Time: Jan 26 10:25 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



POPA0007596

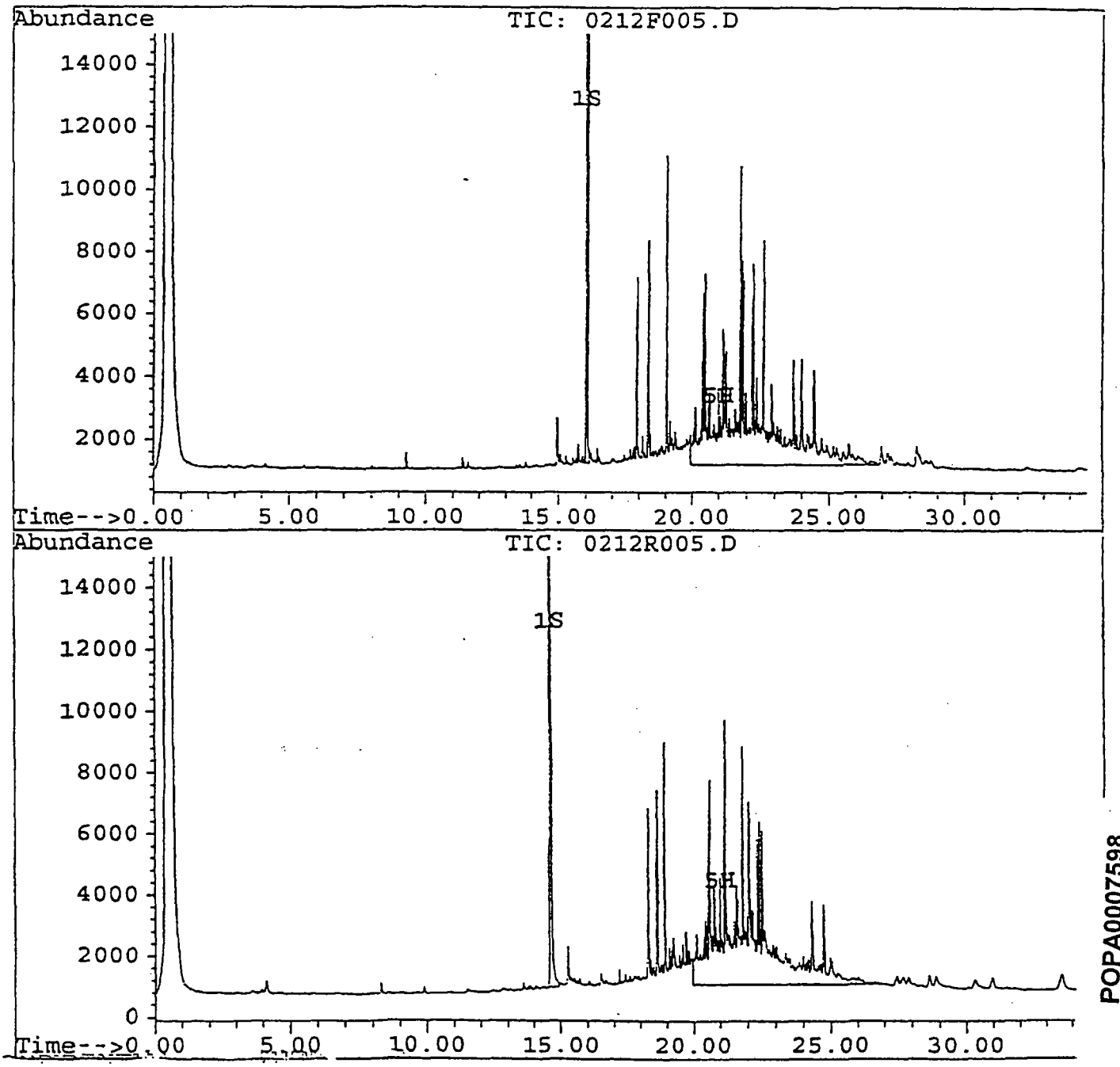
PAH Fingerprint of HC-S-31
Relative Percent of Total PAHs
0
10
20
30
40
50
Polynuclear Aromatic Hydrocarbon
Naphthalene
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
Dibenzothiophene
Phenanthrene
Anthracene
Carbazole
Fluoranthene
Pyrene
Benz(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Benzo(e)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
HC-S-31
Pencil Pitch
T4 Diesel

Quantitation Report

Signal #1 : J:\GC15\DATA\021299\0212F005.D Vial: 4
Signal #2 : J:\GC15\DATA\021299\0212F005.D\0212R005.D
Acq On : 12 Feb 99 06:03 PM Operator: LLANDAUE
Sample : K9807169-016 4X Inst : GC15
Misc : F=1 D=4 A=9.7 Multiplr: 1.00
Quant Time: Feb 16 7:44 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

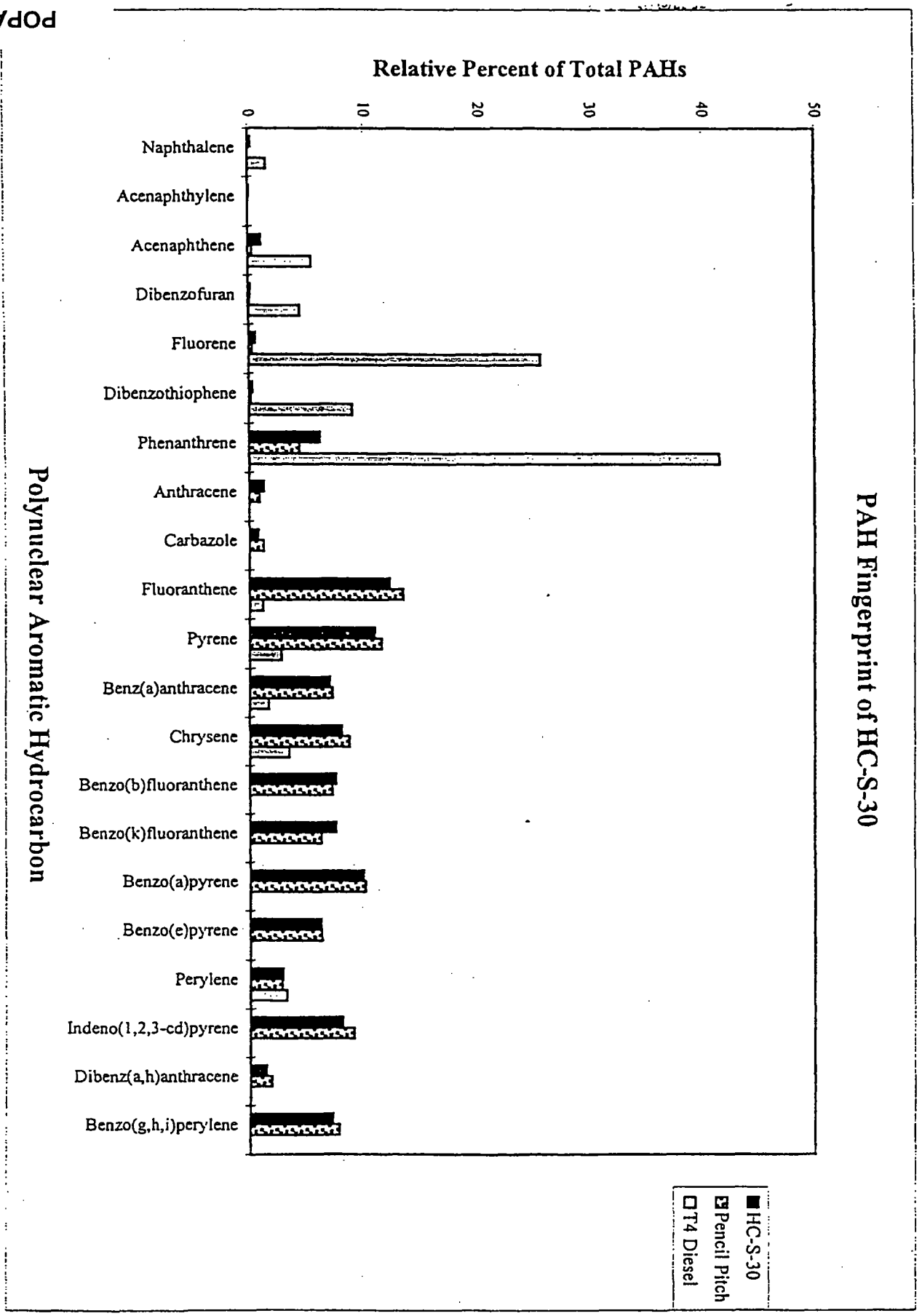
Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



POPA0007598

00147

POPA0007599

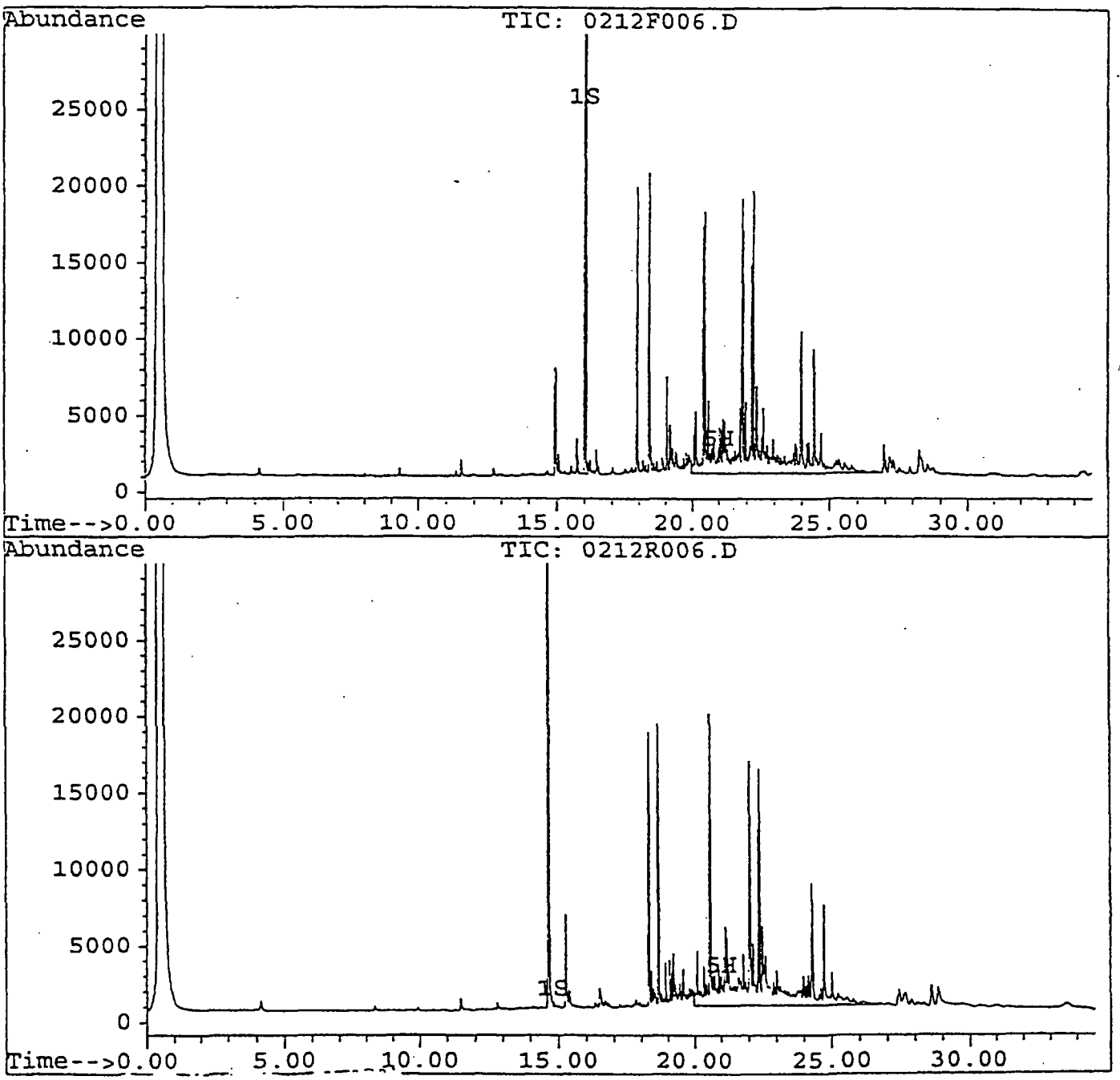


Quantitation Report

Signal #1 : J:\GC15\DATA\021299\0212F006.D Vial: 5
Signal #2 : J:\GC15\DATA\021299\0212F006.D\0212R006.D
Acq On : 12 Feb 99 06:45 PM Operator: LLANDAU
Sample : K9807169-017 10X Inst : GC15
Misc : F=1 D=10 A=10.7 Multiplr: 1.00
Quant Time: Feb 16 7:45 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm

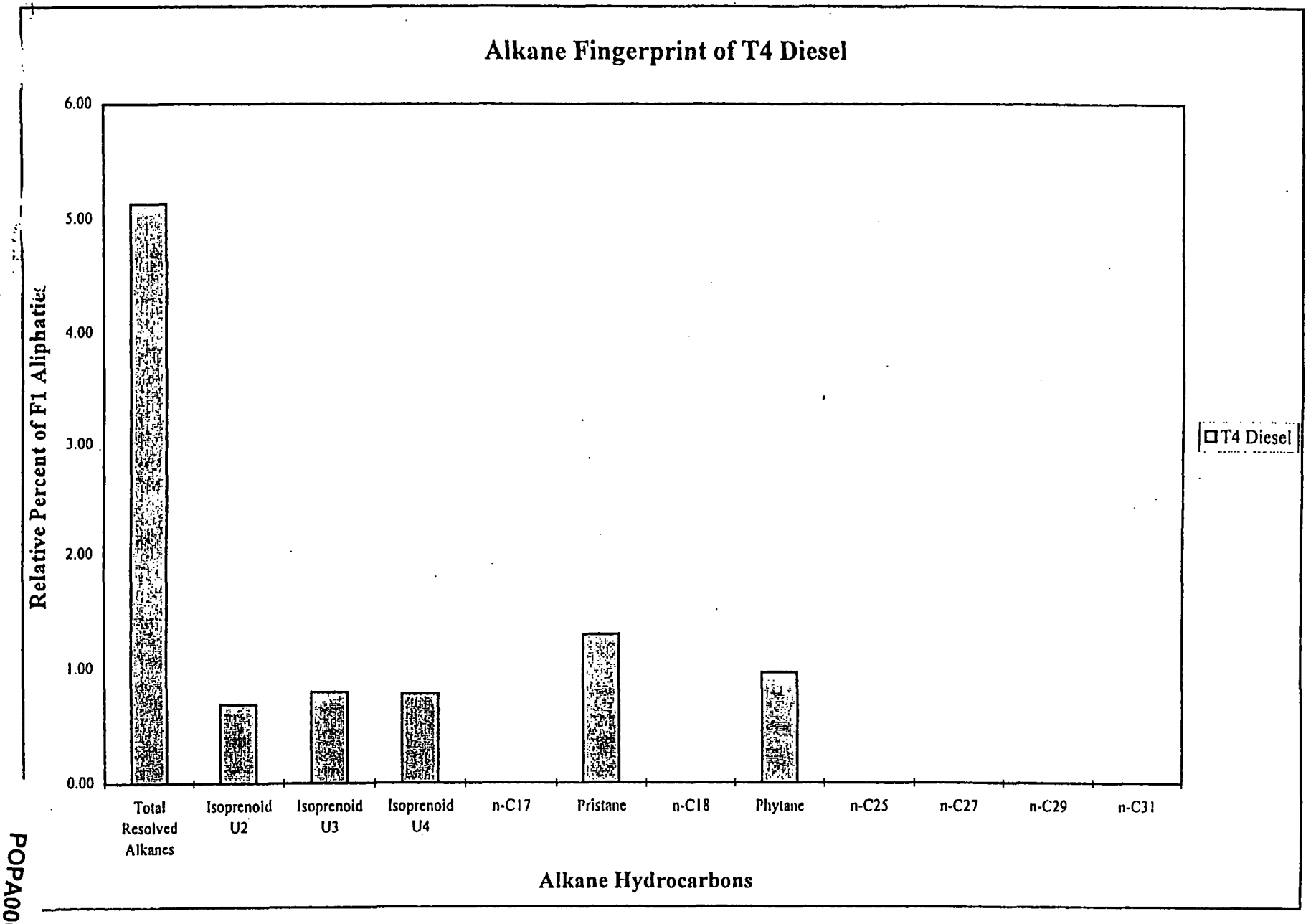


00149

POPA0007600

Appendix B

Aliphatic Fingerprints and Chromatograms

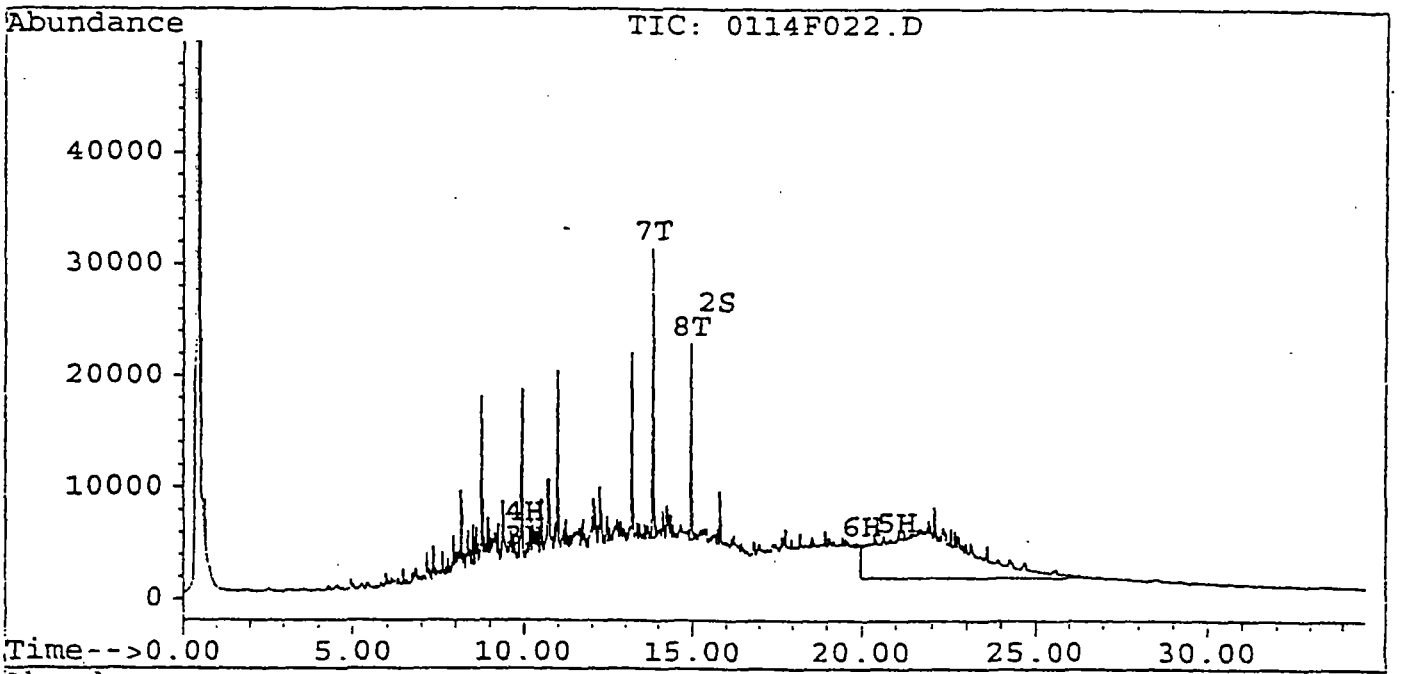

Alkane Fingerprint of T4 Diesel
Relative Percent of F1 Aliphatics
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Total Resolved Alkanes
Isoprenoid U2
Isoprenoid U3
Isoprenoid U4
n-C17
Pristane
n-C18
Phytane
n-C25
n-C27
n-C29
n-C31
Alkane Hydrocarbons
T4 Diesel

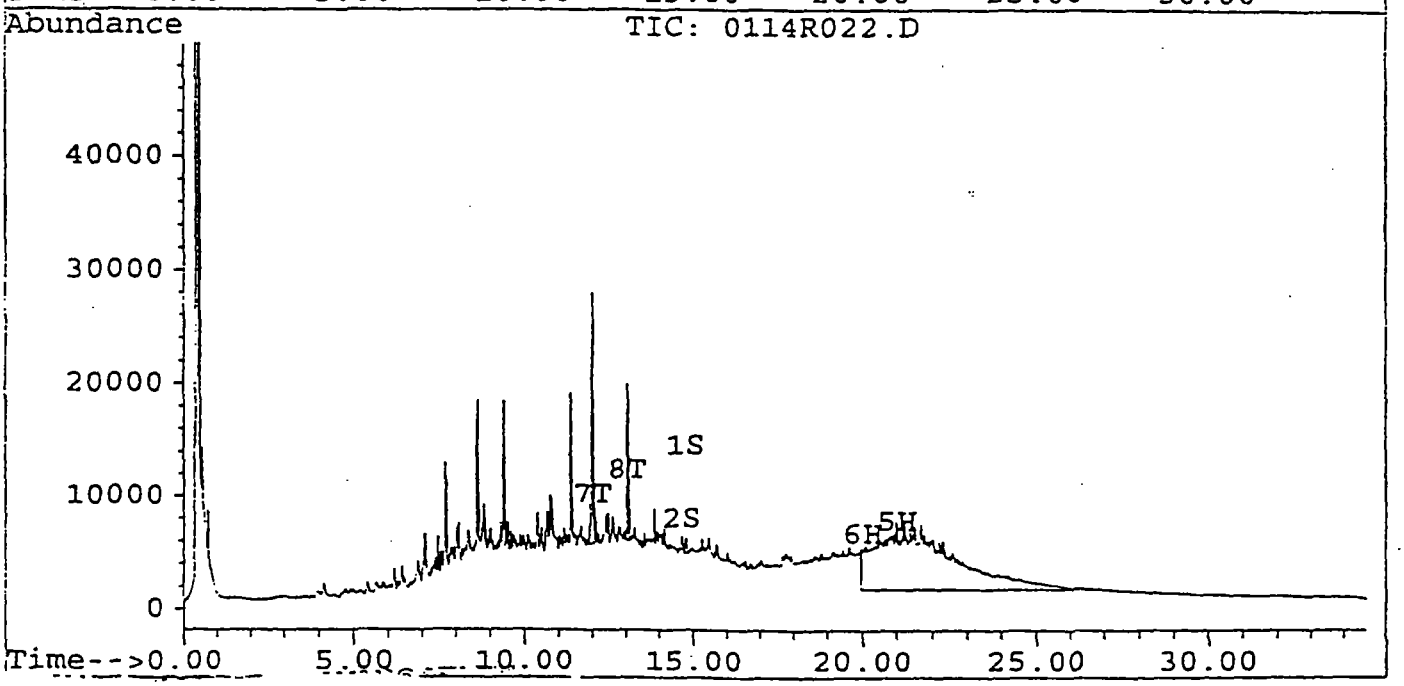
Quantitation Report

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F022.D Vial: 35
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F022.D\0114R022.D
Acq On : 15 Jan 99 07:13 AM Operator: LLANDAU
Sample : Site specific diesel Inst : GC15
Misc : F=4 D=1 A= Multiplr: 1.00
Quant Time: Feb 12 14:36 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Thu Feb 04 19:54:35 1999
Response via : Multiple Level Calibration

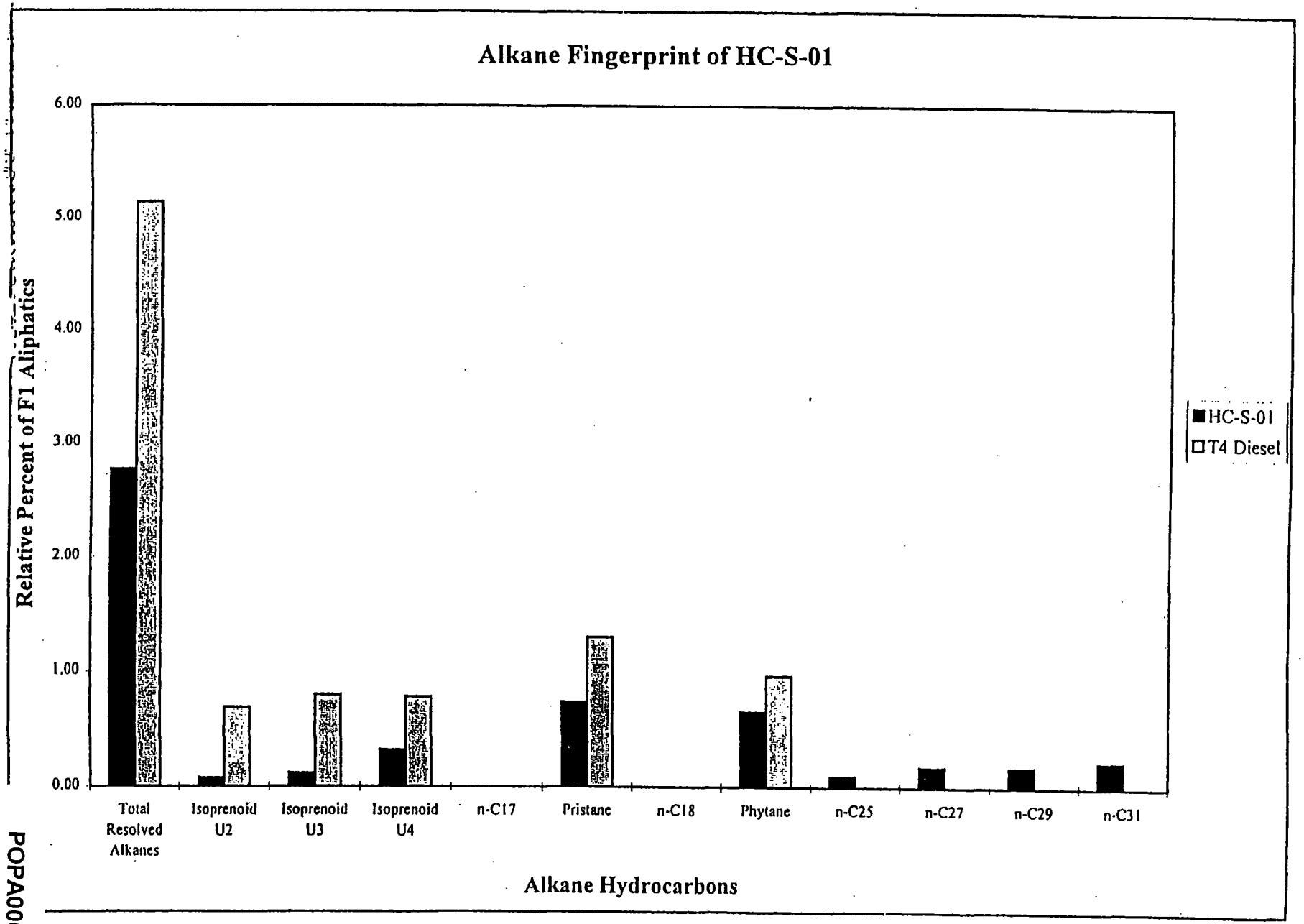
Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





00152

POPA0007603

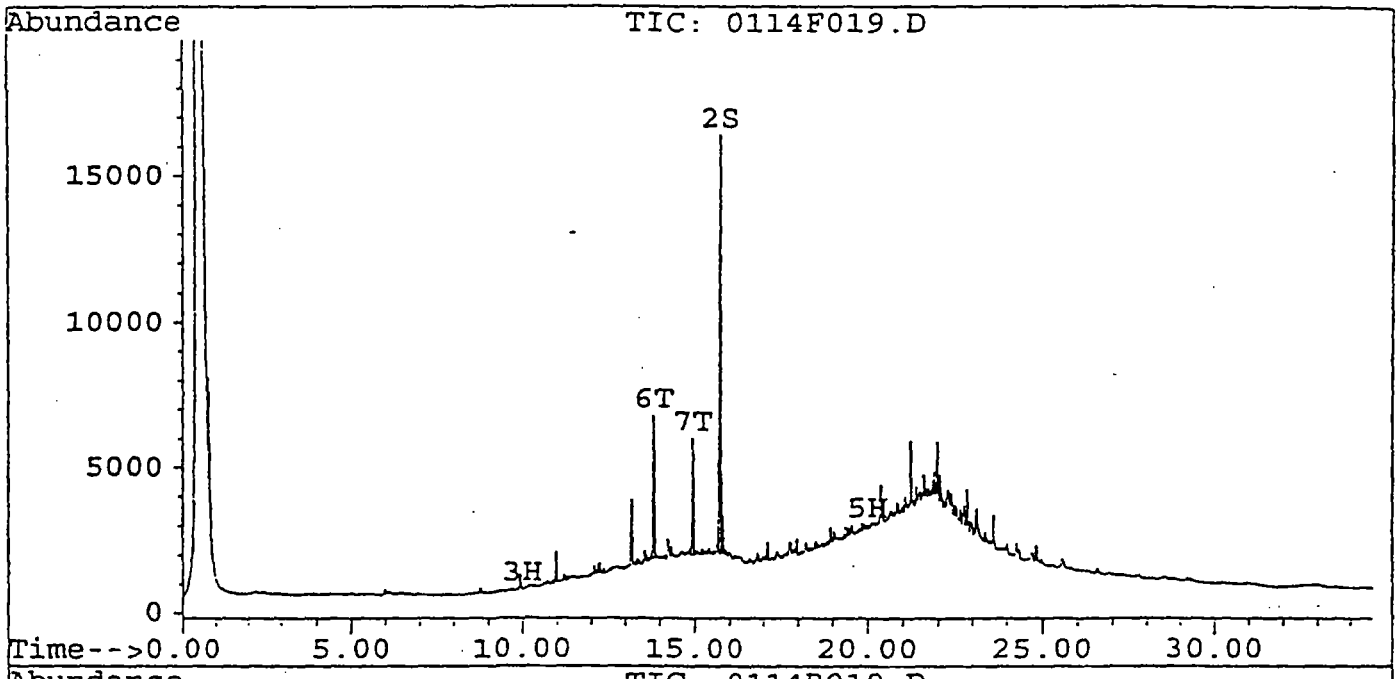


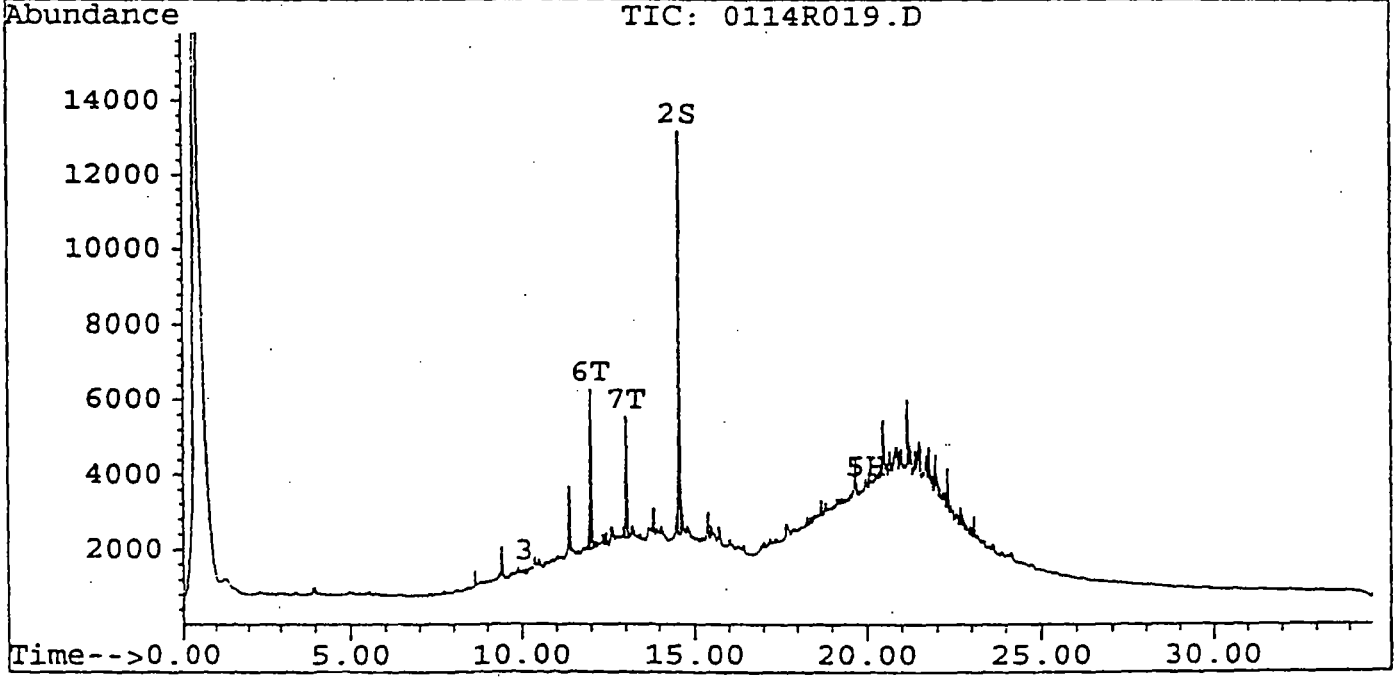
POPA0007604

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F019.D Vial: 16
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F019.D\0114R019.D
Acq On : 15 Jan 99 05:03 AM Operator: LLANDAU
Sample : K9807097-031 Inst : GC15
Misc : F=10 D=1 A=8.01 Multiplr: 1.00
Quant Time: Jan 18 18:55 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

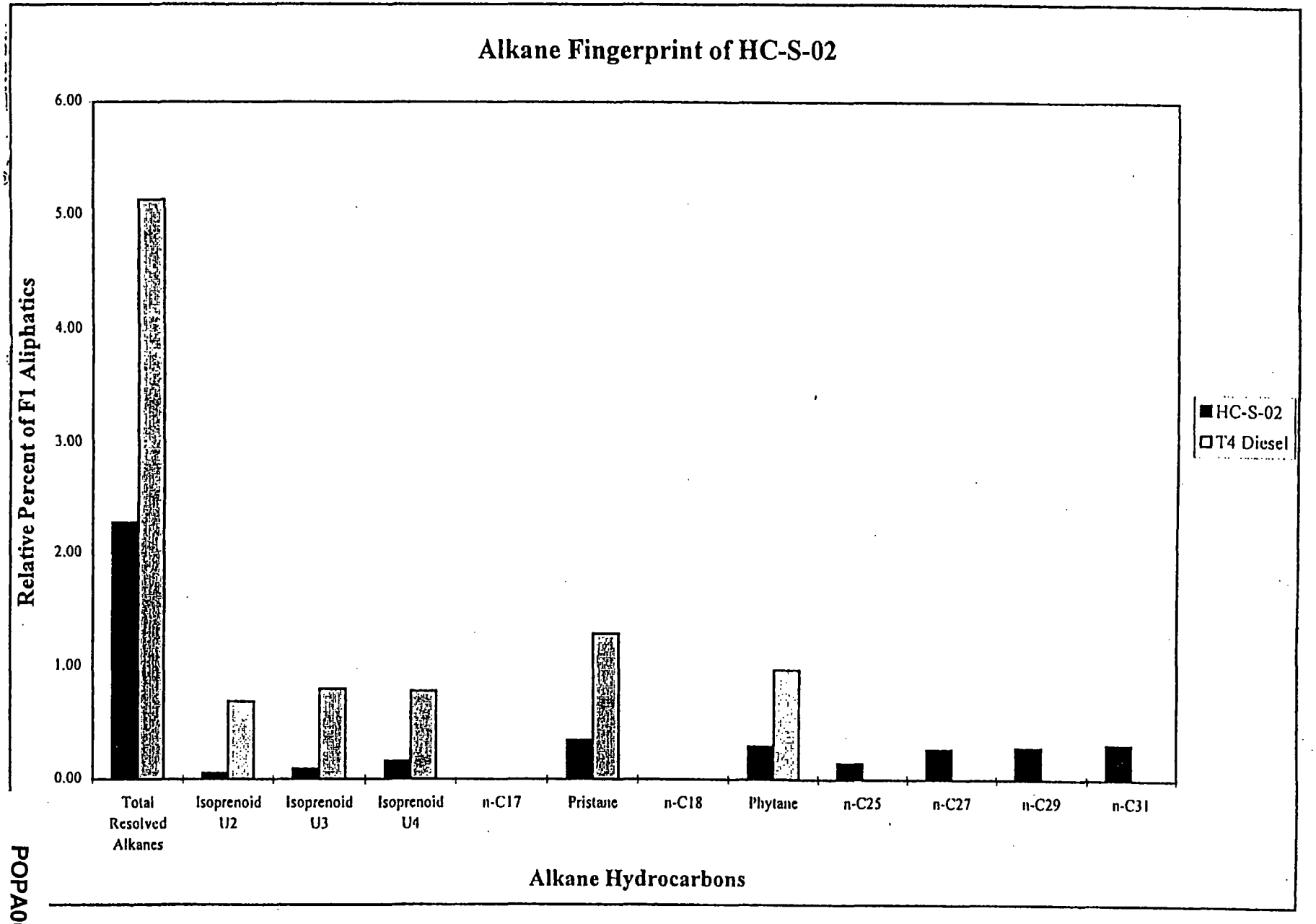
Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





