RCRA FACILITY INVESTIGATION

AT

CHEVRON HAWAII REFINERY
BARBER'S POINT
OAHU, HAWAII

NOVEMBER 1993

Prepared for

CHEVRON U.S.A. PRODUCTS COMPANY
HAWAII REFINERY
91-480 MALAKOLE STREET
EWA BEACH, HAWAII 96707

Prepared by

ENGINEERING-SCIENCE, INC.
DESIGN ▪ RESEARCH ▪ PLANNING
1357 KAPIOLANI BOULEVARD, SUITE 1120, HONOLULU, HAWAII 96814

ES ENGINEERING-SCIENCE

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SECTION 1

INTRODUCTION

This report describes a Resource Conservation and Recovery Act (RCRA) Facility Investigation conducted by Engineering-Science, Inc., (ES) for the Chevron U.S.A Inc. Hawaii Refinery.

The United States Environmental Protection Agency (EPA) Region IX, located in San Francisco, California is the lead regulatory agency for RCRA actions at the Chevron Hawaii Refinery. Under Section 3004(u) of the Hazardous and Solid Waste Amendments (HSWA) to RCRA, corrective action is required for releases of hazardous waste or hazardous waste constituents from any solid waste management unit (SWMU) at treatment storage or disposal facilities (TSDFs). Under section 3005 of HSWA, TSDFs must have a RCRA Part B permit for management of hazardous wastes at the facility. All holders of RCRA Part B permits are subject to a RCRA Facility Assessment (RFA) to identify SWMUs which may be the source of a release to the environment. A RFA was completed for the Chevron Hawaii Refinery in 1986. EPA Region IX and Chevron have developed a RCRA Facility Investigation (RFI) schedule for compliance that includes investigation of the Chevron Hawaii Refinery SWMUs that have been identified as potential sources of hazardous waste releases to the environment.

In partial fulfillment of the RFI schedule for compliance, this RFI involved the collection and laboratory analysis of soil, sludge and samples from 15 identified SWMUs. This RFI also involved in-situ integrity testing of 3 in-ground SWMU sumps, and analysis of soil and groundwater samples collected adjacent to a sump that failed integrity testing. The approved scope of work for this RFI was presented in an August 1992 RFI Work Plan for Chevron Hawaii Refinery (Engineering-Science 1992a).

The investigation summarized in this report incorporates the data and findings presented in three quarterly RFI status reports (Engineering-Science 1992b, 1993a, 1993b).

Section 1 of this report describes the Chevron Hawaii Refinery facility, its environmental setting, previous RCRA reports and the goals of the RFI; Section 2 provides descriptions of SWMUs and summarizes field investigation activities conducted at individual SWMUs; Section 3 presents a discussion of integrity testing

results; and analytical results, and Section 4 contains conclusions and recommendations.

1.1 SITE DESCRIPTION

The Chevron U.S.A. Inc. Hawaii Refinery is located within the Campbell Industrial Park at 91-480 Malakole Road, Ewa Beach, Oahu, Hawaii (Figure 1.1). The Refinery covers an area of approximately 248 acres and is bounded on the west by the Pacific Ocean, on the south by Brewer Chemical Company, on the east by a strip of vacant land within the Industrial Park and on the north by the Camp Malakole Military Reservation and additional vacant land.

The Chevron Hawaii Refinery began operations in 1960, and presently processes approximately 50,000 barrels per day of low and medium sulfur crude oil. Crude oil is delivered from offshore tankers via an underwater pipeline through which the oil is transferred to aboveground storage tanks located within the refinery. The refinery manufactures liquefied petroleum gas (LPG), gasoline, jet fuel, diesel fuel, fuel oil, asphalt and sulfuric acid. Figure 1.2 is a site plan of the facility.

Geology/Hydrogeology

The refinery is located on the Ewa plain of southwestern Oahu. The plain is part of an emerged coral reef complex in which Karst features are common. The reef is estimated to be approximately 600 feet thick beneath the refinery site. The coral unconformity overlies basaltic lava flows from the Waianae Range (A.T. Kearney, 1986).

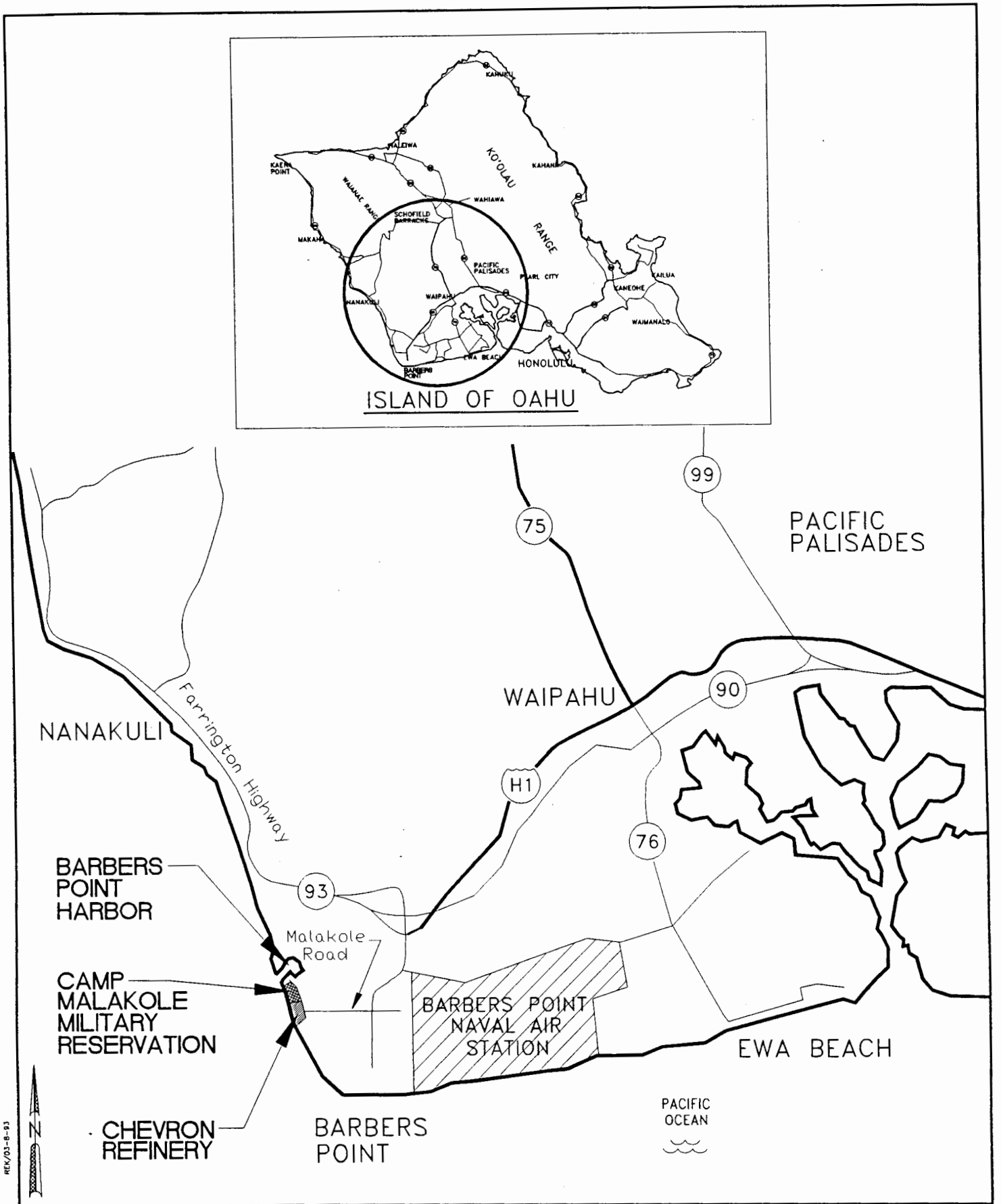
There are two main aquifers in the Barbers Point region. The upper aquifer is contained in the coral deposits and the lower basal aquifer is contained within permeable sections of the Waianae volcanics. The shallow coral aquifer is unconfined, brackish and subject to tidal influence. The depth to the shallow aquifer water table beneath the refinery averages approximately 4 to 5 feet below the ground surface. The shallow aquifer is recharged by infiltration of rainfall and upward leakage from the underlying basal aquifer. The basal aquifer is confined by the lower permeability coral deposits above it. The groundwater in this aquifer exists under artesian conditions. Recharge is primarily from infiltration of rainfall on the Waianae Range (A.T. Kearney, 1986).

1.2 SUMMARY OF PREVIOUS RCRA SUBMITTALS

The following RCRA submittals have been prepared by the Chevron Hawaii Refinery and its consultants:

- Shane, D., EPA RCRA Investigation Report for Chevron USA Hawaii Refinery, Ewa Beach, Hawaii, June 14, 1984
- Chevron U.S.A. Products Co., RCRA Part B Permit Application for Chevron USA Hawaii Refinery, January 1985

FIGURE 1.1



SITE VICINITY MAP
CHEVRON HAWAII REFINERY
BARBERS POINT, HAWAII

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

ES

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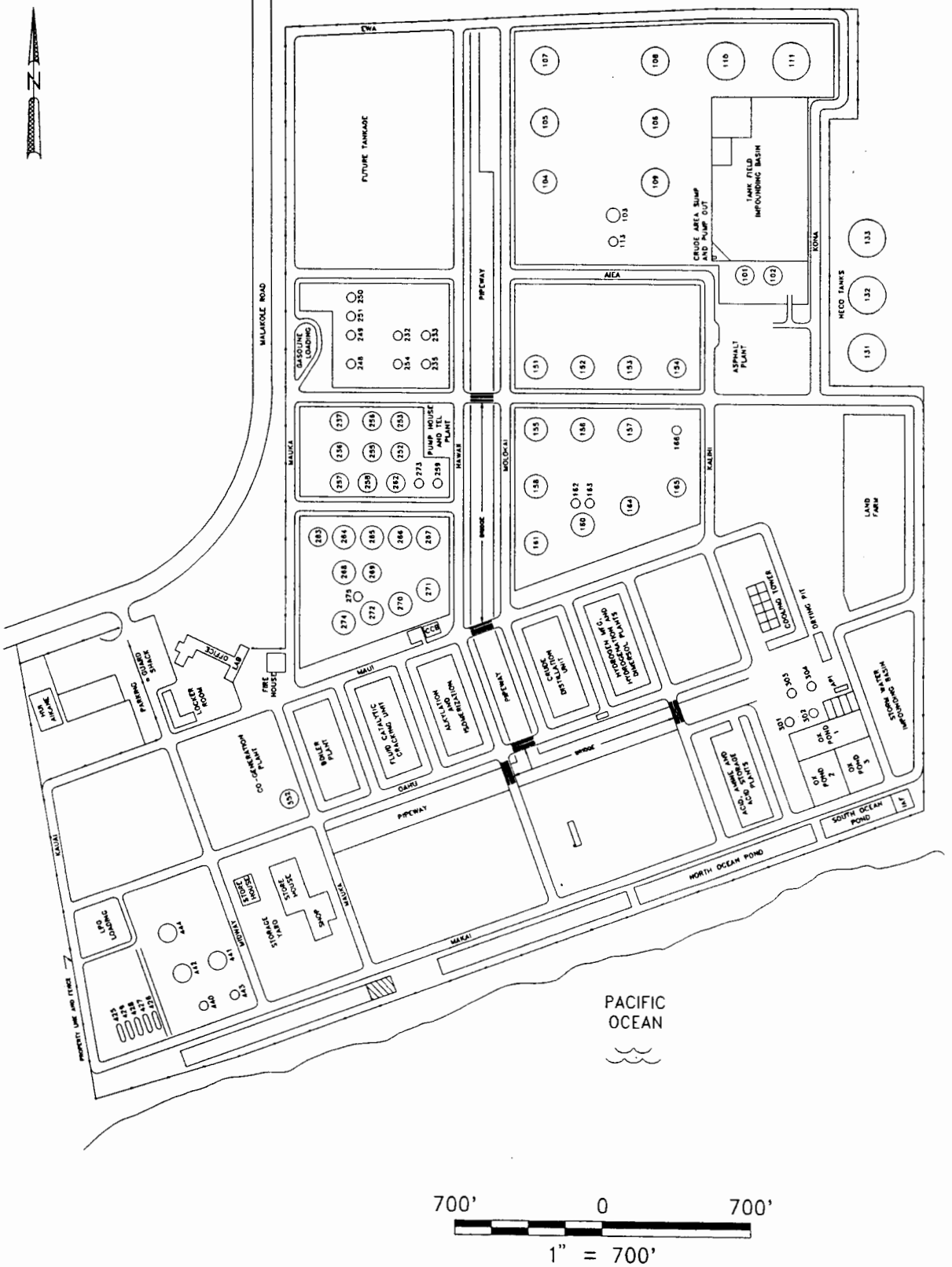
FIGURE 1.2



700' 0 700'

1" = 700'

SITE PLAN

CHEVRON HAWAII REFINERY
BARBERS POINT, HAWAII

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

C:\CHEV\OVERALL.DWG

- Brode, T., EPA RCRA Inspection Report for Chevron USA Hawaii Refinery, Ewa Beach, Hawaii, March 13, 1985
- Chang, D., Hawaii Department of Health RCRA Facility Inspection, Chevron USA Hawaii Refinery, December 26, 1985
- Arthur, G., EPA NPDES Compliance Monitoring Report, Chevron USA Hawaii Refinery, January 24, 1986
- Weis, W. III, RCRA TSD Investigation, Chevron USA Hawaii Refinery, September 8, 1986
- Kearney, A.J., and Science Applications International Corporation, RCRA Facility Assessment of Solid Waste Management Units at Chevron U.S.A. Inc. Hawaii Refinery, December 19, 1986
- Nordrum, S.B., Chevron Hawaii Refinery Land Treatment Demonstration Report, February 28, 1990
- Engineering-Science, Inc., RCRA Facility Investigation Work Plan, Chevron Hawaii Refinery, Barbers Point, Hawaii, August 28, 1992
- Engineering-Science, Inc., First Quarterly Status Report, RCRA Facility Investigation at Chevron Hawaii Refinery, Barbers Point, Oahu, Hawaii, December 1992
- Engineering-Science, Inc., Second Quarterly Status Report, RCRA Facility Investigation at Chevron Hawaii Refinery, Barbers Point, Oahu, Hawaii, March 1993
- Engineering-Science, Inc., Third Quarterly Status Report, RCRA Facility Investigation at Chevron Hawaii Refinery, Barbers Point, Oahu, Hawaii, June 1993

Chevron has submitted both a RCRA Part A and Part B permit application for a land treatment unit, an induced air flotation pond and a flare oily basin. Chevron holds an National Pollution Discharge Elimination System (NPDES) permit for discharges from the refinery wastewater treatment system.