00154

POPA0007605

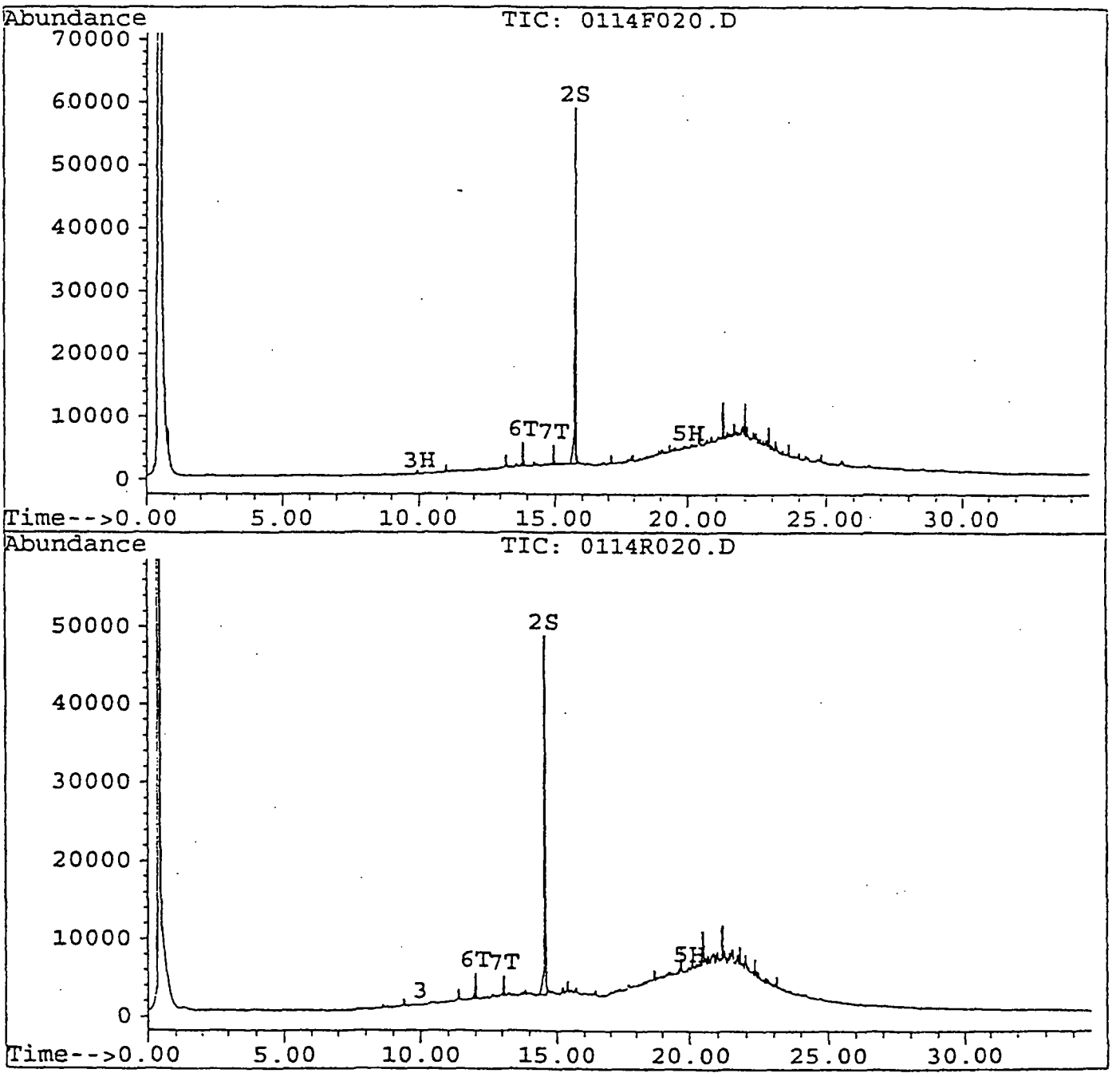


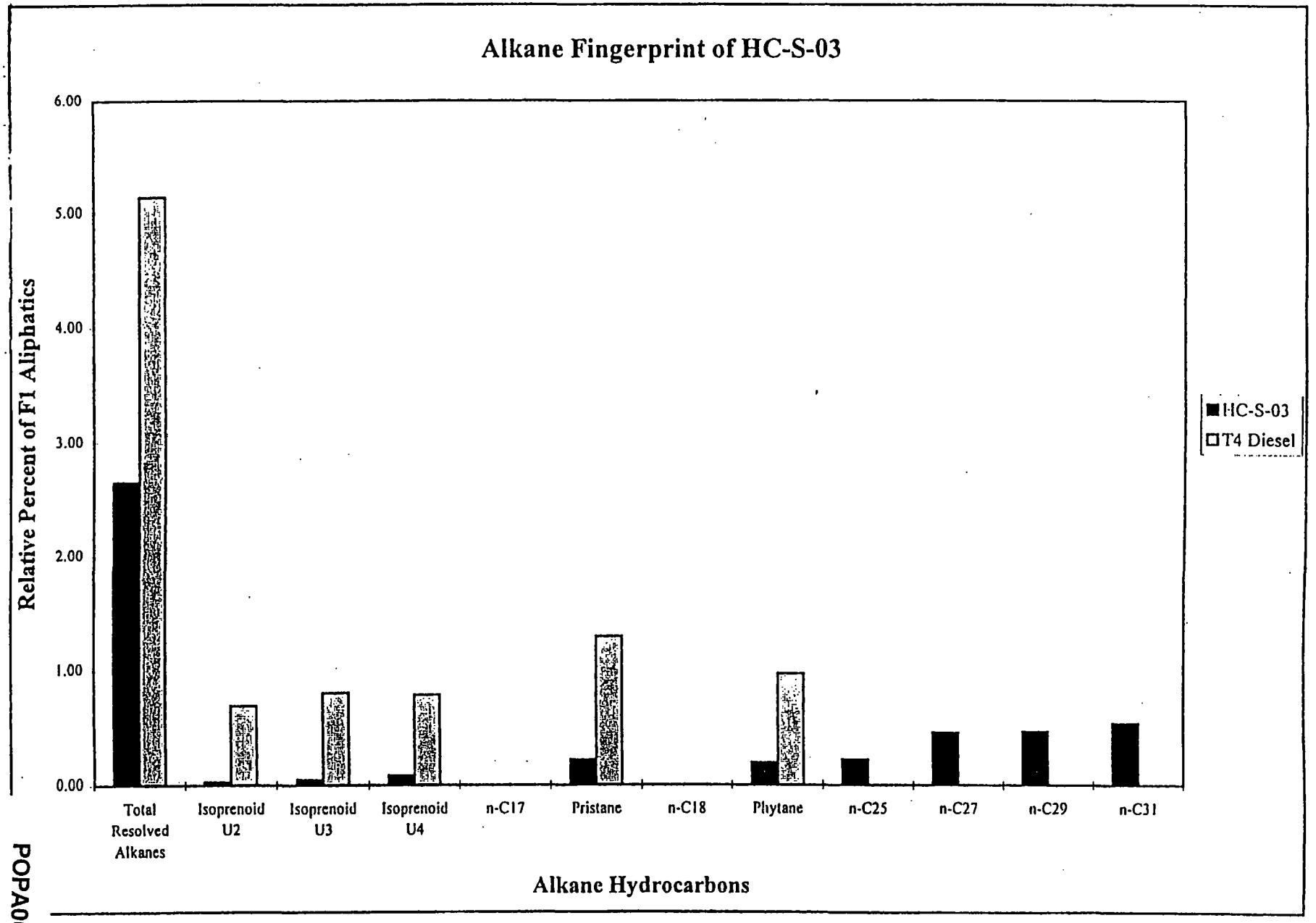
POPA0007606

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F020.D Vial: 17
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F020.D\0114R020.D
Acq On : 15 Jan 99 05:45 AM Operator: LLANDAU
Sample : K9807097-032 Inst : GC15
Misc : F=2 D=1 A=11.3 Multiplr: 1.00
Quant Time: Jan 16 13:36 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



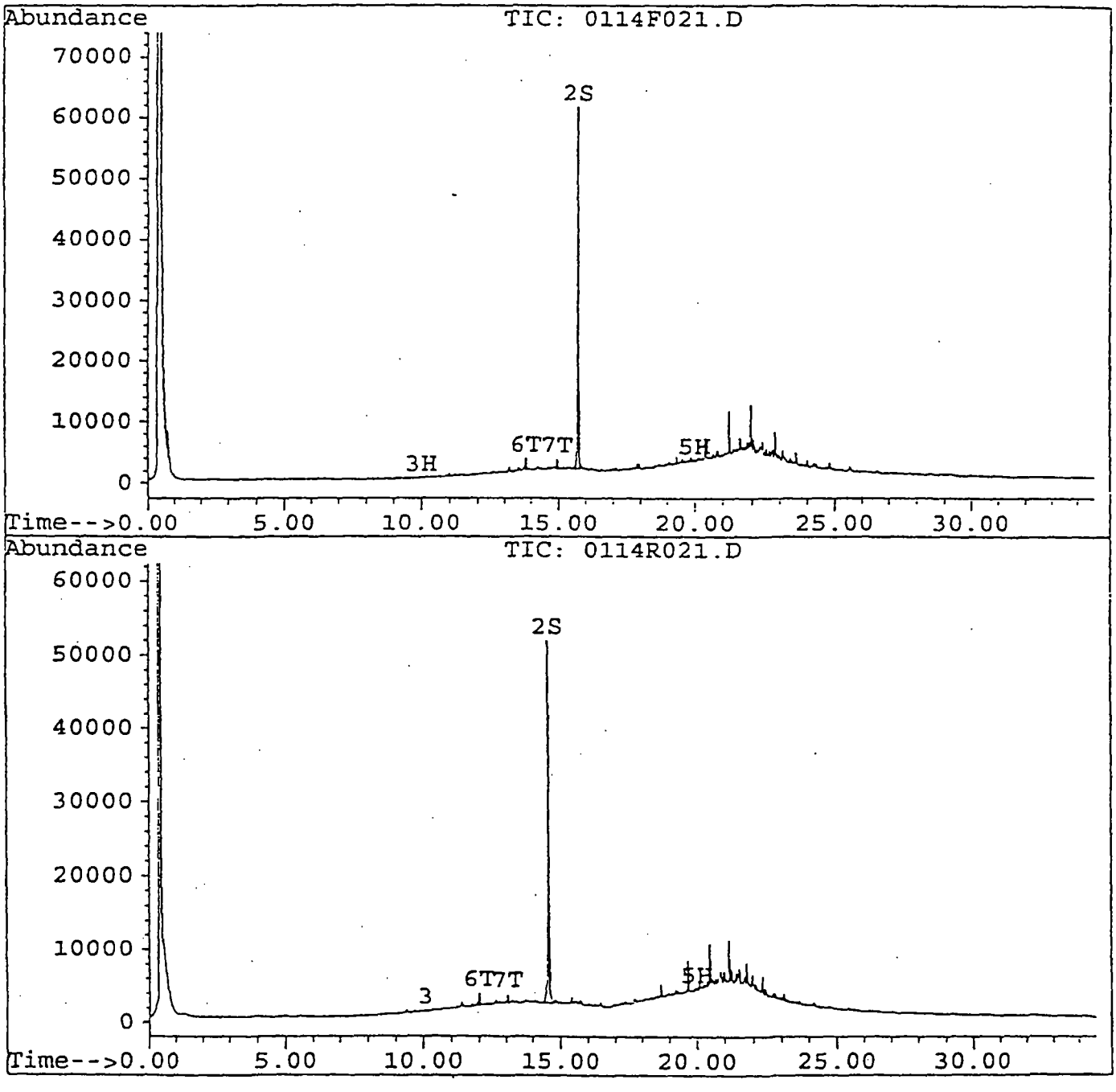


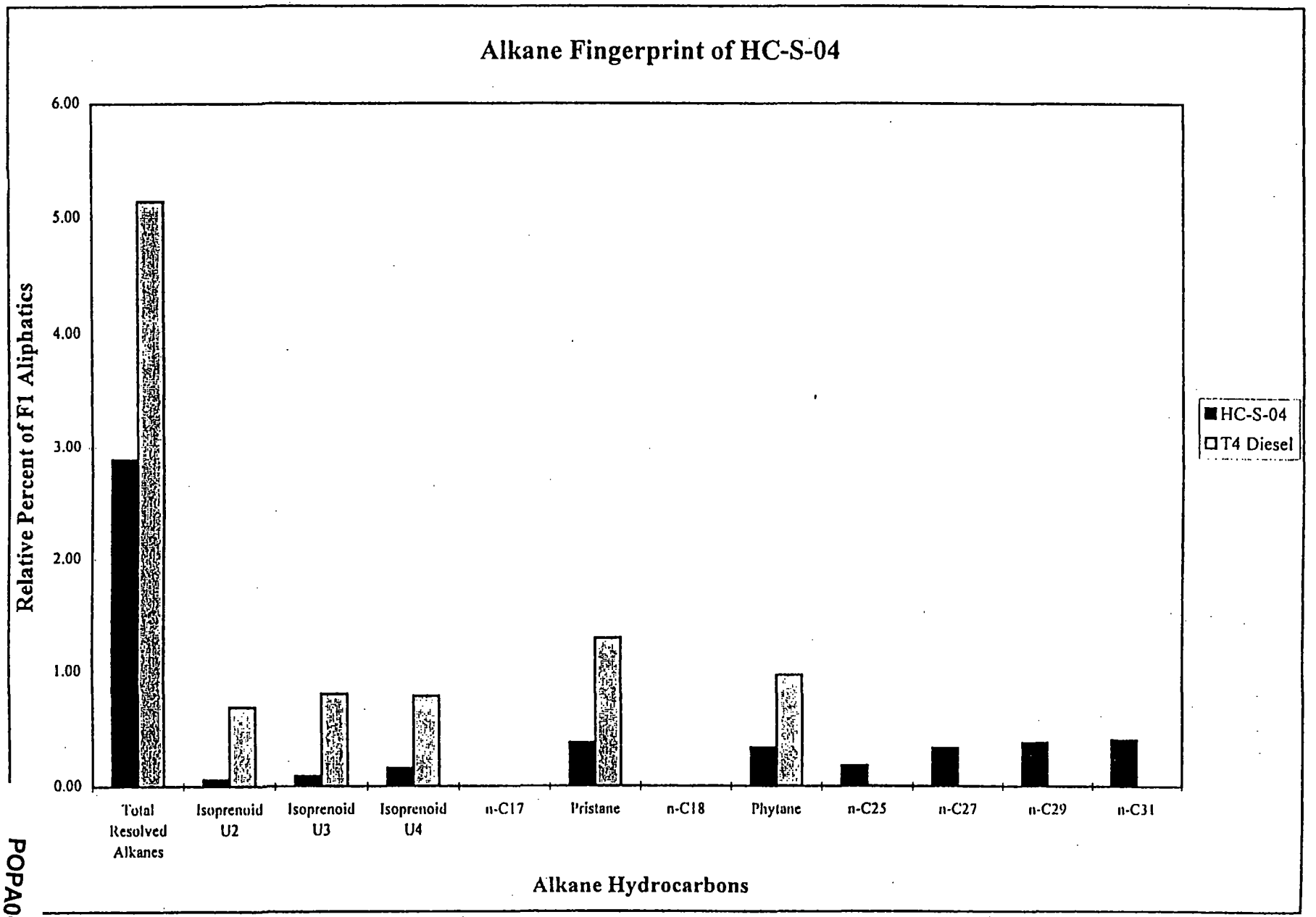
POPA0007608

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F021.D Vial: 18
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F021.D\0114R021.D
Acq On : 15 Jan 99 06:26 AM Operator: LLANDAU
Sample : K9807097-033 Inst : GC15
Misc : F=2 D=1 A=11.4 Multiplr: 1.00
Quant Time: Jan 16 13:36 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



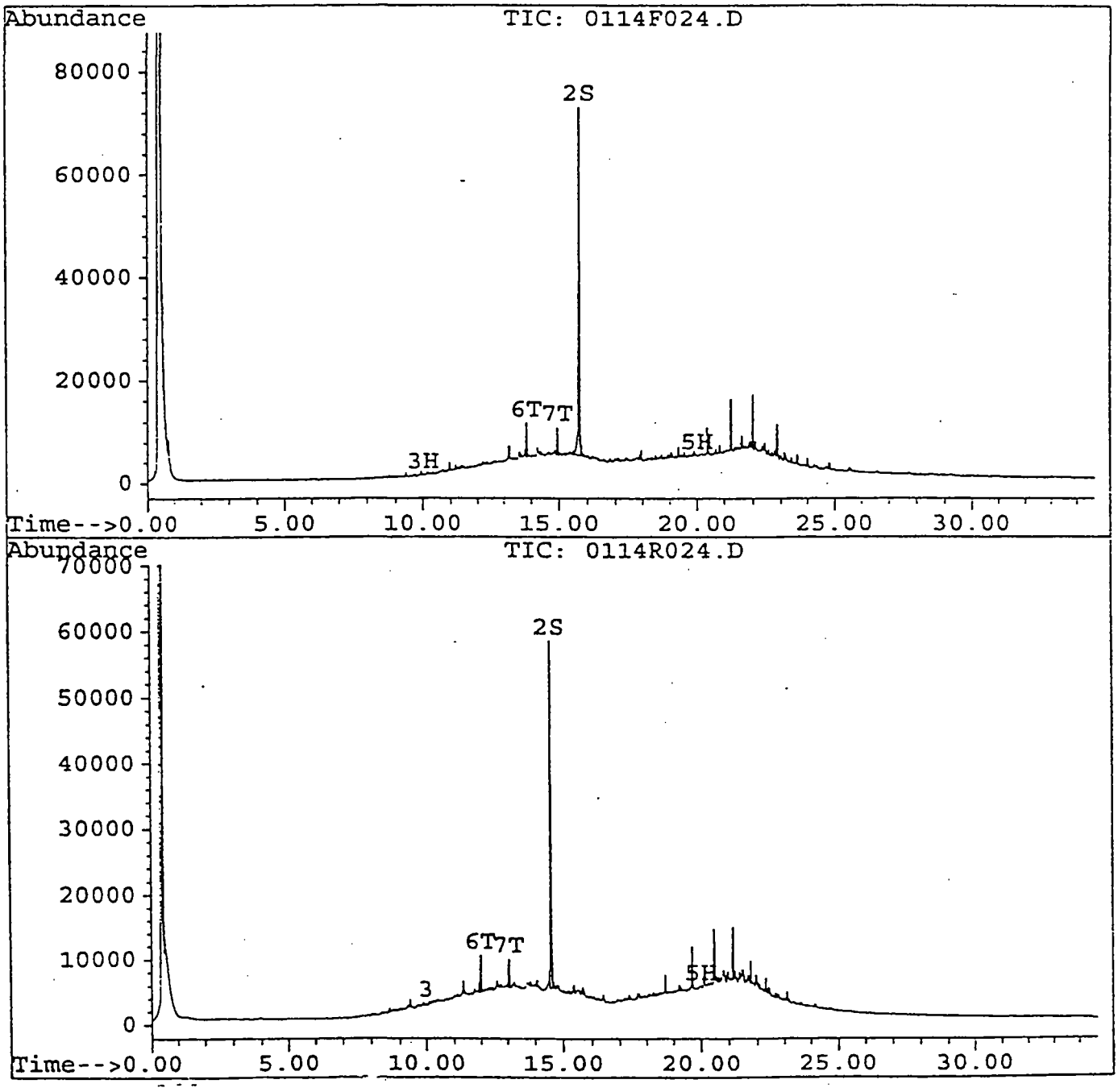

Alkane Fingerprint of HC-S-04
Relative Percent of F1 Aliphatics
6.00
5.00
4.00
3.00
2.00
1.00
0.00
HC-S-04
T4 Diesel
Total Resolved Alkanes
Isoprenoid U2
Isoprenoid U3
Isoprenoid U4
n-C17
Pristane
n-C18
Phytane
n-C25
n-C27
n-C29
n-C31
Alkane Hydrocarbons

Quantitation Report

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F024.D Vial: 19
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F024.D\0114R024.D
Acq On : 15 Jan 99 08:55 AM Operator: LLANDAUER
Sample : K9807097-034 Inst : GC15
Misc : F=2 D=1 A=8.4 Multiplr: 1.00
Quant Time: Jan 16 13:36 1999

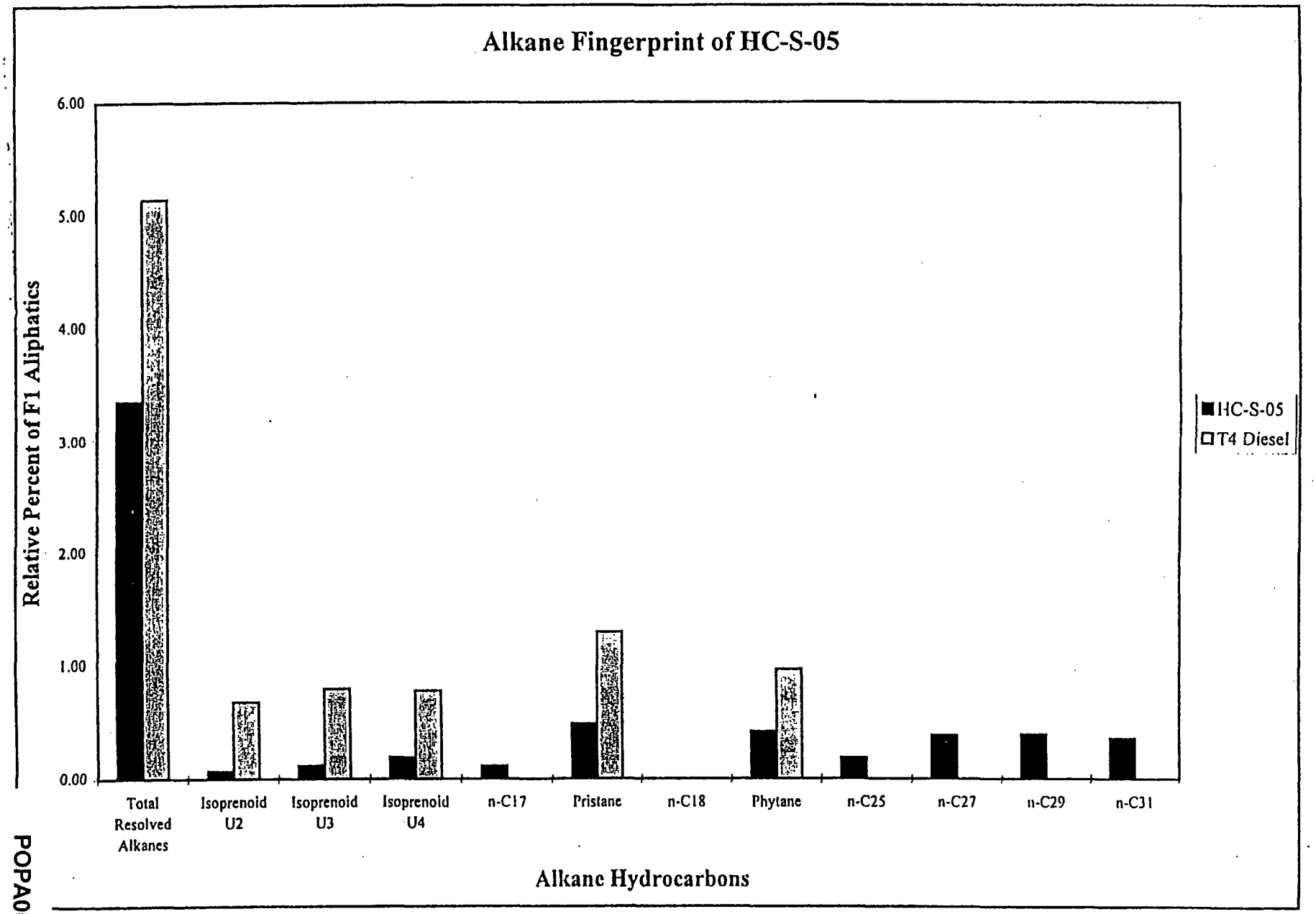
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00160

POPA0007611



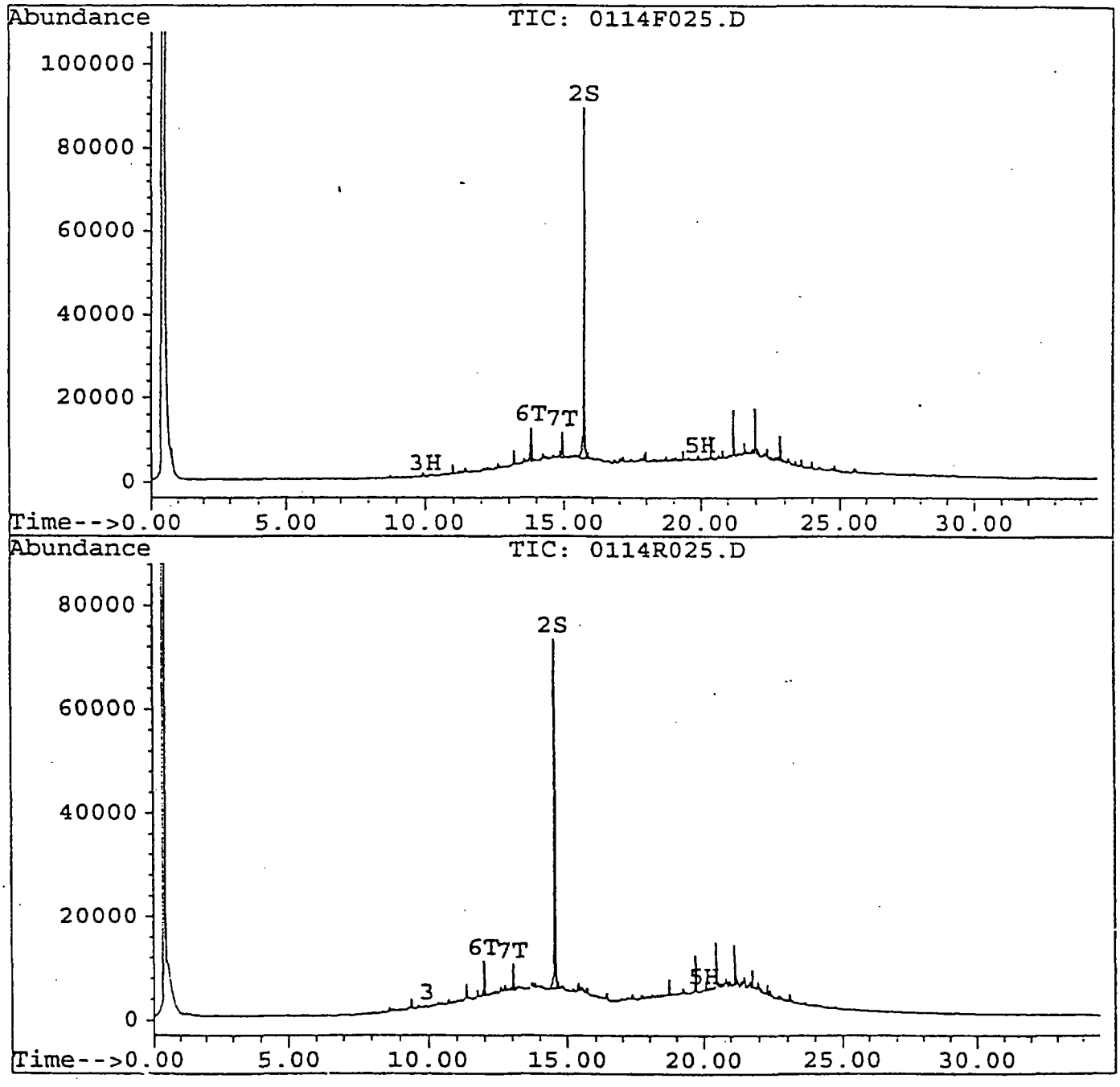
POPA0007612

Quantitation Report

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F025.D Vial: 20
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F025.D\0114R025.D
Acq On : 15 Jan 99 09:37 AM Operator: LLANDAUE
Sample : K9807097-035 Inst : GC15
Misc : F=2 D=1 A=9.58 Multiplr: 1.00
Quant Time: Jan 16 13:37 1999

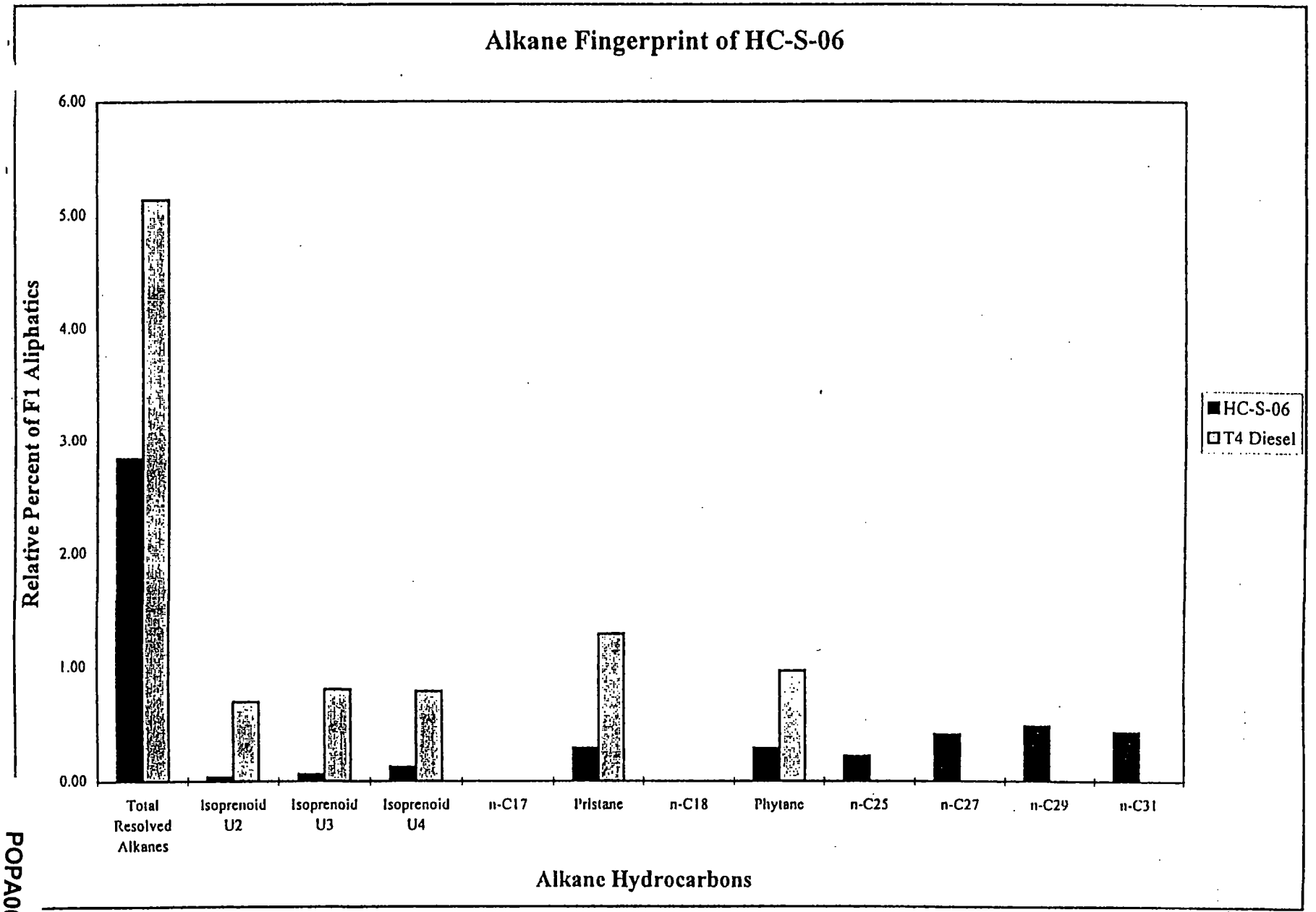
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00162

POPA0007613

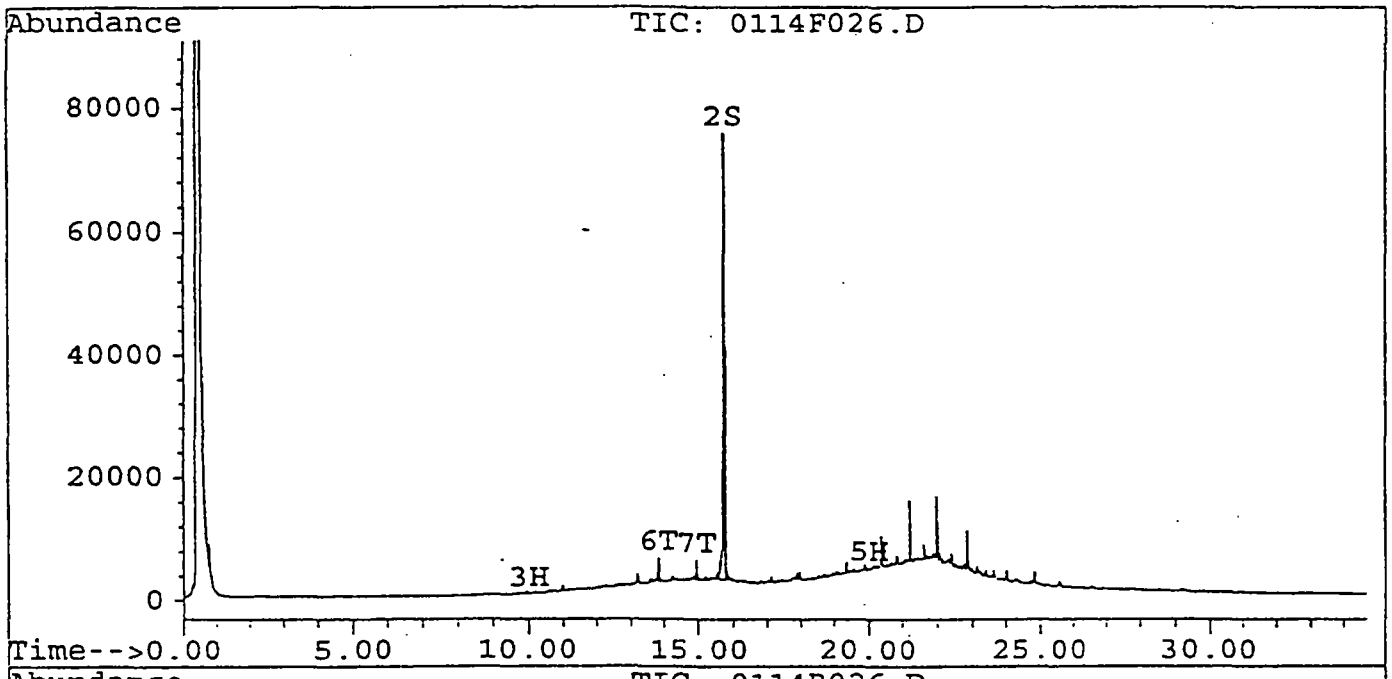

Alkane Fingerprint of HC-S-06
Relative Percent of F1 Aliphatics
6.00
5.00
4.00
3.00
2.00
1.00
0.00
HC-S-06
T4 Diesel
Total Resolved Alkanes
Isoprenoid U2
Isoprenoid U3
Isoprenoid U4
n-C17
Pristane
n-C18
Phytane
n-C25
n-C27
n-C29
n-C31
Alkane Hydrocarbons

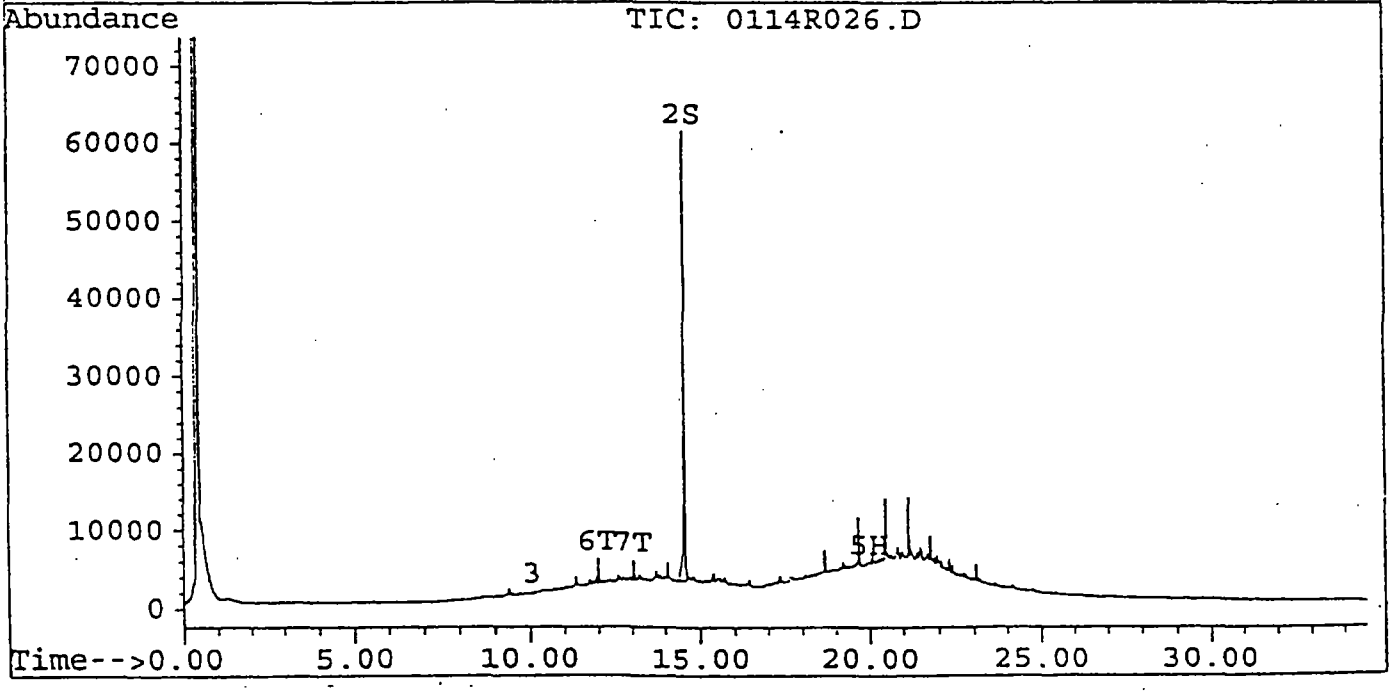
Quantitation Report

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F026.D Vial: 21
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F026.D\0114R026.D
Acq On : 15 Jan 99 10:19 AM Operator: LLANDAUE
Sample : K9807097-036 Inst : GC15
Misc : F=2 D=1 A=7.13 Multiplr: 1.00
Quant Time: Jan 16 13:37 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

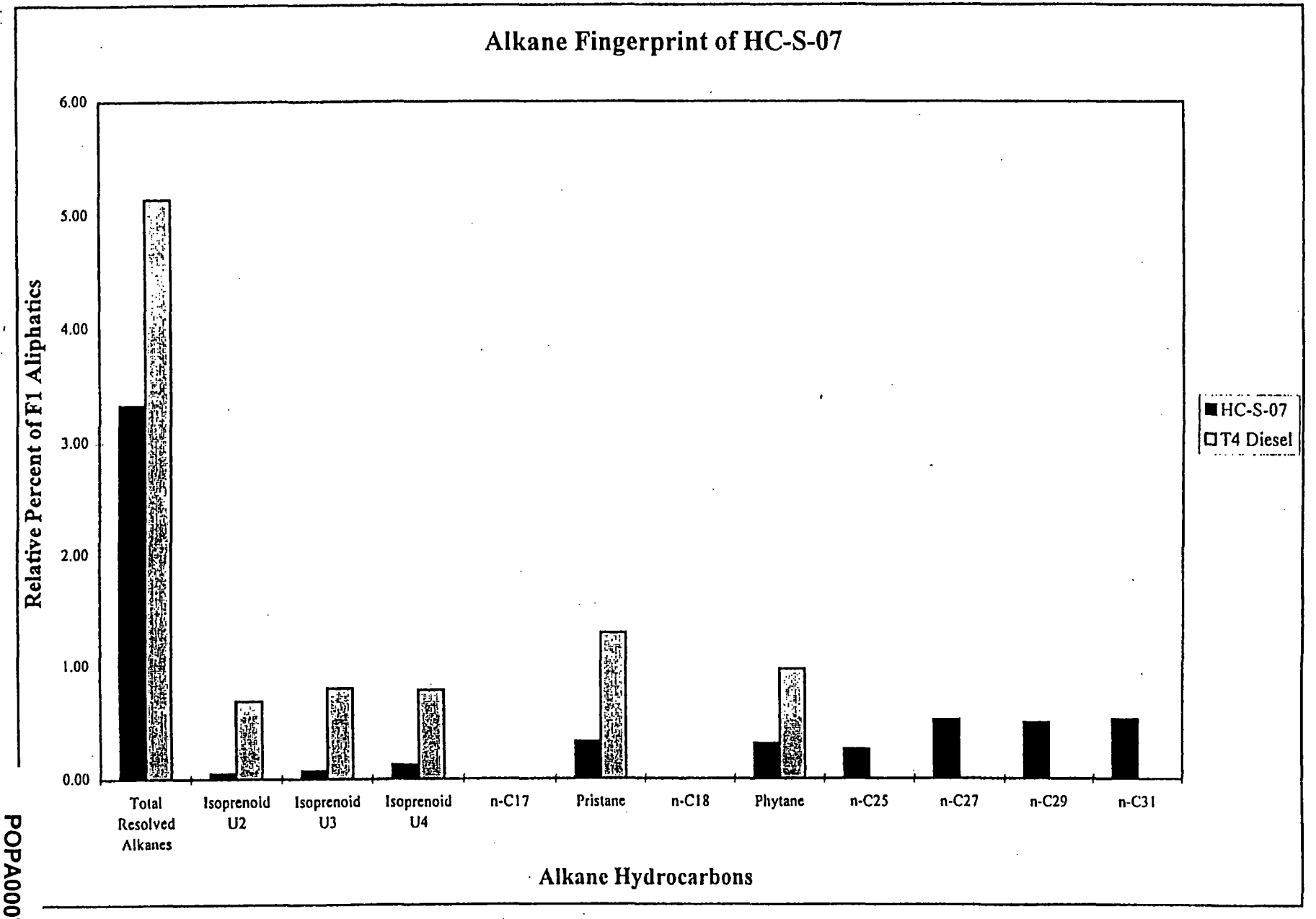
Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