The December 19, 1986 RFA was submitted to EPA Region 9 by A.T. Kearney, Inc. and Science Applications International Corporation. The RFA included identification and evaluation of a total of 37 SWMUs within the refinery. The SWMUs were evaluated for the potential release of hazardous substances to the environment and the RFA report presented suggestions for further actions. Of the 37 SWMUs, 19 required no further investigation.

To fulfill requirements for obtaining a land treatment unit RCRA Part B permit, a Land Treatment Demonstration (LTD) was conducted at the refinery. Since approximately 1982, the land treatment unit has been in operation for biodegradation of sludges generated at the refinery. A summary of the LTD findings was submitted in a February 28, 1990 LTD report.

The August 28 1992 RFI Work Plan prepared by ES was submitted to and approved by EPA Region 9 prior to implementation of the RFI described in this report.

1.3 GOALS OF CURRENT INVESTIGATION

In fulfillment of further actions recommended by the 1986 RFA Report (A.T. Kearney, 1986), and subsequent EPA Region IX RCRA compliance requirements, the goals of this current RFI are to characterize shallow soil and sludge samples for selected potential contaminants from a total of 15 SWMUs and to test the integrity of three active sumps at the Chevron Hawaii Refinery. The characterization and integrity testing activities will be utilized to identify and evaluate the potential for release of hazardous constituents from the selected SWMUs.

1.4 SWMU DESCRIPTIONS

The locations of SWMUs included in this RFI are shown in Figure 1.3. With the exception of SWMU 18, SWMU 19 and the MEK Paint Pits, all of the SWMUs investigated for this RFI were also included in the Chevron RFA report (A.T. Kearney, 1986). Brief descriptions of the RFI SWMUs are presented below:

SWMU 9 - Amine Wash Water Impoundment

This inactive facility was formerly used to collect washwater and vessel sludge from the amine washwater column. The facility was adjacent to the existing acid plant at the refinery and had dimensions of 100 feet by 60 feet. The impoundment was excavated and regraded in 1982.

SWMU 10 - Tetraethyl Lead Weathering Area

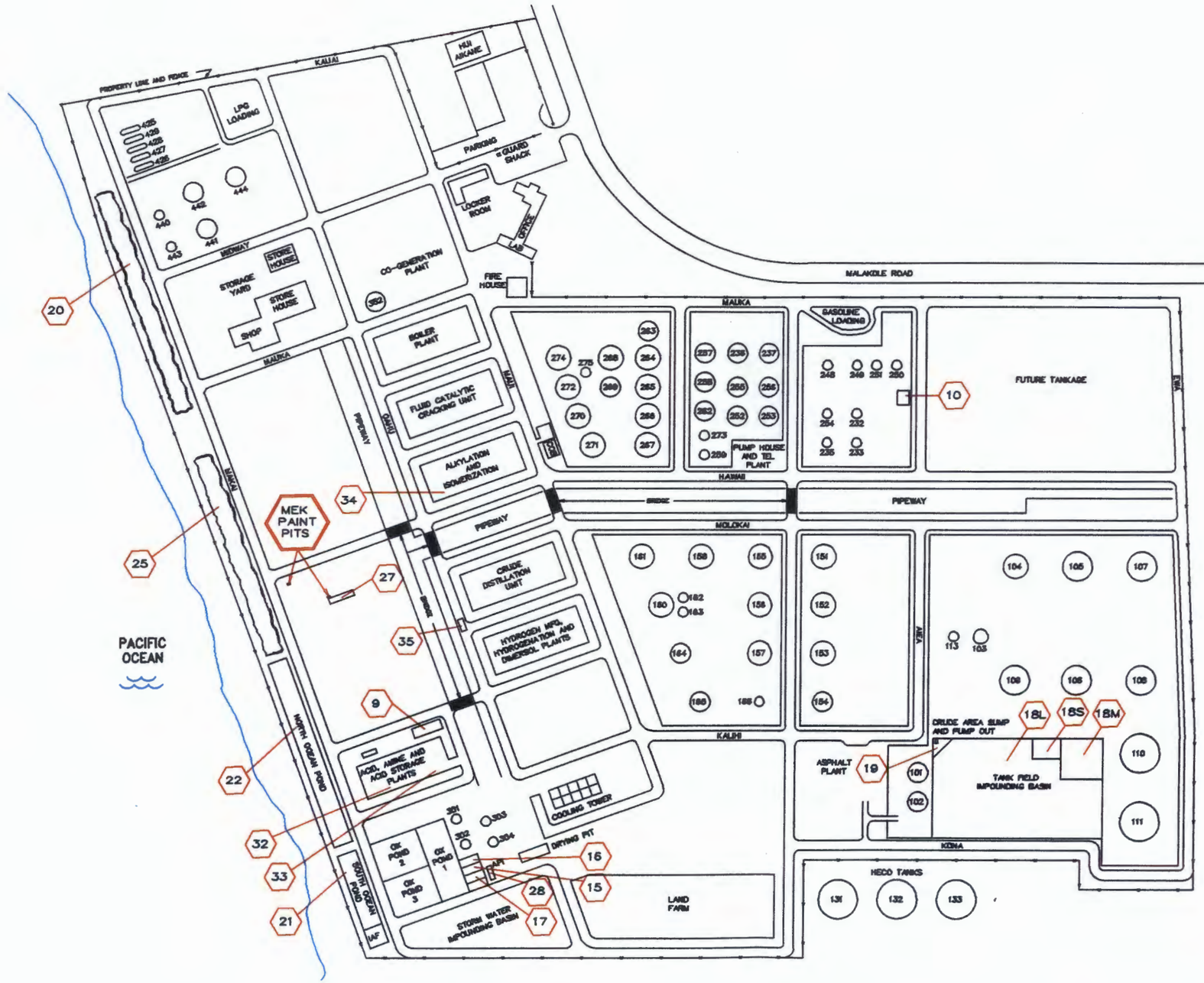
This inactive facility is located in the north central portion of the refinery and has dimensions of approximately 50 feet x 70 feet. Prior to 1980, this facility was used to weather gasoline tank bottoms. The waste management unit has been non-operational since that time.

SWMU 15 - Neutralization Pond

This former neutralization pond was located in the southwest corner of the Chevron facility and had dimensions of approximately 110 feet x 40 feet. This pond was used as part of the wastewater treatment system at the refinery. After completion of the RFI soil sampling at this unit it was regraded and paved over to accommodate upgrades to the wastewater treatment system. The unit is currently the site of two new API separators and a benzene recovery unit (BRU).

SWMU 16 - Settling Basin

This former settling basin was located adjacent to and north of the neutralization pond. It had dimensions of approximately 110 feet x 40 feet. The settling basin received neutralized effluent from the neutralization pond. Its purpose was to provide additional residence time for lime solids to settle out. After completion of the RFI soil sampling at this unit it was regraded and paved over to accommodate upgrades to the



LEGEND

SOLID WASTE MANAGEMENT UNITS

- 9 Amine Wash Water Impoundment
- 10 Tetraethyl Lead Weathering Area
- 15 Neutralization Pond
- 16 Setting Basin
- 17 North Surge Pond
- 18 Crude Tank Area Impoundment Basin (L=Large, M=Medium, S=Small)
- 19 Tank Field Storm Water Sump
- 20 LPG Area Cooling Water Pond
- 21 South Ocean Pond
- 22 North Ocean Pond
- 25 Waste Pile C
- 27 Empty Drum Storage Area
- 28 API Separator
- 32 Weak Acid Neutralization Sump
- 33 Strong Acid Neutralization Sump
- 34 Alkylation Plant Neutralization Sump
- 35 Clay Dewatering Basin

600' 0 600'
Approximate Scale (Feet)

ES	ENGINEERING-SCIENCE, INC. 1357 Kapiolani Blvd., Suite 1120 Honolulu, Hawaii 96814	SCALE: 1" = 600' DATE: 12-21-92 SHEET: 1 OF 1 DRAWN BMKE	RFI SWMU LOCATIONS CHEVRON HAWAII REFINERY BARBER'S POINT, HAWAII

wastewater treatment system. The unit is currently the site of two new API separators and a BRU.

SWMU 17 - North Surge Pond

This former surge pond was located adjacent to and south of the neutralization pond. The pond had the same dimensions and capacity as the neutralization pond. After completion of the RFI soil sampling at this unit it was regraded and paved over to accommodate upgrades to the wastewater treatment system. The unit is currently the site of two new API separators and a BRU.

SWMU 18 - Crude Tank Area Impoundment Basin

The Crude Tank Impoundment basin is located in the southeastern portion of the refinery and is composed of three distinct ponds herein referred to as the large pond, SWMU 18L (800 feet x 400 feet), the medium pond, SWMU 18M (200 feet x 200 feet), and the small pond, SWMU 18S (100 feet x 100 feet). The ponds are constructed of unlined crushed coral dikes. Prior to 1982, crude oil spills and crude tank bottoms were diverted to these ponds. SWMU 18S reportedly received crude tank bottoms for a longer period of time. Since 1990, the ponds have been used primarily for collection of stormwater runoff. Non-hazardous wastewater and non-hazardous solids are occasionally diverted to these ponds. Currently SWMU 18L is considered a U.S. Fish and Wildlife habitat for an endangered species.

SWMU 19 - Tank Field Storm Water Sump

This stormwater sump is in the corner of the Crude Tank Area Impoundment basin located in the southeast portion of the Chevron facility. The sump collects stormwater run-off from the adjacent gasoline and crude tank storage fields. The unit consists of a triangular pond with approximate dimensions of 150 feet x 200 feet. An earthen dike separates this unit from the Crude Tank Impoundment Basin.

SWMU 20 - LPG Area Cooling Water Pond

The former pond is located in the northwest portion of the refinery and has approximate dimensions of 90 feet x 240 feet. This pond was used prior to 1962 to collect non-contact brine water used in the refinery LPG refrigeration system. This SWMU has not been in use for over 30 years. The area was regraded in 1982 and has been dry since that time.

SWMU 21 - South Ocean Pond

The South Ocean Pond lies immediately south of and adjacent to the North Ocean Pond along the west boundary of the refinery facility. The pond is approximately 90 feet x 240 feet and is used for the collection of stormwater runoff as is the North Ocean Pond. This pond can also receive overflow from the Induced Air Flotation Pond.

SWMU 22 - North Ocean Pond

The North Ocean Pond lies south of the LPG Area Cooling pond along the west boundary of the refinery. The pond is approximately 90 feet x 970 feet and is used for the collection of stormwater runoff.

SWMU 25 - Waste Pile C

Waste Pile C is located in the west-central portion of the Chevron refinery and has approximate dimensions of 600 feet x 90 feet. This facility was used for lime blowdown solids and spent jet filter clays. The waste pile was observed to be active during a November 1986 visual site inspection (A.T. Kearney, 1986). The waste pile is currently inactive, former wastes have been removed and the site has been regraded.

SWMU 27 - Empty Drum Storage Area

The empty drum storage area was located near the former MEK paint disposal pits. Empty drums were stored in an area with dimensions of approximately 8 feet x 160 feet, prior to being shipped off-site. The empty lubricating oil and chemical drums were cleaned at operating units prior to being placed in this storage area. The unit is no longer being used.

SWMU 28 - API Separator

The API Separator is located in the southwest portion of the Refinery. The unit has approximate dimensions of 22 feet x 70 feet x 6 feet, is concrete lined, and received process wastewater and stormwater runoff from various refinery process areas. The unit was replaced with two new API separators in 1992.

SWMU 32 - Weak Acid Neutralization Sump

The weak acid neutralization sump is located on the southwest side of the sulfuric acid plant. The sump is five feet in diameter, eight feet deep and is fitted with a cover. The approximate volume of the sump is 1,175 gallons. The sump is constructed of reinforced concrete and it has an interior liner consisting of acid resistant brick. This active unit was constructed in 1960. The unit mixes weak sulfuric acid received from the acid plant with caustic to achieve a pH greater than 2 and less than 12.5. The neutralized effluent is discharged to the neutralization tanks for secondary neutralization and subsequent biological treatment and discharge through the refinery's NPDES wastewater treatment system.

SWMU 33 - Strong Acid Neutralization Sump

The strong acid neutralization sump is located on the southeast side of the sulfuric acid plant. This covered concrete sump has the same dimensions as the weak acid neutralization sump and is also lined with acid resistant brick. It has a volume of approximately 1,175 gallons. This unit was initially constructed in 1960 and was reconstructed in 1984. This active sump was designed to receive acid spills from the acid plant. Accidental acid plant spills will automatically drain to this sump where the spilled liquid is neutralized and subsequently discharged to the neutralization tanks.

SWMU 34 - Alkylation Plant Neutralization Sump

The alkylation plant neutralization sump is located on the west end of the alkylation and isomerization plant. This sump is approximately 6 feet in diameter, six feet deep and is fitted with a steel plate cover. The approximate volume of this sump is 1,270 gallons. The sump is constructed of concrete and has an acid resistant brick

liner. An adjacent concrete valve box has similar dimensions. The sump was installed when the refinery began operation in 1960. This active sump receives incidental acid spills and washdown water from the adjacent alkylation plant. Sump contents are neutralized with caustic prior to biological treatment and discharge through the waste water treatment system.

SWMU 35 - Clay Dewatering Basin

The spent clay dewatering basin is an impoundment with dimensions of approximately 29 feet x 40 feet. It lies in the central portion of the refinery facility near the southwest corner of the Crude Distillation Unit. The basin receives spent clay from refinery clay treaters. The clay is used to treat jet fuel to improve its color, eliminate water and to remove olefins.

Methyl Ethyl Ketone (MEK) and Paint Disposal Pits

These pits consisted of two small holes approximately one foot in diameter to the north and west of the inactive empty drum storage area (SWMU 27). The pits may have been used by non-Chevron contract personnel to dispose of paints and MEK in the past. These pits are the only SWMU without a numerical designation.