00164

POPA0007615

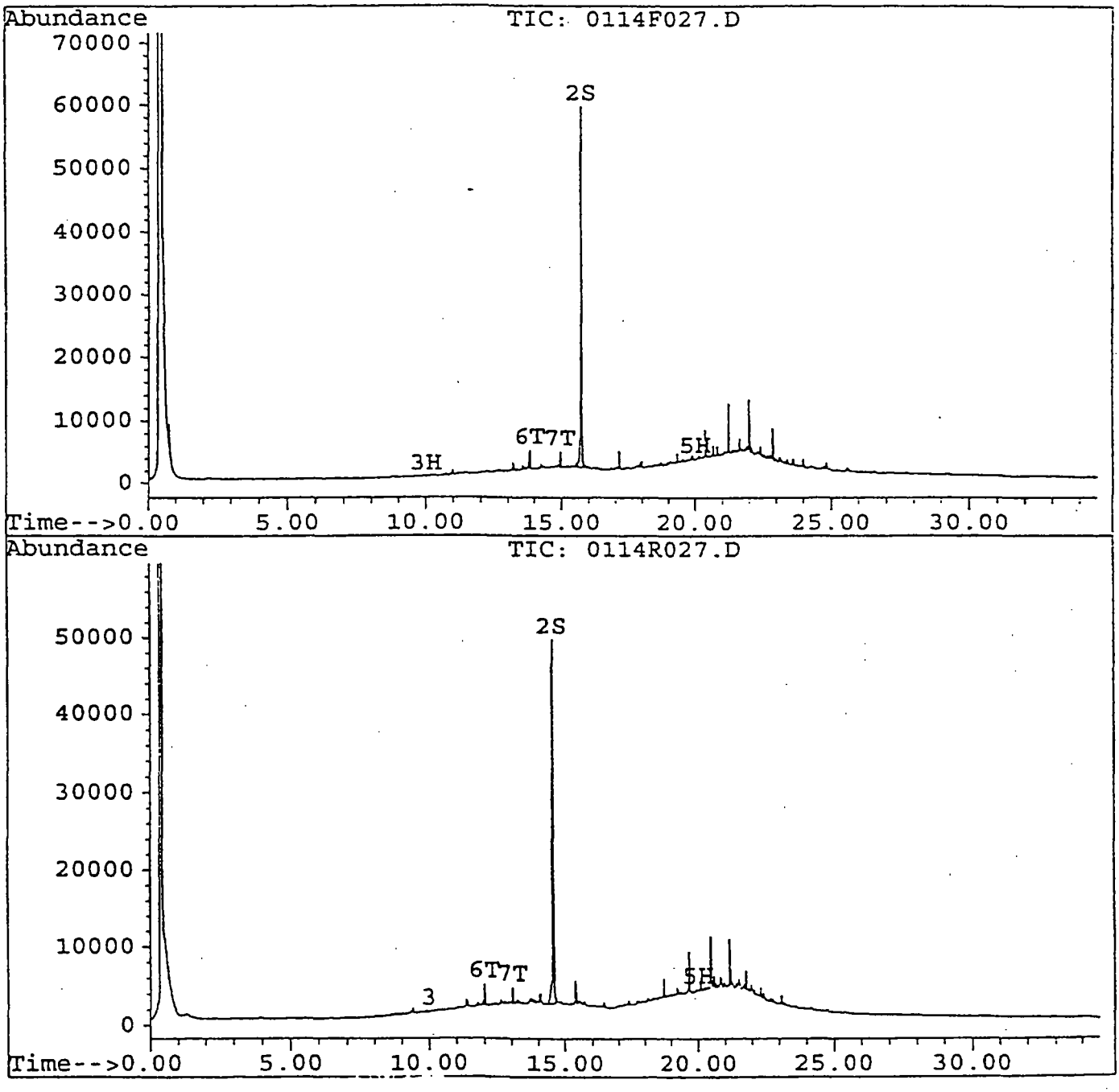

Alkane Fingerprint of HC-S-07
Relative Percent of F1 Aliphatics
6.00
5.00
4.00
3.00
2.00
1.00
0.00
HC-S-07
T4 Diesel
Total Resolved Alkanes
Isoprenoid U2
Isoprenoid U3
Isoprenoid U4
n-C17
Pristane
n-C18
Phytane
n-C25
n-C27
n-C29
n-C31
Alkane Hydrocarbons

POA00076I6

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F027.D Vial: 22
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F027.D\0114R027.D
Acq On : 15 Jan 99 11:00 AM Operator: LLANDAUER
Sample : K9807097-037 Inst : GC15
Misc : F=2 D=1 A=7.29 Multiplr: 1.00
Quant Time: Jan 16 13:38 1999

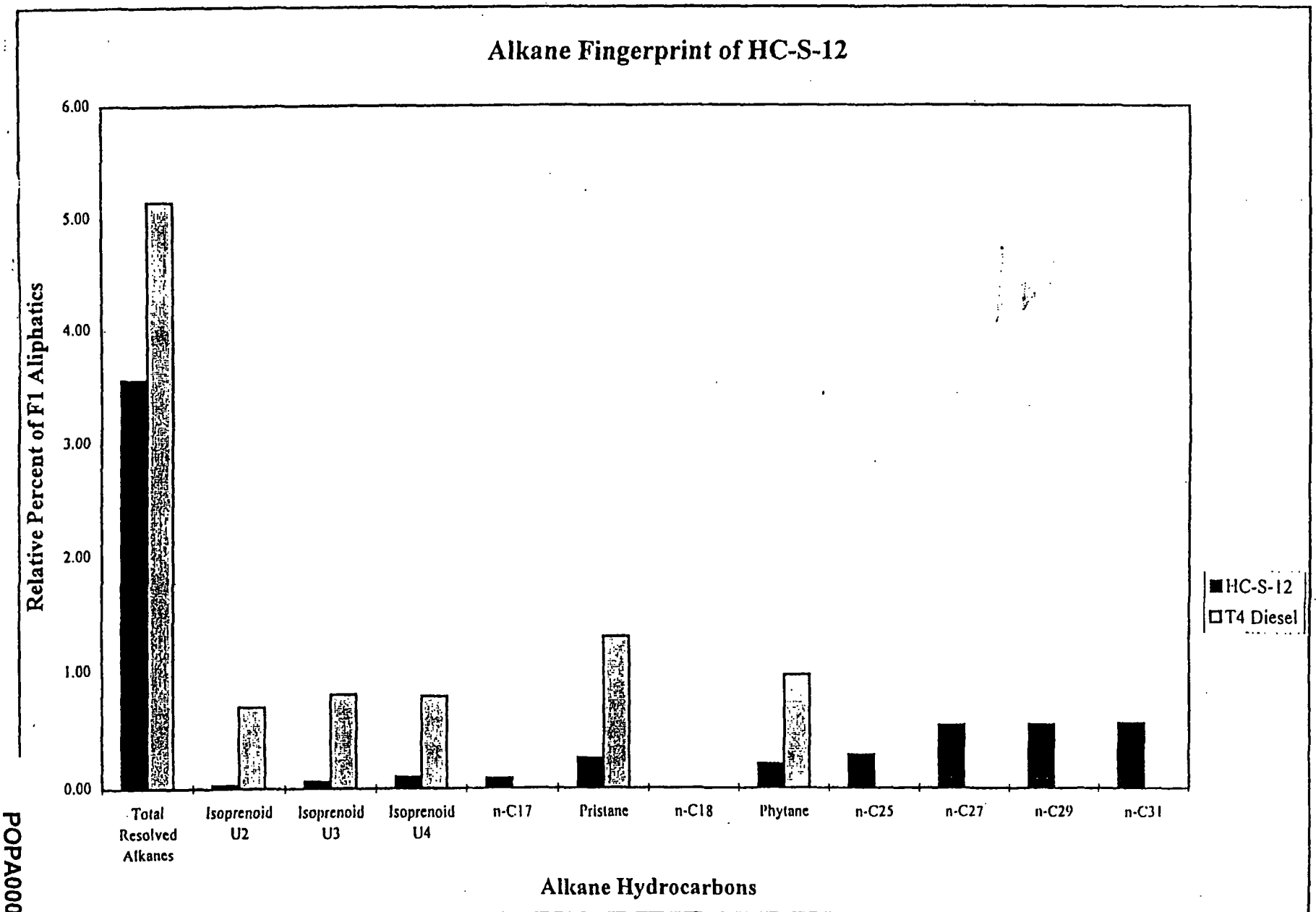
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00166

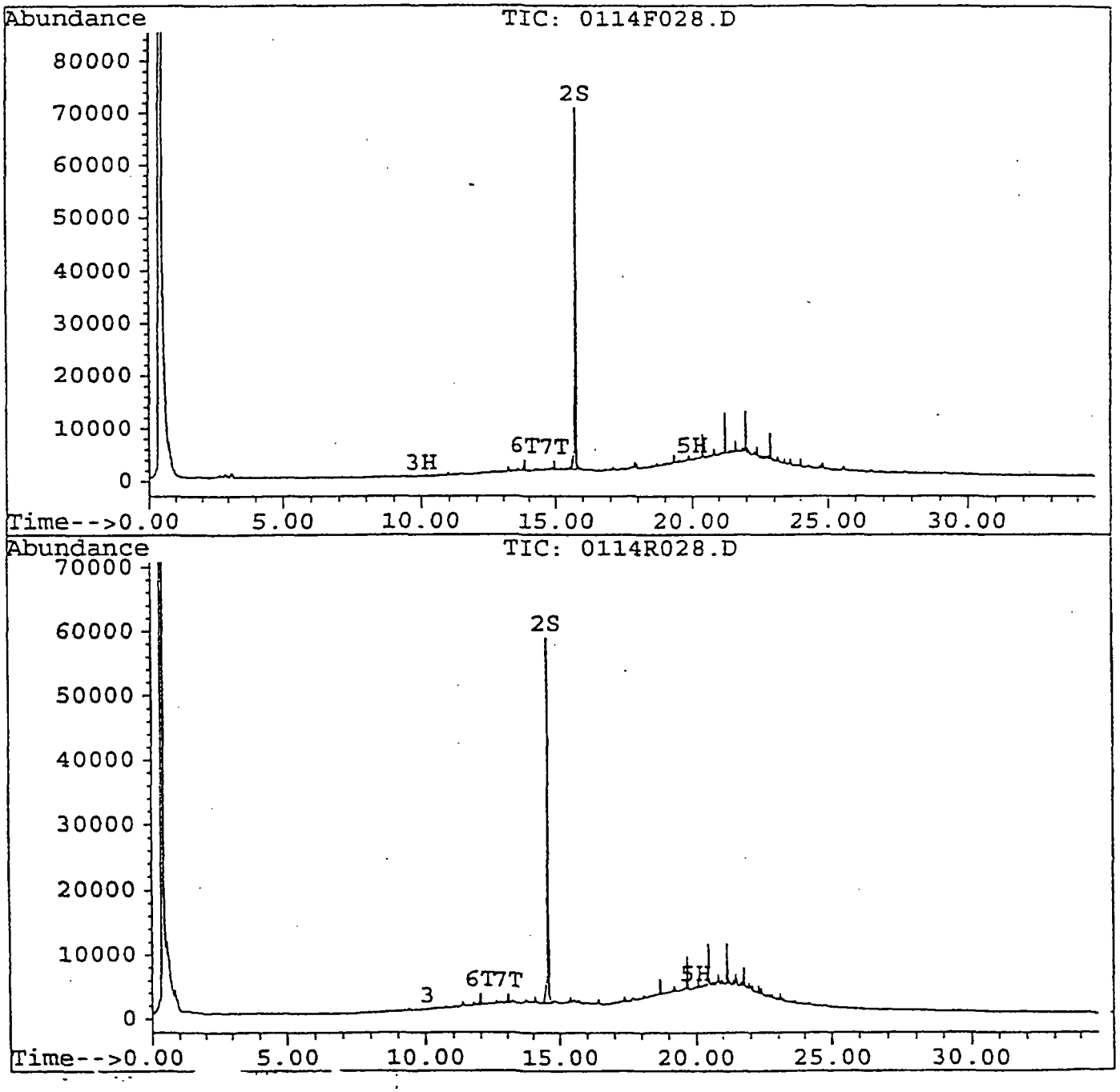
POPA0007617


Alkane Fingerprint of HC-S-12
Relative Percent of F1 Aliphatics
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Total Resolved Alkanes
Isoprenoid U2
Isoprenoid U3
Isoprenoid U4
n-C17
Pristane
n-C18
Phytane
n-C25
n-C27
n-C29
n-C31
Alkane Hydrocarbons
HC-S-12
T4 Diesel

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F028.D Vial: 23
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F028.D\0114R028.D
Acq On : 15 Jan 99 11:42 AM Operator: LLANDAUER
Sample : K9807115-003 Inst : GC15
Misc : F=2 D=1 A=7.19 Multiplr: 1.00
Quant Time: Jan 16 13:38 1999

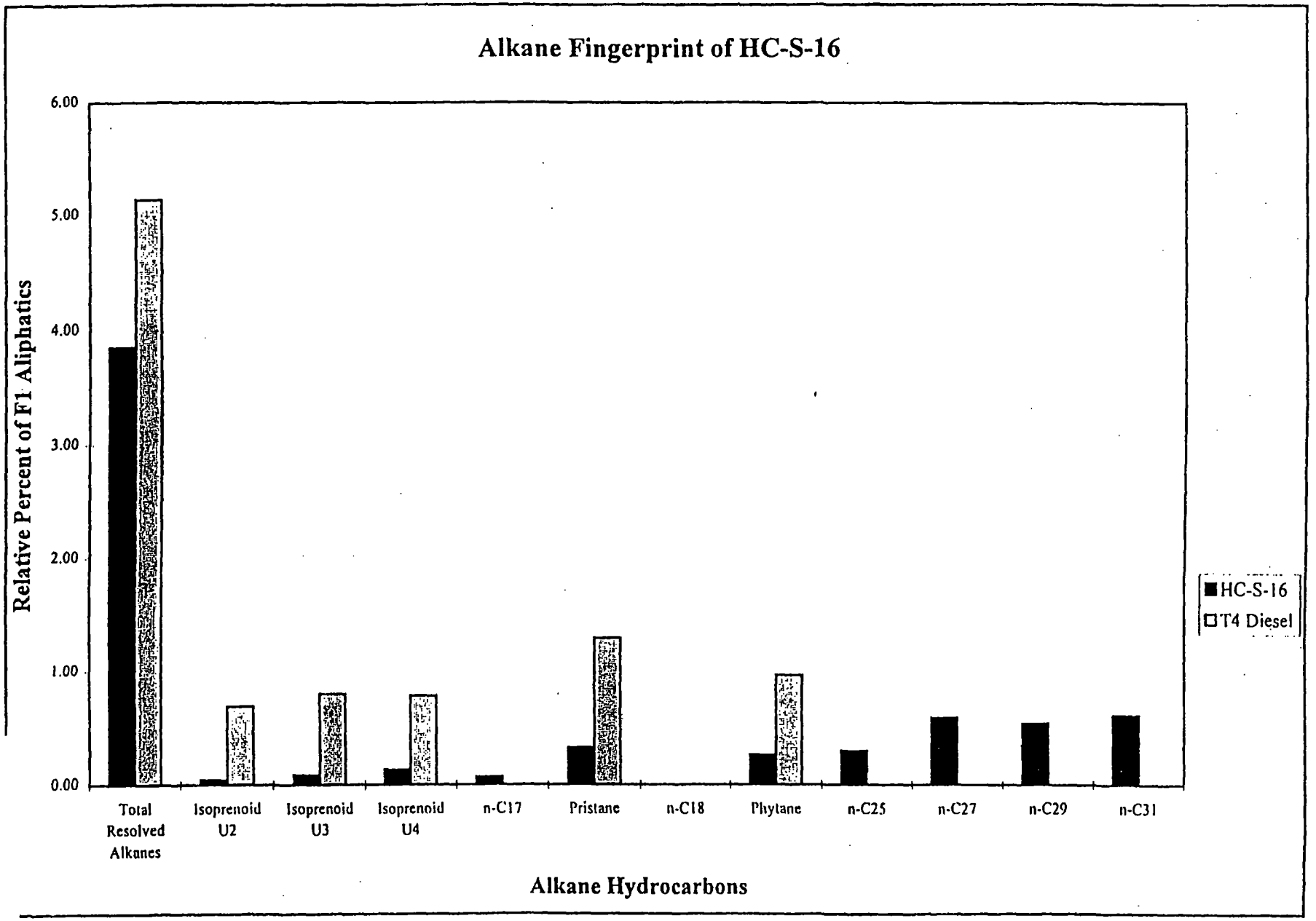
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00168

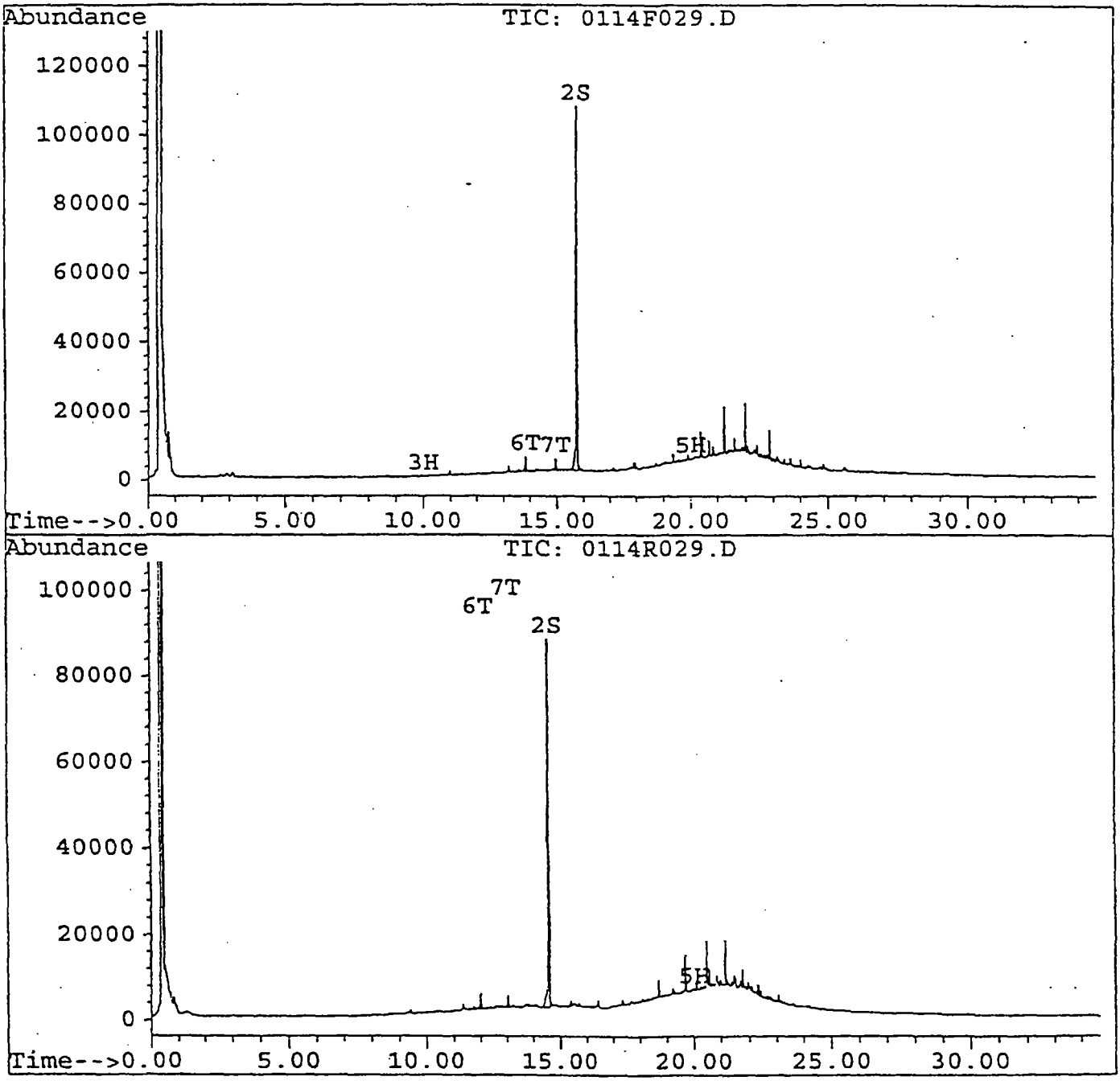
POPA0007619


Alkane Fingerprint of HC-S-16
Relative Percent of F1 Aliphatics
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Total Resolved Alkanes
Isoprenoid U2
Isoprenoid U3
Isoprenoid U4
n-C17
Pristane
n-C18
Phytane
n-C25
n-C27
n-C29
n-C31
Alkane Hydrocarbons
HC-S-16
T4 Diesel

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F029.D Vial: 24
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F029.D\0114R029.D
Acq On : 15 Jan 99 12:23 PM Operator: LLANDAUER
Sample : K9807115-007 Inst : GC15
Misc : F=2 D=1 A=9.01 Multiplr: 1.00
Quant Time: Jan 16 13:38 1999

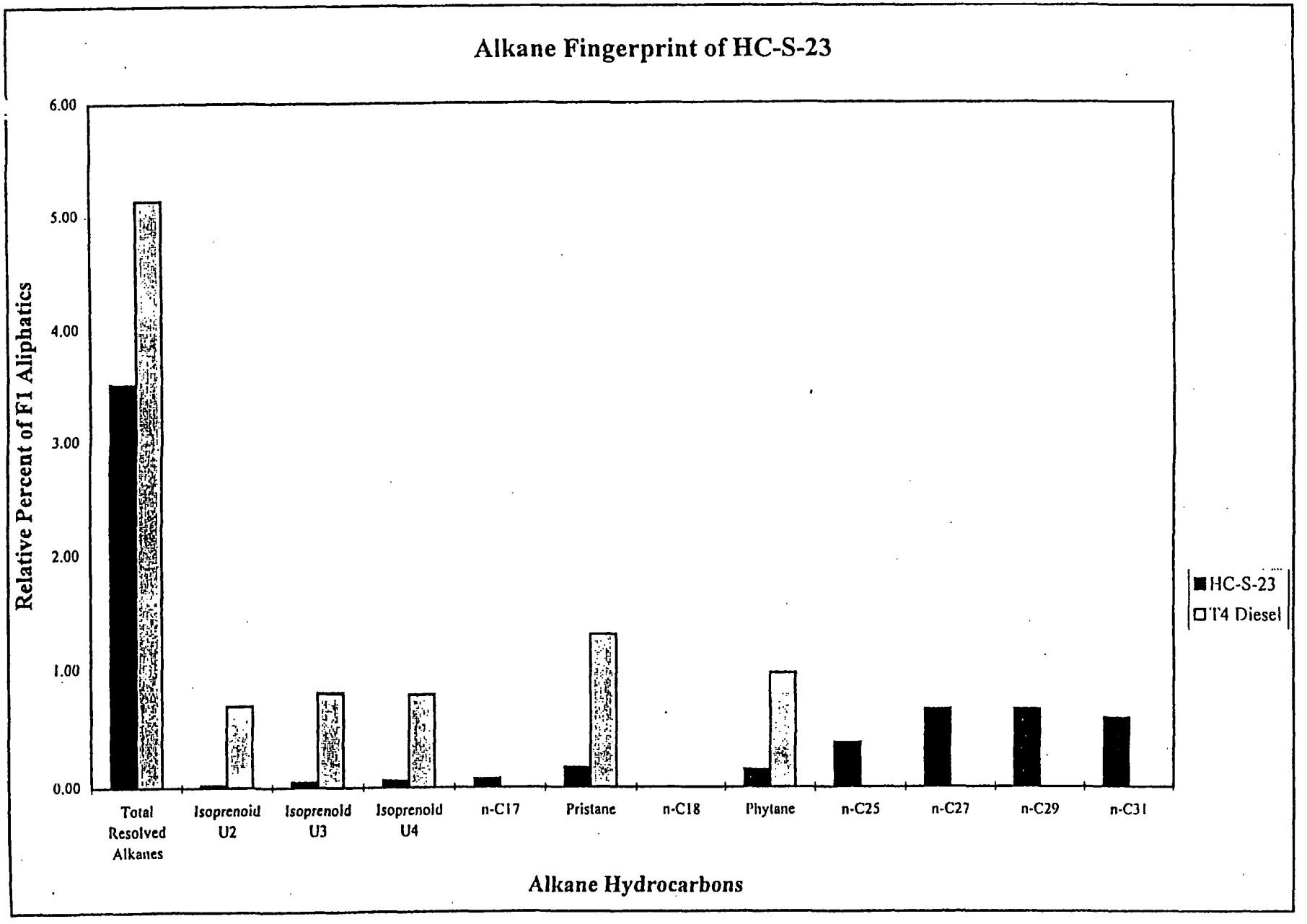
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00170

POPA0007621

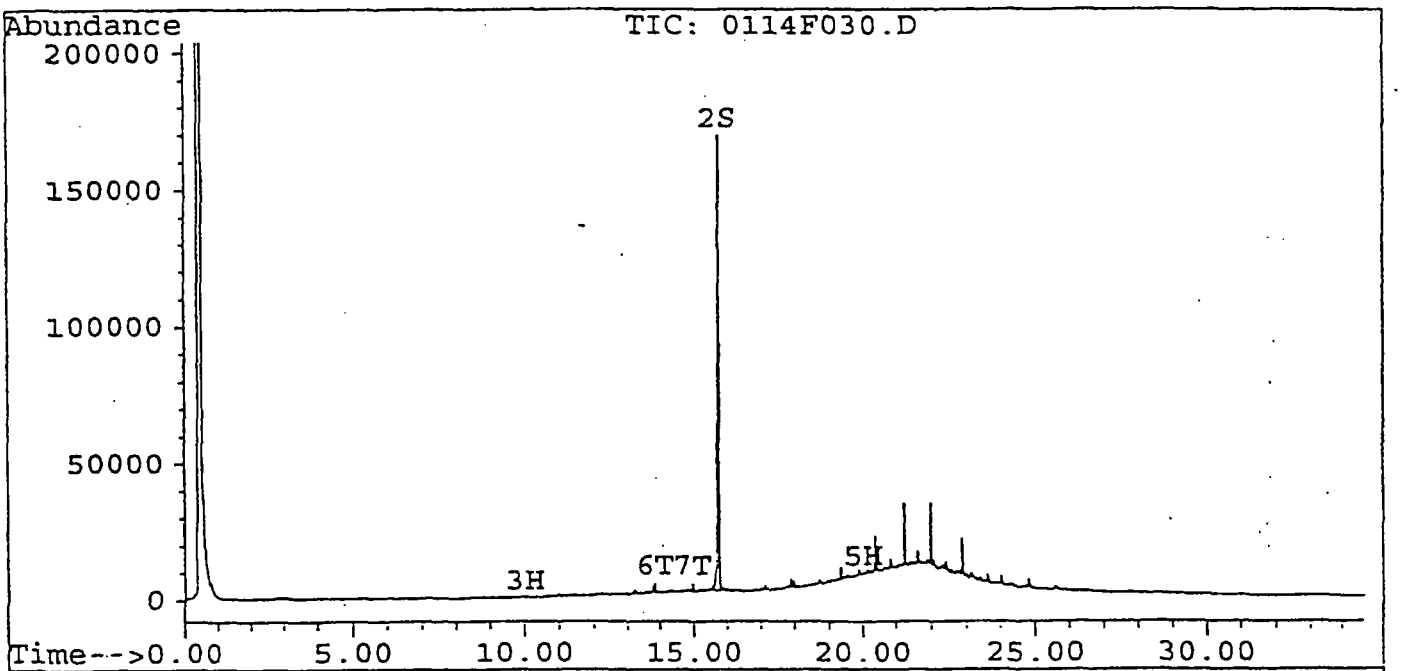


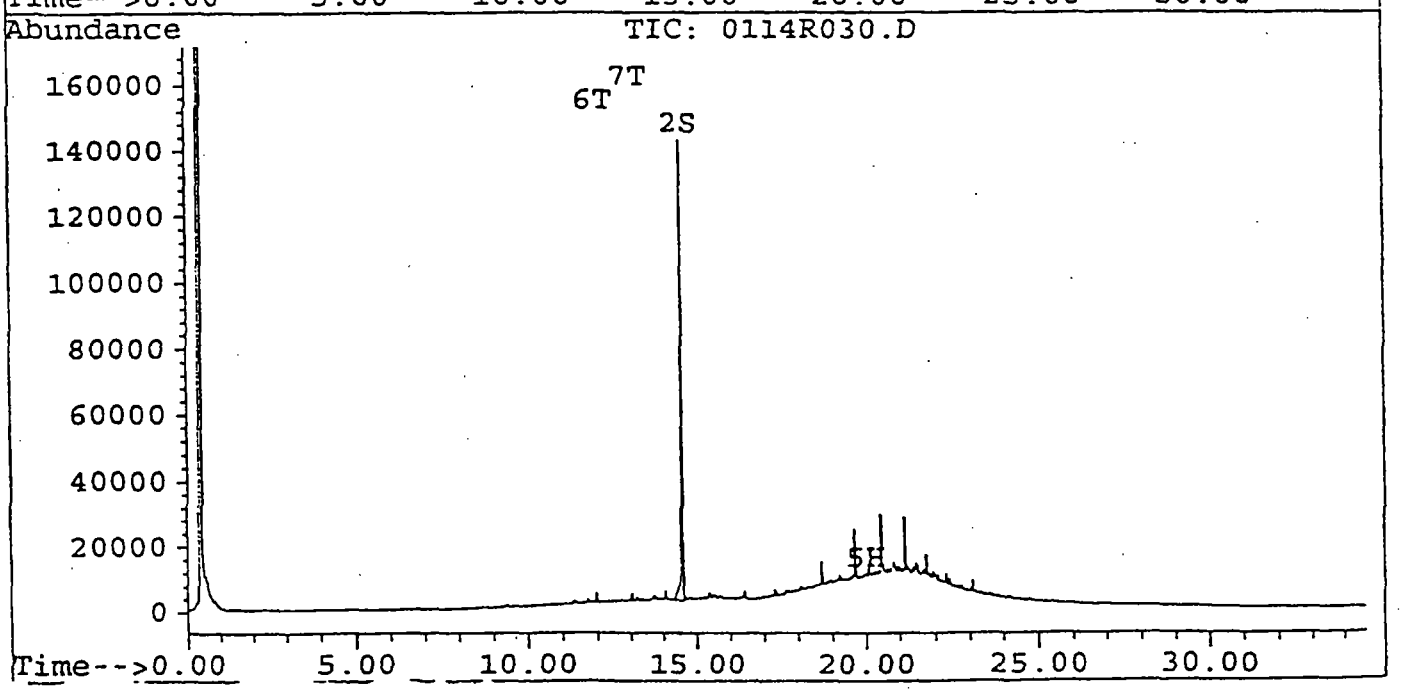
POPA0007622

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F030.D Vial: 25
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F030.D\0114R030.D
Acq On : 15 Jan 99 01:35 PM Operator: LLANDAUER
Sample : K9807115-010 Inst : GC15
Misc : F=1 D=1 A=7.40 Multiplr: 1.00
Quant Time: Jan 16 13:38 1999

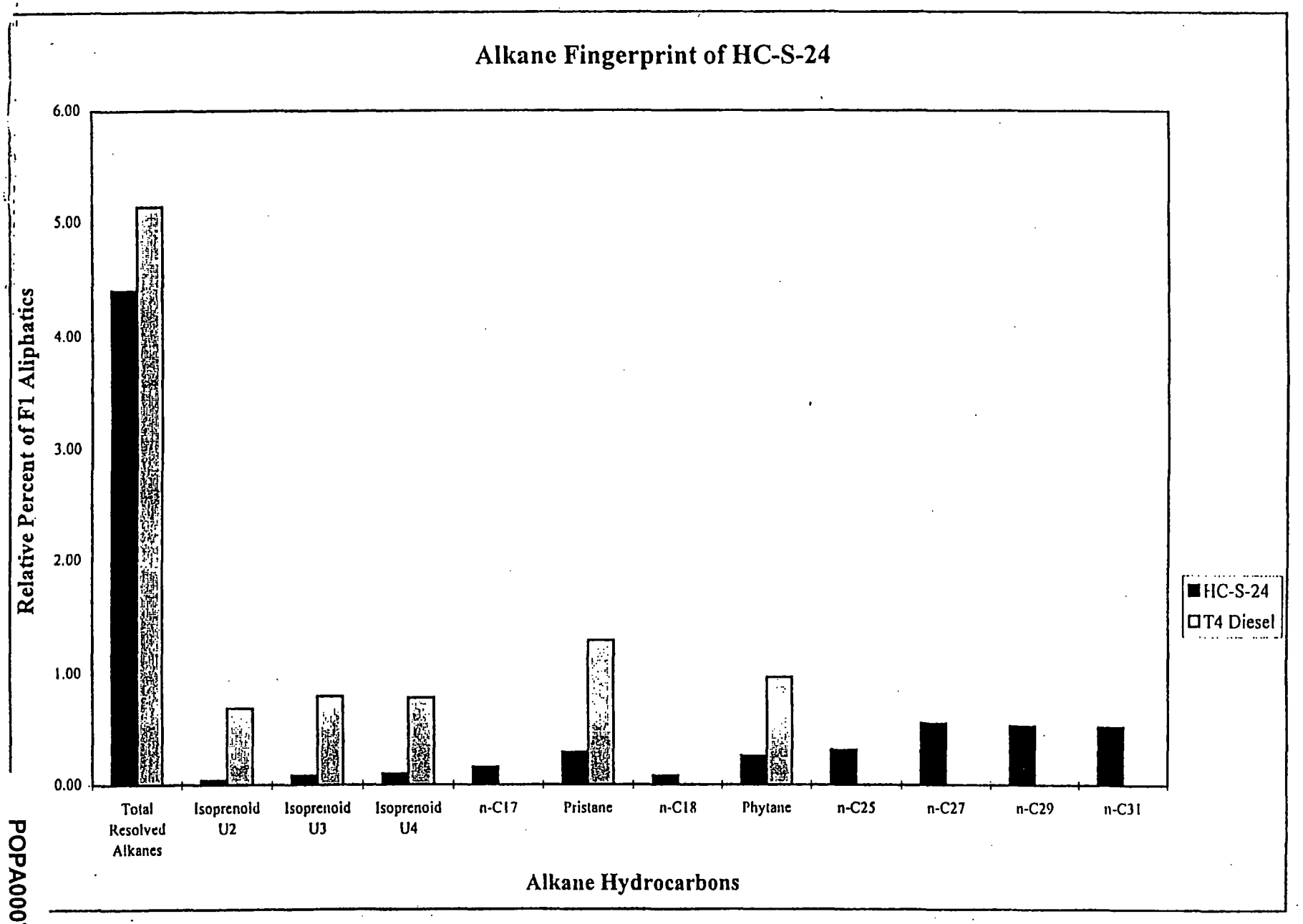
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





POPA0007623 00172

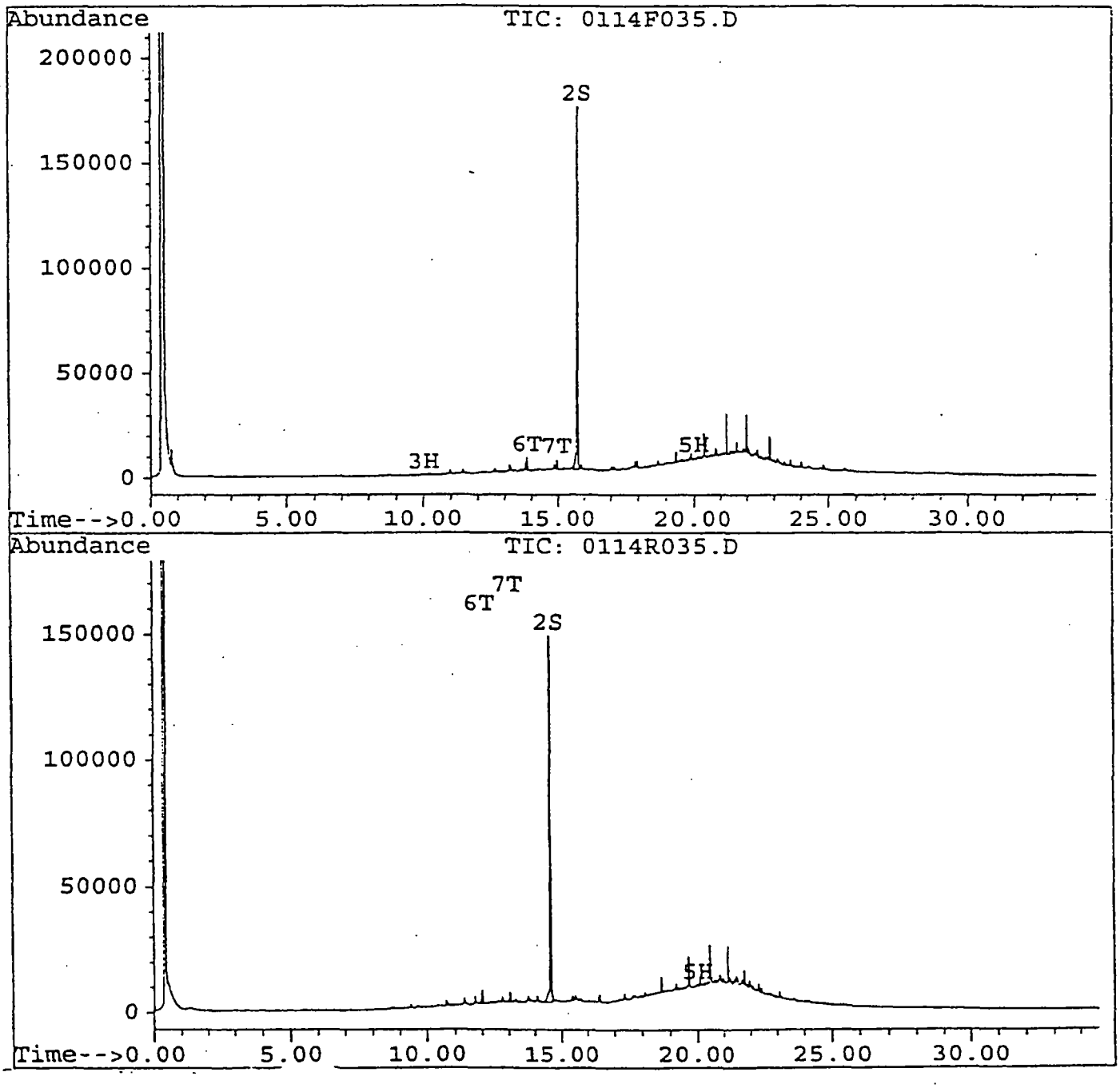

Alkane Fingerprint of HC-S-24
Relative Percent of F1 Aliphatics
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Total Resolved Alkanes
Isoprenoid U2
Isoprenoid U3
Isoprenoid U4
n-C17
Pristane
n-C18
Phytane
n-C25
n-C27
n-C29
n-C31
Alkane Hydrocarbons
HC-S-24
T4 Diesel

Quantitation Report

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F035.D Vial: 26
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F035.D\0114R035.D
Acq On : 15 Jan 99 05:05 PM Operator: LLANDAUER
Sample : K9807115-011 Inst : GC15
Misc : F=1 D=1 A=10.4 Multiplr: 1.00
Quant Time: Jan 16 13:39 1999

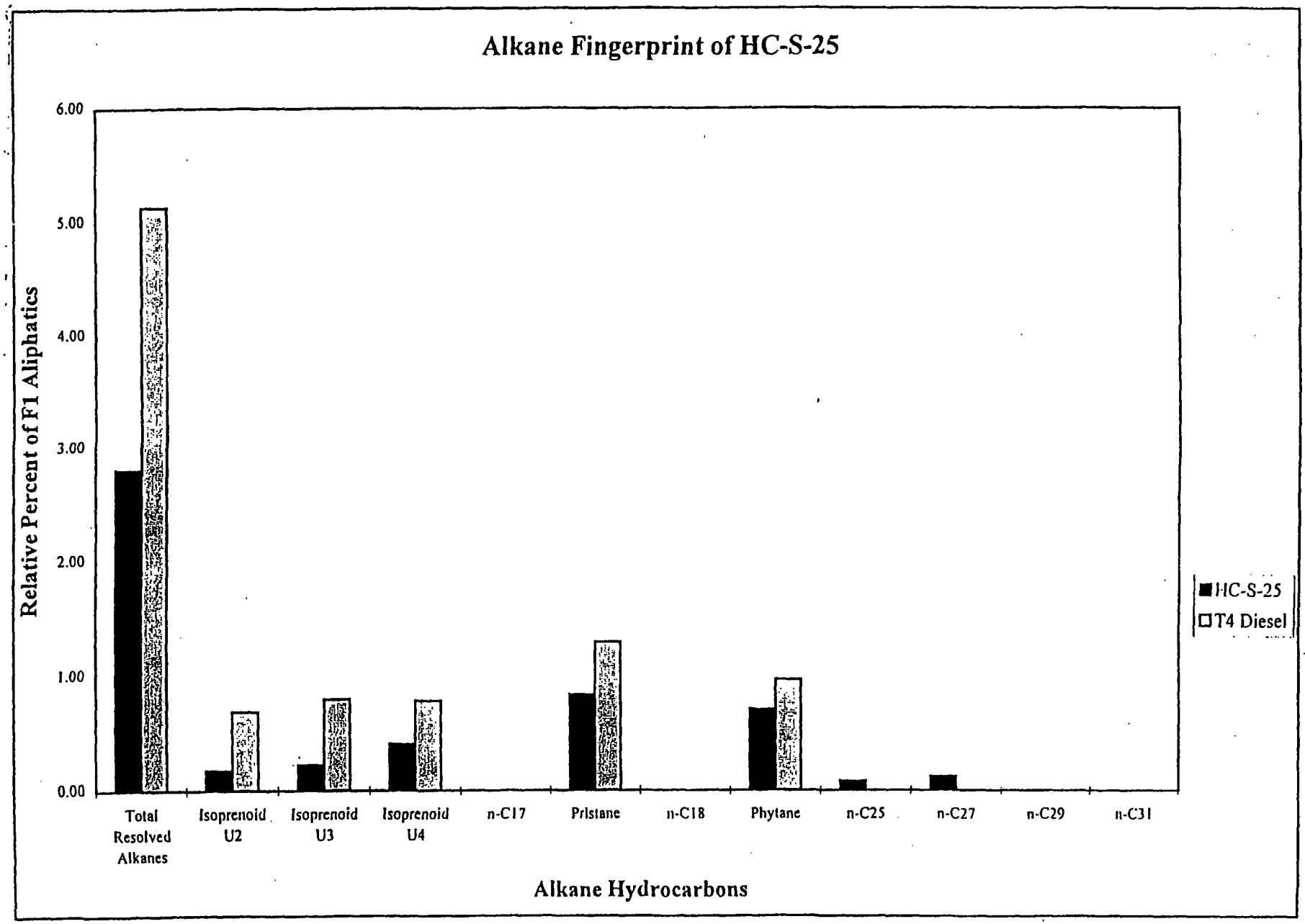
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00174

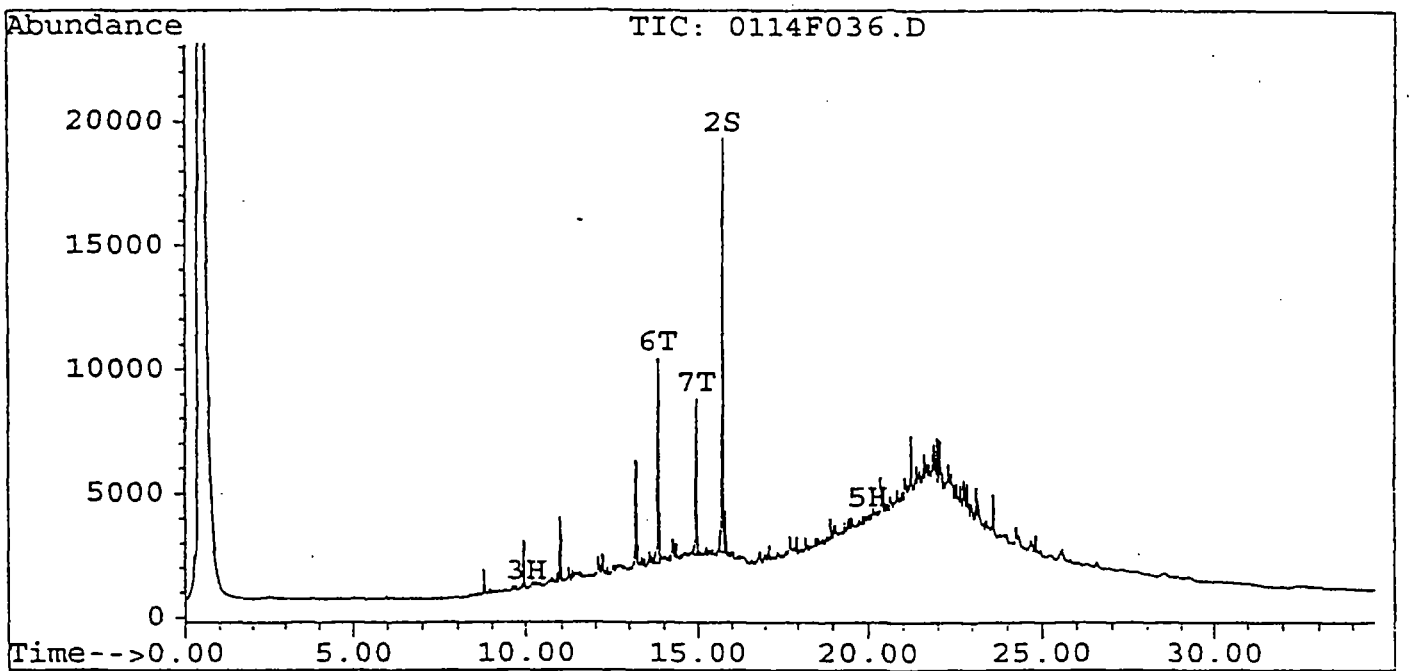
POPA0007625

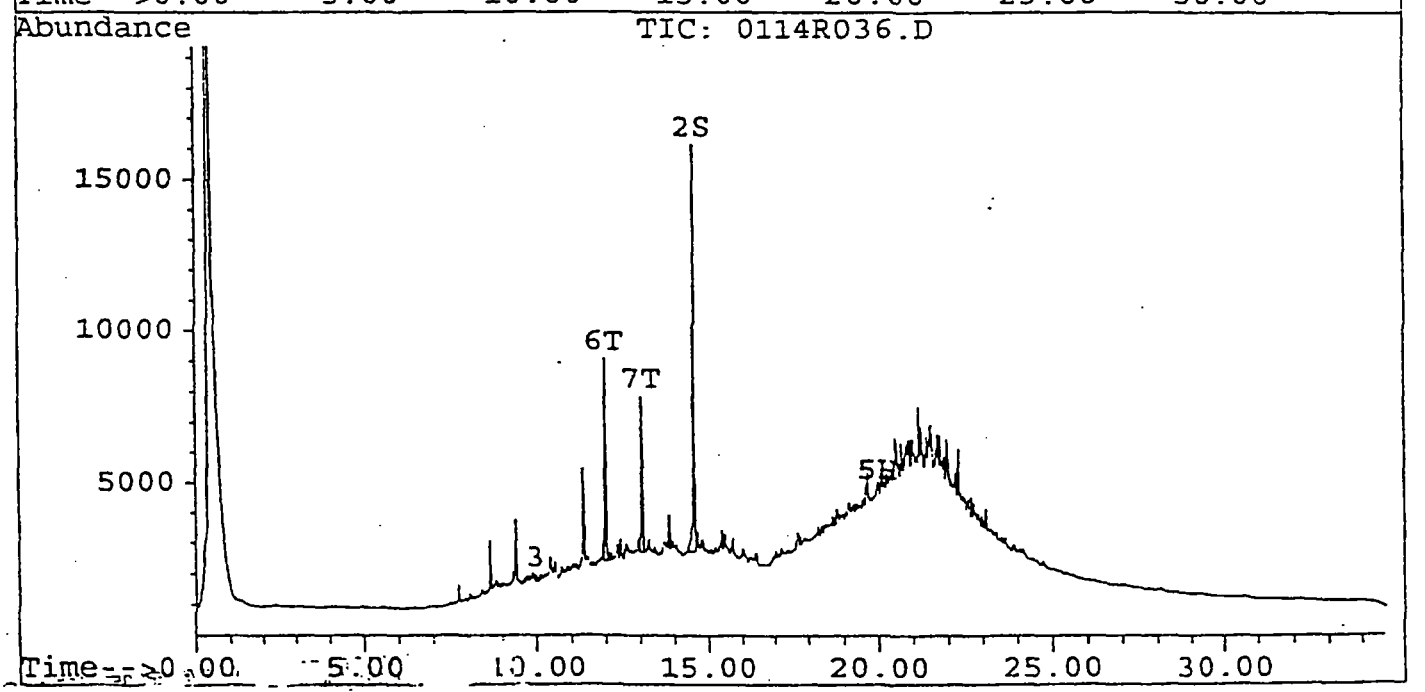

Alkane Fingerprint of HC-S-25
Relative Percent of F1 Aliphatics
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Total Resolved Alkanes
Isoprenoid U2
Isoprenoid U3
Isoprenoid U4
n-C17
Pristane
n-C18
Phytane
n-C25
n-C27
n-C29
n-C31
Alkane Hydrocarbons
HC-S-25
T4 Diesel

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F036.D Vial: 27
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F036.D\0114R036.D
Acq On : 15 Jan 99 05:46 PM Operator: LLANDAUER
Sample : K9807115-013 Inst : GC15
Misc : F=10 D=1 A=10.4 Multiplr: 1.00
Quant Time: Jan 16 13:39 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

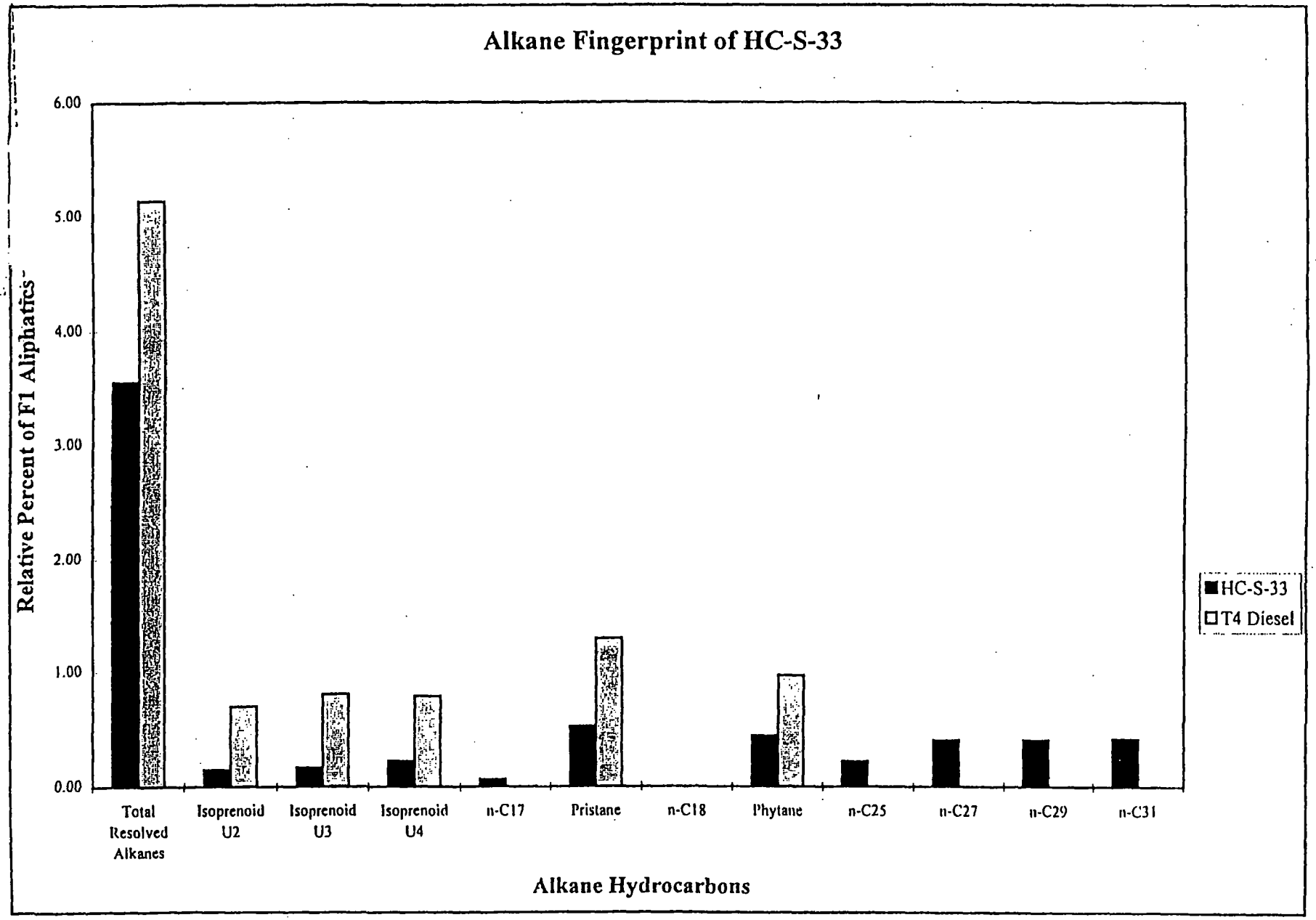
Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





00176

POPA0007627

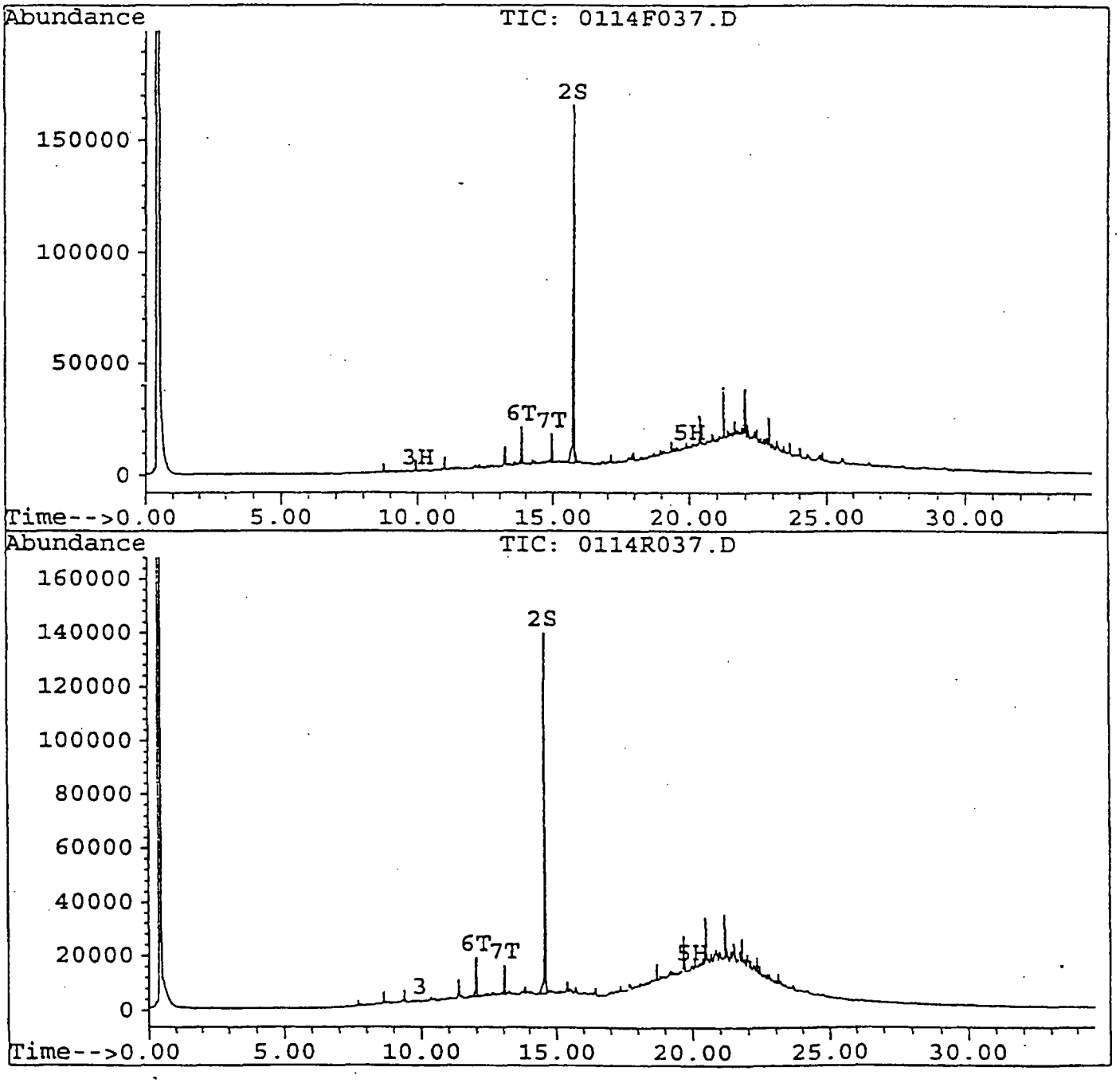


POPA0007628

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F037.D Vial: 28
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F037.D\0114R037.D
Acq On : 15 Jan 99 06:28 PM Operator: LLANDAUE
Sample : K9807115-021 Inst : GC15
Misc : F=1 D=1 A=9.65 Multiplr: 1.00
Quant Time: Jan 16 13:39 1999

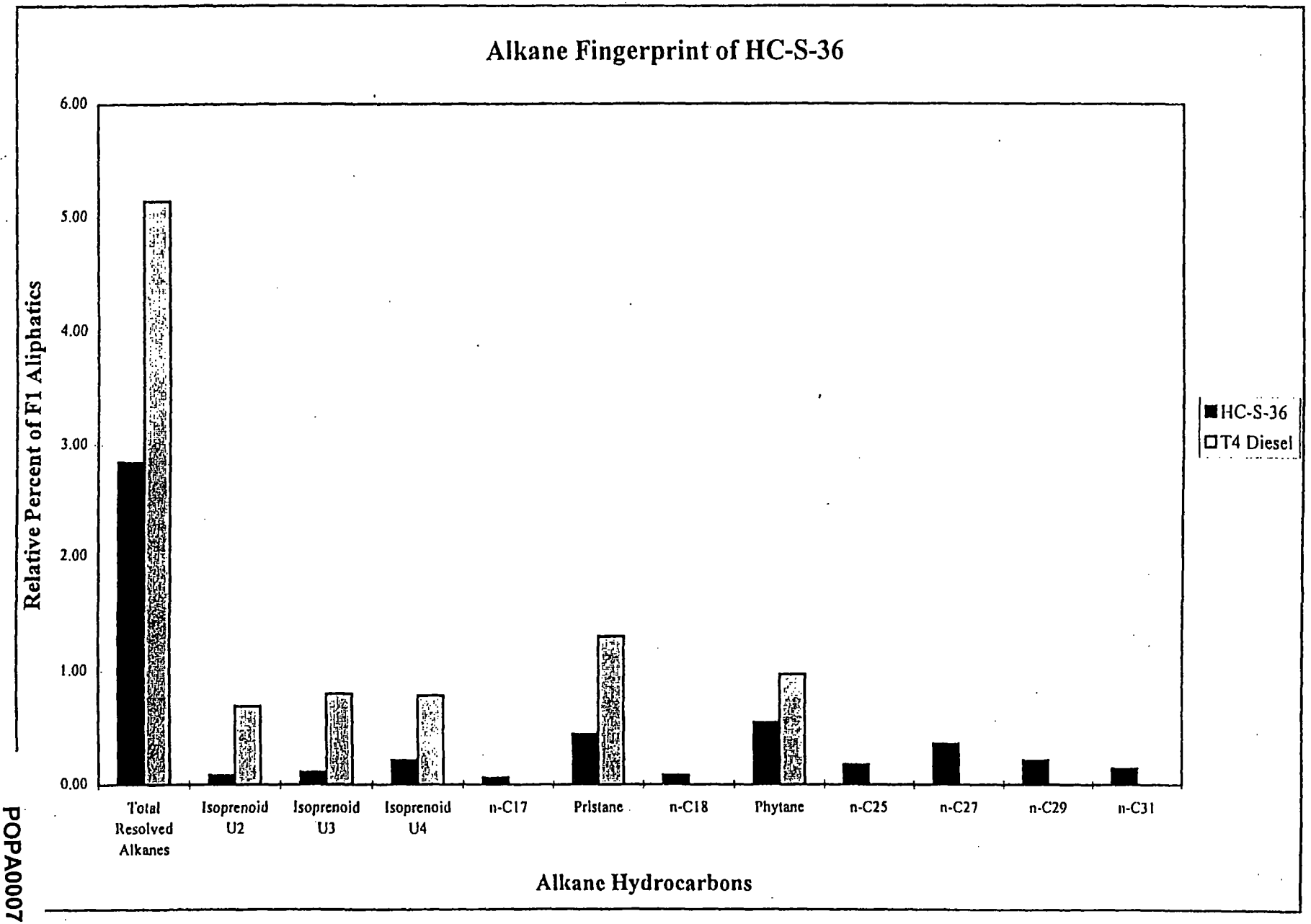
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00178

POPA0007629

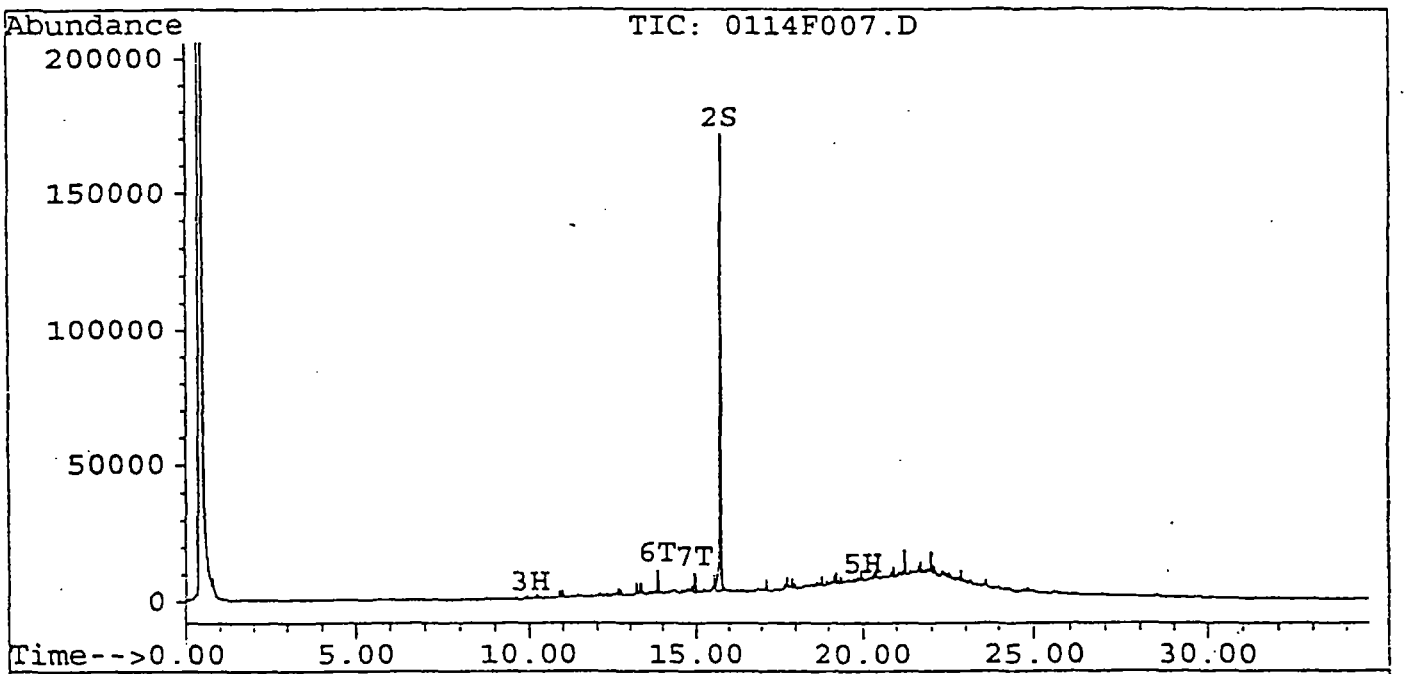


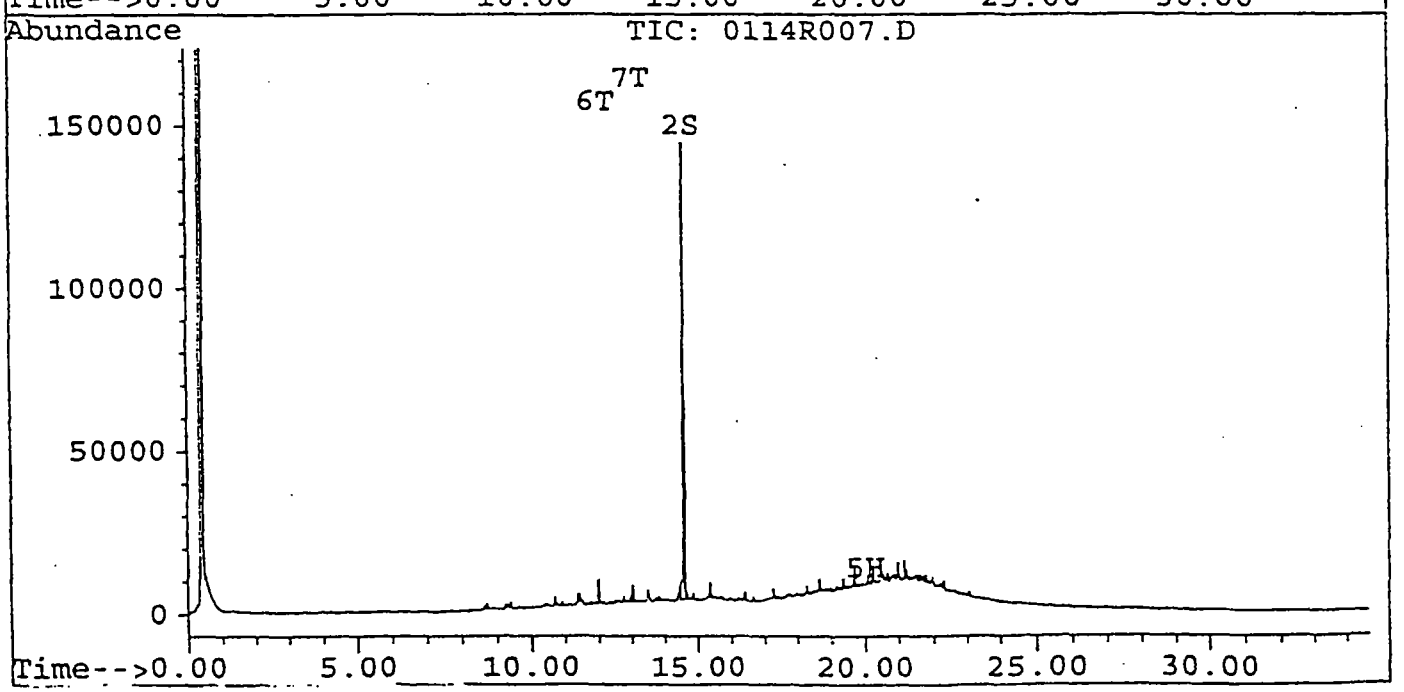
POA00076300

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F007.D Vial: 8
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F007.D\0114R007.D
Acq On : 14 Jan 99 08:42 PM Operator: LLANDAUE
Sample : K9807169-001 Inst : GC15
Misc : F=1 D=1 A=13.8 Multiplr: 1.00
Quant Time: Jan 16 13:32 1999

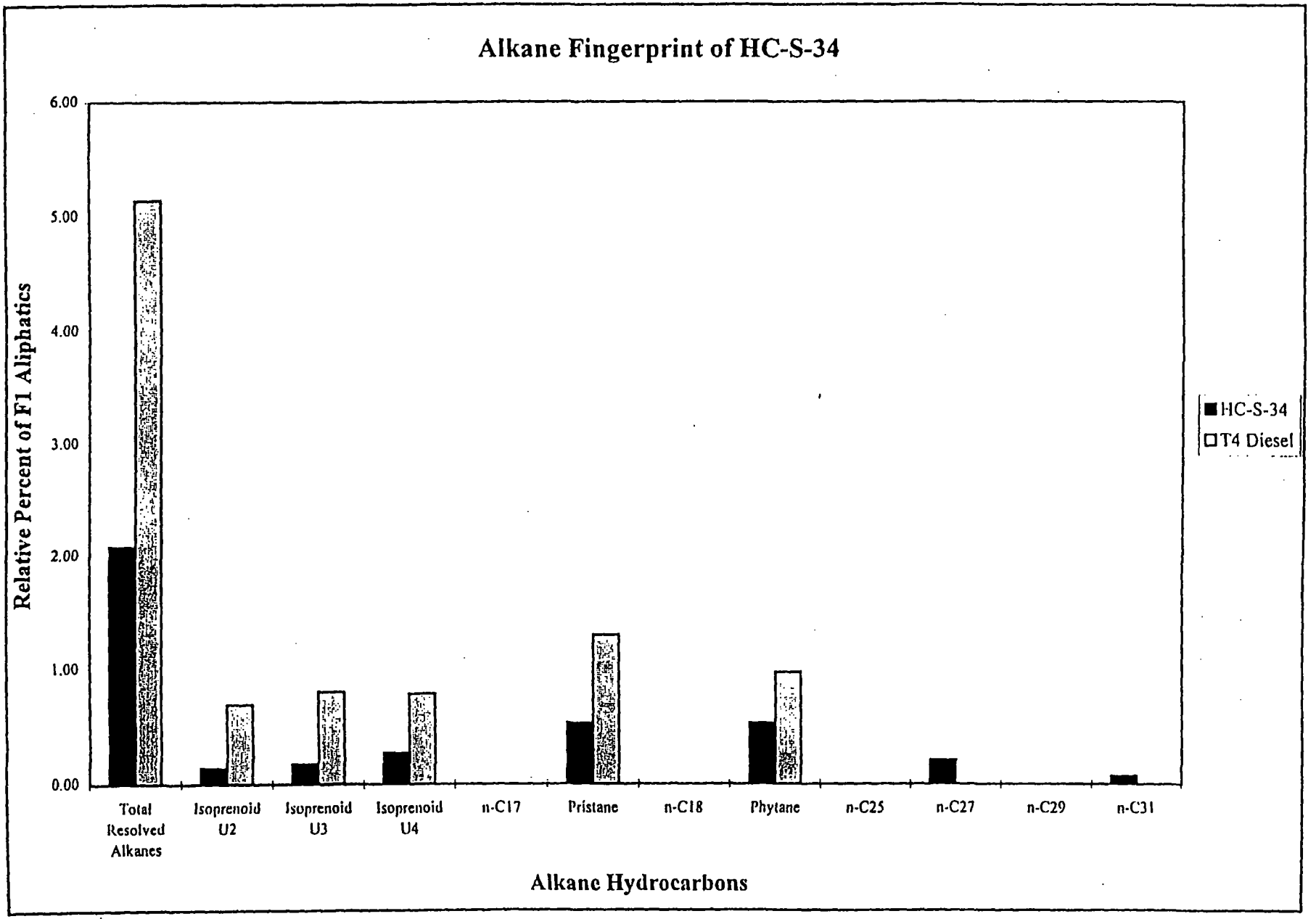
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





POPA0007631



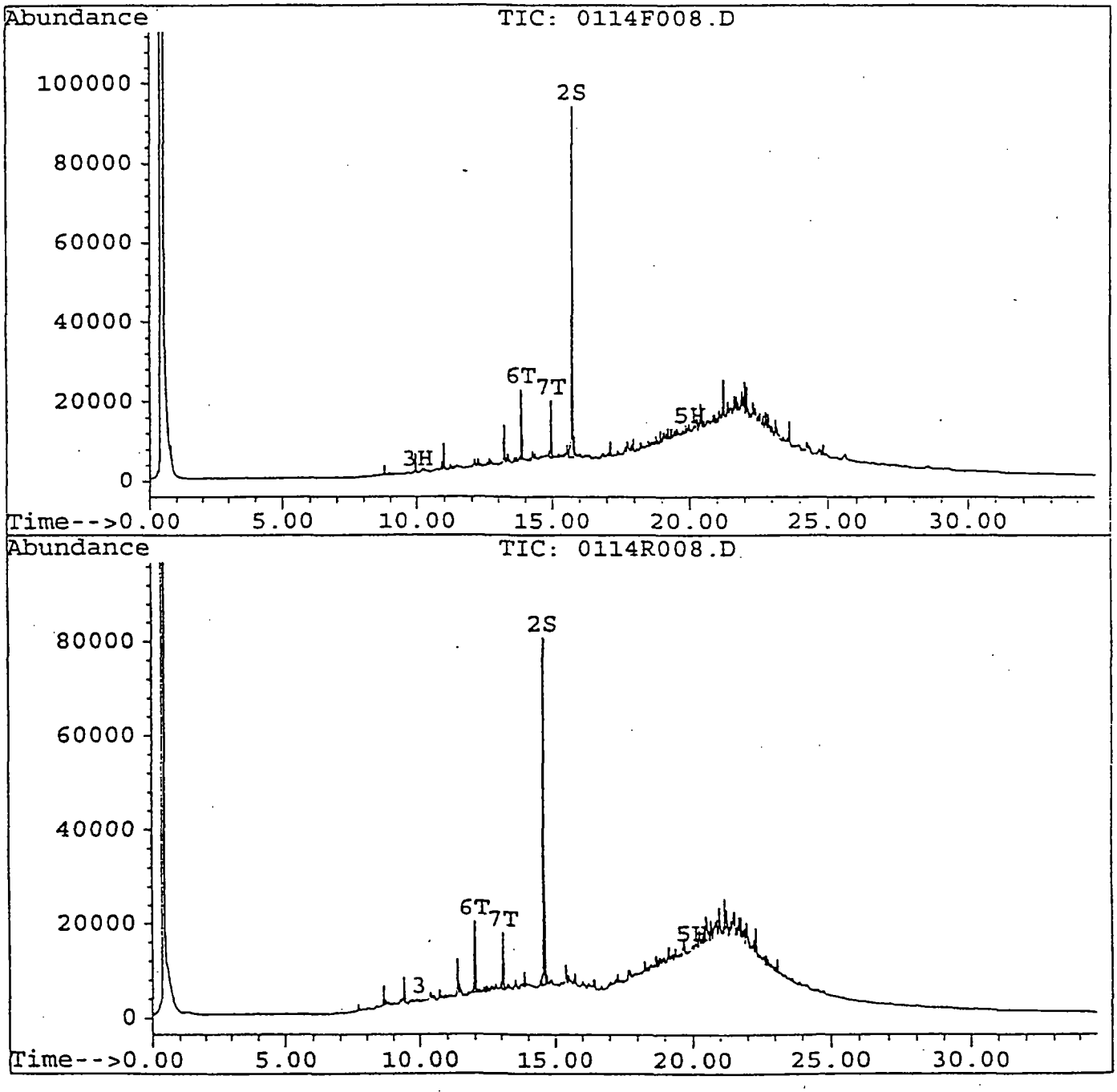
POPA0007632

Quantitation Report

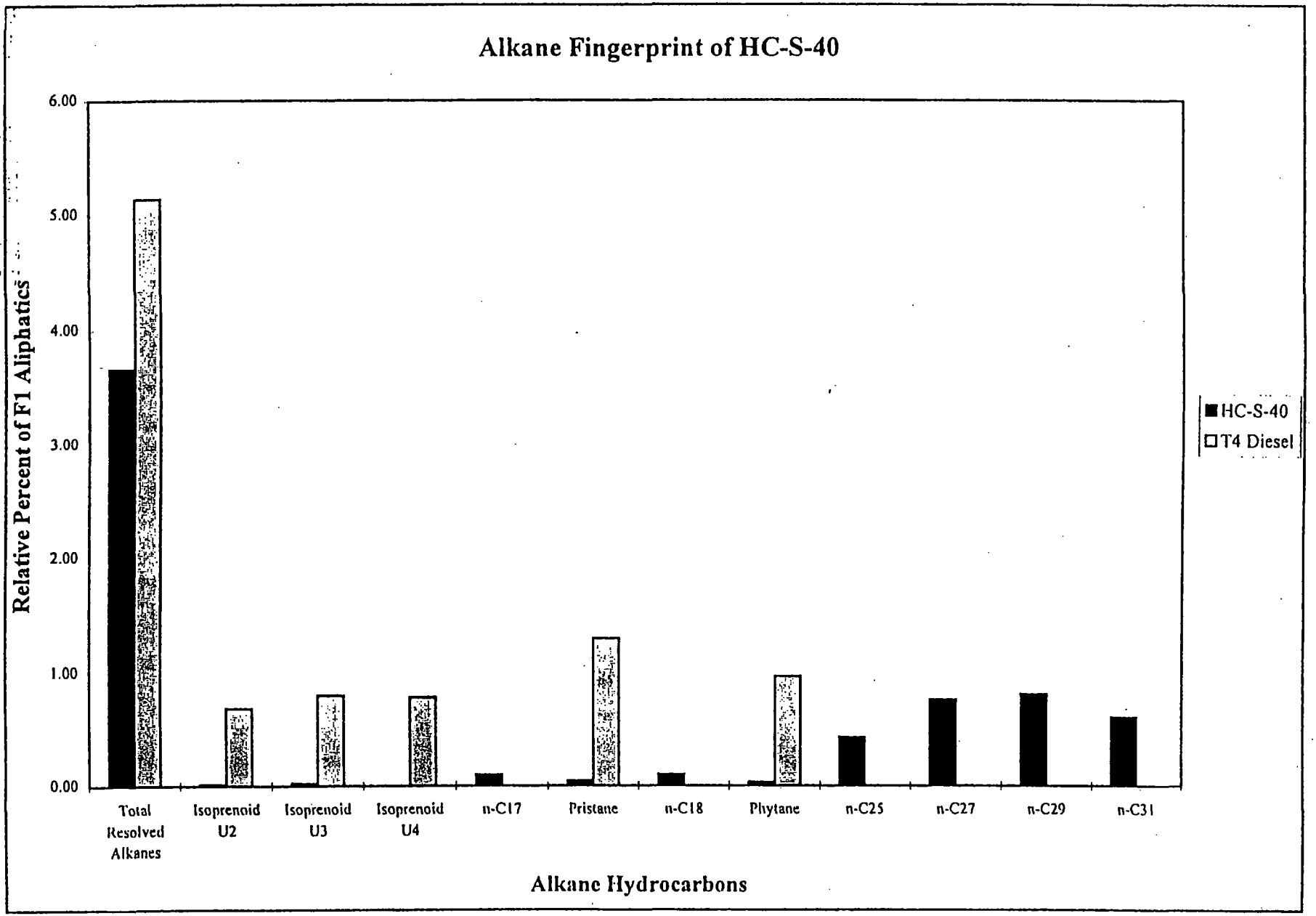
Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F008.D Vial: 9
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F008.D\0114R008.D
Acq On : 14 Jan 99 09:24 PM Operator: LLANDAUEF
Sample : K9807169-002 Inst : GC15
Misc : F=2 D=1 A=12.2 Multiplr: 1.00
Quant Time: Jan 16 13:32 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