SECTION 2

FIELD INVESTIGATION

The RFI fieldwork was conducted from October 1992 through September 1993. Prior to initiation of the fieldwork a RFI Work Plan (Engineering-Science, 1992a) was prepared and submitted to EPA Region IX for approval. The RFI field work involved collection and analysis of soil or sludge samples from 15 SWMUs, sump integrity testing at 3 SWMUs and collection and analysis of soil and groundwater adjacent to a SWMU that failed sump integrity testing.

2.1 SUMP INTEGRITY TESTS

Three underground sumps (SWMUs 32, 33 and 34) utilized for corrosive acid neutralization were subjected to integrity testing to investigate the potential for undetected sump releases to adjacent soil and groundwater.

2.1.1 SUMP Integrity Testing Procedures

Hydrostatic sump integrity testing was performed on the strong acid sump (SWMU 33) on January 27, 1993. The weak acid sump (SWMU 32) was tested on both January 27, 1993 and on August 3, 1993. The second test was required due to the possibility that insufficient pre-saturation caused the first test to fail. The alkylation plant sump was tested on May 6, 1993.

Each sump was drained, re-filled with fresh water and neutralized with soda ash by Chevron personnel prior to beginning the test. Access ports on the sump lids, having approximate dimensions of 6 inches by 12 inches were covered with visqueen during the test period to minimize evaporative loss.

After conducting a Health and Safety meeting with Chevron personnel regarding the sump integrity testing, the pH of each sump was measured by Chevron and ES personnel. Ambient air temperature readings were recorded throughout the testing period. Hydrostatic fluid levels in the sumps were recorded, using a Slope Indicator Co. Model 51453 water level indicator. The accuracy of this instrument is plus or minus 0.01 feet. The initial readings were taken at 15 minute intervals, until 8 measurements were recorded (2 hours). Then readings were taken every half hour for the next 1.5 hours. Then readings were taken every hour for the duration of the test (an additional 4.5 hours, for a total duration of 8 hours). The results of the testing are discussed in Section 3.1.

Groundwater Sampling

One grab groundwater sample was collected from the borehole adjacent to SWMU 32. The grab groundwater sample was obtained with a new disposable Teflon bailer which was lowered into the open borehole. Groundwater obtained from the borehole was poured directly from the bailer into the appropriate laboratory supplied sample containers. The containers were then sealed, labeled, and placed in an iced cooler.

2.2.1.2 Decontamination Procedures

Soil sampling equipment, including augers, trowels, split spoons, shovels and bowls were thoroughly scrubbed and washed with laboratory grade detergent, rinsed with tap water, and rinsed again with distilled water prior to each use. The drilling bits and previously used augers were steam cleaned, washed with detergent and rinsed before each use.

For metals samples the equipment decontamination procedures consisted of the following:

- Wash and scrub with detergent (laboratory grade), rinse with tap water, rinse with nitric acid, and final rinse with distilled water

For semi-volatile organic compounds (SVOCs) samples equipment decontamination procedures consisted of the following:

- Wash and scrub with detergent (laboratory grade), rinse with tap water, rinse with hexane, and double rinse with distilled water

For VOC samples equipment decontamination procedures consisted of the following:

- Wash and scrub with detergent (laboratory grade), rinse with tap water, and final rinse with laboratory grade analyte free water

2.2.1.3 Sample Containers and Preservation

Sample containers and sample preservations are tabulated and presented in Table 2.1. All containers were prepared by the analytical laboratory.

2.2.1.4 Sample Labeling and Shipping

Soil, sludge, and water samples were assigned unique identifiers to provide chain-of-custody control during the transfer of samples from the time of collection through analysis and reporting.

Samples were identified by the SWMU number, the sample location number at that SWMU, and the depth of the sample. For example, a soil sample from the North Surge Pond, sample location 1, at a depth of 1 foot, was designated as SWMU17-1-1.

All samples were shipped by DHL Worldwide Express. Sample containers were enclosed in bubble wrap and packed tightly in iced coolers for shipment from Oahu to Curtis and Tompkins analytical laboratory located in Berkeley, California. Chain-of-

2.2 SOIL, SLUDGE AND GROUNDWATER SAMPLING

As designated in the RFI Work Plan, samples were collected from a total of 15 SWMUs to characterize shallow soil and sludge for selected potential contaminants. In addition to these samples, soil and groundwater samples were collected adjacent to SWMU 32 as required by the Work Plan for any sump failing an integrity test.

The soil and sludge samples were collected between October 27, 1992 and September 17, 1993. Due to SWMU access restrictions, the field work sampling activities were conducted in stages involving multiple site visits.

The samples collected from SWMUs were supplemented with additional quality assurance/quality control (QA/QC) samples collected to meet the specified EPA Region IX data delivery requirements.

The following subsections describe specific sampling procedures, sampling locations, analytical procedures, and QA/QC procedures.

2.2.1 Field Sampling Procedures

2.2.1.1 Sampling Protocol

Surface Soil/Sludge Sampling

Soil and sludge samples were taken using a clean stainless-steel shovel. For surface samples approximately 2 to 6 inches of soil or sludge was removed prior to retrieving the sample.

Samples for volatile organic compounds (VOCs) analysis were collected first and placed immediately into a laboratory prepared sample container and sealed with a Teflon-lined cap. Jars were packed flush with soil so as to minimize headspace. Soil for all other analyses was collected from the sample location and placed in a stainless steel bowl. The soil or sludge was mixed thoroughly in the bowl and divided into quarters. A portion of the sample was then gathered from two of the quartered sections, and the process was repeated until the required sample containers for a specific sample location were full. All sample containers were labeled and placed into an ice-cooled chest.

Borehole Soil Sampling

Soil samples collected at SWMU 9, SWMU 10 and SWMU 32 were collected with the assistance of a drilling rig equipped with steam cleaned solid auger flights. Where soil conditions were favorable, borehole soil samples were collected using a decontaminated California modified split-spoon sampler driven at the depths desired. Most borehole sampling locations were in areas of extremely hard drilling and sample recovery in a driven split-spoon sampler was not possible. In areas of hard drilling soil samples were obtained directly from the bottom section of the flight auger, above the drilling bit. Soil retrieved was transferred to laboratory supplied glass jars, sealed with Teflon lined caps, labeled, and placed in an ice-cooled chest.

TABLE 2.1

CHEVRON HAWAII REFINERY
RCRA FACILITY INVESTIGATION
SUMMARY OF SAMPLE CONTAINERS, SAMPLE PRESERVATION METHODS, AND HOLDING TIMES

Analytical Parameters	Analytical Method	Preservation Method	Number of Containers Type of Sample Container	Holding Time (1)
Water Samples				
Volatile Organic Compounds	EPA 8240	4°C & HCl	2-40 ml, Glass, Teflon Septa	14 days
Semivolatile Organic Compounds	EPA 8270	4°C	2-1 L, Glass	7/40 days (2)
Cyanide	EPA 335.2	4°C & NaOH	1 L, Polyethylene	14 days
Organic Lead	DHS-LUFT	4°C	1 L, Polyethylene	NA
Isobutyl Alcohol	EPA 8015 Modified	4°C	1 L, Glass	14 days
Soil Samples				
Volatile Organic Compounds	EPA 8240	4°C	12 oz. glass jar	14 days
Semivolatile Organic Compounds	EPA 8270	4°C	12 oz. glass jar	14/40 days (3)
Cyanide	EPA 335.2	4°C	8 oz. glass jar	14 days
Organic Lead	DHS-LUFT	4°C	8 oz. glass jar	NA
Isobutyl Alcohol	EPA 8015 Modified	4°C	8 oz. glass jar	14 days

(1) All holding times are determined from date of collection.
(2) Extract within 7 days of collection and analyze within 40 days of collection.
(3) Extract within 14 days of collection and analyze within 40 days of collection.

custody forms were taped in plastic protectors to the inside of each cooler. Copies of the chain of custody forms are presented with the analytical data in Appendix A.

2.2.1.5 Analytical Procedures

Analytical procedures for this RFI were specified by Chevron and EPA Region IX. Analytical methods utilized included procedures to complete the Skinner List of analytes and five other analytes. It should be noted that the original Skinner List of analytes found in the Chevron RFI Work Plan (Engineering-Science, 1992a) was revised after a portion of the Chevron RFI analytical procedures had been completed. ES received the revised Skinner List from Chevron USA in early December 1992. The revised list involved significant changes to the list of required volatile and semivolatile analytes and the total number of Skinner List analytes was reduced from 58 to 43. Upon receipt of the revised Skinner List, the analytical laboratory was instructed to change their analytical procedures to conform to the new criteria. The revised Skinner List of analytes and the five other analytes are presented in Table 2.2. A summary of the number of SWMU samples, and analytical procedures for each sample, including background and field QA/QC samples, is presented in Table 2.3.

2.2.2 Sampling Locations

Samples were collected from investigated SWMUs in 8 general sampling areas as delineated by the rectangular boxes shown in Figure 2.1. Each of the 8 rectangles in Figure 2.1 references a subsequent figure (Figures 2.2 through 2.9). Figures 2.2 through 2.9 show enlarged views of the sampling areas with approximate sample locations and sample designations.

Figure 2.2 shows the approximate locations of samples collected from SWMUs 20 and 25. This figure also shows the location of background sample BKG-1-0.5.

Figures 2.3 and 2.4 show the approximate locations of samples collected from MEK Paint Pits 1 and 2 respectively. Samples were collected from within each of the two small pits and an additional sample was collected from each of two soil stockpiles adjacent to the paint pits. The soil stockpile samples were composited into a single sample for analysis. Figure 2.4 also shows the locations of samples collected from SWMU 27. Samples collected from SWMU 27 included three resamples designated SWMU27-1R-0.5, SWMU27-3R-0.5 and SWMU27-5R-0.5. These resamples were collected to permit re-analysis after the application of revised laboratory sample extraction procedures.

Figure 2.5 shows the approximate locations of samples collected from SWMU 35.

Figure 2.6 shows the approximate locations of samples collected from SWMUs 9, 21, 22 and 32. Sample SWMU32-2 is a groundwater sample, all others shown are soil samples.

Figure 2.7 shows the approximate locations of samples collected from SWMUs 15, 16, 17 and 28.

TABLE 2.2

CHEVRON HAWAII REFINERY
RCRA FACILITY INVESTIGATION
ANALYTICAL METHODS SUMMARY

REVISED SKINNER LIST METALS (1)	EPA METHOD
Antimony	EPA 6010
Arsenic	EPA 7060
Barium	EPA 6010
Beryllium	EPA 6010
Cadmium	EPA 6010
Chromium	EPA 6010
Cobalt	EPA 6010
Lead	EPA 7420
Mercury	EPA 7471
Nickel	EPA 6010
Selenium	EPA 7740
Vanadium	EPA 6010
REVISED SKINNER LIST VOLATILES (1)	
Benzene	EPA 8240
Carbon Disulfide	EPA 8240
Chlorobenzene	EPA 8240
Chloroform	EPA 8240
1,2-Dichloroethane	EPA 8240
1,4-Dioxane	EPA 8240
Ethyl benzene (1,2-Dibromoethane)	EPA 8240
Methyl Ethyl Ketone (2-Butanone)	EPA 8240
Styrene	EPA 8240
Toluene	EPA 8240
Xylene	EPA 8240
REVISED SKINNER LIST SEMIVOLATILE BASE/NEUTRAL EXTRACTABLE COMPOUNDS (1)	
Anthracene	EPA 8270
Benzo (a) anthracene	EPA 8270
Benzo (b) fluoranthene	EPA 8270
Benzo (k) fluoranthene	EPA 8270
Benzo (a) pyrene	EPA 8270
Bis (2-ethylehexyl) phthalate	EPA 8270
Butyl benzyl phthalate	EPA 8270
Chrysene	EPA 8270
Dibenz (a,h) acridine	EPA 8270
Dibenz (a,h) anthracene	EPA 8270

(1) From Petitions to Delist Hazardous Wastes Guidance Manual, April 1985

TABLE 2.2 (CONTINUED)

CHEVRON HAWAII REFINERY
RCRA FACILITY INVESTIGATION
ANALYTICAL METHODS SUMMARY

REVISED SKINNER LIST SEMIVOLATILE BASE/NEUTRAL EXTRACTABLE COMPOUNDS (1)	EPA METHOD
(CONTINUED FROM PAGE 1)	
Dichlorobenzenes	EPA 8270
(1,2-Dichlorobenzene)	
(1,3-Dichlorobenzene)	
(1,4-Dichlorobenzene)	
Diethyl phthlate	EPA 8270
7,12 Dimethylbenz (a) anthracene	EPA 8270
Dimethyl phthlate	EPA 8270
Di (n) butyl phthlate	EPA 8270
Di (n) octyl phthlate	EPA 8270
Fluoranthene	EPA 8270
Indene	EPA 8270
Methyl chrysene	EPA 8270
1-Methyl naphthalene	EPA 8270
Naphthalene	EPA 8270
Phenanthrene	EPA 8270
Pyrene	EPA 8270
Pyridine	EPA 8270
Quinoline	EPA 8270
REVISED SKINNER LIST SEMIVOLATILE ACID-EXTRACTABLE COMPOUNDS (1)	
Benzenethiol	EPA 8270
Cresols	EPA 8270
(2-Methylphenol)	
(4-Methylphenol)	
2,4-Dimethylphenol	EPA 8270
2,4-Dinitrophenol	EPA 8270
4-Nitrophenol	EPA 8270
Phenol	EPA 8270
OTHER ANALYSES	
Cyanide	EPA 335.2 Modified
Organic Lead	DHS LUFT (2)
Isobutyl Alcohol	EPA 8015 Modified
Sulfate	EPA 300.0
pH	EPA 9045

(1) From Petitions to Delist Hazardous Wastes Guidance Manual, April 1985

(2) California Department of Health Services Method specified under Leaking Underground Fuel Tank Guidance Manual, October 1989.