POPA0007633 00182

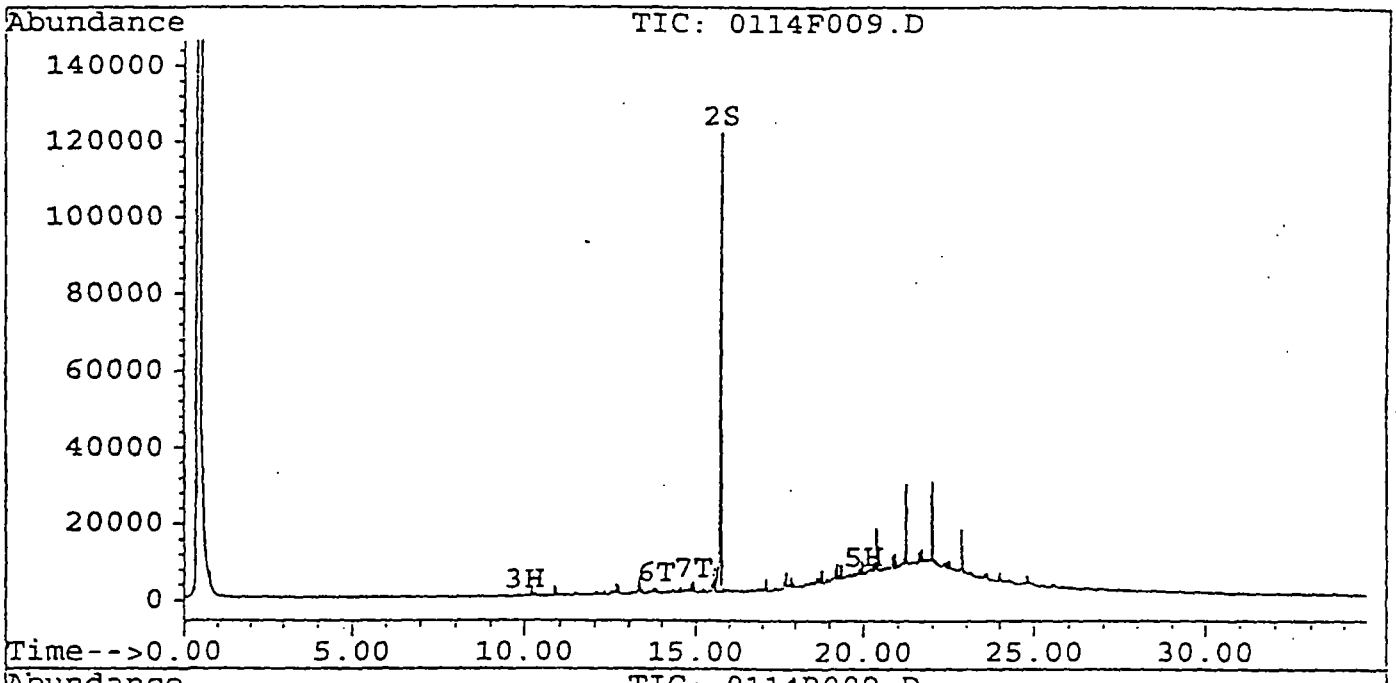


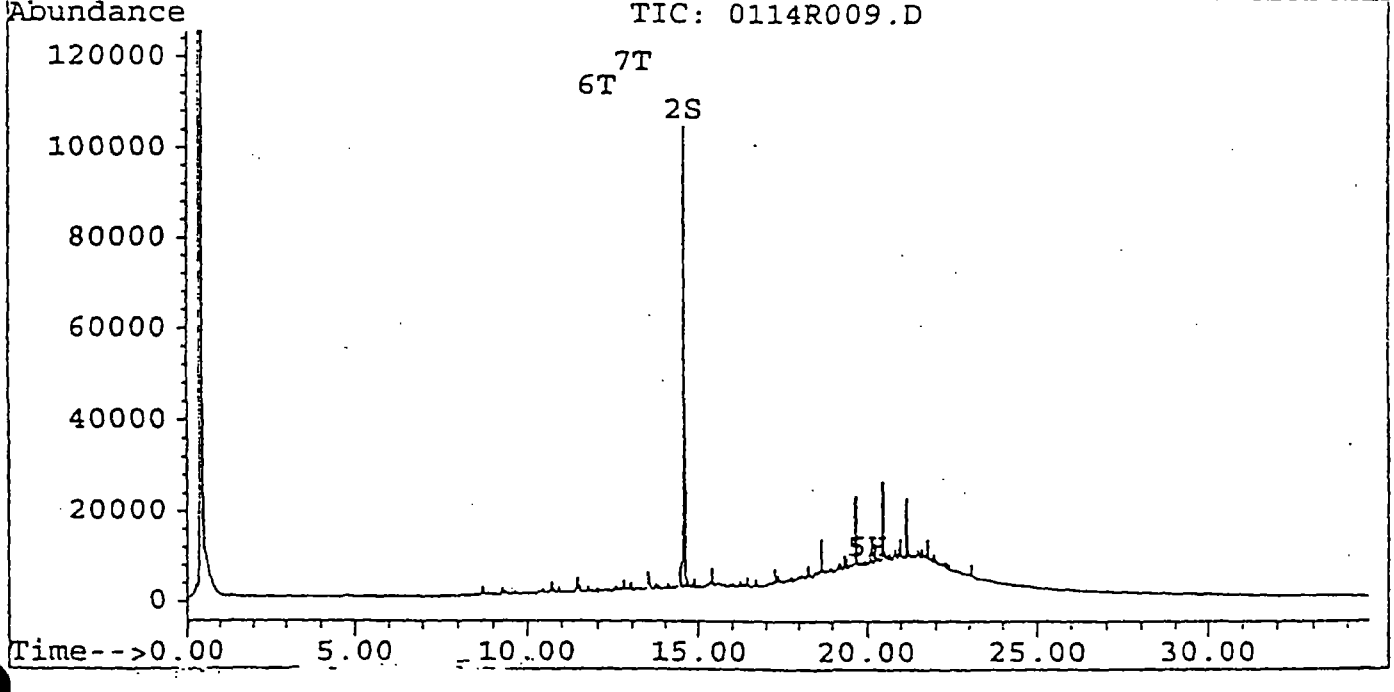
POPA0007634

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F009.D Vial: 10
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F009.D\0114R009.D
Acq On : 14 Jan 99 10:06 PM Operator: LLANDAU
Sample : K9807169-003 Inst : GC15
Misc : F=1 D=1 A=8.6 Multiplr: 1.00
Quant Time: Jan 18 18:30 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

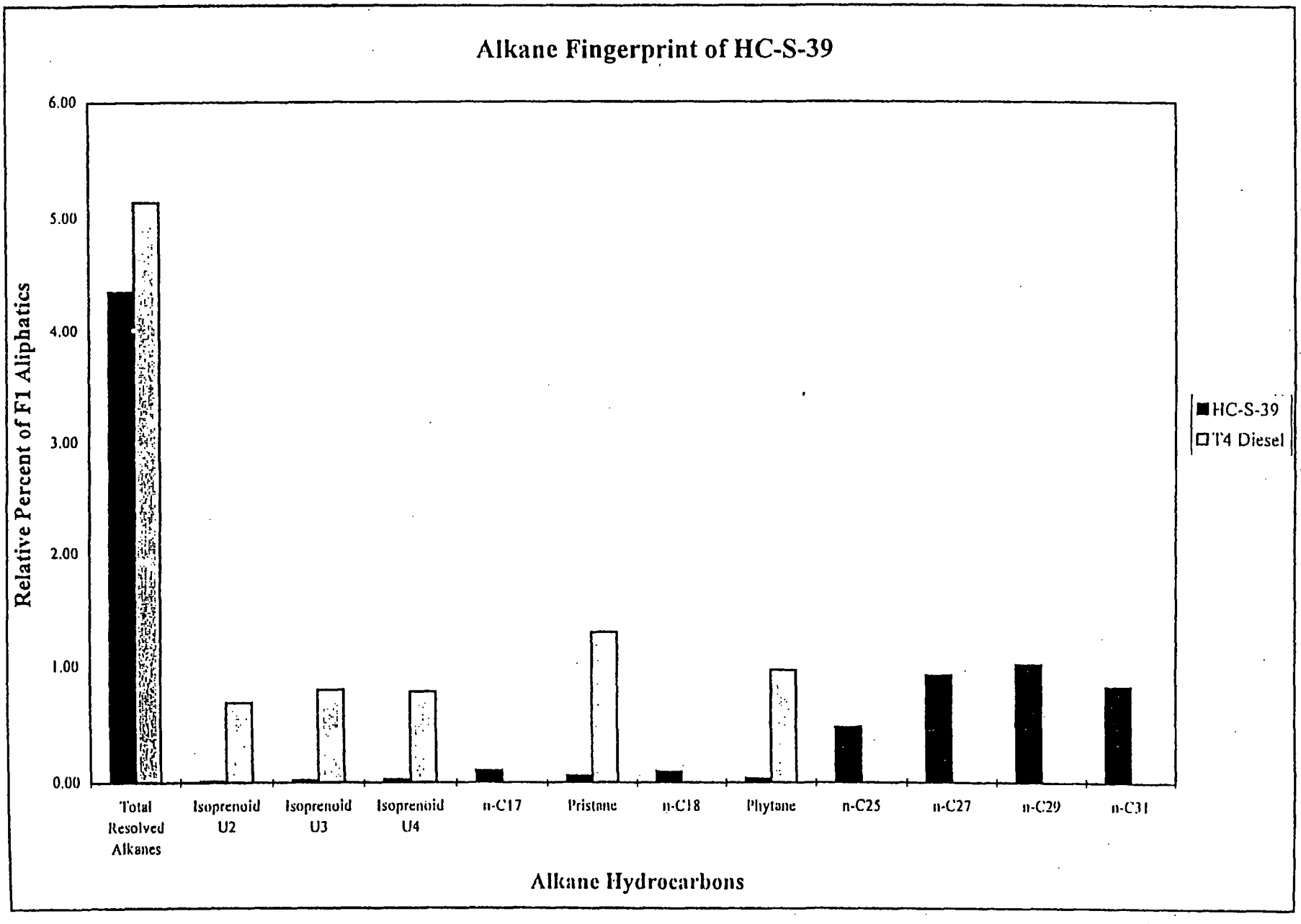
Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm





00184

POPA0007635

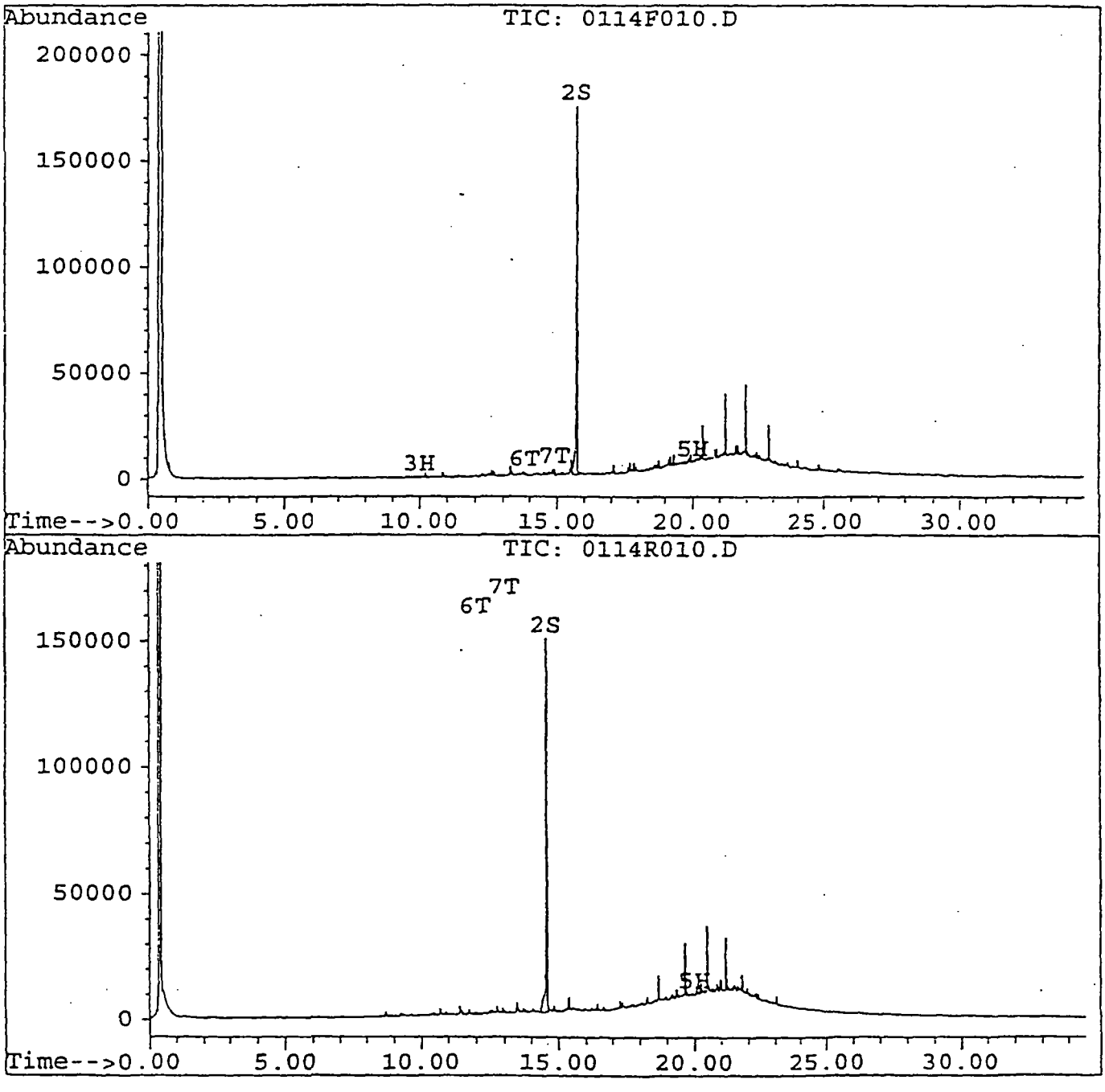


POPA0007936

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F010.D Vial: 11
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F010.D\0114R010.D
Acq On : 14 Jan 99 10:47 PM Operator: LLANDAUE
Sample : K9807169-004 Inst : GC15
Misc : F=1 D=1 A=8.9 Multiplr: 1.00
Quant Time: Jan 18 18:31 1999

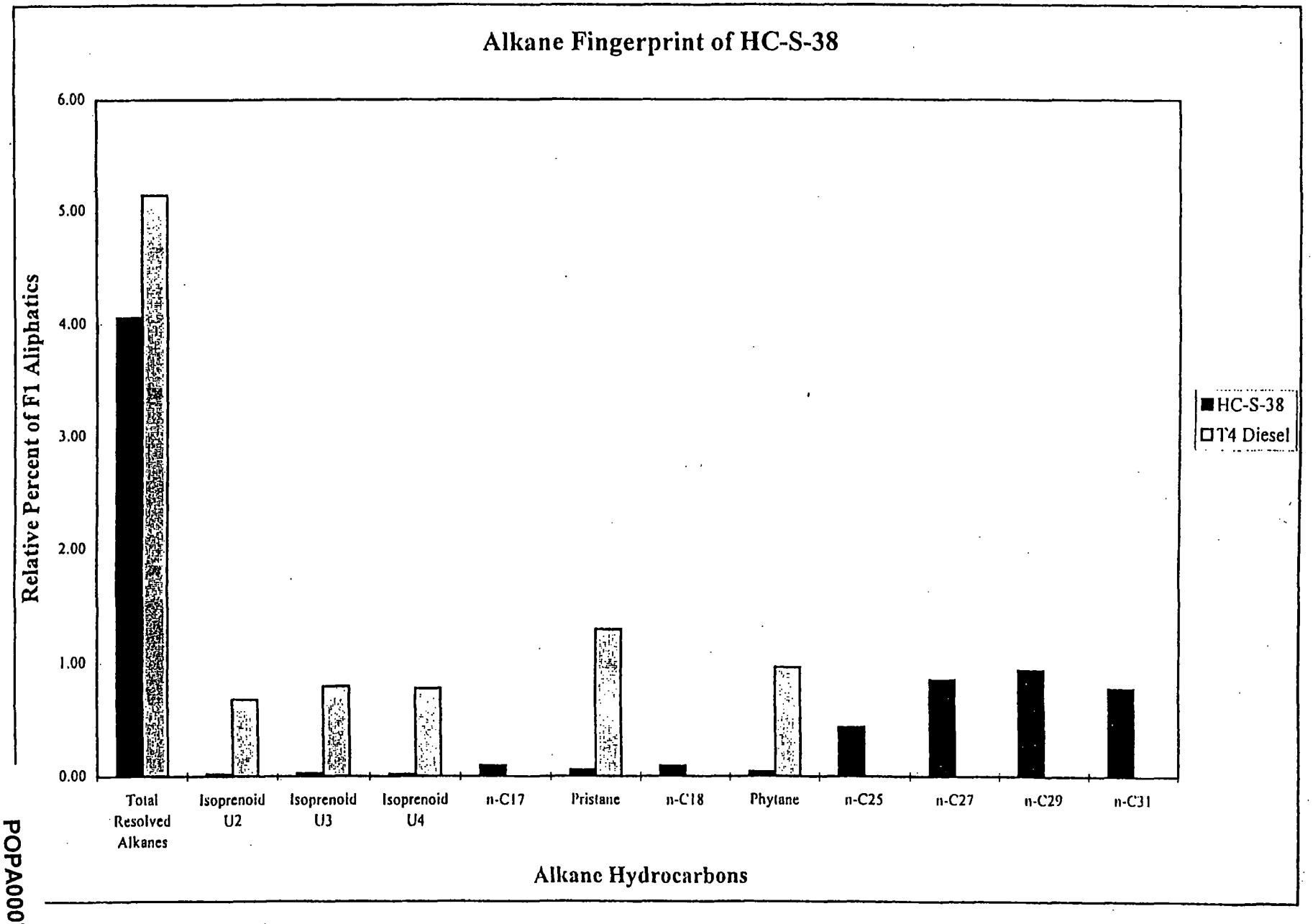
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00186

POPA0007637

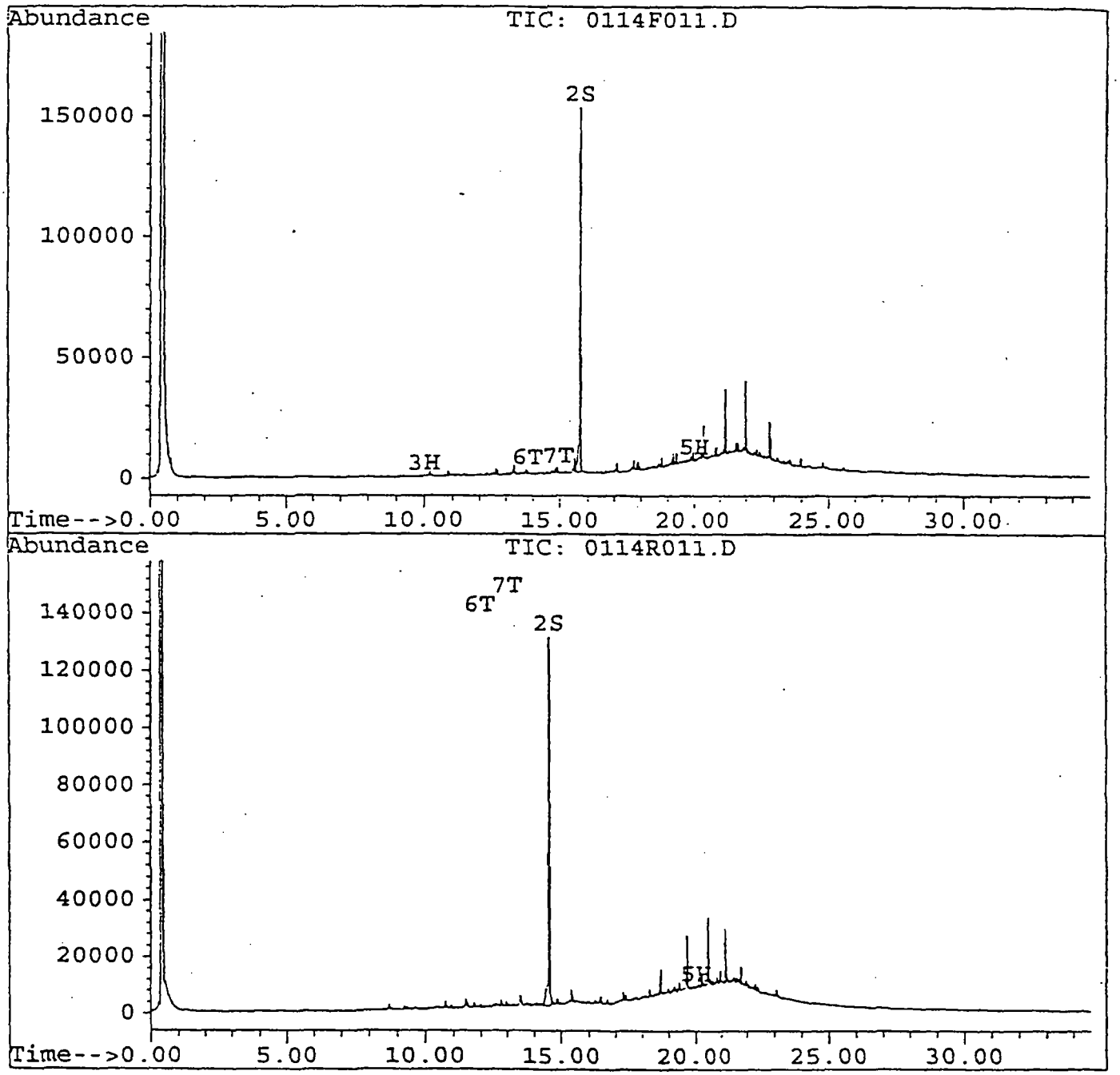


POPA0007638

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F011.D Vial: 12
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F011.D\0114R011.D
Acq On : 14 Jan 99 11:29 PM Operator: LLANDAU
Sample : K9807169-005 Inst : GC15
Misc : F=1 D=1 A=9.3 Multiplr: 1.00
Quant Time: Jan 18 18:32 1999

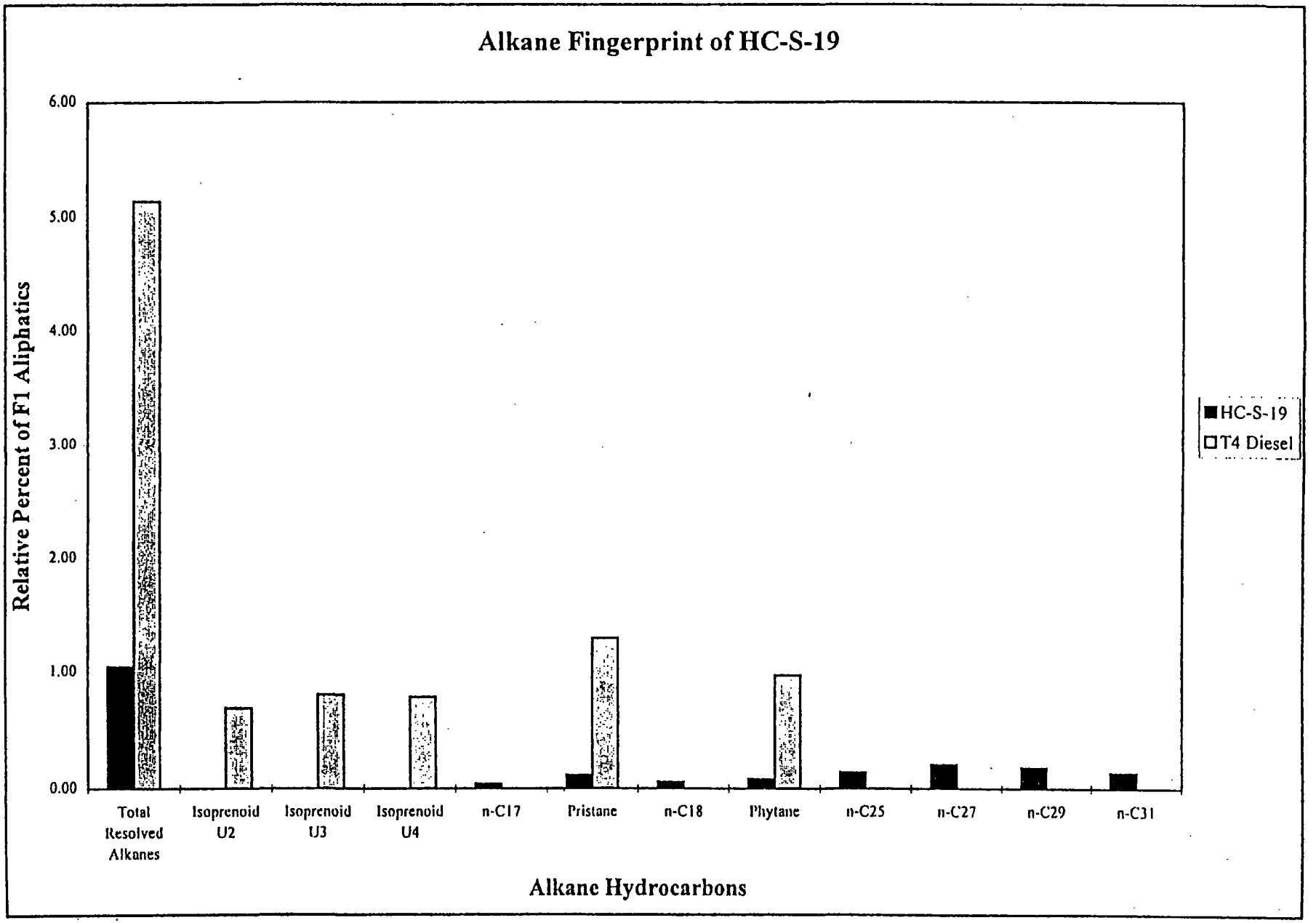
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00188

POPA0007639

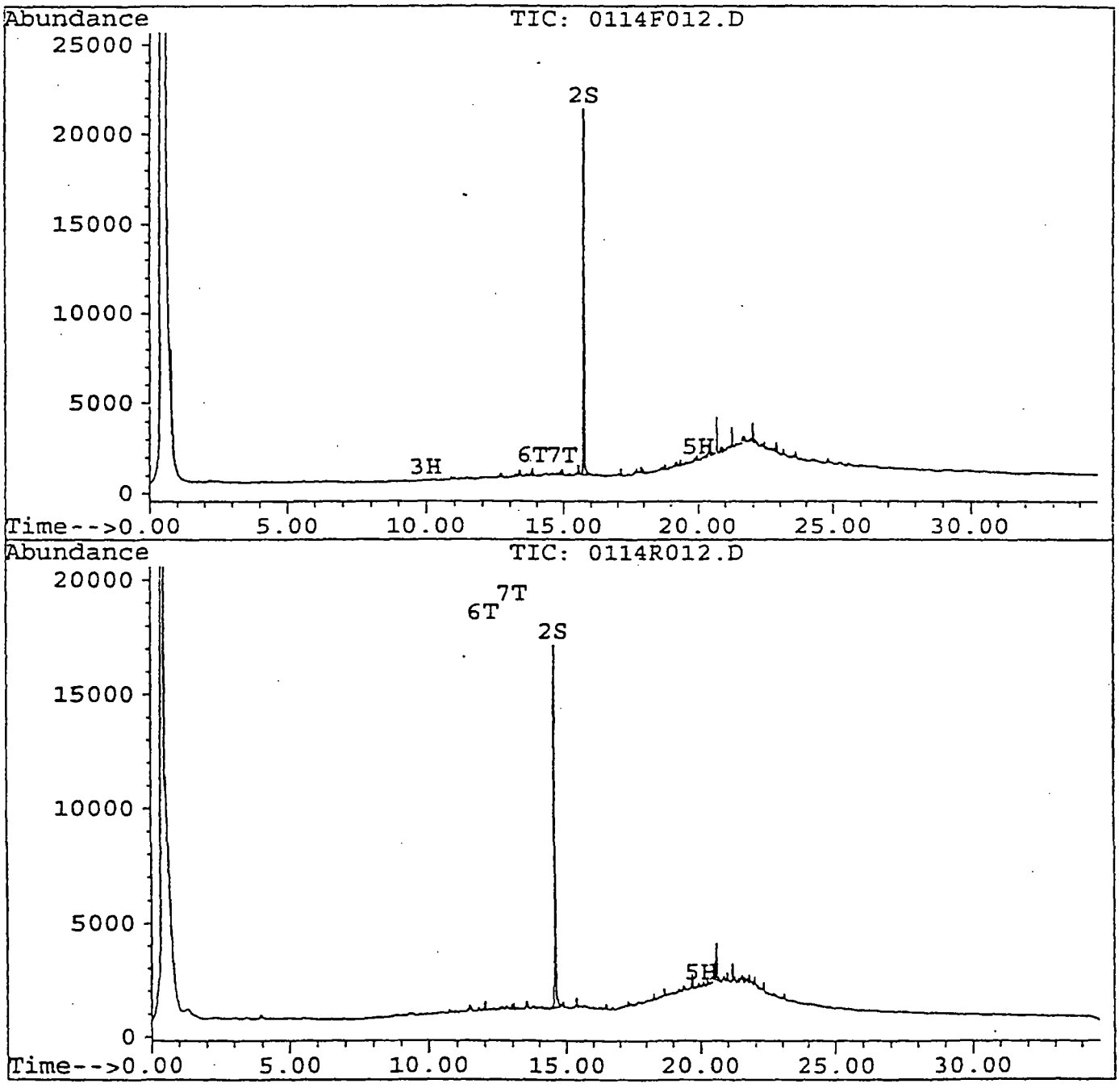


POPA0007640

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F012.D Vial: 13
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F012.D\0114R012.D
Acq On : 15 Jan 99 00:11 AM Operator: LLANDAUI
Sample : K9807169-013 Inst : GC15
Misc : F=10 D=1 A=15.8 Multiplr: 1.00
Quant Time: Jan 18 18:33 1999

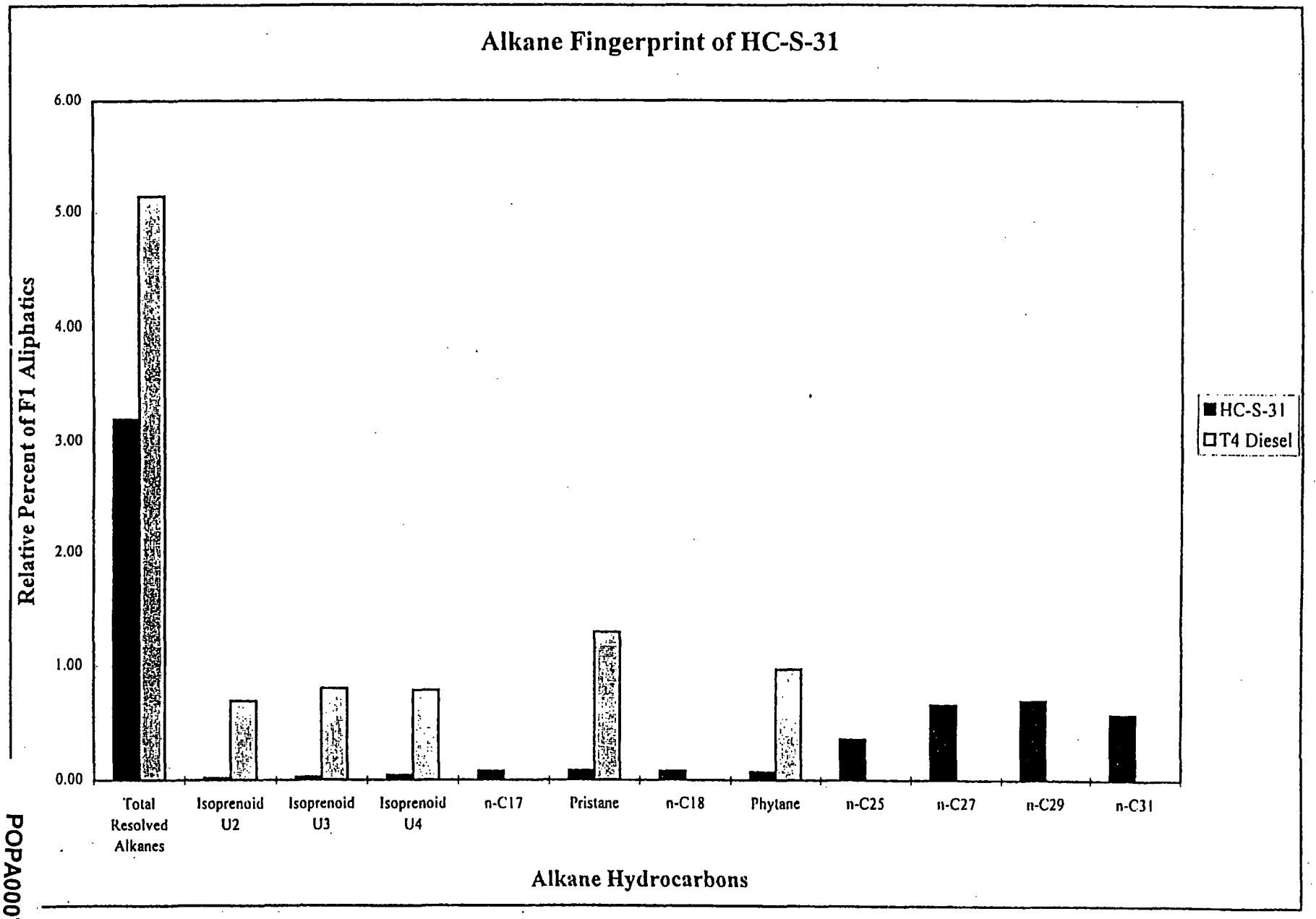
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00190

POPA0007641

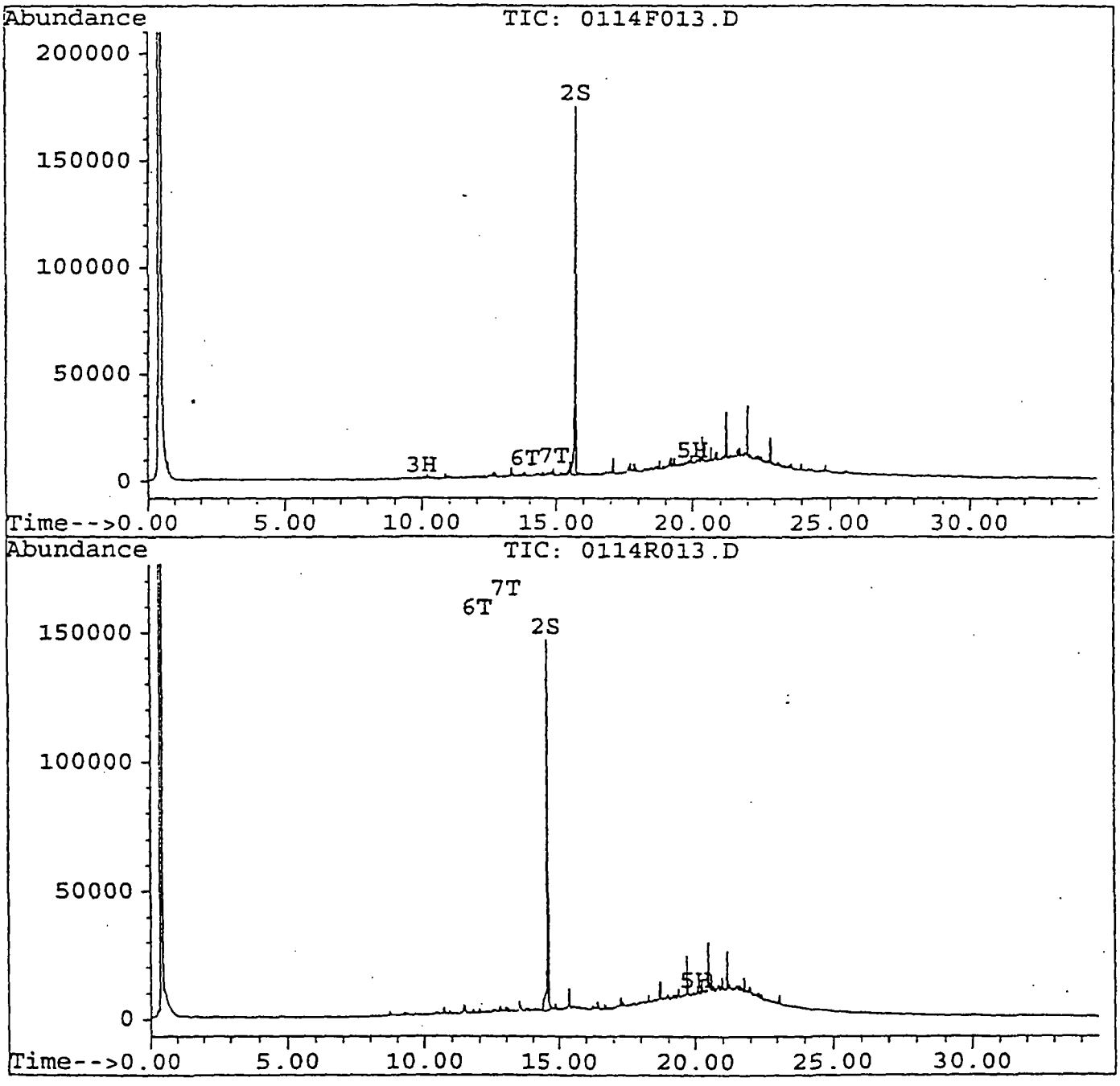

Alkane Fingerprint of HC-S-31
Relative Percent of F1 Aliphatics
6.00
5.00
4.00
3.00
2.00
1.00
0.00
HC-S-31
T4 Diesel
Total Resolved Alkanes
Isoprenoid U2
Isoprenoid U3
Isoprenoid U4
n-C17
Pristane
n-C18
Phytane
n-C25
n-C27
n-C29
n-C31
Alkane Hydrocarbons

POA0007642

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F013.D Vial: 14
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F013.D\0114R013.D
Acq On : 15 Jan 99 00:52 AM Operator: LLANDAUE
Sample : K9807169-016 Inst : GC15
Misc : F=1 D=1 A=9.7 Multiplr: 1.00
Quant Time: Jan 18 18:33 1999

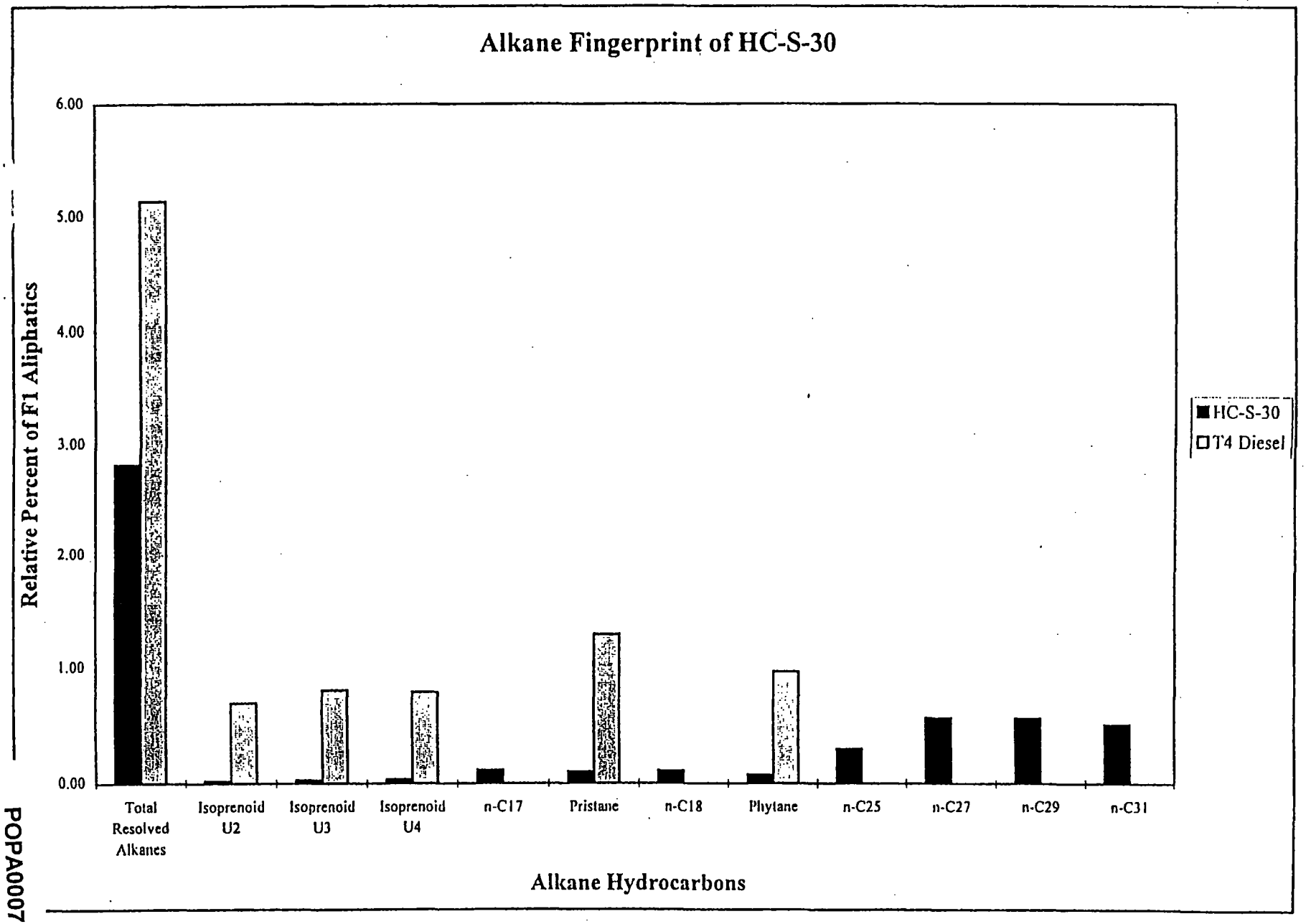
Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00192