TABLE 2.3

CHEVRON HAWAII REFINERY
RFI SAMPLE ANALYSIS SUMMARY

					ANALYSES								
SWMU Number	Matrix / Method	Number of Samples	Sample Type	Sample Depth	Skinner Metals	Skinner SVOCs	Skinner VOCs	Cyanide	Organic Lead	Isobutyl Alcohol	Sulfate	MEK	pH
9	Soil / Bore	4	N	1.5'	X			X					X
9	Soil / Bore	4	N	3.5'	X	X	X	X	X	X			X
9	Soil / Bore	1	D	3.5'	X	X	X	X	X	X			X
10	Soil / Bore	4	N	1.5'	X			X					
10	Soil / Bore	4	N	3.5'	X	X	X	X	X	X			
10	Soil / Bore	1	D	3.5'	X	X	X	X	X	X			
15	Soil / HA	4	N	1'	X			X					X
15	Soil / HA	1	D	1'	X			X					X
16	Soil / HA	4	N	0.5'	X			X	X				X
16	Soil / HA	1	D	0.5'	X			X	X				X
17	Soil / HA	4	N	0.5'	X	X*		X	X				
18 S	Sludge / HA	3	N	0.5'-1'	X	X	X	X	X	X			
18 S	Sludge / HA	3	N	1.5'-2'	X	X	X	X	X	X			
18 S	Sludge / HA	1	R	1.5'-2'	X	X	X	X	X	X			
18 M	Sludge / HA	3	N	1'	X	X	X	X	X	X			
18 M	Sludge / HA	3	N	2'	X	X	X	X	X	X			
18 L	Sludge / HA	3	N	1'	X	X	X	X	X	X			
18 L	Sludge / HA	3	N	2'	X	X	X	X	X	X			
19	Soil / HA	3	N	1'	X	X	X	X	X	X			
20	Soil / HA	3	N	0.5'	X	X*		X	X				
20	Soil / HA	1	R	0.5'	X	X		X	X				
21	Sludge / HA	2	N	0.5'	X	X	X	X	X	X			
22	Sludge / HA	2	N	0.5'	X	X	X	X	X	X			
22	Sludge / HA	1	D	0.5'	X	X	X	X	X	X			
25	Soil / HA	3	N	0.5'	X	X*		X	X				
27	Soil / HA	5	N	0.5'	X	X*		X	X				
27	Soil / HA	1	D	0.5'	X								
27	Soil / HA	3	R	0.5'		X							
28	Soil / HA	4	N	0.5'	X	X*		X	X				
32	Soil / Bore	1	N	3'	X						X		X
32	Water	1	N	7'	X						X		X
35	Soil / HA	2	N	0.5'	X	X*		X	X				
MEK Pit 1	Soil / HA	2	N	0.5'								X	
MEK Pit 2	Soil / HA	2	N	0.5'								X	
MEK Pit 2	Soil / HA	1	D	0.5'								X	
MEK Soil Piles	Soil / HA	1	C	0.5'								X**	
--	Soil / HA	1	BKG-1	0.5'	X	X	X	X	X				
--	Soil / HA	1	BKG-2	1'	X	X	X	X	X	X			
--	Water	1	ERB-1	--		X	X		X				
--	Water	1	ERB-2	--	X		X	X	X	X			
--	Water	6	TB	--			X						

NOTES:

SWMU = Solid Waste Management Units
18 S, 18 M, 18 L = Small, Medium and Large Crude Tank Area Basins
Paint Pits = MEK / Paint Pits
Soil / Bore = Drill Rig Collected Soil Samples
Soil / HA = Hand Collected Soil Samples
Sludge / HA = Hand Collected Sludge Samples
MEK = Methyl Ethyl Ketone
* = Run For Original Skinner List Of Analytes
** = TCLP Extraction

C = Composite Sample
D = Duplicate Sample
N = Normal Sample
R = Resample
BKG = Background Sample
ERB = Equipment Rinsate Blank
TB = Trip Blank
SVOCs = Semivolatile Organic Compounds
VOCs = Volatile Organic Compounds

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REGION 9 RCRA RECORDS ROUTING SLIP

TO: RCRA Records Center, SAIC Circulation Staff, H-3-4, Room #R722

FROM: _____ Date: _____

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RCRA Handler Name RCRA Handler ID#:

Use a separate routing slip for each document to be indexed in RCRA files. Please provide the RCRA Handler ID# and name on the lines above and be sure to sign and date this routing slip. Then, checkmark below beside the appropriate file category in which the document should be placed.

Notification

___ Notification

2. 6-Part Files

___ A) Part A Application Form(s), any HWDMS Modification Forms
___ B) Company Correspondence
___ C) EPA Correspondence
___ D) State Agency Correspondence
___ E) Third Party Correspondence
___ F) Miscellaneous Photos, Maps, Site Summary Descriptions, Financial Assurance Documents

3. Inspection Reports

___ A) EPA Reports: CEI, CME, etc.
___ B) State Agency Reports

4. Groundwater Monitoring

___ A) GWM Reports & Data
___ B) Site Characterization Rpts (Not Submitted with Part B)
___ C) GW Task Force Reports
___ D) Air Quality Reports
___ E) Other Reports

5. RFA

___ A) Prelim. Review, VSIs & PAs
___ B) RFA Workplan & Draft Reports
___ C) Final RFA
___ D) General RFA Correspondence

6. RFI

___ A) 3008(h) Order
___ B) RFI Correspondence
___ C) RFI Workplan, Proposals (Assessment Monitoring)
___ D) Interim RFI, Monthly Progress or Phased Reports
___ E) Final RFI Report
___ F) Public Comments/Responses

7. Corrective Measures Study

___ A) Correspondence
___ B) CMS Workplan, CMS Drafts
___ C) Final CMS, Statement of Basis

8. Corrective Measures Implementation

___ A) Correspondence
___ B) CMI Related Schedules/Updates
___ C) CMI Workplan (Drafts/Final)
___ D) Final CMI, Statement of Basis

9. Enforcement File

___

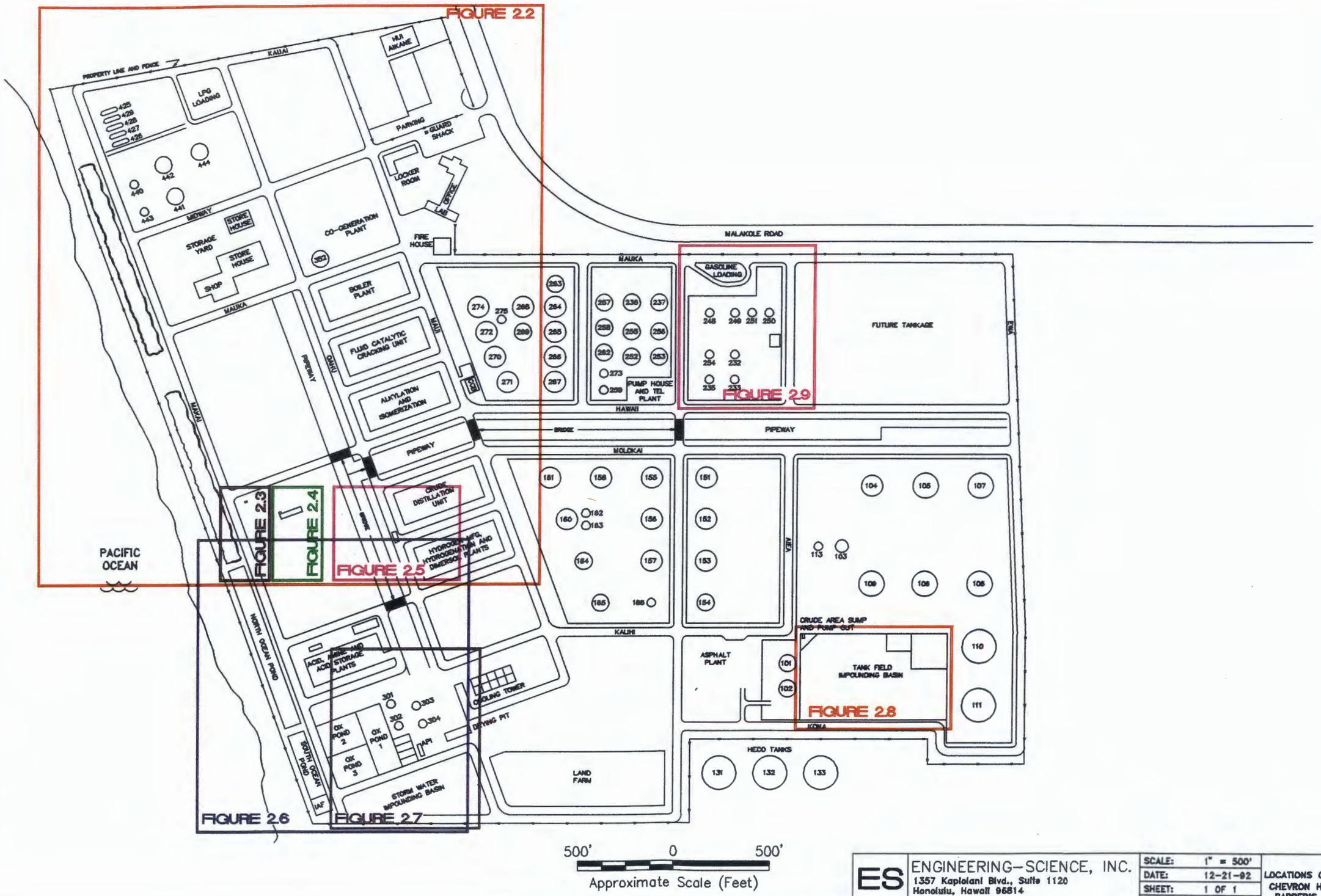
NS. Notification Supplemental File

___

XX. Miscellaneous (describe)

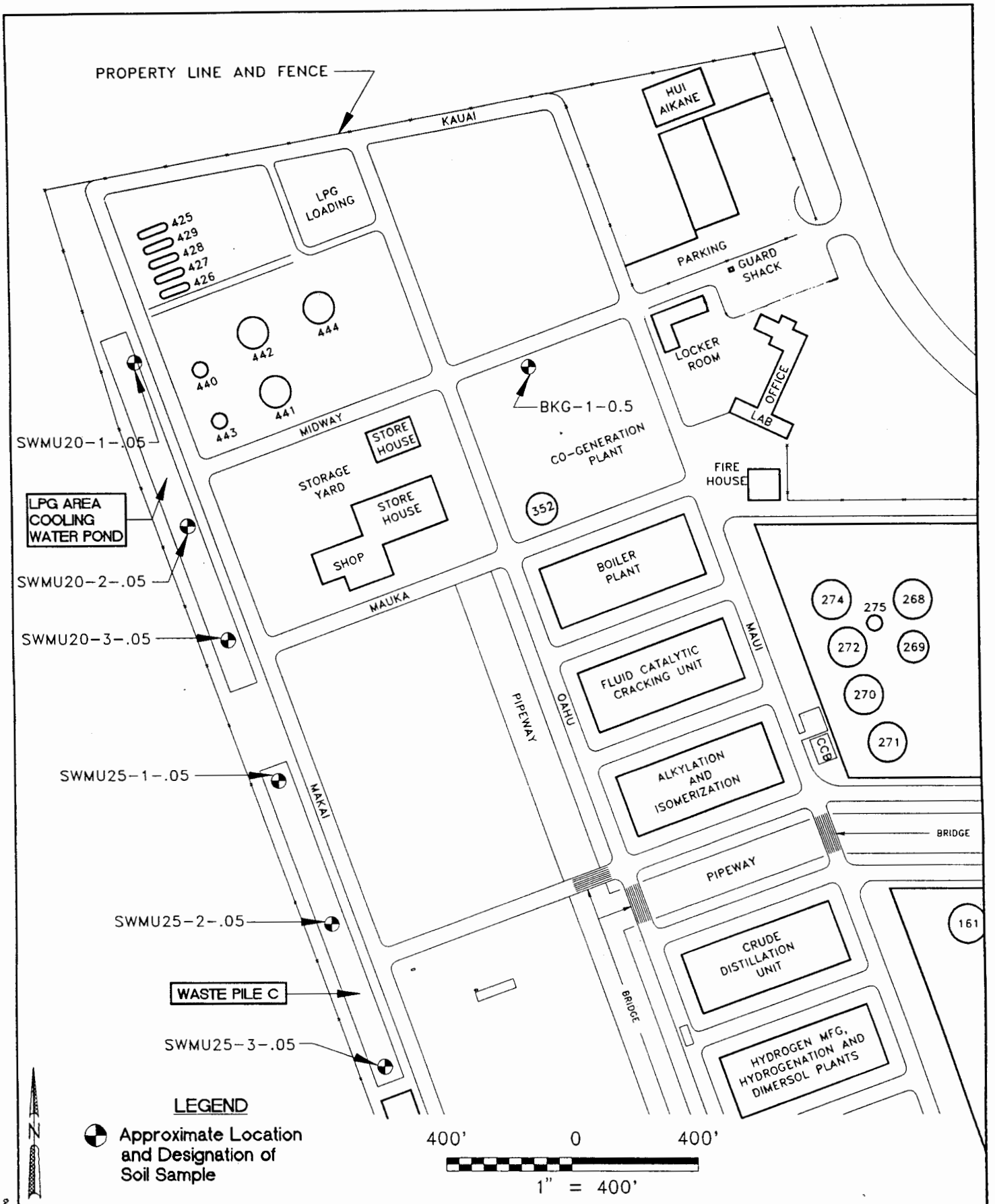
___

17 August 1993



ES	ENGINEERING-SCIENCE, INC. 1357 Kapiolani Blvd., Suite 1120 Honolulu, Hawaii 96814	SCALE: 1" = 500' DATE: 12-21-92 SHEET: 1 OF 1 DRAWN BY: MKE	LOCATIONS OF SAMPLING AREA CHEVRON HAWAII REFINERY BARBER'S POINT, HAWAII