POPA0007643

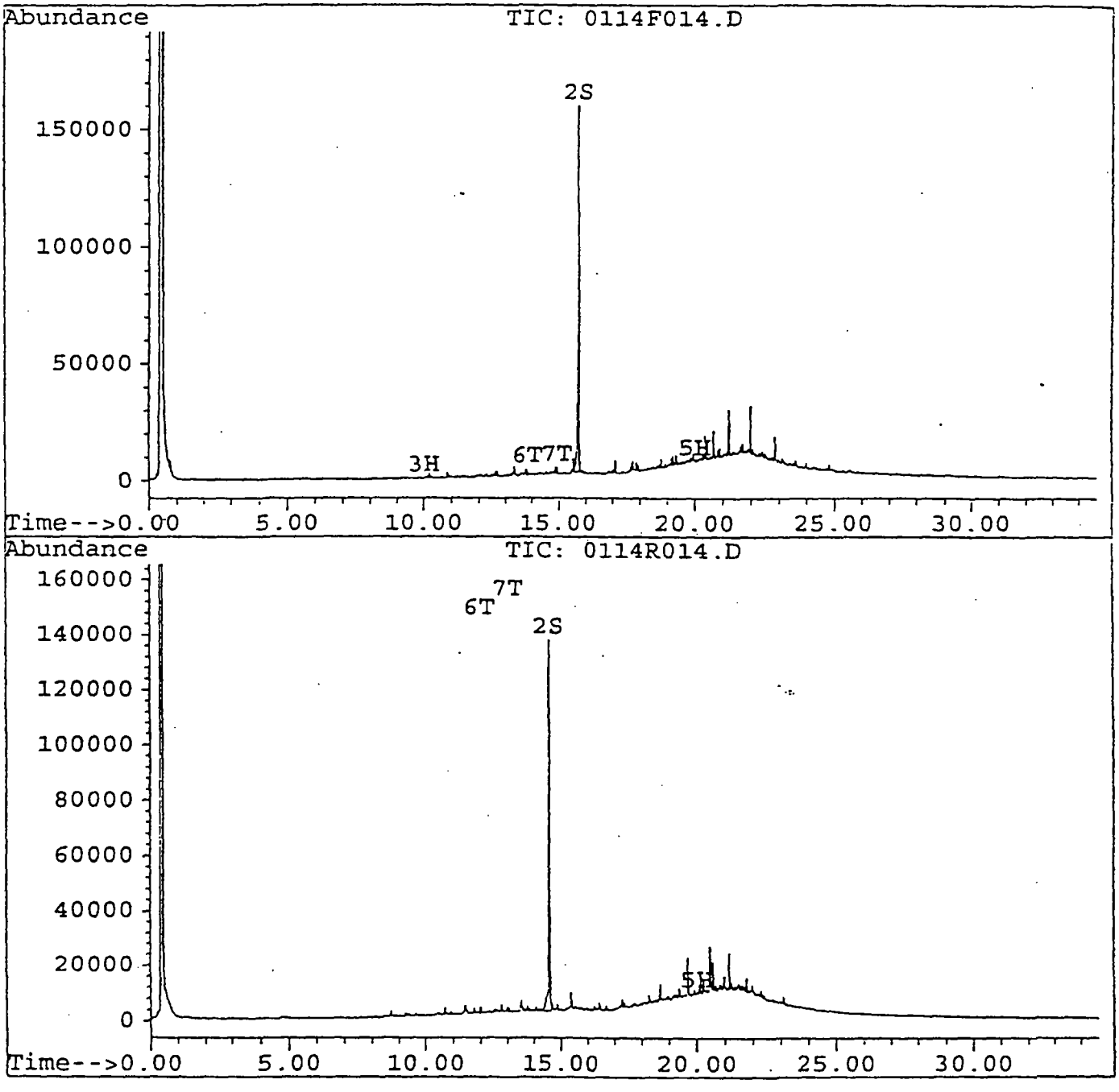


POPA0007644

Signal #1 : J:\GC15\DATA\011499\HARTPPCH\0114F014.D Vial: 15
Signal #2 : J:\GC15\DATA\011499\HARTPPCH\0114F014.D\0114R014.D
Acq On : 15 Jan 99 01:34 AM Operator: LLANDAU
Sample : K9807169-017 Inst : GC15
Misc : F=1 D=1 A=10.7 Multiplr: 1.00
Quant Time: Jan 18 18:34 1999

Method : J:\GC15\METHODS\PPCH0113.M
Title : Pencil Pitch Special Project ical 10/28-30/98
Last Update : Sat Jan 16 13:24:56 1999
Response via : Multiple Level Calibration

Volume Inj. : 2 ul
Signal #1 Phase : RTX 5 Signal #2 Phase: RTX 200
Signal #1 Info : 0.53 mm Signal #2 Info : 0.53 mm



00194

POPA0007645

Appendix C

Analytical Results

NWTPH-Dx Screen Results

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K98070
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-VC-11-S2	Units:	mg/Kg (ppm)
Lab Code:	K9807097-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	2300	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	24	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1S22/020597p

07097PHC.AG2 - 2/2/99

POPA0007650

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-01	Units:	mg/Kg (ppm
Lab Code:	K9807097-031	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	2100	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	11000	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	5.3	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	5.5	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	120	

Approved By: _____ Date: 2/12/99

POPA0007651

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K98070
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-02	Units:	mg/Kg (ppm)
Lab Code:	K9807097-032	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<200	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	5200	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	0.6	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	0.8	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	58	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1522/020597p

07097PHC.AG2 - 2/1/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-03	Units:	mg/Kg (ppm)
Lab Code:	K9807097-033	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	3600	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/23/98	10/26/98	37	

B The MRL is elevated because of matrix interferences.

Approved By: [signature] Date: 2/12/99

22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-04	Units:	mg/Kg (ppm)
Lab Code:	K9807097-034	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	640	E
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	2200	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	1.3	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.9	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	18	

E Estimated concentration. The result is probably high bias due to the presence of Pencil Pitch in the sample.

Approved By: _____ Date: 2/12/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807097
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/13/98
Sample Matrix:	Sediment	Date Received:	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-05	Units:	mg/Kg (ppm)
Lab Code:	K9807097-035	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	550	E
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1600	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	1.5	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.9	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	15	

E Estimated concentration. The result is probably high bias due to the presence of Pencil Pitch in the sample.

Approved By: _____ Date: 2/12/99

POPA0007655

1522/020597p

07097PHCAG1 - 2/1/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980709
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-06	Units:	mg/Kg (ppm)
Lab Code:	K9807097-036	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	440	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1900	E
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	1.0	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	1.0	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	12	

E Estimated concentration. The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 2/12/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-07	Units:	mg/Kg (ppm)
Lab Code:	K9807097-037	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	400	E
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1800	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.8	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.6	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	15	

E — Estimated concentration. The result is probably high bias due to the presence of Pencil Pitch in the sample.

Approved By: _____ Date: 2/12/99

POPA0007657

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980705
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-08	Units:	mg/Kg (ppm
Lab Code:	K9807097-038	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1900	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.6	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	16	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807097
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/13/98
Sample Matrix:	Sediment	Date Received:	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-09	Units:	mg/Kg (ppm)
Lab Code:	K9807097-039	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	3000	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	0.6	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	36	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980709
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-101	Units:	mg/Kg (ppm)
Lab Code:	K9807097-040	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/23/98	10/31/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/23/98	10/31/98	1900	
Pristane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	1	1	10/23/98	10/31/98	16	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-10	Units:	mg/Kg (ppm)
Lab Code:	K9807115-001	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	960	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	7.4	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1522/020599p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-11	Units:	mg/Kg (ppm
Lab Code:	K9807115-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	750	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	6.6	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807115
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/14/98
Sample Matrix:	Sediment	Date Received:	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-12	Units:	mg/Kg (ppm)
Lab Code:	K9807115-003	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	360	E
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1500	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.8	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.5	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	14	

E — Estimated concentration. The result is probably high biased due to the presence of Pencil Pitch in the sample.

Approved By: _____ Date: 2/12/99

POPA0007663

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-13	Units:	mg/Kg (ppm
Lab Code:	K9807115-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/1/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/1/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/1/98	600	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/1/98	4.1	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980711
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-14	Units:	mg/Kg (pp
Lab Code:	K9807115-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Resul Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	310	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	7.2	

B The MRL is elevated because of matrix interferences.

POPA0007665

Approved By: [signature] Date: 2/12/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-16	Units:	mg/Kg (ppm)
Lab Code:	K9807115-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	410	E
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1700	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.7	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.6	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	26	

E Estimated concentration. The result is probably high biased due to the presence of Pencil Pitch in the sample.

Approved By: _____ Date: 2/12/99

1522/020597g

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807115
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/14/98
Sample Matrix:	Sediment	Date Received:	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-17	Units:	mg/Kg (ppm)
Lab Code:	K9807115-008	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1100	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	9.3	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

POPA0007667

1S22/0220597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807115
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/14/98
Sample Matrix:	Sediment	Date Received:	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-22	Units:	mg/Kg (ppm)
Lab Code:	K9807115-009	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1100	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	7.4	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

POPA0007668

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-23	Units:	mg/Kg (ppm)
Lab Code:	K9807115-010	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1700	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.5	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	14	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-24	Units:	mg/Kg (ppm)
Lab Code:	K9807115-011	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/3/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/3/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/3/98	4500	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	0.5	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	100	

B The MRL is elevated because of matrix interferences.

Approved By: [signature] Date: 2/12/99

1S22/020597p

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-102	Units:	mg/Kg (ppm)
Lab Code:	K9807115-012	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/3/98	ND	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/3/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/3/98	2100	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/3/98	33	

Approved By: _____ Date: 2/12/99

1522/020397p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-25	Units:	mg/Kg (ppm)
Lab Code:	K9807115-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	960	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	1100	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<300	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	7.0	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	6.1	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	4.1	

E Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.
B The MRL is elevated because of matrix interferences.

Approved By: [signature] Date: 2/12/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807115
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/14/98
Sample Matrix:	Sediment	Date Received:	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-26	Units:	mg/Kg (ppm
Lab Code:	K9807115-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	560	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	5.0	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

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1S22/020597p

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-27	Units:	mg/Kg (ppm)
Lab Code:	K9807115-015	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1400	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	8.1	

B	The MRL is elevated because of matrix interferences.
E	The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 2/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-28	Units:	mg/Kg (ppm
Lab Code:	K9807115-016	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	1100	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	0.5	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	6.1	

B The MRL is elevated because of matrix interferences.
E The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 2/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-29	Units:	mg/Kg (ppm
Lab Code:	K9807115-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	910	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	3.8	

B	The MRL is elevated because of matrix interferences.
E	The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 2/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-35	Units:	mg/Kg (ppm)
Lab Code:	K9807115-018	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	580	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	2.3	

B	The MRL is elevated because of matrix interferences.
E	The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 2/12/99

POPA0007677

1522/020597p

071115PHC_SWJ - 6 2/1/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-37	Units:	mg/Kg (ppm)
Lab Code:	K9807115-019	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	340	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	1.5	

B The MRL is elevated because of matrix interferences.
E Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.

Approved By: _____ Date: 2/10/99

1SZ1/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807115
Date Collected: 10/14/98
Date Received: 10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name: HC-S-32
Lab Code: K9807115-020
Test Notes:

Units: mg/Kg (ppm
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	860	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	2.8	

B The MRL is elevated because of matrix interferences.
E The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 2/12/99

1522/020597p

07115PHC_FW4 - 2/2/1999

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K98071
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-33	Units:	mg/Kg (ppm
Lab Code:	K9807115-021	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	230	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/24/98	11/2/98	400	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/24/98	11/2/98	<200	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/24/98	11/2/98	2.3	

E — Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.
B — The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807169
Project:	Port of Portland Terminal 4/5624-06	Date Collected:	10/15/98
Sample Matrix:	Sediment	Date Received:	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-18	Units:	mg/Kg (ppm)
Lab Code:	K9807169-012	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	2600	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	26	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

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1522/020397p

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00230

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K98071(
Project:	Port of Portland Terminal 4/5624-06	Date Collected:	10/15/98
Sample Matrix:	Sediment	Date Received:	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-19	Units:	mg/Kg (ppm
Lab Code:	K9807169-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	ND	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	14000	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	<1	B
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	180	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1522/020597p

07169PHC_SW3 - 2/12/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807169
Project:	Port of Portland Terminal 4/5624-06	Date Collected:	10/15/98
Sample Matrix:	Sediment	Date Received:	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-20	Units:	mg/Kg (ppm)
Lab Code:	K9807169-014	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	3700	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	0.5	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	36	

B The MRL is elevated because of matrix interferences.

Approved By: [signature] Date: 2/12/99

1522/020597p

07169PHC.JW3 - 3/2/1/99

POPA0007683

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-21	Units:	mg/Kg (ppm)
Lab Code:	K9807169-015	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	1800	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	10	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-31	Units:	mg/Kg (ppm
Lab Code:	K9807169-016	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	310	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	1.1	

B The MRL is elevated because of matrix interferences.
E Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.

Approved By: [signature] Date: 2/12/99

1S22/020597p

07169PHC.JW3 - 5 1/1/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K98071
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-30	Units:	mg/Kg (pp
Lab Code:	K9807169-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Resu Note
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	880	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	6.5	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-36	Units:	mg/Kg (ppm
Lab Code:	K9807169-001	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/3/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/3/98	160	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/3/98	<100	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/3/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/3/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/3/98	0.5	

B The MRL is elevated because of matrix interferences.
E Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.

Approved By: [signature] Date: 2/12/97

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07169PHC.JW1 - 1 2/1/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980716
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-34	Units:	mg/Kg (ppt
Lab Code:	K9807169-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Resul Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	480	
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	650	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<200	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	2.6	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	2.4	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	1.7	

B The MRL is elevated because of matrix interferences.
E Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sampl

Approved By: _____ Date: 2/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-40	Units:	mg/Kg (ppm)
Lab Code:	K9807169-003	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	770	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	4.4	

B The MRL is elevated because of matrix interferences.
E The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: [signature] Date: 2/12/99

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07169PHC.JW1 3 2/1/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980716.
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-39	Units:	mg/Kg (ppm
Lab Code:	K9807169-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	1200	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	9.8	

B The MRL is elevated because of matrix interferences.

Approved By: [signature] Date: 2/12/99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-38	Units:	mg/Kg (ppm)
Lab Code:	K9807169-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	2100	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	26	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 12/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K980716
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-44	Units:	mg/Kg (ppm
Lab Code:	K9807169-006	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	390	E
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	1.6	

B	The MRL is elevated because of matrix interferences.
E	Estimated concentration. The result has been reported as lube oil, but is probably due to heavy fuel oil in the sample.

Approved By: _____ Date: 2/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-43	Units:	mg/Kg (ppm
Lab Code:	K9807169-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	720	E
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	3.2	

B	The MRL is elevated because of matrix interferences.
E	The result is probably high biased due to the presence of heavy fuel oil in the sample.

Approved By: _____ Date: 2/12/99

1522/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-42	Units:	mg/Kg (ppm)
Lab Code:	K9807169-008	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	1800	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	15	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 2/12/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Semivolatile Petroleum Products
Northwest TPH-Dx

Sample Name:	HC-S-41	Units:	mg/Kg (ppm
Lab Code:	K9807169-009	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Diesel	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	<100	B
Lube Oil	EPA 3550B	NWTPH-Dx	100	1	10/28/98	11/4/98	ND	
Pencil Pitch	EPA 3550B	NWTPH-Dx	25	1	10/28/98	11/4/98	2400	
Pristane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Phytane	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	ND	
Fluoranthene	EPA 3550B	NWTPH-Dx	0.5	1	10/28/98	11/4/98	23	

B The MRL is elevated because of matrix interferences.

Approved By: _____ Date: 11/12/98

1522/020597p

07169PHC_SW2 - 3/1/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98
		Date Extracted:	10/23/98
		Date Analyzed:	1/11-2/12/99

Total Petroleum Hydrocarbons as Diesel and Pencil Pitch
GC-FID
Units: mg/Kg (ppm)
Dry Weight Basis

	Analyte:	Diesel	Pencil Pitch
	Method Reporting Limit:	25	25
Sample Name	**Lab Code**		
HC-S-01	K9807097-031	640	4300
HC-S-02	K9807097-032	130	3400
HC-S-03	K9807097-033	600	3300
HC-S-04	K9807097-034	360	1500
HC-S-05	K9807097-035	320	890
HC-S-06	K9807097-036	270	940
HC-S-07	K9807097-037	180	970
Method Blank	K981023-MB	ND	3400

Approved By: _____ Date: 2/16/99

2A/102094

07097PHC.LL1 - TPH= 2/16/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98
		Date Extracted:	10/24/98
		Date Analyzed:	1/11-2/12/99

Total Petroleum Hydrocarbons as Diesel and Pencil Pitch
GC-FID
Units: mg/Kg (ppm)
Dry Weight Basis

	Analyte:	Diesel	Pencil Pitch
	Method Reporting Limit:	25	25
Sample Name	**Lab Code**		
HC-S-12	K9807115-003	160	1300
HC-S-16	K9807115-007	190	1400
HC-S-23	K9807115-010	160	1200
HC-S-24	K9807115-011	130	2800
HC-S-25	K9807115-013	660	960
HC-S-33	K9807115-021	210	570
Method Blank	K981024-MB	ND	ND

Approved By: [signature] Date: 2/16/99

2A/102094
07115PHC.LL1 - TPHs 2/16/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98
		Date Extracted:	10/28/98
		Date Analyzed:	1/11-2/12/99

Total Petroleum Hydrocarbons as Diesel and Pencil Pitch
GC-FID
Units: mg/Kg (ppm)
Dry Weight Basis

	Analyte:	Diesel	Pencil Pitch
	Method Reporting Limit:	25	25
Sample Name	**Lab Code**		
HC-S-36	K9807169-001	100	100
HC-S-34	K9807169-002	360	430
HC-S-40	K9807169-003	99	310
HC-S-39	K9807169-004	120	610
HC-S-38	K9807169-005	110	1500
HC-S-19	K9807169-013	110	11000
HC-S-31	K9807169-016	120	250
HC-S-30	K9807169-017	110	780
Method Blank	K981028-MB	ND	ND

Approved By: _____ Date: 2/16/99

2A102084

67169PHC.LL1 - TPHS 2/16/99

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F022.D
Acq On : 15 Jan 99 07:13 AM
Sample : Site specific diesel
Misc : F=1 D=1 A=1 2000 ppm

Vial: 35
Operator: LLANDAUER
Inst : GC15

F=Final Volume (mls)= 1
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 1
Conversion Factor=(F*D)/A= 1
Matrix= Water

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
2) Undecane	0.00	5.66	0	5124	0.00	1.92	0.00	1.92	ppb	0.00
3) Dodecane	0.00	6.86	0	2920	0.00	1.02	0.00	1.02	ppb	0.00
4) Isoprenoid U1	8.76	7.70	21678	22925	8.07	8.12	8.07	8.12	ppb	8.07
5) Tridecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
6) Isoprenoid U2	9.93	8.63	26950	21578	9.39	7.56	9.39	7.56	ppb	9.39
7) Tetradecane	10.18	0.00	5367	0	1.83	0.00	1.83	0.00	ppb	0.00
8) Isoprenoid U3	10.98	9.39	31956	25304	10.91	8.49	10.91	8.49	ppb	10.91
9) Pentadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
10) Hexadecane	0.00	10.66	0	12555	0.00	4.17	0.00	4.17	ppb	0.00
11) Isopreniod U4	13.19	11.36	31630	30686	10.69	10.19	10.69	10.19	ppb	10.69
12) Heptadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
13) Pristane	13.83	12.00	50486	52234	17.63	17.23	17.63	17.23	ppb	17.63
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
15) Phytane	14.95	13.05	36921	30181	13.19	10.37	13.19	10.37	ppb	13.19
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
18) Heneicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
20) Tricosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
22) Pentacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
24) Heptacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
26) Nonacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
28) Hentriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
30) Tritriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
31) Tetratriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
34) Heptatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00

Total Resolved ALKANES (TRA): 69.88 ppb
Total ISOPRENOIDS (TI): 69.88 ppb
TI/(TRA-TI): 100.00 *

Evaluation 1: good match
Evaluation 2: good match
Evaluation 3: good match

C25-C31 Odds: 0 ppm
TPH Background (diesel range): 0 ppm
TPH Background (C10 - C36) 0 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007701

0114F022.D A_EPHPAH.MTH

00250

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F005.D
Acq On : 14 Jan 99 07:18 PM
Sample : K981028-SB
Misc : F=5 D=1 A=20.2

Vial: 6
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 5
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 20.2
Conversion Factor=(F*D)/A= 0.24752
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
2) Undecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
3) Dodecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
4) Isoprenoid U1	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
5) Tridecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
6) Isoprenoid U2	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
7) Tetradecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
8) Isoprenoid U3	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
9) Pentadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
10) Hexadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
11) Isopreniod U4	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
12) Heptadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
13) Pristane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.0
20) Tricosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.0
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
24) Heptacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
26) Nonacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
31) Tetratriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 0.00 ppm
Total ISOPRENOIDS (TI): 0.00 ppm
TI/(TRA-TI): 100.00 *

Evaluation 1: good match
Evaluation 2: #
Evaluation 3: #

C25-C31 Odds: 0 ppm
TPH Background (diesel range): 0 ppm
TPH Background (C10 - C36) 0 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007702

00251

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F006.D
Acq On : 14 Jan 99 08:00 PM
Sample : K981028-SL
Misc : F=5 D=1 A=20.5

Vial: 7
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul Signal #2 Phase : RTx-200
Signal #1 Phase : RTx-5 Signal #2 Info : 0.53
Signal #1 Info : 0.53

F=Final Volume (mls)= 5
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 20.5
Conversion Factor=(F*D)/A= 0.2439
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.62	4.22	60717	56292	20.15	20.70	4.92	5.05	ppm	4.92
2) Undecane	6.94	5.70	101686	105766	35.52	39.57	8.66	9.65	ppm	8.66
3) Dodecane	8.04	6.85	109650	121852	40.83	42.52	9.96	10.37	ppm	9.96
4) Isoprenoid U1	8.76	7.70	44741	23435	16.66	8.30	4.06	2.02	ppm	4.06
5) Tridecane	9.04	7.83	117965	129865	41.11	45.48	10.03	11.09	ppm	10.03
6) Isoprenoid U2	9.93	8.63	33575	25496	11.70	8.93	2.85	2.18	ppm	2.85
7) Tetradecane	10.22	8.71	140326	119694	47.92	40.14	11.69	9.79	ppm	11.69
8) Isoprenoid U3	10.98	9.40	44917	43368	15.34	14.54	3.74	3.55	ppm	3.74
9) Pentadecane	11.45	9.64	148777	138764	51.09	46.92	12.46	11.44	ppm	12.46
10) Hexadecane	12.63	10.71	133507	129283	45.11	42.94	11.00	10.47	ppm	11.00
11) Isopreniod U4	13.19	11.37	52484	36886	17.73	12.25	4.33	2.99	ppm	4.33
12) Heptadecane	13.77	11.76	119838	113207	41.13	39.64	10.03	9.67	ppm	10.03
13) Pristane	13.83	12.01	64395	65347	22.49	21.56	5.48	5.26	ppm	5.48
14) Octadecane	14.85	12.77	100134	97885	33.96	33.40	8.28	8.15	ppm	8.28
15) Phytane	14.95	13.05	49995	42476	17.87	14.59	4.36	3.56	ppm	4.36
16) Nonadecane	15.88	13.73	86041	78326	29.23	26.67	7.13	6.51	ppm	7.13
17) Eicosane	17.02	14.65	64708	66365	21.69	22.73	5.29	5.54	ppm	5.29
18) Heneicosane	17.97	15.52	45699	44938	16.18	16.12	3.95	3.93	ppm	3.95
19) Docosane	18.71	16.42	29276	32665	9.83	11.23	2.40	2.74	ppm	2.40
20) Tricosane	19.34	17.37	17422	15886	5.87	5.50	1.43	1.34	ppm	1.43
21) Tetracosane	19.88	18.10	9640	9038	3.07	3.02	0.75	0.74	ppm	0.75
22) Pentacosane	20.37	18.71	5104	4374	1.67	1.47	0.41	0.36	ppm	0.41
23) Hexacosane	20.81	19.23	2750	2534	0.90	0.85	0.22	0.21	ppm	0.22
24) Heptacosane	21.23	19.70	1738	1191	0.57	0.40	0.14	0.10	ppm	0.14
25) Octacosane	21.61	20.11	701	697	0.22	0.22	0.05	0.05	ppm	0.05
26) Nonacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
31) Tetratriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 133.62 ppm
Total ISOPRENOIDS (TI): 24.82 ppm
TI/(TRA-TI): 0.23

Evaluation 1: biased by background
Evaluation 2: suspect false positive
Evaluation 3: good match

C25-C31 Odds: 0.55 ppm
TPH Background (diesel range): 14 ppm
TPH Background (C10 - C36) 19 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.
Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.
Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

0114F006.D A_EPHPAH.MTH

POPA0007703

00252

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F019.D
Acq On : 15 Jan 99 05:03 AM
Sample : K9807097-031
Misc : F=10 D=1 A=8.01

Vial: 16
Operator: LLANDAUER
Inst : GC15

F=Final Volume (mls)= 10
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 8.01
Conversion Factor=(F*D)/A= 1.24844
Matrix= Water

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
2) Undecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
3) Dodecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
4) Isoprenoid U1	8.77	7.71	419	203	0.16	0.07	0.19	0.09	ppb	0.19
5) Tridecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
6) Isoprenoid U2	9.93	8.64	1039	678	0.36	0.24	0.45	0.30	ppb	0.45
7) Tetradecane	10.19	0.00	293	0	0.10	0.00	0.12	0.00	ppb	0.00
8) Isoprenoid U3	10.98	9.40	1617	1680	0.55	0.56	0.69	0.70	ppb	0.69
9) Pentadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
10) Hexadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
11) Isopreniod U4	13.19	11.37	4380	3740	1.48	1.24	1.85	1.55	ppb	1.85
12) Heptadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
13) Pristane	13.83	12.01	9859	9404	3.44	3.10	4.30	3.87	ppb	4.30
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
15) Phytane	14.95	13.05	8533	7504	3.05	2.58	3.81	3.22	ppb	3.81
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
18) Heneicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.(
20) Tricosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
22) Pentacosane	20.37	18.70	1368	591	0.45	0.20	0.56	0.25	ppb	0.56
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
24) Heptacosane	21.22	19.68	2501	1050	0.82	0.36	1.02	0.44	ppb	1.02
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
26) Nonacosane	21.99	20.48	2562	2726	0.83	0.92	1.04	1.15	ppb	1.04
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
28) Hentriacontane	22.86	21.16	3092	2381	1.04	0.83	1.30	1.04	ppb	1.30
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
30) Tritriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
31) Tetratriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
32) Pentatriacontane	25.57	22.31	1947	1506	0.68	0.55	0.85	0.68	ppb	0.85
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
34) Heptatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00

Total Resolved ALKANES (TRA):	16.06	ppb
Total ISOPRENOIDS (TI):	11.29	ppb
TI/(TRA-TI):	2.37	

Evaluation 1: good match
Evaluation 2: good match
Evaluation 3: good match

C25-C31 Odds: 3.92 ppm
TPH Background (diesel range): 97 ppm
TPH Background (C10 - C36) 132 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007704

0114F019.D EPHPAH.MTH

00253

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F020.D
Acq On : 15 Jan 99 05:45 AM
Sample : K9807097-032
Misc : F=2 D=1 A=11.3

Vial: 17
Operator: LLANDAUER
Inst : GC15

F=Final Volume (mls)= 2
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 11.3
Conversion Factor=(F*D)/A= 0.17699
Matrix= Soil

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
2) Undecane	6.94	5.71	279	293	0.10	0.11	0.02	0.02	ppm	0.02
3) Dodecane	0.00	6.87	0	221	0.00	0.08	0.00	0.01	ppm	0.00
4) Isoprenoid U1	8.77	7.71	723	404	0.27	0.14	0.05	0.03	ppm	0.05
5) Tridecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.64	1277	852	0.45	0.30	0.08	0.05	ppm	0.08
7) Tetradecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
8) Isoprenoid U3	10.98	9.40	2180	1667	0.74	0.56	0.13	0.10	ppm	0.13
9) Pentadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
10) Hexadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
11) Isopreniod U4	13.19	11.37	3804	3102	1.29	1.03	0.23	0.18	ppm	0.23
12) Heptadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
13) Pristane	13.83	12.01	7849	7368	2.74	2.43	0.49	0.43	ppm	0.49
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.05	6677	5848	2.39	2.01	0.42	0.36	ppm	0.42
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	2064	0	0.73	0.00	0.13	0.00	ppm	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
20) Tricosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	3429	1919	1.12	0.65	0.20	0.11	ppm	0.20
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
24) Heptacosane	21.22	19.68	6528	5315	2.13	1.80	0.38	0.32	ppm	0.38
25) Octacosane	0.00	20.09	0	2007	0.00	0.65	0.00	0.11	ppm	0.00
26) Nonacosane	21.99	20.47	7009	7503	2.28	2.53	0.40	0.45	ppm	0.40
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	7383	6183	2.48	2.16	0.44	0.38	ppm	0.44
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	0.00	21.77	0	3985	0.00	1.44	0.00	0.25	ppm	0.00
31) Tetratriacontane	24.82	0.00	3486	0	1.17	0.00	0.21	0.00	ppm	0.00
32) Pentatriacontane	25.56	22.31	3778	4244	1.32	1.54	0.23	0.27	ppm	0.23
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	27.75	23.08	2068	2561	0.72	0.95	0.13	0.17	ppm	0.13
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 3.20 ppm
Total ISOPRENOIDS (TI): 1.40 ppm
TI/(TRA-TI): 0.78

Evaluation 1: biased by background
Evaluation 2: good match
Evaluation 3: biased by background

C25-C31 Odds: 1.42 ppm
TPH Background (diesel range): 35 ppm
TPH Background (C10 - C36) 48 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.
Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.
Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007705

00254

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F021.D
Acq On : 15 Jan 99 06:26 AM
Sample : K9807097-033
Misc : F=2 D=1 A=11.4

Vial: 18
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 2
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 11.4
Conversion Factor=(F*D)/A= 0.17544
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
2) Undecane	6.94	5.72	208	220	0.07	0.08	0.01	0.01	ppm	0.01
3) Dodecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
4) Isoprenoid U1	8.77	0.00	434	0	0.16	0.00	0.03	0.00	ppm	0.00
5) Tridecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.64	502	249	0.17	0.09	0.03	0.02	ppm	0.03
7) Tetradecane	10.19	0.00	246	0	0.08	0.00	0.01	0.00	ppm	0.00
8) Isoprenoid U3	10.98	9.40	793	852	0.27	0.29	0.05	0.05	ppm	0.05
9) Pentadecane	11.45	0.00	553	0	0.19	0.00	0.03	0.00	ppm	0.00
10) Hexadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
11) Isopreniod U4	13.19	11.37	1565	1174	0.53	0.39	0.09	0.07	ppm	0.09
12) Heptadecane	13.77	0.00	616	0	0.21	0.00	0.04	0.00	ppm	0.00
13) Pristane	13.83	12.01	3992	3312	1.39	1.09	0.24	0.19	ppm	0.24
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.05	3411	2844	1.22	0.98	0.21	0.17	ppm	0.21
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.97	0.00	1237	0	0.44	0.00	0.08	0.00	ppm	0.0
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.0
20) Tricosane	19.34	17.37	1428	1136	0.48	0.39	0.08	0.07	ppm	0.08
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	4181	2882	1.37	0.97	0.24	0.17	ppm	0.24
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
24) Heptacosane	21.22	19.68	8682	6598	2.84	2.23	0.50	0.39	ppm	0.50
25) Octacosane	0.00	20.09	0	2661	0.00	0.86	0.00	0.15	ppm	0.00
26) Nonacosane	21.99	20.47	9010	9294	2.93	3.13	0.51	0.55	ppm	0.51
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	10017	7844	3.37	2.74	0.59	0.48	ppm	0.59
29) Dotriacontane	23.39	0.00	2245	0	0.73	0.00	0.13	0.00	ppm	0.00
30) Tritriacontane	24.00	21.77	2811	4274	0.96	1.54	0.17	0.27	ppm	0.17
31) Tetratriacontane	24.81	0.00	2261	0	0.76	0.00	0.13	0.00	ppm	0.00
32) Pentatriacontane	25.56	22.31	3087	3918	1.08	1.42	0.19	0.25	ppm	0.19
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.08	0	2602	0.00	0.97	0.00	0.17	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 2.91 ppm
Total ISOPRENOIDS (TI): 0.62 ppm
TI/(TRA-TI): 0.27

Evaluation 1: biased by background
Evaluation 2: good match
Evaluation 3: biased by background

C25-C31 Odds: 1.84 ppm
TPH Background (diesel range): 46 ppm
TPH Background (C10 - C36) 62 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparsion of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007706

00255

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F024.D
Acq On : 15 Jan 99 08:55 AM
Sample : K9807097-034
Misc : F=2 D=1 A=8.4

Vial: 19
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 2
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 8.4
Conversion Factor=(F*D)/A= 0.2381
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.62	0.00	218	0	0.07	0.00	0.02	0.00	ppm	0.00
2) Undecane	6.94	5.71	305	271	0.11	0.10	0.03	0.02	ppm	0.03
3) Dodecane	0.00	6.86	0	261	0.00	0.09	0.00	0.02	ppm	0.00
4) Isoprenoid U1	8.77	7.70	1547	482	0.58	0.17	0.14	0.04	ppm	0.14
5) Tridecane	9.04	0.00	542	0	0.19	0.00	0.04	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.63	1935	1022	0.67	0.36	0.16	0.09	ppm	0.16
7) Tetradecane	10.18	0.00	931	0	0.32	0.00	0.08	0.00	ppm	0.00
8) Isoprenoid U3	10.98	9.39	2933	2877	1.00	0.96	0.24	0.23	ppm	0.24
9) Pentadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
10) Hexadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
11) Isoprenoid U4	13.19	11.36	5348	4314	1.81	1.43	0.43	0.34	ppm	0.43
12) Heptadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
13) Pristane	13.83	12.00	12366	12489	4.32	4.12	1.03	0.98	ppm	1.03
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.04	10870	9876	3.88	3.39	0.92	0.81	ppm	0.92
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	2864	0	1.01	0.00	0.24	0.00	ppm	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
20) Tricosane	19.34	17.36	2247	1659	0.76	0.57	0.18	0.14	ppm	0.18
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.69	6311	4143	2.06	1.39	0.49	0.33	ppm	0.49
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
24) Heptacosane	21.22	19.67	11668	9950	3.81	3.37	0.91	0.80	ppm	0.91
25) Octacosane	21.61	20.09	3452	3268	1.07	1.05	0.26	0.25	ppm	0.26
26) Nonacosane	21.99	20.47	13490	13131	4.39	4.42	1.04	1.05	ppm	1.04
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	13695	11366	4.60	3.98	1.10	0.95	ppm	1.10
29) Dotriacontane	23.39	0.00	2825	0	0.92	0.00	0.22	0.00	ppm	0.00
30) Tritriacontane	24.00	21.77	4156	5408	1.42	1.95	0.34	0.46	ppm	0.34
31) Tetratriacontane	24.81	0.00	3422	0	1.15	0.00	0.27	0.00	ppm	0.00
32) Pentatriacontane	25.57	22.30	4013	4508	1.40	1.63	0.33	0.39	ppm	0.33
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	27.76	23.08	2391	2723	0.83	1.01	0.20	0.24	ppm	0.20
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 7.80 ppm
Total ISOPRENOIDS (TI): 2.92 ppm
TI/(TRA-TI): 0.60

Evaluation 1: biased by background
Evaluation 2: good match
Evaluation 3: biased by background

C25-C31 Odds: 3.54 ppm
TPH Background (diesel range): 88 ppm
TPH Background (C10 - C36) 120 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.
Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.
Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007707

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F025.D
Acq On : 15 Jan 99 09:37 AM
Sample : K9807097-035
Misc : F=2 D=1 A=9.58

Vial: 20
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 2
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 9.58
Conversion Factor=(F*D)/A= 0.20877
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reporte Value (Conc. #1
Target Compounds										
1) Decane	5.62	0.00	235	0	0.08	0.00	0.02	0.00	ppm	0.00
2) Undecane	6.94	5.71	441	251	0.15	0.09	0.03	0.02	ppm	0.03
3) Dodecane	8.04	6.86	249	320	0.09	0.11	0.02	0.02	ppm	0.02
4) Isoprenoid U1	8.76	7.70	1472	763	0.55	0.27	0.11	0.06	ppm	0.11
5) Tridecane	9.04	0.00	558	0	0.19	0.00	0.04	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.63	2332	1560	0.81	0.55	0.17	0.11	ppm	0.17
7) Tetradecane	0.00	8.71	0	549	0.00	0.18	0.00	0.04	ppm	0.00
8) Isoprenoid U3	10.97	9.39	4169	3757	1.42	1.26	0.30	0.26	ppm	0.30
9) Pentadecane	11.44	0.00	2133	0	0.73	0.00	0.15	0.00	ppm	0.00
10) Hexadecane	12.63	0.00	2268	0	0.77	0.00	0.16	0.00	ppm	0.00
11) Isopreniod U4	13.19	11.36	6597	5611	2.23	1.86	0.47	0.39	ppm	0.47
12) Heptadecane	13.77	11.75	4007	2615	1.38	0.92	0.29	0.19	ppm	0.29
13) Pristane	13.83	12.00	16498	14888	5.76	4.91	1.20	1.03	ppm	1.20
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.05	13843	11546	4.95	3.97	1.03	0.83	ppm	1.03
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	3264	0	1.16	0.00	0.24	0.00	ppm	0
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	
20) Tricosane	19.33	17.36	2802	2259	0.94	0.78	0.20	0.16	ppm	0.20
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	6708	4821	2.19	1.62	0.46	0.34	ppm	0.46
23) Hexacosane	20.81	19.22	2836	1418	0.93	0.48	0.19	0.10	ppm	0.19
24) Heptacosane	21.22	19.67	13929	12088	4.55	4.09	0.95	0.85	ppm	0.95
25) Octacosane	21.61	20.09	3658	3378	1.14	1.09	0.24	0.23	ppm	0.24
26) Nonacosane	21.98	20.47	14233	13908	4.63	4.68	0.97	0.98	ppm	0.97
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	12598	10703	4.23	3.75	0.88	0.78	ppm	0.88
29) Dotriacontane	23.38	0.00	2886	0	0.94	0.00	0.20	0.00	ppm	0.00
30) Tritriacontane	23.99	21.77	4035	5226	1.38	1.88	0.29	0.39	ppm	0.29
31) Tetratriacontane	24.81	0.00	3794	0	1.27	0.00	0.27	0.00	ppm	0.00
32) Pentatriacontane	25.56	22.30	3844	3815	1.34	1.38	0.28	0.29	ppm	0.28
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.08	0	2745	0.00	1.02	0.00	0.21	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 8.08 ppm
Total ISOPRENOIDS (TI): 3.28 ppm
TI/(TRA-TI): 0.68