FIGURE 2.2

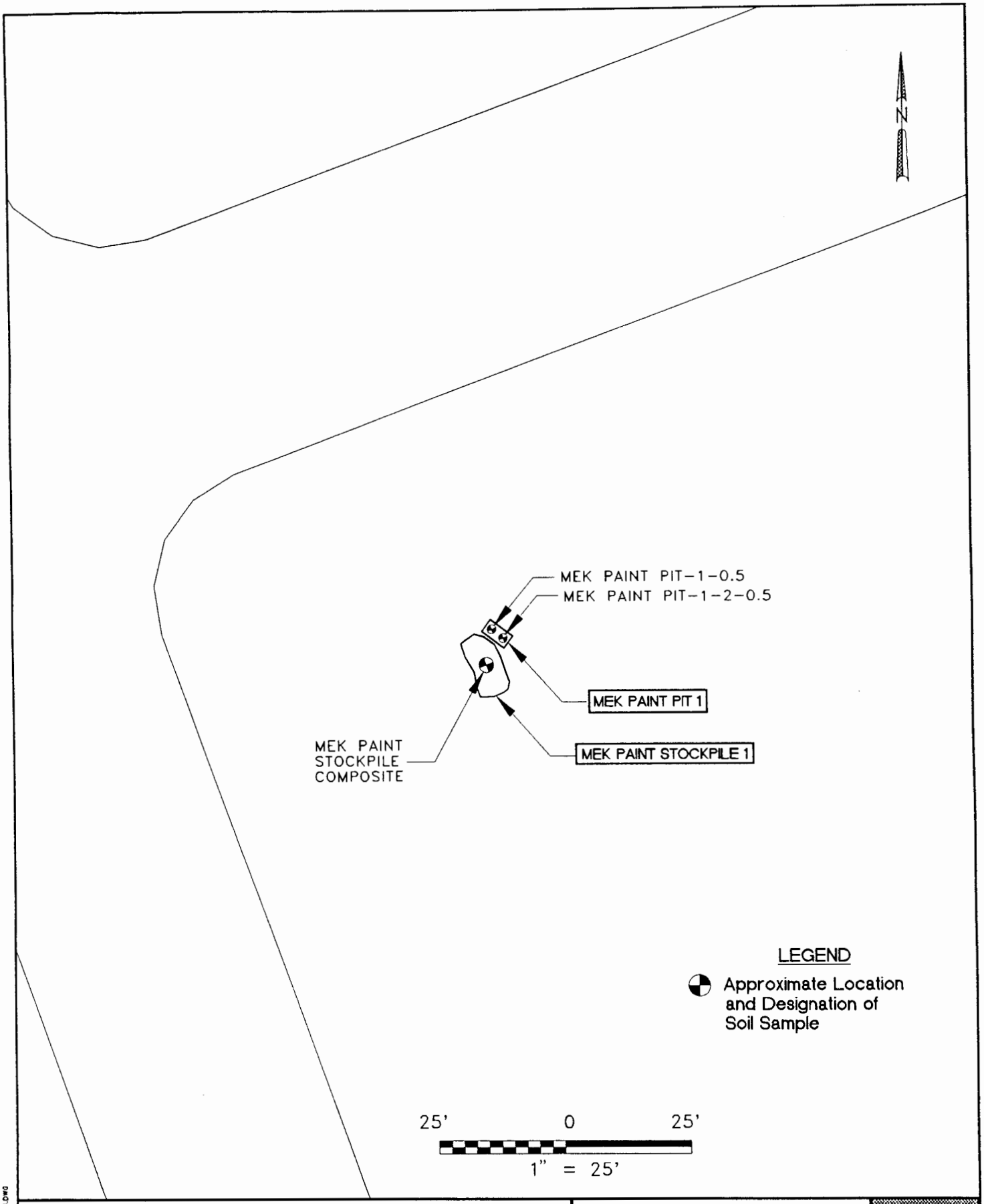


SWMU20 & SWMU25 SAMPLE LOCATIONS
CHEVRON HAWAII REFINERY
BARBERS POINT, HAWAII

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

C:\CHEV\FIGURE3.DWG

FIGURE 2.3

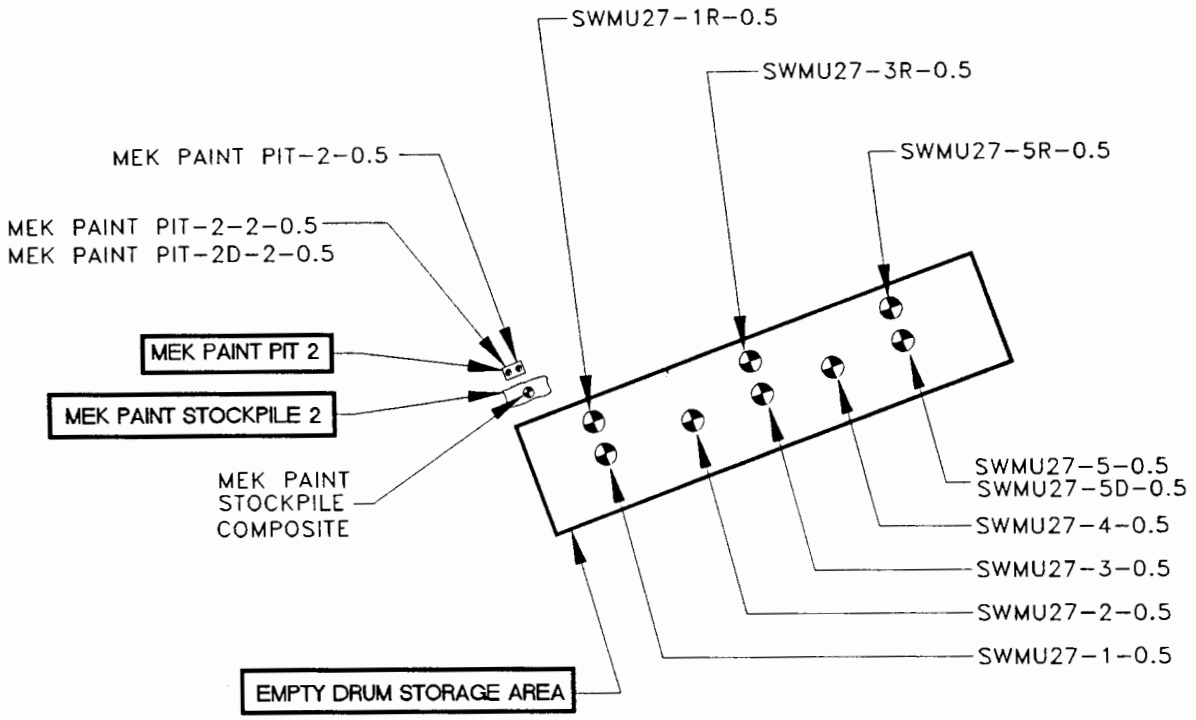


MEK PAINT PIT 1 SAMPLE LOCATIONS
CHEVRON HAWAII REFINERY
BARBERS POINT, HAWAII

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

C:\CHEV\FIGURE2.DWG

FIGURE 2.4



LEGEND

Approximate Location and Designation of Soil Sample

N

50' 0 50'

1" = 50'

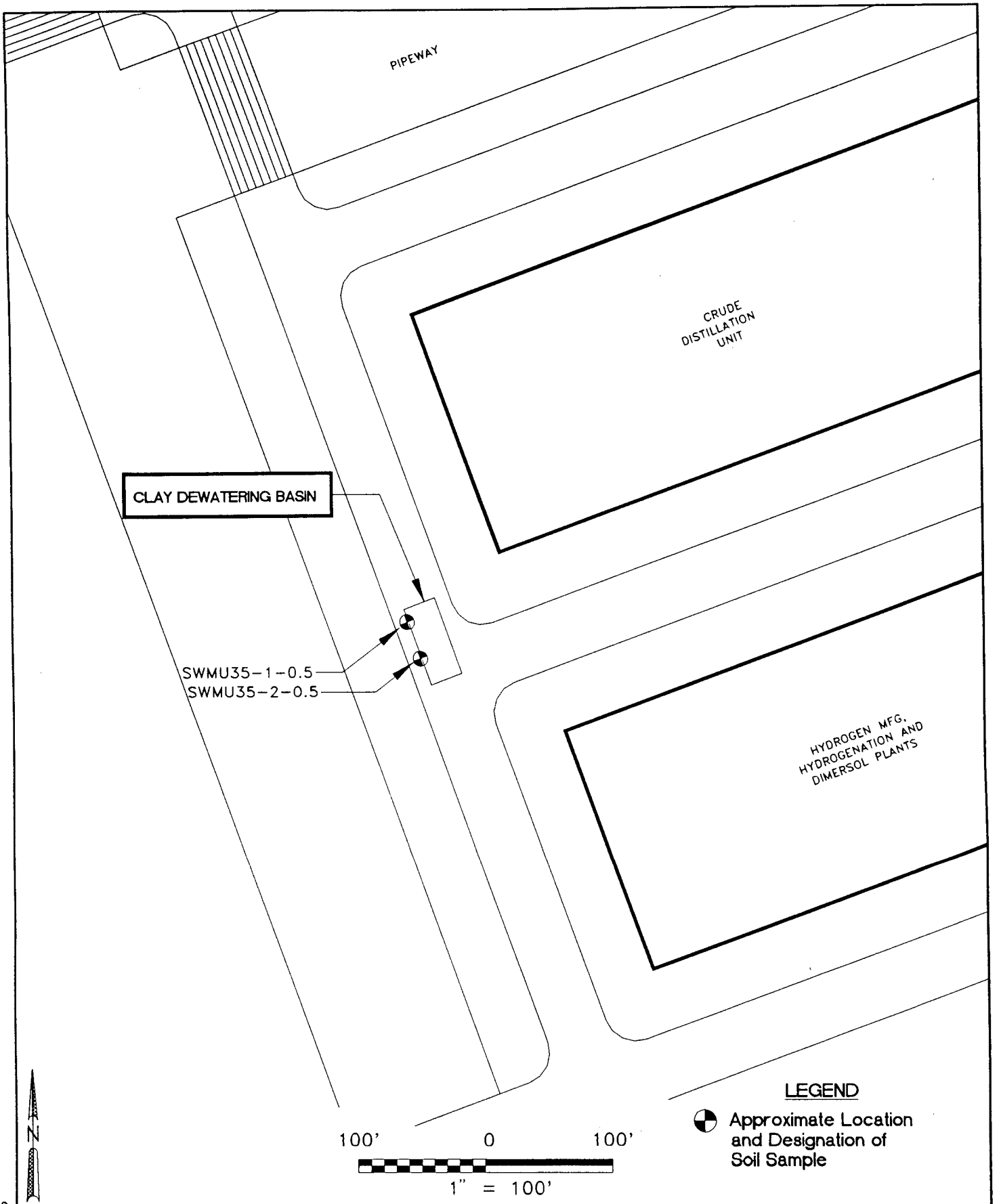
MEK PAINT PIT 2 and SWMU27 SAMPLE LOCATIONS
CHEVRON HAWAII REFINERY
BARBERS POINT, HAWAII