Evaluation 1: biased by background
Evaluation 2: probable match with high bias
Evaluation 3: biased by background

C25-C31 Odds: 3.26 ppm
TPH Background (diesel range): 81 ppm
TPH Background (C10 - C36) 110 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007708

00257

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F026.D
Acq On : 15 Jan 99 10:19 AM
Sample : K9807097-036
Misc : F=2 D=1 A=7.13

Vial: 21
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 2
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 7.13
Conversion Factor=(F*D)/A= 0.2805
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
2) Undecane	6.94	5.71	357	354	0.12	0.13	0.03	0.04	ppm	0.03
3) Dodecane	0.00	6.86	0	262	0.00	0.09	0.00	0.03	ppm	0.00
4) Isoprenoid U1	8.77	7.70	901	282	0.34	0.10	0.09	0.03	ppm	0.09
5) Tridecane	9.04	7.85	301	334	0.10	0.12	0.03	0.03	ppm	0.03
6) Isoprenoid U2	9.93	8.63	1031	588	0.36	0.21	0.10	0.06	ppm	0.10
7) Tetradecane	10.18	0.00	388	0	0.13	0.00	0.04	0.00	ppm	0.00
8) Isoprenoid U3	10.98	9.40	1657	1624	0.57	0.54	0.16	0.15	ppm	0.16
9) Pentadecane	11.44	0.00	546	0	0.19	0.00	0.05	0.00	ppm	0.05
10) Hexadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
11) Isopreniod U4	13.19	11.36	3246	1978	1.10	0.66	0.31	0.18	ppm	0.31
12) Heptadecane	13.77	0.00	1486	0	0.51	0.00	0.14	0.00	ppm	0.00
13) Pristane	13.83	12.00	7274	6520	2.54	2.15	0.71	0.60	ppm	0.71
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.05	7061	5815	2.52	2.00	0.71	0.56	ppm	0.71
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	1900	0	0.67	0.00	0.19	0.00	ppm	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
20) Tricosane	19.34	17.36	2403	1772	0.81	0.61	0.23	0.17	ppm	0.23
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	5917	4242	1.94	1.43	0.54	0.40	ppm	0.54
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
24) Heptacosane	21.22	19.67	10925	10699	3.57	3.62	1.00	1.02	ppm	1.00
25) Octacosane	21.61	20.09	3119	1890	0.97	0.61	0.27	0.17	ppm	0.27
26) Nonacosane	21.99	20.47	13083	12088	4.26	4.07	1.19	1.14	ppm	1.19
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	11193	9499	3.76	3.32	1.05	0.93	ppm	1.05
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	23.99	21.77	3733	5104	1.28	1.84	0.36	0.52	ppm	0.36
31) Tetratriacontane	24.81	0.00	4867	0	1.63	0.00	0.46	0.00	ppm	0.00
32) Pentatriacontane	25.56	22.31	3396	2350	1.19	0.85	0.33	0.24	ppm	0.33
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.08	0	4797	0.00	1.78	0.00	0.50	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA):	7.11	ppm
Total ISOPRENOIDS (TI):	2.08	ppm
TI/(TRA-TI):	0.41	

Evaluation 1: biased by background
Evaluation 2: good match
Evaluation 3: biased by background

C25-C31 Odds: 3.78 ppm
TPH Background (diesel range): 94 ppm
TPH Background (C10 - C36) 128 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25+C27+C29+C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F027.D
Acq On : 15 Jan 99 11:00 AM
Sample : K9807097-037
Misc : F=2 D=1 A=7.29

Vial: 22
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 2
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 7.29
Conversion Factor=(F*D)/A= 0.27435
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.62	0.00	201	0	0.07	0.00	0.02	0.00	ppm	0.00
2) Undecane	6.94	5.72	358	230	0.13	0.09	0.03	0.02	ppm	0.03
3) Dodecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
4) Isoprenoid U1	8.77	7.71	815	216	0.30	0.08	0.08	0.02	ppm	0.08
5) Tridecane	9.04	0.00	316	0	0.11	0.00	0.03	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.64	848	241	0.30	0.08	0.08	0.02	ppm	0.08
7) Tetradecane	10.18	0.00	223	0	0.08	0.00	0.02	0.00	ppm	0.00
8) Isoprenoid U3	10.98	9.40	1283	1300	0.44	0.44	0.12	0.12	ppm	0.12
9) Pentadecane	11.44	0.00	797	0	0.27	0.00	0.08	0.00	ppm	0.00
10) Hexadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
11) Isoprenoid U4	13.19	11.37	2389	1406	0.81	0.47	0.22	0.13	ppm	0.22
12) Heptadecane	13.77	0.00	989	0	0.34	0.00	0.09	0.00	ppm	0.00
13) Pristane	13.83	12.01	5974	5814	2.09	1.92	0.57	0.53	ppm	0.57
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.05	5496	4549	1.96	1.56	0.54	0.43	ppm	0.54
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	2056	0	0.73	0.00	0.20	0.00	ppm	0.0
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.0
20) Tricosane	19.34	0.00	1887	0	0.64	0.00	0.17	0.00	ppm	0.00
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	5048	3644	1.65	1.23	0.45	0.34	ppm	0.45
23) Hexacosane	20.81	19.22	2027	1296	0.67	0.44	0.18	0.12	ppm	0.18
24) Heptacosane	21.22	19.67	9920	8108	3.24	2.74	0.89	0.75	ppm	0.89
25) Octacosane	21.61	20.09	2635	2453	0.82	0.79	0.22	0.22	ppm	0.22
26) Nonacosane	21.99	20.47	9530	10033	3.10	3.38	0.85	0.93	ppm	0.85
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	9781	8287	3.29	2.90	0.90	0.80	ppm	0.90
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	23.99	21.77	3351	3786	1.15	1.37	0.31	0.37	ppm	0.31
31) Tetratriacontane	24.81	0.00	2582	0	0.87	0.00	0.24	0.00	ppm	0.00
32) Pentatriacontane	25.56	22.31	2464	2467	0.86	0.89	0.24	0.25	ppm	0.24
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.08	0	2684	0.00	1.00	0.00	0.27	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA):	5.68	ppm
Total ISOPRENOIDS (TI):	1.61	ppm
TI/(TRA-TI):	0.40	

Evaluation 1: biased by background
Evaluation 2: good match
Evaluation 3: biased by background

C25-C31 Odds: 3.09 ppm
TPH Background (diesel range): 77 ppm
TPH Background (C10 - C36) 104 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007710

0114F027.D A_EPHPAH.MTH

00259

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F028.D
Acq On : 15 Jan 99 11:42 AM
Sample : K9807115-003
Misc : F=2 D=1 A=7.19

Vial: 23
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 2
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 7.19
Conversion Factor=(F*D)/A= 0.27816
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
2) Undecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
3) Dodecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
4) Isoprenoid U1	8.77	7.71	267	114	0.10	0.04	0.03	0.01	ppm	0.03
5) Tridecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.64	523	341	0.18	0.12	0.05	0.03	ppm	0.05
7) Tetradecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
8) Isoprenoid U3	10.98	9.40	1110	706	0.38	0.24	0.11	0.07	ppm	0.11
9) Pentadecane	11.44	0.00	854	0	0.29	0.00	0.08	0.00	ppm	0.00
10) Hexadecane	12.63	0.00	599	0	0.20	0.00	0.06	0.00	ppm	0.00
11) Isopreniod U4	13.19	11.37	1758	1408	0.59	0.47	0.17	0.13	ppm	0.17
12) Heptadecane	13.77	11.76	1532	1108	0.53	0.39	0.15	0.11	ppm	0.15
13) Pristane	13.83	12.01	4404	4152	1.54	1.37	0.43	0.38	ppm	0.43
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.05	3528	3223	1.26	1.11	0.35	0.31	ppm	0.35
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.97	0.00	1917	0	0.68	0.00	0.19	0.00	ppm	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
20) Tricosane	19.34	17.37	1963	1260	0.66	0.44	0.18	0.12	ppm	0.18
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	5270	3629	1.72	1.22	0.48	0.34	ppm	0.48
23) Hexacosane	20.81	19.22	2349	1203	0.77	0.40	0.21	0.11	ppm	0.21
24) Heptacosane	21.22	19.68	10053	8058	3.29	2.73	0.91	0.76	ppm	0.91
25) Octacosane	21.61	20.09	2847	2874	0.89	0.93	0.25	0.26	ppm	0.25
26) Nonacosane	21.99	20.47	10216	9635	3.32	3.24	0.92	0.90	ppm	0.92
27) Triacontane	22.40	20.83	3330	1388	1.07	0.46	0.30	0.13	ppm	0.30
28) Hentriacontane	22.86	21.16	10092	8567	3.39	3.00	0.94	0.83	ppm	0.94
29) Dotriacontane	23.38	0.00	2782	0	0.90	0.00	0.25	0.00	ppm	0.00
30) Tritriacontane	23.99	21.77	3259	4504	1.12	1.62	0.31	0.45	ppm	0.31
31) Tetratriacontane	24.81	0.00	2970	0	1.00	0.00	0.28	0.00	ppm	0.00
32) Pentatriacontane	25.56	22.41	2922	3346	1.02	1.21	0.28	0.34	ppm	0.28
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.08	0	2697	0.00	1.00	0.00	0.28	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 6.07 ppm
Total ISOPRENOIDS (TI): 1.14 ppm
TI/(TRA-TI): 0.23

Evaluation 1: biased by background
Evaluation 2: probable match with high bias
Evaluation 3: biased by background

C25-C31 Odds: 3.25 ppm
TPH Background (diesel range): 81 ppm
TPH Background (C10 - C36) 110 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F029.D
Acq On : 15 Jan 99 12:23 PM
Sample : K9807115-007
Misc : F=2 D=1 A=9.01

Vial: 24
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 2
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 9.01
Conversion Factor=(F*D)/A= 0.22198
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.62	0.00	222	0	0.07	0.00	0.02	0.00	ppm	0.00
2) Undecane	6.94	5.71	621	288	0.22	0.11	0.05	0.02	ppm	0.05
3) Dodecane	0.00	6.86	0	398	0.00	0.14	0.00	0.03	ppm	0.00
4) Isoprenoid U1	8.76	7.70	667	394	0.25	0.14	0.06	0.03	ppm	0.06
5) Tridecane	9.04	0.00	363	0	0.13	0.00	0.03	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.63	1224	907	0.43	0.32	0.09	0.07	ppm	0.09
7) Tetradecane	0.00	8.71	0	290	0.00	0.10	0.00	0.02	ppm	0.00
8) Isoprenoid U3	10.98	9.40	2413	2136	0.82	0.72	0.18	0.16	ppm	0.18
9) Pentadecane	11.44	0.00	761	0	0.26	0.00	0.06	0.00	ppm	0.00
10) Hexadecane	12.63	0.00	669	0	0.23	0.00	0.05	0.00	ppm	0.00
11) Isopreniod U4	13.19	11.36	3794	3052	1.28	1.01	0.28	0.23	ppm	0.28
12) Heptadecane	13.77	11.76	1931	1441	0.66	0.50	0.15	0.11	ppm	0.15
13) Pristane	13.83	12.00	9068	8257	3.17	2.72	0.70	0.60	ppm	0.70
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.05	7210	5495	2.58	1.89	0.57	0.42	ppm	0.57
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	2758	0	0.98	0.00	0.22	0.00	ppm	0.00
19) Docosane	18.71	16.43	1673	4670	0.56	1.61	0.12	0.36	ppm	0.12
20) Tricosane	19.33	17.36	3279	2345	1.11	0.81	0.25	0.18	ppm	0.25
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	8846	6048	2.89	2.03	0.64	0.45	ppm	0.64
23) Hexacosane	20.81	19.22	3728	2069	1.23	0.70	0.27	0.15	ppm	0.27
24) Heptacosane	21.22	19.67	17245	13647	5.64	4.62	1.25	1.02	ppm	1.25
25) Octacosane	21.61	20.09	4918	4703	1.53	1.52	0.34	0.34	ppm	0.34
26) Nonacosane	21.99	20.47	15921	16790	5.18	5.65	1.15	1.25	ppm	1.15
27) Triacontane	22.40	0.00	5554	0	1.78	0.00	0.40	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	17375	14402	5.84	5.04	1.30	1.12	ppm	1.30
29) Dotriacontane	23.38	0.00	3751	0	1.22	0.00	0.27	0.00	ppm	0.00
30) Tritriacontane	23.99	21.77	4936	6669	1.69	2.40	0.38	0.53	ppm	0.38
31) Tetratriacontane	24.81	0.00	4732	0	1.59	0.00	0.35	0.00	ppm	0.00
32) Pentatriacontane	25.56	22.30	4138	4687	1.45	1.70	0.32	0.38	ppm	0.32
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.08	0	3257	0.00	1.21	0.00	0.27	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 8.10 ppm
Total ISOPRENOIDS (TI): 1.88 ppm
TI/(TRA-TI): 0.30

Evaluation 1: biased by background
Evaluation 2: probable match with high bias
Evaluation 3: biased by background

C25-C31 Odds: 4.34 ppm
TPH Background (diesel range): 108 ppm
TPH Background (C10 - C36) 147 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F030.D
Acq On : 15 Jan 99 01:35 PM
Sample : K9807115-010
Misc : F=1 D=1 A=7.40

Vial: 25
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul Signal #2 Phase : RTx-200
Signal #1 Phase : RTx-5 Signal #2 Info : 0.53
Signal #1 Info : 0.53

F=Final Volume (mls)= 1
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 7.40
Conversion Factor=(F*D)/A= 0.13514
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
2) Undecane	6.94	0.00	306	0	0.11	0.00	0.01	0.00	ppm	0.00
3) Dodecane	0.00	6.86	0	257	0.00	0.09	0.00	0.01	ppm	0.00
4) Isoprenoid U1	8.77	7.70	603	332	0.22	0.12	0.03	0.02	ppm	0.03
5) Tridecane	9.04	0.00	288	0	0.10	0.00	0.01	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.63	1153	617	0.40	0.22	0.05	0.03	ppm	0.05
7) Tetradecane	0.00	8.70	0	203	0.00	0.07	0.00	0.01	ppm	0.00
8) Isoprenoid U3	10.98	9.39	2257	2009	0.77	0.67	0.10	0.09	ppm	0.10
9) Pentadecane	11.44	9.64	1360	876	0.47	0.30	0.06	0.04	ppm	0.06
10) Hexadecane	12.63	0.00	741	0	0.25	0.00	0.03	0.00	ppm	0.00
11) Isoprenoid U4	13.19	11.36	2577	1799	0.87	0.60	0.12	0.08	ppm	0.12
12) Heptadecane	13.77	11.75	3132	2287	1.07	0.80	0.15	0.11	ppm	0.15
13) Pristane	13.83	12.00	6924	7117	2.42	2.35	0.33	0.32	ppm	0.33
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.04	6077	5610	2.17	1.93	0.29	0.26	ppm	0.29
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.97	0.00	4598	0	1.63	0.00	0.22	0.00	ppm	0.00
19) Docosane	0.00	16.42	0	7362	0.00	2.53	0.00	0.34	ppm	0.00
20) Tricosane	19.34	17.36	5537	4240	1.87	1.47	0.25	0.20	ppm	0.25
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.69	16299	10995	5.33	3.70	0.72	0.50	ppm	0.72
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
24) Heptacosane	21.23	19.67	28348	21073	9.27	7.13	1.25	0.96	ppm	1.25
25) Octacosane	21.61	20.09	5861	3801	1.82	1.23	0.25	0.17	ppm	0.25
26) Nonacosane	21.99	20.47	28473	24614	9.26	8.29	1.25	1.12	ppm	1.25
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	24445	19972	8.21	6.99	1.11	0.94	ppm	1.11
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	24.00	21.77	8623	10433	2.95	3.76	0.40	0.51	ppm	0.40
31) Tetratriacontane	24.82	0.00	8626	0	2.90	0.00	0.39	0.00	ppm	0.00
32) Pentatriacontane	25.56	22.41	6874	3590	2.41	1.30	0.33	0.18	ppm	0.33
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.08	0	7916	0.00	2.94	0.00	0.40	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA):	6.69	ppm
Total ISOPRENOIDS (TI):	0.92	ppm
TI/(TRA-TI):	0.16	

Evaluation 1: biased by background
Evaluation 2: probable match with high bias
Evaluation 3: biased by background

C25-C31 Odds: 4.33 ppm
TPH Background (diesel range): 107 ppm
TPH Background (C10 - C36) 146 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprencids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

0114F030.D EPHPAH.MTH

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F035.D
Acq On : 15 Jan 99 05:05 PM
Sample : K9807115-011
Misc : F=1 D=1 A=10.4

Vial: 26
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 1
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 10.4
Conversion Factor=(F*D)/A= 0.09615
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
2) Undecane	6.94	0.00	650	0	0.23	0.00	0.02	0.00	ppm	0.00
3) Dodecane	8.04	0.00	223	0	0.08	0.00	0.01	0.00	ppm	0.00
4) Isoprenoid U1	8.77	7.70	1257	382	0.47	0.14	0.05	0.01	ppm	0.05
5) Tridecane	9.04	7.84	496	533	0.17	0.19	0.02	0.02	ppm	0.02
6) Isoprenoid U2	9.93	8.63	1695	1253	0.59	0.44	0.06	0.04	ppm	0.06
7) Tetradecane	10.21	8.71	1182	942	0.40	0.32	0.04	0.03	ppm	0.04
8) Isoprenoid U3	10.98	9.39	3705	3241	1.27	1.09	0.12	0.10	ppm	0.12
9) Pentadecane	11.44	9.64	3675	2773	1.26	0.94	0.12	0.09	ppm	0.12
10) Hexadecane	12.63	10.71	4158	3125	1.40	1.04	0.14	0.10	ppm	0.14
11) Isopreniod U4	13.19	11.36	5458	5082	1.84	1.69	0.18	0.16	ppm	0.18
12) Heptadecane	13.77	11.75	6624	5599	2.27	1.96	0.22	0.19	ppm	0.22
13) Pristane	13.83	12.00	12278	12319	4.29	4.06	0.41	0.39	ppm	0.41
14) Octadecane	14.85	12.76	3364	3192	1.14	1.09	0.11	0.10	ppm	0.11
15) Phytane	14.95	13.05	10439	9151	3.73	3.14	0.36	0.30	ppm	0.36
16) Nonadecane	15.88	13.73	4305	4638	1.46	1.58	0.14	0.15	ppm	0.14
17) Eicosane	17.03	14.65	3191	2703	1.07	0.93	0.10	0.09	ppm	0.10
18) Heneicosane	17.97	15.52	6494	5028	2.30	1.80	0.22	0.17	ppm	0.22
19) Docosane	18.71	16.43	3754	10119	1.26	3.48	0.12	0.33	ppm	0.
20) Tricosane	19.34	17.36	4621	4735	1.56	1.64	0.15	0.16	ppm	0.
21) Tetracosane	19.88	18.09	3061	2590	0.97	0.87	0.09	0.08	ppm	0.09
22) Pentacosane	20.37	18.70	14030	9681	4.59	3.26	0.44	0.31	ppm	0.44
23) Hexacosane	20.81	19.22	5652	3240	1.86	1.09	0.18	0.10	ppm	0.18
24) Heptacosane	21.22	19.68	24914	19803	8.15	6.70	0.78	0.64	ppm	0.78
25) Octacosane	21.61	20.09	6277	7302	1.95	2.35	0.19	0.23	ppm	0.19
26) Nonacosane	21.99	20.47	23994	23120	7.80	7.79	0.75	0.75	ppm	0.75
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	22869	19942	7.68	6.98	0.74	0.67	ppm	0.74
29) Dotriacontane	23.39	0.00	5102	0	1.66	0.00	0.16	0.00	ppm	0.00
30) Tritriacontane	24.00	21.77	7766	9516	2.66	3.43	0.26	0.33	ppm	0.26
31) Tetratriacontane	24.82	0.00	7219	0	2.42	0.00	0.23	0.00	ppm	0.00
32) Pentatriacontane	25.57	22.31	5753	7140	2.01	2.59	0.19	0.25	ppm	0.19
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.09	0	6069	0.00	2.25	0.00	0.22	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 6.18 ppm
Total ISOPRENOIDS (TI): 1.18 ppm
TI/(TRA-TI): 0.24

Evaluation 1: biased by background
Evaluation 2: probable match with high bias
Evaluation 3: biased by background

C25-C31 Odds: 2.71 ppm
TPH Background (diesel range): 67 ppm
TPH Background (C10 - C36) 92 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007714

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F036.D
Acq On : 15 Jan 99 05:46 PM
Sample : K9807115-013
Misc : F=10 D=1 A=10.4

Vial: 27
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 10
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 10.4
Conversion Factor=(F*D)/A= 0.96154
Matrix= Water

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
2) Undecane	0.00	5.72	0	269	0.00	0.10	0.00	0.10	ppb	0.00
3) Dodecane	0.00	6.87	0	604	0.00	0.21	0.00	0.20	ppb	0.00
4) Isoprenoid U1	8.76	7.71	1826	1314	0.68	0.47	0.65	0.45	ppb	0.65
5) Tridecane	8.98	0.00	281	0	0.10	0.00	0.09	0.00	ppb	0.00
6) Isoprenoid U2	9.93	8.63	3473	2731	1.21	0.96	1.16	0.92	ppb	1.16
7) Tetradecane	10.18	0.00	683	0	0.23	0.00	0.22	0.00	ppb	0.00
8) Isoprenoid U3	10.98	9.40	4563	4313	1.56	1.45	1.50	1.39	ppb	1.50
9) Pentadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
10) Hexadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
11) Isopreniod U4	13.19	11.36	8323	6981	2.81	2.32	2.70	2.23	ppb	2.70
12) Heptadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
13) Pristane	13.83	12.01	16305	15233	5.69	5.03	5.47	4.83	ppb	5.47
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
15) Phytane	14.95	13.05	13446	12053	4.81	4.14	4.62	3.98	ppb	4.62
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
18) Heneicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
20) Tricosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
22) Pentacosane	20.37	18.70	1730	541	0.57	0.18	0.54	0.17	ppb	0.54
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
24) Heptacosane	21.23	19.68	2644	1762	0.86	0.60	0.83	0.57	ppb	0.83
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
26) Nonacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
28) Hentriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
30) Tritriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
31) Tetratriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
32) Pentatriacontane	25.57	22.31	2329	3083	0.81	1.12	0.78	1.07	ppb	0.78
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
34) Heptatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppb	0.00

Total Resolved ALKANES (TRA): 18.25 ppb
Total ISOPRENOIDS (TI): 16.10 ppb
TI/(TRA-TI): 7.49

Evaluation 1: good match
Evaluation 2: good match
Evaluation 3: good match

C25-C31 Odds: 1.37 ppm
TPH Background (diesel range): 34 ppm
TPH Background (C10 - C36) 46 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F037.D
Acq On : 15 Jan 99 06:28 PM
Sample : K9807115-021
Misc : F=1 D=1 A=9.65

Vial: 28
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 1
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 9.65
Conversion Factor=(F*D)/A= 0.10363
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.62	0.00	225	0	0.07	0.00	0.01	0.00	ppm	0.00
2) Undecane	6.94	5.71	387	513	0.14	0.19	0.01	0.02	ppm	0.01
3) Dodecane	8.04	6.86	800	601	0.30	0.21	0.03	0.02	ppm	0.03
4) Isoprenoid U1	8.76	7.70	6685	4901	2.49	1.74	0.26	0.18	ppm	0.26
5) Tridecane	9.03	0.00	459	0	0.16	0.00	0.02	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.63	9529	7429	3.32	2.60	0.34	0.27	ppm	0.34
7) Tetradecane	10.18	0.00	1666	0	0.57	0.00	0.06	0.00	ppm	0.00
8) Isoprenoid U3	10.98	9.39	10815	9952	3.69	3.34	0.38	0.35	ppm	0.38
9) Pentadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
10) Hexadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
11) Isopreniod U4	13.19	11.36	16369	14313	5.53	4.75	0.57	0.49	ppm	0.57
12) Heptadecane	13.77	11.76	4233	2645	1.45	0.93	0.15	0.10	ppm	0.15
13) Pristane	13.83	12.00	32925	32566	11.50	10.74	1.19	1.11	ppm	1.19
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.05	27140	24964	9.70	8.58	1.01	0.89	ppm	1.01
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.97	0.00	5571	0	1.97	0.00	0.20	0.00	ppm	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
20) Tricosane	19.34	17.36	5678	4776	1.91	1.65	0.20	0.17	ppm	0.2
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	14861	9412	4.86	3.17	0.50	0.33	ppm	0.50
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
24) Heptacosane	21.23	19.68	27143	18377	8.87	6.22	0.92	0.64	ppm	0.92
25) Octacosane	21.61	20.09	8605	4478	2.68	1.44	0.28	0.15	ppm	0.28
26) Nonacosane	21.99	20.48	27543	27913	8.96	9.40	0.93	0.97	ppm	0.93
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	27230	23267	9.15	8.14	0.95	0.84	ppm	0.95
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	24.00	21.77	8007	14180	2.74	5.11	0.28	0.53	ppm	0.28
31) Tetratriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	27.78	23.09	4779	6240	1.66	2.32	0.17	0.24	ppm	0.17
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 8.17 ppm
Total ISOPRENOIDS (TI): 3.75 ppm
TI/(TRA-TI): 0.85

Evaluation 1: biased by background
Evaluation 2: good match
Evaluation 3: biased by background

C25-C31 Odds: 3.3 ppm
TPH Background (diesel range): 82 ppm
TPH Background (C10 - C36) 112 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007716

00265

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F038.D
Acq On : 15 Jan 99 07:10 PM
Sample : K981222-LCS ALIPH site specific dsl
Misc : F=4 D=1 A=20

Vial: 29
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 4
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 20
Conversion Factor=(F*D)/A= 0.2
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.59	0.00	328	0	0.11	0.00	0.02	0.00	ppm	0.00
2) Undecane	6.95	5.67	1110	2769	0.39	1.04	0.08	0.21	ppm	0.08
3) Dodecane	0.00	6.86	0	4104	0.00	1.43	0.00	0.29	ppm	0.00
4) Isoprenoid U1	8.76	7.70	14500	11618	5.40	4.11	1.08	0.82	ppm	1.08
5) Tridecane	9.03	0.00	767	0	0.27	0.00	0.05	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.63	17544	13208	6.11	4.63	1.22	0.93	ppm	1.22
7) Tetradecane	10.18	0.00	3372	0	1.15	0.00	0.23	0.00	ppm	0.00
8) Isoprenoid U3	10.98	9.39	16519	15921	5.64	5.34	1.13	1.07	ppm	1.13
9) Pentadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
10) Hexadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
11) Isopreniod U4	13.19	11.36	21053	17675	7.11	5.87	1.42	1.17	ppm	1.42
12) Heptadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
13) Pristane	13.83	12.01	36585	31738	12.77	10.47	2.55	2.09	ppm	2.55
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.05	23491	21512	8.40	7.39	1.68	1.48	ppm	1.68
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.96	15.48	1302	2534	0.46	0.91	0.09	0.18	ppm	0.09
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
20) Tricosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.36	0.00	999	0	0.33	0.00	0.07	0.00	ppm	0.00
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
24) Heptacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
26) Nonacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
31) Tetratriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
32) Pentatriacontane	25.59	22.31	1615	2688	0.57	0.97	0.11	0.19	ppm	0.11
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 9.36 ppm
Total ISOPRENOIDS (TI): 9.08 ppm
TI/(TRA-TI): 32.43

Evaluation 1: good match
Evaluation 2: good match
Evaluation 3: good match

C25-C31 Odds: 0 ppm
TPH Background (diesel range): 0 ppm
TPH Background (C10 - C36) 0 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F007.D
Acq On : 14 Jan 99 08:42 PM
Sample : K9807169-001
Misc : F=1 D=1 A=13.8

Vial: 8
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul Signal #2 Phase : RTx-200
Signal #1 Phase : RTx-5 Signal #2 Info : 0.53
Signal #1 Info : 0.53

F=Final Volume (mls)= 1
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 13.8
Conversion Factor=(F*D)/A= 0.07246
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.60	4.24	518	327	0.17	0.12	0.01	0.01	ppm	0.01
2) Undecane	6.94	5.72	624	874	0.22	0.33	0.02	0.02	ppm	0.02
3) Dodecane	8.04	6.86	927	1041	0.35	0.36	0.03	0.03	ppm	0.03
4) Isoprenoid U1	8.76	7.70	2148	1015	0.80	0.36	0.06	0.03	ppm	0.06
5) Tridecane	9.04	7.84	417	425	0.15	0.15	0.01	0.01	ppm	0.01
6) Isoprenoid U2	9.93	8.63	3338	2707	1.16	0.95	0.08	0.07	ppm	0.08
7) Tetradecane	10.21	8.71	3286	3932	1.12	1.32	0.08	0.10	ppm	0.08
8) Isoprenoid U3	10.97	9.40	4592	5874	1.57	1.97	0.11	0.14	ppm	0.11
9) Pentadecane	11.44	9.64	2483	1407	0.85	0.48	0.06	0.03	ppm	0.06
10) Hexadecane	12.63	10.71	4935	5418	1.67	1.80	0.12	0.13	ppm	0.12
11) Isopreniod U4	13.19	11.36	8652	7667	2.92	2.55	0.21	0.18	ppm	0.21
12) Heptadecane	13.77	11.76	2582	2302	0.89	0.81	0.06	0.06	ppm	0.06
13) Pristane	13.83	12.00	17096	17345	5.97	5.72	0.43	0.41	ppm	0.43
14) Octadecane	14.85	12.76	3183	3925	1.08	1.34	0.08	0.10	ppm	0.08
15) Phytane	14.95	13.05	20390	12915	7.29	4.44	0.53	0.32	ppm	0.53
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	14.59	0	280455	0.00	96.04	0.00	6.96	ppm	0.00
18) Heneicosane	17.96	0.00	4656	0	1.65	0.00	0.12	0.00	ppm	0.00
19) Docosane	0.00	16.43	0	8762	0.00	3.01	0.00	0.22	ppm	0.(
20) Tricosane	19.33	0.00	1676	0	0.56	0.00	0.04	0.00	ppm	0.00
21) Tetracosane	19.95	0.00	4497	0	1.43	0.00	0.10	0.00	ppm	0.00
22) Pentacosane	20.37	18.68	7136	8817	2.33	2.97	0.17	0.21	ppm	0.17
23) Hexacosane	20.89	0.00	4998	0	1.64	0.00	0.12	0.00	ppm	0.00
24) Heptacosane	21.22	19.68	14683	10235	4.80	3.46	0.35	0.25	ppm	0.35
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
26) Nonacosane	21.99	20.47	8718	8435	2.84	2.84	0.21	0.21	ppm	0.21
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	5835	8210	1.96	2.87	0.14	0.21	ppm	0.14
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
31) Tetratriacontane	24.81	0.00	4070	0	1.37	0.00	0.10	0.00	ppm	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.09	0	3273	0.00	1.21	0.00	0.09	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 2.76 ppm
Total ISOPRENOIDS (TI): 1.42 ppm
TI/(TRA-TI): 1.06

Evaluation 1: biased by background
Evaluation 2: good match
Evaluation 3: biased by background

C25-C31 Odds: 0.87 ppm
TPH Background (diesel range): 22 ppm
TPH Background (C10 - C36) 29 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007718

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F008.D
Acq On : 14 Jan 99 09:24 PM
Sample : K9807169-002
Misc : F=2 D=1 A=12.2

Vial: 9
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #2 Phase : RTx-200
Signal #1 Phase : RTx-5
Signal #2 Info : 0.53
Signal #1 Info : 0.53

F=Final Volume (mls)= 2
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 12.2
Conversion Factor=(F*D)/A= 0.16393
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.62	0.00	235	0	0.08	0.00	0.01	0.00	ppm	0.00
2) Undecane	6.94	5.71	575	360	0.20	0.13	0.03	0.02	ppm	0.03
3) Dodecane	8.04	6.86	768	879	0.29	0.31	0.05	0.05	ppm	0.05
4) Isoprenoid U1	8.76	7.70	4890	2771	1.82	0.98	0.30	0.16	ppm	0.30
5) Tridecane	9.04	0.00	547	0	0.19	0.00	0.03	0.00	ppm	0.00
6) Isoprenoid U2	9.93	8.63	9098	7176	3.17	2.51	0.52	0.41	ppm	0.52
7) Tetradecane	10.18	8.71	1344	2063	0.46	0.69	0.08	0.11	ppm	0.08
8) Isoprenoid U3	10.98	9.40	11753	11039	4.01	3.70	0.66	0.61	ppm	0.66
9) Pentadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
10) Hexadecane	12.63	10.71	2777	3861	0.94	1.28	0.15	0.21	ppm	0.15
11) Isopreniod U4	13.19	11.36	18105	16873	6.12	5.60	1.00	0.92	ppm	1.00
12) Heptadecane	13.83	0.00	34123	0	11.71	0.00	1.92	0.00	ppm	0.00
13) Pristane	13.83	12.00	34123	35074	11.92	11.57	1.95	1.90	ppm	1.95
14) Octadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
15) Phytane	14.95	13.05	33219	28068	11.87	9.64	1.95	1.58	ppm	1.95
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	4786	0	1.69	0.00	0.28	0.00	ppm	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
20) Tricosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	0.00	7544	0	2.47	0.00	0.40	0.00	ppm	0.00
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
24) Heptacosane	21.22	19.68	14151	9858	4.63	3.34	0.76	0.55	ppm	0.76
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
26) Nonacosane	21.99	0.00	9444	0	3.07	0.00	0.50	0.00	ppm	0.00
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	4741	5659	1.59	1.98	0.26	0.32	ppm	0.26
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
31) Tetratriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
32) Pentatriacontane	0.00	22.31	0	11503	0.00	4.16	0.00	0.68	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 7.71 ppm
Total ISOPRENOIDS (TI): 6.38 ppm
TI/(TRA-TI): 4.80

Evaluation 1: good match
Evaluation 2: good match
Evaluation 3: good match

C25-C31 Odds: 1.02 ppm
TPH Background (diesel range): 25 ppm
TPH Background (C10 - C36) 34 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007719

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F009.D
Acq On : 14 Jan 99 10:06 PM
Sample : K9807169-003
Misc : F=1 D=1 A=8.6

Vial: 10
Operator: LLANDAUER
Inst : GC15

F=Final Volume (mls)= 1
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 8.6
Conversion Factor=(F*D)/A= 0.11628
Matrix= Soil

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.62	4.24	394	321	0.13	0.12	0.02	0.01	ppm	0.02
2) Undecane	6.94	5.72	497	723	0.17	0.27	0.02	0.03	ppm	0.02
3) Dodecane	8.04	6.86	963	1310	0.36	0.46	0.04	0.05	ppm	0.04
4) Isoprenoid U1	8.76	7.71	335	233	0.12	0.08	0.01	0.01	ppm	0.01
5) Tridecane	9.04	7.84	402	952	0.14	0.33	0.02	0.04	ppm	0.02
6) Isoprenoid U2	9.93	8.63	466	600	0.16	0.21	0.02	0.02	ppm	0.02
7) Tetradecane	10.22	8.71	3987	5440	1.36	1.82	0.16	0.21	ppm	0.16
8) Isoprenoid U3	10.98	9.35	667	1286	0.23	0.43	0.03	0.05	ppm	0.03
9) Pentadecane	11.44	9.64	2443	2185	0.84	0.74	0.10	0.09	ppm	0.10
10) Hexadecane	12.63	10.71	4582	5012	1.55	1.66	0.18	0.19	ppm	0.18
11) Isopreniod U4	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
12) Heptadecane	13.77	11.76	3315	3235	1.14	1.13	0.13	0.13	ppm	0.13
13) Pristane	13.83	12.01	1418	1461	0.50	0.48	0.06	0.06	ppm	0.06
14) Octadecane	14.85	12.76	3172	4255	1.08	1.45	0.13	0.17	ppm	0.13
15) Phytane	14.94	13.05	967	844	0.35	0.29	0.04	0.03	ppm	0.04
16) Nonadecane	0.00	13.74	0	2900	0.00	0.99	0.00	0.11	ppm	0.00
17) Eicosane	17.02	0.00	1706	0	0.57	0.00	0.07	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	3026	0	1.07	0.00	0.12	0.00	ppm	0.00
19) Docosane	0.00	16.43	0	6861	0.00	2.36	0.00	0.27	ppm	0.00
20) Tricosane	19.33	17.36	4734	4065	1.60	1.41	0.19	0.16	ppm	0.19
21) Tetracosane	19.95	0.00	3244	0	1.03	0.00	0.12	0.00	ppm	0.00
22) Pentacosane	20.37	18.69	14604	15627	4.78	5.26	0.56	0.61	ppm	0.56
23) Hexacosane	20.81	0.00	4958	0	1.63	0.00	0.19	0.00	ppm	0.00
24) Heptacosane	21.22	19.68	26427	25624	8.64	8.67	1.00	1.01	ppm	1.00
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
26) Nonacosane	21.99	20.47	27918	27503	9.08	9.26	1.06	1.08	ppm	1.06
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	20454	18027	6.87	6.31	0.80	0.73	ppm	0.80
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	24.00	21.77	4739	5225	1.62	1.88	0.19	0.22	ppm	0.19
31) Tetratriacontane	24.81	0.00	4545	0	1.53	0.00	0.18	0.00	ppm	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.09	0	4916	0.00	1.82	0.00	0.21	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA):	4.76	ppm
Total ISOPRENOIDS (TI):	0.16	ppm
TI/(TRA-TI):	0.03	

Evaluation 1: biased by background
Evaluation 2: suspect false positive
Evaluation 3: biased by background

C25-C31 Odds: 3.42 ppm
TPH Background (diesel range): 85 ppm
TPH Background (C10 - C36) 116 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007720

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F010.D
Acq On : 14 Jan 99 10:47 PM
Sample : K9807169-004
Misc : F=1 D=1 A=8.9

Vial: 11
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 1
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 8.9
Conversion Factor=(F*D)/A= 0.11236
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.62	4.25	300	284	0.10	0.10	0.01	0.01	ppm	0.01
2) Undecane	6.94	5.72	510	683	0.18	0.26	0.02	0.03	ppm	0.02
3) Dodecane	8.04	6.86	764	1460	0.28	0.51	0.03	0.06	ppm	0.03
4) Isoprenoid U1	8.76	7.71	349	265	0.13	0.09	0.01	0.01	ppm	0.01
5) Tridecane	9.04	7.84	431	955	0.15	0.33	0.02	0.04	ppm	0.02
6) Isoprenoid U2	9.93	8.63	587	670	0.20	0.23	0.02	0.03	ppm	0.02
7) Tetradecane	10.21	8.71	4019	5202	1.37	1.74	0.15	0.20	ppm	0.15
8) Isoprenoid U3	10.98	9.35	886	1239	0.30	0.42	0.03	0.05	ppm	0.03
9) Pentadecane	11.44	9.64	2626	2530	0.90	0.86	0.10	0.10	ppm	0.10
10) Hexadecane	12.63	10.71	4553	5567	1.54	1.85	0.17	0.21	ppm	0.17
11) Isopreniod U4	13.19	11.37	922	557	0.31	0.19	0.04	0.02	ppm	0.04
12) Heptadecane	13.77	11.76	4134	3960	1.42	1.39	0.16	0.16	ppm	0.16
13) Pristane	13.83	12.01	2288	2889	0.80	0.95	0.09	0.11	ppm	0.09
14) Octadecane	14.85	12.76	3658	4864	1.24	1.66	0.14	0.19	ppm	0.14
15) Phytane	14.94	13.05	1561	1985	0.56	0.68	0.06	0.08	ppm	0.06
16) Nonadecane	0.00	13.74	0	3389	0.00	1.15	0.00	0.13	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	4054	0	1.44	0.00	0.16	0.00	ppm	0.00
19) Docosane	0.00	16.43	0	8541	0.00	2.94	0.00	0.33	ppm	0.00
20) Tricosane	19.34	17.36	6062	5396	2.04	1.87	0.23	0.21	ppm	0.23
21) Tetracosane	19.96	0.00	2877	0	0.92	0.00	0.10	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	19649	19657	6.43	6.61	0.72	0.74	ppm	0.72
23) Hexacosane	20.81	0.00	5892	0	1.94	0.00	0.22	0.00	ppm	0.00
24) Heptacosane	21.23	19.68	38213	34760	12.49	11.76	1.40	1.32	ppm	1.40
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
26) Nonacosane	21.99	20.48	41838	41138	13.61	13.85	1.53	1.56	ppm	1.53
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	33167	28064	11.14	9.82	1.25	1.10	ppm	1.25
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	23.99	21.77	9008	10922	3.09	3.94	0.35	0.44	ppm	0.35
31) Tetratriacontane	24.82	0.00	6856	0	2.30	0.00	0.26	0.00	ppm	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.09	0	8035	0.00	2.98	0.00	0.34	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 6.53 ppm
Total ISOPRENOIDS (TI): 0.25 ppm
TI/(TRA-TI): 0.04