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

ES

C:\CHEX\FIGURES.DWL

FIGURE 2.5

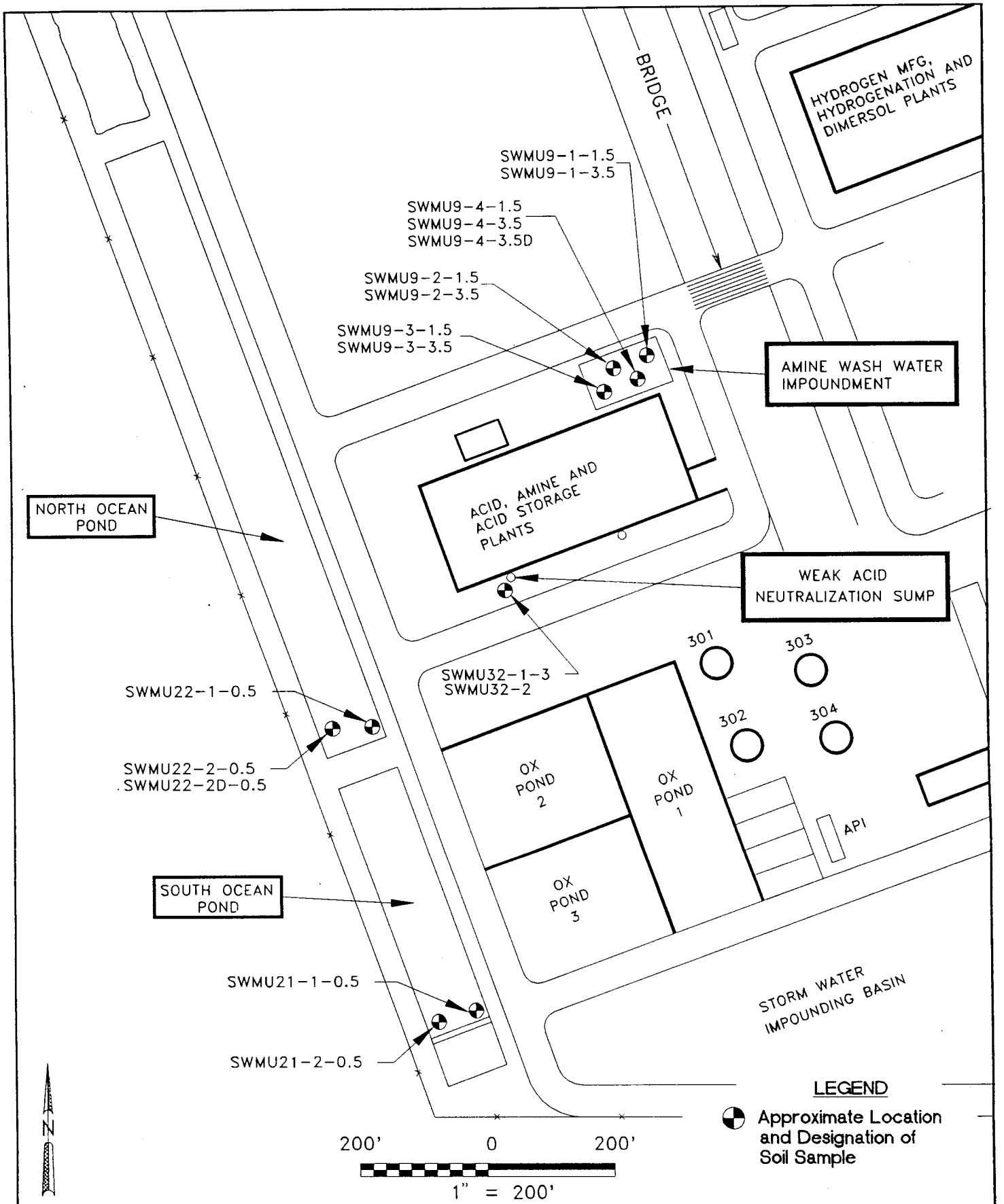


SWMU35 SAMPLE LOCATION
CHEVRON HAWAII REFINERY
BARBERS POINT, HAWAII

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

C:\CHEV\FIGURE7.DWG

FIGURE 2.6

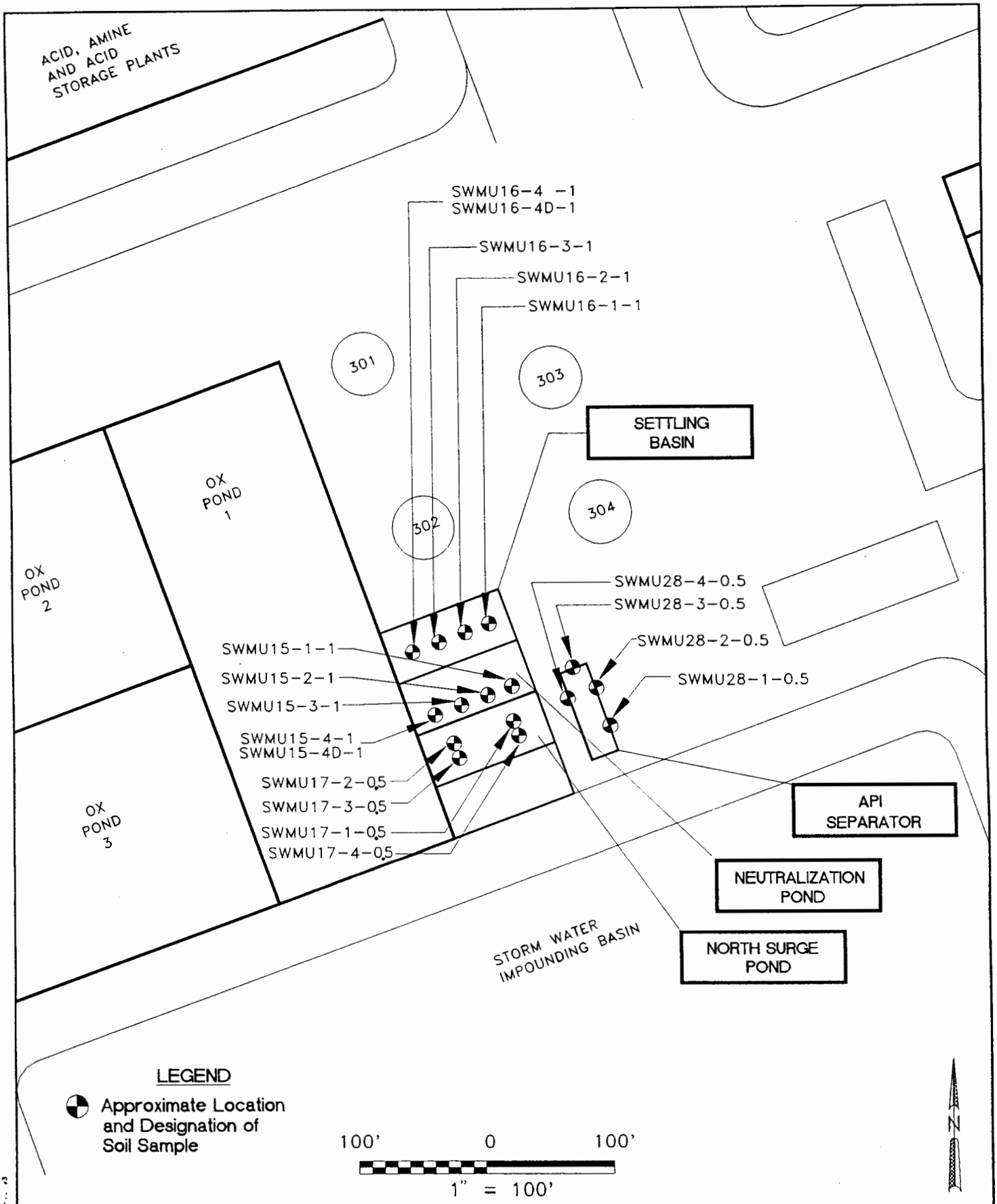


SWMU9, SWMU21, SWMU22 and SWMU32 SAMPLE LOCATIONS
CHEVRON HAWAII REFINERY
BARBERS POINT, HAWAII

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

c:\CHEV\FIGURE8.DWG

FIGURE 2.7



SWMU15, SWMU16, SWMU17 and SWMU28 SAMPLE LOCATIONS
CHEVRON HAWAII REFINERY
BARBERS POINT, HAWAII

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

ES

C:/CHEV/FIGURE6/11-... r3

Figure 2.8 shows the approximate locations of samples collected from SWMUs 18 and 19. SWMU 18 is divided into three separate ponds designated as the small (S), medium (M) and large (L) ponds respectively.

Figure 2.9 shows the approximate location of samples collected from SWMU 10. This figure also shows the location of background sample BKG-2-1.

2.2.3 QA/QC Procedures

Field and laboratory quality control procedures and samples are described below. Table 2.3 summarizes the analytical procedures conducted for field duplicate samples, background samples, equipment rinsate blanks and trip blanks.

2.2.3.1 Field QA/QC Procedures

Field QA/QC procedures implemented for this investigation included collection and analysis of field duplicate samples, and equipment rinsate blanks. Field duplicates were collected as a check on the reproducibility of laboratory procedures and field sampling procedures.

Duplicate samples included SWMU9-4D-3.5, SWMU10-4D-3.5, SWMU15-4D-1, SWMU16-4D-1, SWMU22-2D-0.5, SWMU27-5D-0.5, and MEK Paint Pit-2D-2-0.5.

Equipment rinsate blank samples were collected as a check for cross-contamination during sample collection. Blanks were collected using analytically certified organic-free water (HPLC-grade). Blanks were taken by pouring the HPLC-grade water over properly decontaminated sampling equipment and into the laboratory prepared bottles for the desired analyses.

Equipment rinsate blanks collected for this investigation included ERB-1 and ERB-2.

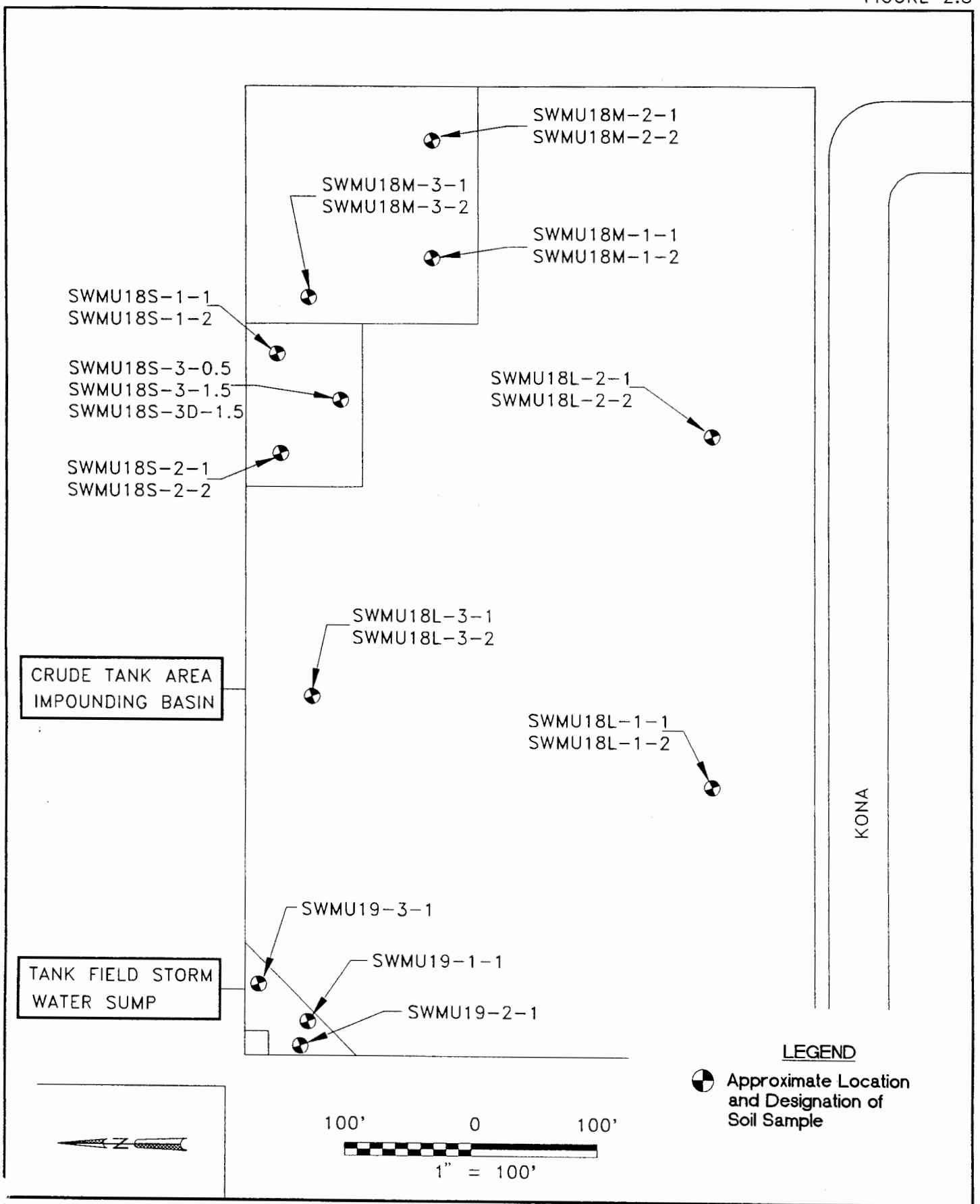
2.2.3.2 Laboratory QA/QC Procedures

Laboratory quality control QA/QC procedures implemented for this investigation include analysis of method blanks, blank spikes, matrix spikes, and matrix spike duplicates for the soil matrix and the analysis of VOC trip blanks for the water matrix.

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value. Accuracy is a measure of the difference between a measured value and a "true" value or accepted reference value.

For this project, laboratory precision was evaluated by recording duplicate measurements of the same parameter on similar sample aliquots under the same conditions and calculating the relative percent difference (RPD) between values. The accuracy of the laboratory measured data was evaluated by determining the percent recovery of matrix spikes, matrix spike duplicates, and blank spikes. This method allows for the calculation of a RPD for target analytes. The data quality goals are adopted from the EPA Contract Laboratory Program data quality objectives as they

FIGURE 2.8

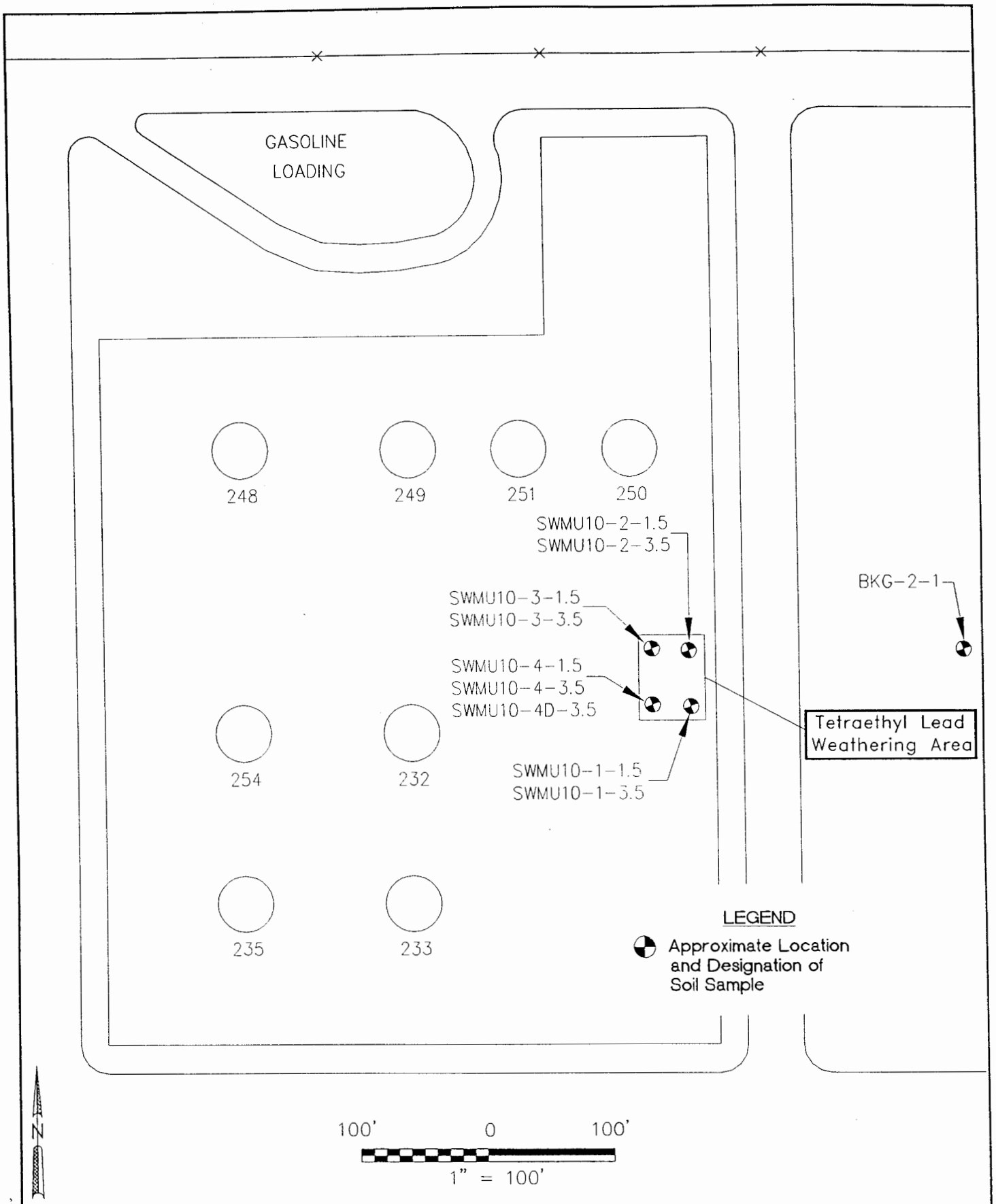


SWMU18 & SWMU 19 SAMPLE LOCATIONS
CHEVRON HAWAII REFINERY
BARBERS POINT, HAWAII

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

C:\CHEV\FIGURE

FIGURE 2.9



SWMU10 SAMPLE LOCATIONS
CHEVRON HAWAII REFINERY
BARBERS POINT, HAWAII

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

apply. Cyanide and organic lead objectives were established based on laboratory experience with the methods. The method blanks were analyzed to assure that no false positives occurred in analyses of regular samples.

Organic data quality objectives were established for matrix spike and matrix spike duplicates (Engineering-Science, 1992a), which were analyzed once a batch or every twenty samples. All failures of matrix spike results to meet the required limits were summarized in the laboratory case narratives which precede each batch of analytical data delivered by the laboratory. In addition, method blanks were analyzed with each batch, and could not be contaminated at levels above the reporting limit, or samples containing the contaminant detected were re-analyzed. Blank spikes were utilized and were required to meet the appropriate accuracy limits. Failure to meet the accuracy limits for more than twenty percent of the spiked compounds in the blank spike resulted in re-analysis of the batch.

Inorganic data quality objectives were established for samples, sample duplicates, and matrix spikes (Engineering-Science, 1992a). Method control for inorganic analyses relied on the analysis of a laboratory control standard which was required to be in the recovery range of 80-120 percent. Failure to meet this objective resulted in re-analysis. Data which did not meet the data quality objectives but did meet the laboratory control sample (LCS) limits were summarized in the corresponding laboratory case narratives. Method blanks were also used for inorganic analyses and were required to be below the reporting limit or re-analysis of all samples containing the contaminant at a level above the detection limit and less than ten times the level noted in the blank was mandated.

EPA Region IX RCRA Facility Investigation Part 1 QC Summary Forms for inorganics and organics and the Part 2 QC Summary Forms for inorganics were filled out by the analytical laboratory. The QC Summary Forms are discussed in Section 3.2.4 of this RFI report.

SECTION 3

FIELD INVESTIGATION RESULTS

3.1 SUMP INTEGRITY TESTING

Hydrostatic integrity testing was performed as described in Section 2.1.1 on January 27, 1993 (Weak Acid Sump Test #1 and Strong Acid Sump), on May 6, 1993 (Alkylation Plant Sump), and on August 3, 1993 (Weak Acid Sump Test #2).

3.1.1 Discussion of Integrity Test Results

Both the Strong Acid (SWMU 33) and Alkylation (SWMU 34) Sumps retained constant hydrostatic water levels for the 8 hour testing period. During the first test on the Weak Acid Sump (SWMU 32), the water level dropped a total of 0.002 feet which equated to an approximate volumetric loss of 2.512 gallons over 8 hours. Due to the possibility that the water level drop was caused by insufficient pre-saturation time, the Weak Acid Sump was retested at a later date. The second test also resulted in a water level drop of 0.002 feet. Due to this second failure, the Weak Acid Sump was scheduled for RFI soil and groundwater sampling as required by the Chevron RFI Work Plan (Engineering-Science 1992a).

Table 3.1 presents the data collected during each of the sump integrity tests conducted for this investigation.

3.2 SWMU SAMPLING

SWMU sampling was performed as described in Section 2.2.1 during several site visits conducted from October 27, 1992 through September 19, 1993.

3.2.1 Discussion of Sampling Results

Analytical results for all SWMU samples and duplicate samples are summarized in Tables 3.2 through 3.19. Analytical results for field quality control samples (background samples, equipment rinsate blanks and trip blanks) are summarized in Table 3.20. Where both organic and inorganic analyses were conducted, the data tables appear on two pages. For all these two-page summary tables the first page contains results for volatiles and/or semivolatiles, and the table number is followed by the letter "A", while the second page contains metals and other analytes results, and the table number is followed by the letter "B".

TABLE 3.1

SUMP INTEGRITY TEST RESULTS

Time	Test #1 Weak Acid Sump (SWMU 32) Water Level	Ambient Air Temp (F°)
9:46 AM	3.95'	75°
10:01	3.95'	76°
10:15	3.95'	77°
10:30	3.95'	77°
10:45	3.95'	78°
11:00	3.95'	78°
11:15	3.95'	79°
11:30	3.96'	79°
12:00 PM	3.96'	80°
12:30	3.97'	82°
13:00	3.97'	82°
14:00	3.97'	82°
15:00	3.97'	80°
16:00	3.97'	78°
17:00	3.97'	76°
18:00	3.97'	76°

Notes: Test conducted on 1/27/93, Wind Speed Avg. 10 - 15 mpg.

Time	Test #2 Weak Acid Sump (SWMU 32) Water Level	Ambient Air Temp (F°)
12:45 PM	2.95'	79
1:00 AM	2.95'	79
1:15	2.95'	79
1:30	2.95'	79
1:45	2.95'	79
2:00	2.95'	79
2:35	2.95'	79
3:00	2.95'	79
4:00	2.95'	79
5:00	2.96'	79
6:00	2.96'	79
7:00	2.96'	80
8:00	2.97'	81
9:00	2.97'	81

Notes: Test conducted on 8/3/93, Wind Speed Avg. 5 mph.

Time	Strong Acid Sump (SWMU 33) Water Level	Ambient Air Temp (F°)
9:49 AM	3.65'	75°
10:03	3.65'	76°
10:17	3.65'	77°
10:33	3.65'	77°
10:48	3.65'	78°
11:02	3.65'	78°
11:18	3.65'	79°
11:33	3.65'	79°
12:03 PM	3.65'	80°
12:33	3.65'	82°
13:33	3.65'	82°
14:32	3.65'	82°
15:33	3.65'	80°
16:33	3.65'	78°
17:33	3.65'	76°
18:33	3.65'	76°

Notes: Test conducted on 1/27/93, Wind Speed Avg. 10 - 15 mpg.

Time	Alkylation Plant Sump (SWMU 34) Water Level	Ambient Air Temp (F°)
7:30 AM	2.53'	79
7:45	2.53'	79
8:00	2.53'	79
8:15	2.53'	79
8:30	2.53'	82
8:45	2.53'	82
9:00	2.53'	81
9:30	2.53'	81
10:30	2.53'	82
11:30	2.53'	84
12:30 PM	2.53'	84
13:30	2.53'	83
14:30	2.53'	83
15:30	2.53'	83

Notes: Test conducted on 5/6/93, Wind Speed Avg. 15 - 30 mph.

Table 3.2A
Analytical Results for
SWMU 9

Sample Designation	9-1-1.5	9-1-3.5	9-2-1.5	9-2-3.5	9-3-1.5	9-3-3.5	9-4-1.5	9-4-3.5	9-4D-3.5
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	N	N	N	D

PARAMETER	Analyte Concentration/Detection Limit								
	µg/kg								
VOCs									
Ethyl Benzene	NA	5,700 / 300	NA	2,800 / 100	NA	ND	NA	ND	ND
SVOCs									
Naphthalene	NA	120,000 / 7,000	NA	3,900 / 70	NA	170 / 7	NA	ND	ND
1-Methylnaphthalene	NA	570,000 / 7,000	NA	21,000 / 70	NA	1,100 / 7	NA	69,000 / 3000	110,000 / 3000
2,4-Dinitrophenol	NA	ND	NA	550 / 70	NA	ND	NA	ND	ND
Phenanthrene	NA	ND	NA	2,800 / 70	NA	ND	NA	ND	ND
Anthracene	NA	ND	NA	140 / 70	NA	ND	NA	ND	ND
4-Methylchrysene	NA	ND	NA	520 / 70	NA	ND	NA	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
NA = Not Analyzed
ND = Not Detected
D = Duplicate Sample

N = Normal Sample
VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
µg/kg = Microgram per Kilogram = Parts per Billion

Table 3.2B
Analytical Results for
SWMU 9

Sample Designation	9-1-1.5	9-1-3.5	9-2-1.5	9-2-3.5	9-3-1.5	9-3-3.5	9-4-1.5	9-4-3.5	9-4D-3.5
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	N	N	N	D

PARAMETER	Analyte Concentration/Detection Limit Mg/Kg								
Metals									
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	2.8 / 2.5	ND	3.4 / 2.5	6.4 / 2.5	ND
Barium	8.2 / 0.5	13 / 0.5	8.2 / 0.5	7.2 / 0.49	6.6 / 0.49	7.9 / 0.5	9.0 / 0.5	22 / 0.5	34 / 0.5
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	9.7 / 5	16 / 5	12 / 5	8.9 / 4.9	9.0 / 4.9	ND	7.6 / 5	17 / 5	24 / 5
Cobalt	ND	0.97 / 0.89	ND	ND	ND	ND	ND	3.2 / 0.9	3.3 / 0.9
Lead	5/5	ND	13 / 5	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	3.0 / 1.6	4.2 / 1.6	3.3 / 1.6	3.6 / 1.6	2.5 / 1.6	2.3 / 1.6	5.4 / 1.6	12 / 1.6	17 / 1.6
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	5.5 / 5	ND	5.4 / 5	ND	5.8 / 4.9	ND	5.8 / 5	9.8 / 5	17 / 5
Other									
Cyanide	ND	ND	0.8 / 0.3	ND	0.5 / 0.3	ND	1.1 / 0.3	ND	ND
Organic Lead	NA	ND	NA	ND	NA	ND	NA	ND	NA
Isobutyl Alcohol	NA	ND	NA	ND	NA	ND	NA	ND	NA
pH	8.0	8.3	8.0	7.8	8.6	8.4	7.9	9.6	9.6

NOTES:

SWMU = Solid Waste Management Unit
NA = Not Analyzed
ND = Not Detected
D = Duplicate Sample

N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.3A
Analytical Results for
SWMU 10

Sample Designation	10-1-1.5	10-1-3.5	10-2-1.5	10-2-3.5	10-3-1.5	10-3-3.5	10-4-1.5	10-4-3.5	10-4D-3.5
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	N	N	N	D

PARAMETER	Analyte Concentration/Detection Limit								
	µg/kg								
VOCs									
Total Xylenes	NA	ND	NA	ND	NA	6 / 5	NA	ND	ND
2-Butanone	NA	20 / 10	NA	ND	NA	10 / 10	NA	ND	ND
SVOCs									
1-Methylnaphthalene	NA	21 / 7	NA	25 / 7	NA	ND	NA	18 / 7	ND

NOTES:

SWMU = Solid Waste Management Unit
NA = Not Analyzed
ND = Not Detected
D = Duplicate Sample

N = Normal Sample
VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
µg/kg = Microgram per kilogram = Parts per Billion

Table 3.3B
Analytical Results for
SWMU 10

Sample Designation	10-1-1.5	10-1-3.5	10-2-1.5	10-2-3.5	10-3-1.5	10-3-3.5	10-4-1.5	10-4-3.5	10-4D-3.5
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	N	N	N	D

PARAMETER	Analyte Concentration/Detection Limit								
	Mg/Kg								
Metals									
Antimony	ND	ND	ND	ND	33 / 30	ND	ND	ND	ND
Arsenic	11 / 2.5	ND	4.9 / 2.5	3.5 / 2.5	8.6 / 2.5	6.5 / 2.5	19 / 2.5	20 / 2.5	20 / 2.5
Barium	9.4 / 0.5	6.8 / 0.5	9 / 0.5	12 / 0.49	7.1 / 0.5	7.7 / 0.49	7.1 / 0.51	5.8 / 0.5	5.9 / 0.5
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	9.7 / 5	6.4 / 5	6.1 / 5	5.7 / 5	9.7 / 5	8.1 / 5	6.7 / 5	ND	6.5 / 5
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	15/5	ND	15 / 5	ND	11 / 5	4.9 / 4.9	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	3.8 / 1.6	ND	2.3 / 1.6	ND	2.3 / 1.6	1.9 / 1.6	1.9 / 1.6	1.9 / 1.6	2.4 / 1.6
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	5.4 / 5	ND	5.4 / 5	ND	6.2 / 5	5.1 / 4.9	ND	ND	ND
Other									
Cyanide	0.8 / 0.3	ND	0.6 / 0.3	0.3 / 0.3	0.4 / 0.3	ND	ND	0.4 / 0.3	0.3 / 0.3
Organic Lead	NA	ND	NA	ND	NA	ND	NA	ND	ND
Isobutyl Alcohol	NA	ND	NA	ND	NA	ND	NA	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
NA = Not Analzed
ND = Not Detected
D = Duplicate Sample

N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.4
Analytical Results for
SWMU 15

Sample Designation	15-1-1	15-2-1	15-3-1	15-4-1	15-4D-1
Sample Matrix	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	D

PARAMETER	Analyte Concentration/Detection Limit				
	Mg/Kg				
Metals					
Antimony	4 / 3	ND	4.9 / 3	3 / 3	ND
Arsenic	ND	ND	ND	ND	ND
Barium	13 / 0.5	9.1 / 0.5	10 / 0.5	14 / 0.5	13 / 0.5
Beryllium	ND	ND	0.2 / 0.2	ND	ND
Cadmium	ND	0.4 / 0.3	ND	ND	ND
Chromium	11 / 0.5	11 / 0.5	13 / 0.5	9.7 / 0.5	9.2 / 0.5
Cobalt	1.6 / 0.9	1.3 / 0.9	5.6 / 0.9	1.0 / 0.9	1.3 / 0.9
Lead	7 / 3	5 / 3	ND	3 / 3	7 / 3
Mercury	ND	ND	ND	ND	ND
Nickel	7 / 2	4 / 2	8 / 2	3 / 2	4 / 2
Selenium	ND	ND	ND	ND	ND
Vanadium	6.2 / 0.5	6.0 / 0.5	19 / 0.5	6.6 / 0.5	7.9 / 0.5
Other					
Cyanide	ND	ND	ND	ND	ND
pH	8.1	8.5	8.4	8.3	NA

NOTES:

SWMU = Solid Waste Management Unit
NA = Not Analyzed
ND = Not detected
D = Duplicate Sample
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.5
Analytical Results for
SWMU 16

Sample Designation	16-1-0.5	16-2-0.5	16-3-0.5	16-4-0.5	16-4D-0.5
Sample Matrix	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	D