Evaluation 1: biased by background
Evaluation 2: suspect false positive
Evaluation 3: biased by background

C25-C31 Odds: 4.9 ppm
TPH Background (diesel range): 122 ppm
TPH Background (C10 - C36) 166 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.
Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.
Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F011.D
Acq On : 14 Jan 99 11:29 PM
Sample : K9807169-005
Misc : F=1 D=1 A=9.3

Vial: 12
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 1
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 9.3
Conversion Factor=(F*D)/A= 0.10753
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.61	4.25	322	234	0.11	0.09	0.01	0.01	ppm	0.01
2) Undecane	6.94	5.72	593	683	0.21	0.26	0.02	0.03	ppm	0.02
3) Dodecane	8.04	6.86	947	1392	0.35	0.49	0.04	0.05	ppm	0.04
4) Isoprenoid U1	8.74	7.71	359	290	0.13	0.10	0.01	0.01	ppm	0.01
5) Tridecane	9.04	7.84	475	545	0.17	0.19	0.02	0.02	ppm	0.02
6) Isoprenoid U2	9.93	8.63	704	694	0.25	0.24	0.03	0.03	ppm	0.03
7) Tetradecane	10.22	8.71	3644	5134	1.24	1.72	0.13	0.19	ppm	0.13
8) Isoprenoid U3	10.98	9.35	956	1133	0.33	0.38	0.04	0.04	ppm	0.04
9) Pentadecane	11.44	9.64	2287	2393	0.79	0.81	0.08	0.09	ppm	0.08
10) Hexadecane	12.63	10.71	4108	4827	1.39	1.60	0.15	0.17	ppm	0.15
11) Isopreniod U4	13.19	11.37	895	1000	0.30	0.33	0.03	0.04	ppm	0.03
12) Heptadecane	13.77	11.76	3729	3664	1.28	1.28	0.14	0.14	ppm	0.14
13) Pristane	13.83	12.01	2241	2841	0.78	0.94	0.08	0.10	ppm	0.08
14) Octadecane	14.85	12.76	3501	4337	1.19	1.48	0.13	0.16	ppm	0.13
15) Phytane	14.94	13.05	1680	2086	0.60	0.72	0.06	0.08	ppm	0.06
16) Nonadecane	0.00	13.74	0	2881	0.00	0.98	0.00	0.11	ppm	0.00
17) Eicosane	17.02	0.00	2018	0	0.68	0.00	0.07	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	3779	0	1.34	0.00	0.14	0.00	ppm	0.0
19) Docosane	0.00	16.43	0	8397	0.00	2.89	0.00	0.31	ppm	0.0
20) Tricosane	19.34	17.37	4360	3463	1.47	1.20	0.16	0.13	ppm	0.16
21) Tetracosane	19.95	0.00	4472	0	1.42	0.00	0.15	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	17555	17399	5.74	5.85	0.62	0.63	ppm	0.62
23) Hexacosane	20.89	0.00	4497	0	1.48	0.00	0.16	0.00	ppm	0.00
24) Heptacosane	21.22	19.68	34276	31404	11.21	10.62	1.21	1.14	ppm	1.21
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
26) Nonacosane	21.99	20.47	37936	36702	12.34	12.36	1.33	1.33	ppm	1.33
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	30753	25956	10.33	9.08	1.11	0.98	ppm	1.11
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	24.00	21.77	7770	7238	2.66	2.61	0.29	0.28	ppm	0.29
31) Tetratriacontane	24.82	0.00	5429	0	1.82	0.00	0.20	0.00	ppm	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.09	0	6086	0.00	2.26	0.00	0.24	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 5.69 ppm
Total ISOPRENOIDS (TI): 0.25 ppm
TI/(TRA-TI): 0.05

Evaluation 1: biased by background
Evaluation 2: suspect false positive
Evaluation 3: biased by background

C25-C31 Odds: 4.27 ppm
TPH Background (diesel range): 106 ppm
TPH Background (C10 - C36) 144 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F012.D
Acq On : 15 Jan 99 00:11 AM
Sample : K9807169-013
Misc : F=10 D=1 A=15.8

Vial: 13
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 10
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 15.8
Conversion Factor=(F*D)/A= 0.63291
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
2) Undecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
3) Dodecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
4) Isoprenoid U1	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
5) Tridecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
6) Isoprenoid U2	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
7) Tetradecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
8) Isoprenoid U3	10.99	0.00	212	0	0.07	0.00	0.05	0.00	ppm	0.00
9) Pentadecane	11.46	0.00	314	0	0.11	0.00	0.07	0.00	ppm	0.00
10) Hexadecane	12.64	10.75	447	396	0.15	0.13	0.10	0.08	ppm	0.10
11) Isopreniod U4	13.20	0.00	340	0	0.11	0.00	0.07	0.00	ppm	0.00
12) Heptadecane	13.77	11.78	345	382	0.12	0.13	0.07	0.08	ppm	0.07
13) Pristane	13.83	12.02	850	907	0.30	0.30	0.19	0.19	ppm	0.19
14) Octadecane	14.85	12.78	423	468	0.14	0.16	0.09	0.10	ppm	0.09
15) Phytane	14.95	13.06	591	670	0.21	0.23	0.13	0.15	ppm	0.13
16) Nonadecane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.97	0.00	492	0	0.17	0.00	0.11	0.00	ppm	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
20) Tricosane	19.34	0.00	425	0	0.14	0.00	0.09	0.00	ppm	0.00
21) Tetracosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
22) Pentacosane	20.37	18.70	1123	837	0.37	0.28	0.23	0.18	ppm	0.23
23) Hexacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
24) Heptacosane	21.23	19.68	1660	1312	0.54	0.44	0.34	0.28	ppm	0.34
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
26) Nonacosane	21.99	20.48	1447	1646	0.47	0.55	0.30	0.35	ppm	0.30
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	1032	1045	0.35	0.37	0.22	0.23	ppm	0.22
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
31) Tetratriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 1.67 ppm
Total ISOPRENOIDS (TI): 0.32 ppm
TI/(TRA-TI): 0.24

Evaluation 1: biased by background
Evaluation 2: suspect false positive
Evaluation 3: biased by background

C25-C31 Odds: 1.09 ppm
TPH Background (diesel range): 27 ppm
TPH Background (C10 - C36) 37 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.
Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.
Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

POPA0007723

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F013.D
Acq On : 15 Jan 99 00:52 AM
Sample : K9807169-016
Misc : F=1 D=1 A=9.7

Vial: 14
Operator: LLANDAUER
Inst : GC15

F=Final Volume (mls)= 1
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 9.7
Conversion Factor=(F*D)/A= 0.10309
Matrix= Soil

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	5.62	0.00	303	0	0.10	0.00	0.01	0.00	ppm	0.00
2) Undecane	6.94	5.72	600	693	0.21	0.26	0.02	0.03	ppm	0.02
3) Dodecane	8.04	6.86	871	1105	0.32	0.39	0.03	0.04	ppm	0.03
4) Isoprenoid U1	8.74	7.71	595	369	0.22	0.13	0.02	0.01	ppm	0.02
5) Tridecane	9.04	7.84	370	430	0.13	0.15	0.01	0.02	ppm	0.01
6) Isoprenoid U2	9.93	8.63	945	496	0.33	0.17	0.03	0.02	ppm	0.03
7) Tetradecane	10.21	8.71	3192	4536	1.09	1.52	0.11	0.16	ppm	0.11
8) Isoprenoid U3	10.98	9.35	1185	1179	0.40	0.40	0.04	0.04	ppm	0.04
9) Pentadecane	11.44	9.64	2005	1980	0.69	0.67	0.07	0.07	ppm	0.07
10) Hexadecane	12.63	10.71	3940	5080	1.33	1.69	0.14	0.17	ppm	0.14
11) Isopreniod U4	13.19	11.37	1582	1315	0.53	0.44	0.06	0.05	ppm	0.06
12) Heptadecane	13.77	11.76	3116	3271	1.07	1.15	0.11	0.12	ppm	0.11
13) Pristane	13.83	12.01	3269	4303	1.14	1.42	0.12	0.15	ppm	0.12
14) Octadecane	14.85	12.77	3112	3995	1.06	1.36	0.11	0.14	ppm	0.11
15) Phytane	14.94	13.05	2841	3089	1.02	1.06	0.10	0.11	ppm	0.10
16) Nonadecane	0.00	13.74	0	2362	0.00	0.80	0.00	0.08	ppm	0.00
17) Eicosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	3984	0	1.41	0.00	0.15	0.00	ppm	0.00
19) Docosane	0.00	16.43	0	8014	0.00	2.76	0.00	0.28	ppm	0.00
20) Tricosane	19.33	17.37	3613	3257	1.22	1.13	0.13	0.12	ppm	0.13
21) Tetracosane	19.95	0.00	4933	0	1.57	0.00	0.16	0.00	ppm	0.00
22) Pentacosane	20.37	18.69	14763	15208	4.83	5.12	0.50	0.53	ppm	0.50
23) Hexacosane	20.89	0.00	4825	0	1.59	0.00	0.16	0.00	ppm	0.00
24) Heptacosane	21.22	19.68	27327	25525	8.93	8.64	0.92	0.89	ppm	0.92
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
26) Nonacosane	21.99	20.47	28990	29375	9.43	9.89	0.97	1.02	ppm	0.97
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	23224	20851	7.80	7.30	0.80	0.75	ppm	0.80
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	23.99	21.77	5487	8829	1.88	3.18	0.19	0.33	ppm	0.19
31) Tetratriacontane	24.82	0.00	7531	0	2.53	0.00	0.26	0.00	ppm	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.09	0	6725	0.00	2.50	0.00	0.26	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA): 4.48 ppm
Total ISOPRENOIDS (TI): 0.37 ppm
TI/(TRA-TI): 0.09

Evaluation 1: biased by background
Evaluation 2: suspect false positive
Evaluation 3: biased by background

C25-C31 Odds: 3.19 ppm
TPH Background (diesel range): 79 ppm
TPH Background (C10 - C36) 108 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

0114F013.D A_EPHPAH.MTH

POPA0007724

00273

Datafile : J:\GC15\DATA\011499\HARTALKN\0114F014.D
Acq On : 15 Jan 99 01:34 AM
Sample : K9807169-017
Misc : F=1 D=1 A=10.7

Vial: 15
Operator: LLANDAUER
Inst : GC15

Method : A_EPHPAH.MTH
Title : Aliphatic Hydrocarbons (nC8 - nC40)
Volume Inj. : 1.0ul
Signal #1 Phase : RTx-5
Signal #1 Info : 0.53
Signal #2 Phase : RTx-200
Signal #2 Info : 0.53

F=Final Volume (mls)= 1
D=Dilution Factor= 1
A=Amount Extracted (g or mL)= 10.7
Conversion Factor=(F*D)/A= 0.09346
Matrix= Soil

Compound	RT#1	RT#2	Resp#1	Resp#2	Solution Conc.#1	Solution Conc#2	Original Conc.#1	Original Conc.#2	Units	Reported Value (Conc. #1)
Target Compounds										
1) Decane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
2) Undecane	6.94	5.72	693	815	0.24	0.30	0.02	0.03	ppm	0.02
3) Dodecane	8.04	6.86	1001	1397	0.37	0.49	0.03	0.05	ppm	0.03
4) Isoprenoid U1	8.74	7.70	404	390	0.15	0.14	0.01	0.01	ppm	0.01
5) Tridecane	9.04	7.84	504	581	0.18	0.20	0.02	0.02	ppm	0.02
6) Isoprenoid U2	9.93	8.63	1020	843	0.36	0.30	0.03	0.03	ppm	0.03
7) Tetradecane	10.21	8.71	3689	5235	1.26	1.76	0.12	0.16	ppm	0.12
8) Isoprenoid U3	10.98	9.35	1228	875	0.42	0.29	0.04	0.03	ppm	0.04
9) Pentadecane	11.44	9.64	2299	2357	0.79	0.80	0.07	0.07	ppm	0.07
10) Hexadecane	12.63	10.71	4330	5142	1.46	1.71	0.14	0.16	ppm	0.14
11) Isopreniod U4	13.19	11.37	1704	1822	0.58	0.61	0.05	0.06	ppm	0.05
12) Heptadecane	13.77	11.76	4740	4260	1.63	1.49	0.15	0.14	ppm	0.15
13) Pristane	13.83	12.01	4097	4996	1.43	1.65	0.13	0.15	ppm	0.13
14) Octadecane	14.85	12.76	4494	5196	1.52	1.77	0.14	0.17	ppm	0.14
15) Phytane	14.94	13.05	3063	3811	1.09	1.31	0.10	0.12	ppm	0.10
16) Nonadecane	0.00	13.73	0	4642	0.00	1.58	0.00	0.15	ppm	0.00
17) Eicosane	17.02	0.00	2147	0	0.72	0.00	0.07	0.00	ppm	0.00
18) Heneicosane	17.96	0.00	4711	0	1.67	0.00	0.16	0.00	ppm	0.00
19) Docosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
20) Tricosane	19.33	17.36	3542	3420	1.19	1.18	0.11	0.11	ppm	0.11
21) Tetracosane	19.95	0.00	4662	0	1.48	0.00	0.14	0.00	ppm	0.00
22) Pentacosane	20.37	18.69	12621	12810	4.13	4.31	0.39	0.40	ppm	0.39
23) Hexacosane	20.89	0.00	4487	0	1.47	0.00	0.14	0.00	ppm	0.00
24) Heptacosane	21.22	19.68	23779	23293	7.77	7.88	0.73	0.74	ppm	0.73
25) Octacosane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
26) Nonacosane	21.99	20.47	23918	23217	7.78	7.82	0.73	0.73	ppm	0.73
27) Triacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
28) Hentriacontane	22.86	21.16	20998	18167	7.06	6.36	0.66	0.59	ppm	0.66
29) Dotriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
30) Tritriacontane	0.00	21.77	0	5834	0.00	2.10	0.00	0.20	ppm	0.00
31) Tetratriacontane	24.81	0.00	4717	0	1.58	0.00	0.15	0.00	ppm	0.00
32) Pentatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
33) Hexatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
34) Heptatriacontane	0.00	23.09	0	6023	0.00	2.24	0.00	0.21	ppm	0.00
35) Octatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
36) Nonatriacontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00
37) Tetracontane	0.00	0.00	0	0	0.00	0.00	0.00	0.00	ppm	0.00

Total Resolved ALKANES (TRA):	3.67	ppm
Total ISOPRENOIDS (TI):	0.36	ppm
TI/(TRA-TI):	0.11	

Evaluation 1: biased by background
Evaluation 2: suspect false positive
Evaluation 3: biased by background

C25-C31 Odds: 2.51 ppm
TPH Background (diesel range): 62 ppm
TPH Background (C10 - C36) 85 ppm

* Division by 0 = 100 for evaluation.

Evaluation 1 = comparision of total isoprenoids to total resolved alkanes minus total isoprenoids. A good match is indicated by a predominance of isoprenoids.

Evaluation 2 = checks U2, U3, U4, Pristane and Phytane; comparison of C17 to Pristane. A good match is indicated by presence of all isoprenoids and low C17 relative to Pristane.

Evaluation 3 = comparison of C25 + C27 + C29 + C31 to Pristane + Phytane. Good match is indicated by at least 2 X Pristane + Phytane.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Polynuclear Aromatic Hydrocarbons

Sample Name: HC-S-01
Lab Code: K9807097-031
Test Notes:

Units: ug/Kg (ppb)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
Acenaphthylene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
Acenaphthene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
Dibenzofuran	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
Fluorene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C1-Fluorenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C2-Fluorenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C3-Fluorenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
Dibenzothiophene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
Phenanthrene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	50000	
Anthracene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
Fluoranthene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	70000	
Pyrene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	66000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	32000	
Benz(a)anthracene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	54000	
Chrysene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	59000	
C1-Chrysenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C2-Chrysenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C3-Chrysenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
C4-Chrysenes	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	60000	
Benzo(k)fluoranthene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	55000	
Benzo(a)pyrene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	67000	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	62000	
Dibenz(a,h)anthracene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	ND	
Benzo(g,h,i)perylene	EPA 3550B	SIM	30000	10000	10/23/98	1/11/99	53000	

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Approved By: _____ Date: 1 15 99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-02	Units:	ug/Kg (ppb)
Lab Code:	K9807097-032	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Acenaphthylene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Acenaphthene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	5800	
Dibenzofuran	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Fluorene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C1-Fluorenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C2-Fluorenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C3-Fluorenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Dibenzothiophene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Phenanthrene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	23000	
Anthracene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	4900	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	5000	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Fluoranthene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	44000	
Pyrene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	37000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	15000	
Benz(a)anthracene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	30000	
Chrysene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	32000	
C1-Chrysenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	12000	
C2-Chrysenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	5600	
C3-Chrysenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C4-Chrysenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	31000	
Benzo(k)fluoranthene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	30000	
Benzo(a)pyrene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	38000	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	29000	
Dibenz(a,h)anthracene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	6600	
Benzo(g,h,i)perylene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	26000	

Approved By: _____ Date: 1/15/99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807097
Project:	Port of Portland Terminal 4/5624	Date Collected:	10/13/98
Sample Matrix:	Sediment	Date Received:	10/14/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-03	Units:	ug/Kg (ppb)
Lab Code:	K9807097-033	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Acenaphthylene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Acenaphthene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Dibenzofuran	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Fluorene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C1-Fluorenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C2-Fluorenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C3-Fluorenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Dibenzothiophene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Phenanthrene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	12000	
Anthracene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	3100	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Fluoranthene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	28000	
Pyrene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	26000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	11000	
Benz(a)anthracene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	20000	
Chrysene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	23000	
C1-Chrysenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	8300	
C2-Chrysenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C3-Chrysenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
C4-Chrysenes	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	21000	
Benzo(k)fluoranthene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	21000	
Benzo(a)pyrene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	25000	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	19000	
Dibenz(a,h)anthracene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	4300	
Benzo(g,h,i)perylene	EPA 3550B	SIM	3000	1000	10/23/98	1/11/99	17000	

Approved By: _____ Date: 1/15/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-04	Units:	ug/Kg (ppb)
Lab Code:	K9807097-034	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Acenaphthylene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Acenaphthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	860	
Dibenzofuran	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Fluorene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	470	
C1-Fluorenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C2-Fluorenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C3-Fluorenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Dibenzothiophene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Phenanthrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	5400	
Anthracene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	1200	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	1300	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	660	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	380	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Fluoranthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	13000	
Pyrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	14000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	4400	
Benz(a)anthracene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	8400	
Chrysene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	9600	
C1-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	3500	
C2-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	950	
C3-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C4-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	9400	
Benzo(k)fluoranthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	9000	
Benzo(a)pyrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	12000	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	10000	
Dibenz(a,h)anthracene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	2000	
Benzo(g,h,i)perylene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	9500	

Approved By: _____ Date: 6/2/99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.
Project: Port of Portland Terminal 4/5624
Sample Matrix: Sediment

Service Request: K9807097
Date Collected: 10/13/98
Date Received: 10/14/98

Polynuclear Aromatic Hydrocarbons

Sample Name: HC-S-05
Lab Code: K9807097-035
Test Notes:

Units: ug/Kg (ppb)
Basis: Dry

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	300	
2-Methylnaphthalene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Acenaphthylene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Acenaphthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	550	
Dibenzofuran	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Fluorene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	450	
C1-Fluorenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C2-Fluorenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C3-Fluorenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Dibenzothiophene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Phenanthrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	4200	
Anthracene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	1100	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	1400	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	790	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	360	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Fluoranthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	12000	
Pyrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	14000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	3500	
Benz(a)anthracene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	6100	
Chrysene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	7100	
C1-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	2400	
C2-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	770	
C3-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C4-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	6200	
Benzo(k)fluoranthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	6300	
Benzo(a)pyrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	8900	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	7300	
Dibenz(a,h)anthracene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	1200	
Benzo(g,h,i)perylene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	7300	

Approved By: _____ Date: 1/15/99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-06	Units:	ug/Kg (ppb)
Lab Code:	K9807097-036	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
Acenaphthylene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
Acenaphthene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	550	
Dibenzofuran	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
Fluorene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C1-Fluorenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C2-Fluorenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C3-Fluorenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
Dibenzothiophene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
Phenanthrene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	3800	
Anthracene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	950	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	400	100	10/23/98	1/11/99	990	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	400	100	10/23/98	1/11/99	540	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
Fluoranthene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	9400	
Pyrene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	10000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	3200	
Benz(a)anthracene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	5800	
Chrysene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	6800	
C1-Chrysenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	2200	
C2-Chrysenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	660	
C3-Chrysenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
C4-Chrysenes	EPA 3550B	SIM	400	100	10/23/98	1/11/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	6100	
Benzo(k)fluoranthene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	6500	
Benzo(a)pyrene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	8000	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	6500	
Dibenz(a,h)anthracene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	1200	
Benzo(g,h,i)perylene	EPA 3550B	SIM	400	100	10/23/98	1/11/99	6800	

Approved By: _____ Date: 1/15/99

Page No.:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807097
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/13/98
Sample Matrix:	Sediment	**Date Received:**	10/14/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-07	Units:	ug/Kg (ppb)
Lab Code:	K9807097-037	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Acenaphthylene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Acenaphthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	660	
Dibenzofuran	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Fluorene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	390	
C1-Fluorenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C2-Fluorenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C3-Fluorenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Dibenzothiophene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Phenanthrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	4300	
Anthracene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	1100	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	1100	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	530	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Fluoranthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	11000	
Pyrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	12000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	3600	
Benz(a)anthracene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	6500	
Chrysene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	7600	
C1-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	3000	
C2-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	770	
C3-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
C4-Chrysenes	EPA 3550B	SIM	300	100	10/23/98	1/11/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	6500	
Benzo(k)fluoranthene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	7500	
Benzo(a)pyrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	9200	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	7700	
Dibenz(a,h)anthracene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	1200	
Benzo(g,h,i)perylene	EPA 3550B	SIM	300	100	10/23/98	1/11/99	7900	

Approved By: _____ Date: 1/15/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-12	Units:	ug/Kg (ppb)
Lab Code:	K9807115-003	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
Acenaphthylene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
Acenaphthene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	450	
Dibenzofuran	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
Fluorene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	330	
C1-Fluorenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
C2-Fluorenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
C3-Fluorenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
Dibenzothiophene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
Phenanthrene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	3800	
Anthracene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	1000	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/11/99	1100	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/11/99	540	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
Fluoranthene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	8900	
Pyrene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	12000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	3000	
Benz(a)anthracene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	5200	
Chrysene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	6200	
C1-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	1900	
C2-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	380	
C3-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
C4-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/11/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	5100	
Benzo(k)fluoranthene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	5700	
Benzo(a)pyrene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	7300	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	6100	
Dibenz(a,h)anthracene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	960	
Benzo(g,h,i)perylene	EPA 3550B	SIM	300	100	10/24/98	1/11/99	6600	

Approved By: _____ Date: 1-15-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-16	Units:	ug/Kg (ppb)
Lab Code:	K9807115-007	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	300	
2-Methylnaphthalene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Acenaphthylene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	320	
Acenaphthene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	520	
Dibenzofuran	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Fluorene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	1000	
C1-Fluorenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	310	
C2-Fluorenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C3-Fluorenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Dibenzothiophene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	460	
C1-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Phenanthrene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	9100	
Anthracene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	2900	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/12/99	2600	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/12/99	1100	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/12/99	320	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	17000	
Pyrene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	27000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	5000	
Benz(a)anthracene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	7700	
Chrysene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	9500	
C1-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	2600	
C2-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	870	
C3-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	6900	
Benzo(k)fluoranthene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	7800	
Benzo(a)pyrene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	11000	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	8400	
Dibenz(a,h)anthracene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	1300	
Benzo(g,h,i)perylene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	9800	

Approved By: _____ Date: 1-15-99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/9

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-23	Units:	ug/Kg (ppb
Lab Code:	K9807115-010	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Resul Notes
Naphthalene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Acenaphthylene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Acenaphthene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	540	
Dibenzofuran	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Fluorene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	340	
C1-Fluorenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C2-Fluorenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C3-Fluorenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Dibenzothiophene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Phenanthrene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	3600	
Anthracene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	1100	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/12/99	1100	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/12/99	560	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	9500	
Pyrene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	1300	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	3300	
Benz(a)anthracene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	5600	
Chrysene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	6700	
C1-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	2200	
C2-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	600	
C3-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	300	100	10/24/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	5500	
Benzo(k)fluoranthene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	5900	
Benzo(a)pyrene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	7700	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	6300	
Dibenz(a,h)anthracene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	1000	
Benzo(g,h,i)perylene	EPA 3550B	SIM	300	100	10/24/98	1/12/99	7100	

Approved By: _____ Date: 1/20/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-24	Units:	ug/Kg (ppb)
Lab Code:	K9807115-011	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	1200	
2-Methylnaphthalene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
Acenaphthylene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	1400	
Acenaphthene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
Dibenzofuran	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
Fluorene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
C1-Fluorenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	1500	
C2-Fluorenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
C3-Fluorenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
Dibenzothiophene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	1400	
C1-Dibenzothiophenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	1300	
C3-Dibenzothiophenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
Phenanthrene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	16000	
Anthracene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	6200	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	9300	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	4800	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	1700	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	70000	
Pyrene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	96000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	18000	
Benz(a)anthracene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	23000	
Chrysene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	27000	
C1-Chrysenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	9800	
C2-Chrysenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	2100	
C3-Chrysenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	15000	
Benzo(k)fluoranthene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	20000	
Benzo(a)pyrene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	26000	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	19000	
Dibenz(a,h)anthracene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	2400	
Benzo(g,h,i)perylene	EPA 3550B	SIM	1000	500	10/24/98	1/12/99	19000	

Approved By: _____ Date: 1-15-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-25	Units:	ug/Kg (ppb)
Lab Code:	K9807115-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	63	
C3-Naphthalenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	43	
C4-Naphthalenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Acenaphthylene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Acenaphthene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Dibenzofuran	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Fluorene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C1-Fluorenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C2-Fluorenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C3-Fluorenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Dibenzothiophene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Phenanthrene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	150	
Anthracene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	51	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/24/98	1/12/99	93	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/24/98	1/12/99	98	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/24/98	1/12/99	70	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	300	
Pyrene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	380	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	110	
Benz(a)anthracene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	110	
Chrysene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	180	
C1-Chrysenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C2-Chrysenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C3-Chrysenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	75	
Benzo(k)fluoranthene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	140	
Benzo(a)pyrene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	160	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	130	
Dibenz(a,h)anthracene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Benzo(g,h,i)perylene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	180	

Approved By: _____ Date: 1.15.99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807115
Project:	Port of Portland Terminal 4/5624	**Date Collected:**	10/14/98
Sample Matrix:	Sediment	**Date Received:**	10/15/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-33	Units:	ug/Kg (ppb)
Lab Code:	K9807115-021	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	90	
2-Methylnaphthalene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	51	
C3-Naphthalenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	100	
C4-Naphthalenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	120	
Acenaphthylene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Acenaphthene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	140	
Dibenzofuran	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Fluorene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	85	
C1-Fluorenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C2-Fluorenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	64	
C3-Fluorenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	77	
Dibenzothiophene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	64	
Phenanthrene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	830	
Anthracene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	220	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/24/98	1/12/99	290	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/24/98	1/12/99	260	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/24/98	1/12/99	210	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	1800	
Pyrene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	2200	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	660	
Benz(a)anthracene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	1000	
Chrysene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	1300	
C1-Chrysenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	400	
C2-Chrysenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	160	
C3-Chrysenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	50	20	10/24/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	1100	
Benzo(k)fluoranthene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	1300	
Benzo(a)pyrene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	1500	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	1200	
Dibenz(a,h)anthracene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	230	
Benzo(g,h,i)perylene	EPA 3550B	SIM	50	20	10/24/98	1/12/99	1400	

Approved By: _____ Date: 1-15-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807169
Project:	Port of Portland Terminal 4/5624-06	Date Collected:	10/15/98
Sample Matrix:	Sediment	Date Received:	10/16/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-36	Units:	ug/Kg (ppb)
Lab Code:	K9807169-001	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	50	
2-Methylnaphthalene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	34	
1-Methylnaphthalene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	14	
C2-Naphthalenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	15	
C3-Naphthalenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	23	
C4-Naphthalenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	33	
Acenaphthylene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	8	
Acenaphthene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	26	
Dibenzofuran	EPA 3550B	SIM	5	1	10/28/98	1/12/99	12	
Fluorene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	19	
C1-Fluorenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	14	
C2-Fluorenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	27	
C3-Fluorenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	37	
Dibenzothiophene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	8	
C1-Dibenzothiophenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	25	
C2-Dibenzothiophenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	15	
C3-Dibenzothiophenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	15	
Phenanthrene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	180	
Anthracene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	30	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	5	1	10/28/98	1/12/99	93	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	5	1	10/28/98	1/12/99	100	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	5	1	10/28/98	1/12/99	74	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	5	1	10/28/98	1/12/99	20	
Fluoranthene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	280	
Pyrene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	330	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	130	
Benz(a)anthracene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	140	
Chrysene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	170	
C1-Chrysenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	90	
C2-Chrysenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	47	
C3-Chrysenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	22	
C4-Chrysenes	EPA 3550B	SIM	5	1	10/28/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	130	
Benzo(k)fluoranthene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	120	
Benzo(a)pyrene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	190	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	180	
Dibenz(a,h)anthracene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	30	
Benzo(g,h,i)perylene	EPA 3550B	SIM	5	1	10/28/98	1/12/99	180	

Approved By: _____ Date: 1-15-99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-34	Units:	ug/Kg (ppb)
Lab Code:	K9807169-002	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	100	
2-Methylnaphthalene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	130	
C3-Naphthalenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	270	
C4-Naphthalenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	260	
Acenaphthylene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
Acenaphthene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	170	
Dibenzofuran	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
Fluorene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
C1-Fluorenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
C2-Fluorenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	160	
C3-Fluorenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	170	
Dibenzothiophene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	140	
C3-Dibenzothiophenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	160	
Phenanthrene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	500	
Anthracene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	40	10/28/98	1/12/99	370	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	40	10/28/98	1/12/99	470	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	40	10/28/98	1/12/99	380	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	40	10/28/98	1/12/99	160	
Fluoranthene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	1300	
Pyrene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	1500	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	550	
Benz(a)anthracene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	540	
Chrysene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	760	
C1-Chrysenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	430	
C2-Chrysenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	210	
C3-Chrysenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	100	40	10/28/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	480	
Benzo(k)fluoranthene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	510	
Benzo(a)pyrene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	750	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	680	
Dibenz(a,h)anthracene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	110	
Benzo(g,h,i)perylene	EPA 3550B	SIM	100	40	10/28/98	1/12/99	770	

Approved By: R Date: 1-15-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-40	Units:	ug/Kg (ppb)
Lab Code:	K9807169-003	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	55	
2-Methylnaphthalene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	72	
1-Methylnaphthalene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	59	
C2-Naphthalenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Acenaphthylene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Acenaphthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	230	
Dibenzofuran	EPA 3550B	SIM	50	20	10/28/98	1/12/99	70	
Fluorene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	160	
C1-Fluorenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	40	
C2-Fluorenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C3-Fluorenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Dibenzothiophene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Phenanthrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	1700	
Anthracene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	250	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	300	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	110	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2900	
Pyrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2500	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	960	
Benz(a)anthracene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	1600	
Chrysene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2200	
C1-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	760	
C2-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	180	
C3-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2100	
Benzo(k)fluoranthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	1600	
Benzo(a)pyrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2100	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2000	
Dibenz(a,h)anthracene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	470	
Benzo(g,h,i)perylene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	1800	

Approved By: _____ Date: 1-15-99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807169
Project:	Port of Portland Terminal 4/5624-06	Date Collected:	10/15/98
Sample Matrix:	Sediment	Date Received:	10/16/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-39	Units:	ug/Kg (ppb)
Lab Code:	K9807169-004	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	140	
1-Methylnaphthalene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	120	
C2-Naphthalenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Acenaphthylene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Acenaphthene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	570	
Dibenzofuran	EPA 3550B	SIM	100	50	10/28/98	1/12/99	160	
Fluorene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	400	
C1-Fluorenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C2-Fluorenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C3-Fluorenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Dibenzothiophene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	180	
C1-Dibenzothiophenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Phenanthrene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	4100	
Anthracene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	570	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	50	10/28/98	1/12/99	710	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	50	10/28/98	1/12/99	230	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	7500	
Pyrene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	5800	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	2300	
Benz(a)anthracene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	3800	
Chrysene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	5100	
C1-Chrysenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	1600	
C2-Chrysenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	350	
C3-Chrysenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	4900	
Benzo(k)fluoranthene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	3900	
Benzo(a)pyrene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	4800	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	4500	
Dibenz(a,h)anthracene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	1100	
Benzo(g,h,i)perylene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	4000	

Approved By: R Date: 1-15-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-38	Units:	ug/Kg (ppb)
Lab Code:	K9807169-005	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	180	
2-Methylnaphthalene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	420	
1-Methylnaphthalene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	260	
C2-Naphthalenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	160	
C3-Naphthalenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Acenaphthylene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Acenaphthene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	1800	
Dibenzofuran	EPA 3550B	SIM	100	50	10/28/98	1/12/99	500	
Fluorene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	1200	
C1-Fluorenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	290	
C2-Fluorenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C3-Fluorenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Dibenzothiophene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	560	
C1-Dibenzothiophenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Phenanthrene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	12000	
Anthracene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	1700	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	50	10/28/98	1/12/99	1900	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	50	10/28/98	1/12/99	610	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	50	10/28/98	1/12/99	170	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	20000	
Pyrene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	17000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	7300	
Benz(a)anthracene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	11000	
Chrysene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	15000	
C1-Chrysenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	4800	
C2-Chrysenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	1300	
C3-Chrysenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	100	50	10/28/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	14000	
Benzo(k)fluoranthene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	11000	
Benzo(a)pyrene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	14000	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	13000	
Dibenz(a,h)anthracene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	3100	
Benzo(g,h,i)perylene	EPA 3550B	SIM	100	50	10/28/98	1/12/99	11000	

Approved By: _____ Date: 1-15-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807169
Project:	Port of Portland Terminal 4/5624-06	Date Collected:	10/15/98
Sample Matrix:	Sediment	Date Received:	10/16/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-19	Units:	ug/Kg (ppb)
Lab Code:	K9807169-013	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	4000	
2-Methylnaphthalene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
Acenaphthylene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
Acenaphthene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	19000	
Dibenzofuran	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
Fluorene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	7100	
C1-Fluorenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
C2-Fluorenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
C3-Fluorenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
Dibenzothiophene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
Phenanthrene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	68000	
Anthracene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	14000	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	15000	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	5400	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	130000	
Pyrene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	110000	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	50000	
Benz(a)anthracene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	82000	
Chrysene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	93000	
C1-Chrysenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	39000	
C2-Chrysenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	12000	
C3-Chrysenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	84000	
Benzo(k)fluoranthene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	76000	
Benzo(a)pyrene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	100000	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	78000	
Dibenz(a,h)anthracene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	16000	
Benzo(g,h,i)perylene	EPA 3550B	SIM	3000	1000	10/28/98	1/12/99	66000	

Approved By: _____ Date: 1·15·99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	**Service Request:**	K9807169
Project:	Port of Portland Terminal 4/5624-06	**Date Collected:**	10/15/98
Sample Matrix:	Sediment	**Date Received:**	10/16/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-31	Units:	ug/Kg (ppb)
Lab Code:	K9807169-016	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Acenaphthylene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Acenaphthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	55	
Dibenzofuran	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Fluorene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C1-Fluorenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C2-Fluorenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C3-Fluorenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Dibenzothiophene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Phenanthrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	330	
Anthracene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	69	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	96	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	51	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	830	
Pyrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	880	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	290	
Benz(a)anthracene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	470	
Chrysene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	570	
C1-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	230	
C2-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	70	
C3-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	510	
Benzo(k)fluoranthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	510	
Benzo(a)pyrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	650	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	590	
Dibenz(a,h)anthracene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	120	
Benzo(g,h,i)perylene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	580	

Approved By: R Date: 1·15·99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807169
Project:	Port of Portland Terminal 4/5624-06	Date Collected:	10/15/98
Sample Matrix:	Sediment	Date Received:	10/16/98

Polynuclear Aromatic Hydrocarbons

Sample Name:	HC-S-30	Units:	ug/Kg (ppb)
Lab Code:	K9807169-017	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	100	
2-Methylnaphthalene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	68	
1-Methylnaphthalene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	53	
C2-Naphthalenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Acenaphthylene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Acenaphthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	440	
Dibenzofuran	EPA 3550B	SIM	50	20	10/28/98	1/12/99	84	
Fluorene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	220	
C1-Fluorenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	78	
C2-Fluorenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C3-Fluorenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Dibenzothiophene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	120	
C1-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Phenanthrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2400	
Anthracene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	490	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	550	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	230	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	74	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Fluoranthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	4700	
Pyrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	4200	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	1500	
Benz(a)anthracene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2700	
Chrysene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	3100	
C1-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	1200	
C2-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	330	
C3-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
C4-Chrysenes	EPA 3550B	SIM	50	20	10/28/98	1/12/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2900	
Benzo(k)fluoranthene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2900	
Benzo(a)pyrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	3800	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	3100	
Dibenz(a,h)anthracene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	550	
Benzo(g,h,i)perylene	EPA 3550B	SIM	50	20	10/28/98	1/12/99	2800	

Approved By: _____ Date: 1-15-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Hart Crowser, Inc.	Service Request:	K9807169
Project:	Port of Portland Terminal 4/5624-06	Date Collected:	NA
Sample Matrix:	Sediment	Date Received:	NA

Polynuclear Aromatic Hydrocarbons

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	K981028-MB	Basis:	Dry
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
1-Methylnaphthalene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C2-Naphthalenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C3-Naphthalenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C4-Naphthalenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Acenaphthylene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Acenaphthene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Dibenzofuran	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Fluorene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C1-Fluorenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C2-Fluorenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C3-Fluorenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Dibenzothiophene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C1-Dibenzothiophenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C2-Dibenzothiophenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C3-Dibenzothiophenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Phenanthrene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Anthracene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C1-Phenanthrenes/Anthrace	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C2-Phenanthrenes/Anthrace	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C3-Phenanthrenes/Anthrace	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C4-Phenanthrenes/Anthrace	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Fluoranthene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Pyrene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C1-Fluoranthenes/Pyrenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Benz(a)anthracene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Chrysene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C1-Chrysenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C2-Chrysenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C3-Chrysenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
C4-Chrysenes	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Benzo(k)fluoranthene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Benzo(a)pyrene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Dibenz(a,h)anthracene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	
Benzo(g,h,i)perylene	EPA 3550B	SIM	10	5	10/28/98	1/11/99	ND	

Approved By: _____ Date: 1-15-99

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