PARAMETER	Analyte Concentration/Detection Limit Mg/Kg				
Metals					
Antimony	ND	4 / 3	4 / 3	3 / 3	ND
Arsenic	11 / 3	9 / 3	13 / 3	4 / 3	4 / 3
Barium	27 / 0.5	20 / 0.5	19 / 0.5	24 / 0.5	23 / 0.5
Beryllium	ND	ND	ND	0.1 / 0.1	0.1 / 0.1
Cadmium	ND	0.3 / 0.3	0.4 / 0.3	ND	ND
Chromium	13 / 0.5	12 / 0.5	12 / 0.5	11 / 0.5	12 / 0.5
Cobalt	1.6 / 0.9	1.4 / 0.9	2.0 / 0.9	1.9 / 0.9	2.1 / 0.9
Lead	10 / 3	12 / 3	5 / 3	4 / 3	230 / 3
Mercury	ND	ND	ND	ND	ND
Nickel	5 / 2	5 / 2	5 / 2	8 / 2	6 / 2
Selenium	ND	ND	ND	ND	ND
Vanadium	7.5 / 0.5	6.2 / 0.5	15 / 0.5	9.1 / 0.5	9.7 / 0.5
Other					
Cyanide	ND	ND	ND	ND	ND
Organic Lead	ND	ND	ND	ND	ND
pH	8.3	8.2	8.1	8.2	8.3

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
D = Duplicate Sample
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.6A
Analytical Results for
SWMU 17

Sample Designation	17-1-0.5	17-2-0.5	17-3-0.5	17-4-0.5
Sample Matrix	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N

PARAMETER	Analyte Concentration/Detection Limit			
	µg/kg			
SVOCs	ND*	ND*	ND*	ND*

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
SVOCs = Semivolatile Organic Compounds
µg/kg = Microgram per kilogram = Parts per Billion
* = Run for Original Skinner List of Analytes

Table 3.6B
Analytical Results for
SWMU 17

Sample Designation	17-1-0.5	17-2-0.5	17-3-0.5	17-4-0.5
Sample Matrix	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N

PARAMETER	Analyte Concentration/Detection Limit Mg/Kg			
Metals				
Antimony	ND	ND	ND	ND
Arsenic	5 / 3	5 / 3	7 / 3	3 / 3
Barium	23 / 5	16 / 5	34 / 5	16 / 5
Beryllium	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND
Chromium	25 / 5	21 / 5	27 / 5	19 / 5
Cobalt	ND	ND	ND	ND
Lead	48 / 3	22 / 3	72 / 3	13 / 3
Mercury	0.1 / 0.1	ND	ND	ND
Nickel	30 / 20	ND	40 / 20	ND
Selenium	ND	ND	ND	ND
Vanadium	42 / 5	22 / 5	48 / 5	15 / 5
Other				
Cyanide	ND	0.3 / 0.3	ND	ND
Organic Lead	ND	ND	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.7A
Analytical Results for
SWMU 18S

Sample Designation	18S-1-1	18S-1-2	18S-2-1	18S-2-2	18S-3-0.5	18S-3-1.5	18S-3D-1.5
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	N	R

PARAMETER	Analyte Concentration/Detection Limit						
	µg/kg						
VOCs							
Benzene	1,000 / 1,000	ND	ND	2,000 / 3,000	300 / 500	ND	ND
Toluene	2,000 / 1,000	200 / 300	900 / 1,000	ND	900 / 500	5,000 / 3,000	12,000 / 3,000
Ethyl Benzene	14,000 / 1,000	2,700 / 300	18,000 / 1,000	30,000 / 3,000	5,600 / 500	39,000 / 3,000	ND
Total Xylenes	6,000 / 1,000	1,500 / 300	6,000 / 1,000	11,000 / 3,000	2,300 / 500	28,000 / 3,000	53,000 / 3,000
SVOCs							
Naphthalene	53,000 / 2,000	ND	ND	250,000 / 40,000	31,000 / 2,000	240,000 / 40,000	12,000 / 700
1-Methylnaphthalene	640,000 / 20,000	23,000 / 2,000	3,000 / 2,000	830,000 / 40,000	290,000 / 20,000	1,500,000 / 40,000	47,000 / 700
Dimethylphthalate	ND	ND	ND	ND	3,000 / 2,000	9,000 / 2,000	ND
2,4-Dinitrophenol	32,000 / 2,000	ND	ND	21,000 / 2,000	22,000 / 2,000	43,000 / 2,000	ND
Phenanthrene	770,000 / 20,000	11,000 / 2,000	ND	180,000 / 40,000	270,000 / 20,000	500,000 / 40,000	10,000 / 700
Anthracene	36,000 / 2,000	ND	ND	18,000 / 2,000	22,000 / 2,000	38,000 / 2,000	840 / 700
Di-n-butylphthalate	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	32,000 / 2,000	ND	ND	14,000 / 2,000	23,000 / 2,000	35,000 / 2,000	ND
Pyrene	250,000 / 20,000	ND	ND	86,000 / 2,000	120,000 / 20,000	192,000 / 2,000	5,400 / 700
Butylbenzylphthalate	3,000 / 2,000	ND	ND	ND	ND	3,000 / 2,000	ND
Benzo(a)anthracene	79,000 / 2,000	ND	ND	23,000 / 2,000	36,000 / 2,000	75,000 / 2,000	1,200 / 700
Chrysene	230,000 / 20,000	ND	5,000 / 2,000	65,000 / 2,000	94,000 / 2,000	150,000 / 2,000	4,300 / 700
4-Methylchrysene	97,000 / 2,000	4,000 / 2,000	4,000 / 2,000	53,000 / 2,000	70,000 / 2,000	110,000 / 2,000	3,600 / 700
7,12-Dimethylbenz(a)anthracene	74,000 / 2,000	ND	ND	32,000 / 2,000	55,000 / 2,000	75,000 / 2,000	ND
Benzo(b)fluoranthene	29,000 / 2,000	ND	ND	15,000 / 2,000	21,000 / 2,000	32,000 / 2,000	ND
Benzo(a)pyrene	60,000 / 2,000	ND	ND	30,000 / 2,000	42,000 / 2,000	65,000 / 2,000	ND
Dibenz(a,h)anthracene	15,000 / 2,000	ND	ND	ND	ND	16,000 / 2,000	ND
bis(2-ethylhexyl)phthalate	ND	ND	38,000 / 2,000	ND	ND	71,000 / 2,000	ND
Di-n-butylphalate	ND	ND	ND	ND	ND	16,000 / 2,000	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
D = Duplicate Sample
N = Normal Sample

VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
µg/kg = Microgram per kilogram = Parts per Billion
R = Resample of 18S-3-1.5

Table 3.7B
Analytical Results for
SWMU 18S

Sample Designation	18S-1-1	18S-1-2	18S-2-1	18S-2-2	18S-3-0.5	18S-3-1.5	18S-3D-1.5
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	N	R

PARAMETER	Analyte Concentration/Detection Limit						
	Mg/Kg						
Metals							
Antimony	ND	ND	ND	ND	ND	ND	ND
Arsenic	8 / 3	ND	7 / 3	8 / 3	9 / 3	7 / 3	4 / 3
Barium	30 / 0.5	8.2 / 0.5	36 / 5	24 / 0.5	32 / 0.5	38 / 0.5	5.7 / 0.5
Beryllium	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	3 / 3	ND	3 / 3	ND	0.9 / 0.3
Chromium	430 / 0.5	20 / 5	440 / 5	210 / 5	540 / 5	500 / 5	200 / 0.5
Cobalt	13 / 0.9	ND	14 / 0.9	8.2 / 0.9	15 / 0.9	14 / 0.9	5 / 0.9
Lead	1,200 / 30	30 / 5	1,300 / 30	410 / 5	1,300 / 30	1,100 / 30	350 / 5
Mercury	0.1 / 0.1	ND	0.1 / 0.1	0.2 / 0.1	ND	0.2 / 0.1	ND
Nickel	23 / 2	2 / 2	31 / 2	14 / 2	30 / 2	28 / 2	8 / 2
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	48 / 5	7 / 5	48 / 5	24 / 5	48 / 5	51 / 0.5	10 / 0.5
Other							
Cyanide	ND	ND	ND	0.4 / 0.3	ND	ND	0.5 / 0.3
Organic Lead	44 / 1	ND	22 / 0.5	43 / 1	36 / 1	23 / 0.5	170 / 5
Isobutyl Alcohol	ND	ND	ND	ND	ND	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
D = Duplicate Sample
R = Resample of 18S-3-1.5

N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.8A
Analytical Results for
SWMU 18M

Sample Designation	18M-1-1	18M-1-2	18M-2-1	18M-2-2	18M-3-1	18M-3-2
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	N

PARAMETER	Analyte Concentration/Detection Limit µg/kg					
VOCs						
2-Butanone	200 / 300	ND	ND	140 / 60	190 / 50	ND
Benzene	ND	ND	ND	120 / 30	50 / 30	98 / 100
Toluene	ND	200 / 100	80 / 100	130 / 30	120 / 30	100 / 100
Ethyl Benzene	100 / 200	400 / 100	190 / 100	230 / 30	150 / 30	700 / 100
Total Xylenes	500 / 200	1,900 / 100	1,000 / 100	1,100 / 30	1,500 / 30	900 / 100
Carbon Disulfide	ND	ND	ND	40 / 30	80 / 30	ND
SVOCs						
Naphthalene	210,000 / 40,000	ND	ND	ND	ND	ND
1-Methylnaphthalene	960,000 / 40,000	22,000 / 2,000	ND	3,000 / 2,000	2,000 / 2,000	1,100 / 70
Dimethylphthalate	2,000 / 2,000	ND	ND	ND	ND	ND
2,4-Dinitrophenol	40,000 / 2,000	3,000 / 2,000	ND	ND	ND	220 / 70
Phenanthrene	410,000 / 40,000	27,000 / 2,000	ND	ND	ND	980 / 70
Anthracene	32,000 / 2,000	3,000 / 2,000	ND	ND	ND	230 / 70
Di-n-butylphthalate	10,000 / 2,000	ND	ND	ND	ND	ND
Fluoranthene	26,000 / 2,000	ND	ND	ND	ND	ND
Pyrene	140,000 / 2,000	11,000 / 2,000	ND	ND	8,000 / 2,000	2,000 / 70
Butylbenzylphthalate	4,000 / 2,000	ND	ND	ND	ND	ND
Benzo(a)anthracene	65,000 / 2,000	ND	ND	ND	ND	640 / 70
Chrysene	120,000 / 2,000	ND	ND	ND	7,000 / 2,000	1,500 / 70
4-Methylchrysene	78,000 / 2,000	3,000 / 2,000	8,000 / 2,000	4,000 / 2,000	2,000 / 2,000	1,300 / 70
7,12-Dimethylbenz(a)anthracene	62,000 / 2,000	ND	ND	ND	ND	630 / 70
Benzo(b)fluoranthene	24,000 / 2,000	ND	ND	ND	ND	260 / 70
Benzo(a)pyrene	49,000 / 2,000	ND	ND	ND	ND	510 / 70
1,2-Dichlorobenzene	ND	9,000 / 2,000	ND	ND	ND	ND
bis(2-ethylhexyl)phthalate	ND	120,000 / 2,000	ND	ND	18,000 / 2,000	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
µk/kg = Microgram per kilogram = Parts per Billion

Table 3.8B
Analytical Results for
SWMU 18M

Sample Designation	18M-1-1	18M-1-2	18M-2-1	18M-2-2	18M-3-1	18M-3-2
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	N

PARAMETER	Analyte Concentration/Detection Limit Mg/Kg					
Metals						
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	3 / 3	3 / 3	ND	ND	7 / 3
Barium	7.6 / 0.5	10 / 0.5	10 / 0.5	11 / 0.5	10 / 0.5	10 / 0.5
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	0.6 / 0.3	ND	1.3 / 0.3	1.5 / 0.3	1.1 / 0.3	ND
Chromium	36 / 0.3	170 / 5	78 / 0.5	47 / 0.5	48 / 0.5	74 / 5
Cobalt	2.9 / 0.9	4.9 / 0.9	5.2 / 0.9	5 / 0.9	5.8 / 0.9	3.2 / 0.9
Lead	32 / 5	44 / 5	48 / 5	36 / 5	40 / 5	190 / 5
Mercury	0.6 / 0.1	0.5 / 0.1	0.8 / 0.1	0.6 / 0.1	0.7 / 0.1	0.6 / 0.1
Nickel	76 / 2	39 / 2	65 / 2	75 / 2	52 / 2	13 / 2
Selenium	ND	ND	ND	3 / 3	ND	ND
Vanadium	36 / 0.5	53 / 5	53 / 0.5	46 / 0.5	46 / 0.5	16 / 5
Other						
Cyanide	0.8 / 0.3	1.5 / 0.3	0.6 / 0.3	ND	ND	ND
Organic Lead	ND	ND	ND	ND	ND	3.2 / 0.5
Isobutyl Alcohol	ND	ND	ND	ND	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.9A
Analytical Results for
SWMU 18L

Sample Designation	18L-1-1	18L-1-2	18L-2-1	18L-2-2	18L-3-1	18L-3-2
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	N

PARAMETER	Analyte Concentration/Detection Limit µg/kg					
VOCs						
Benzene	ND	ND	4 / 5	600 / 100	ND	300 / 100
Toluene	ND	200 / 100	31 / 5	4,800 / 100	40 / 30	200 / 100
Ethyl Benzene	ND	100 / 100	14 / 5	2,900 / 100	130 / 20	1,900/100
Total Xylenes	100 / 100	500 / 100	15 / 5	3,300 / 100	600 / 30	3,200 / 100
SVOCs						
Naphthalene	ND	ND	ND	ND	ND	ND
1-Methylnaphthalene	ND	9,000 / 2,000	ND	21,000 / 2,000	8,000 / 2,000	12,000 / 2,000
Dimethylphthalate	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	ND	3,000 / 2,000	ND	8,000 / 10,000	ND	ND
Phenanthrene	ND	21,000 / 2,000	8,000 / 2,000	140,000 / 10,000	ND	23,000 / 2,000
Anthracene	ND	4,000 / 2,000	2,000 / 2,000	13,000 / 2,000	ND	ND
Di-n-butylphthalate	ND	6,000 / 2,000	ND	ND	ND	ND
Fluoranthene	ND	8,000 / 2,000	11,000 / 2,000	19,000 / 2,000	ND	ND
Pyrene	ND	58,000 / 2,000	87,000 / 2,000	97,000 / 2,000	ND	9,000 / 2,000
Butylbenzylphthalate	ND	3,000 / 2,000	3,000 / 2,000	ND	ND	ND
Benzo(a)anthracene	ND	19,000 / 2,000	19,000 / 2,000	47,000 / 2,000	ND	ND
Chrysene	5,000 / 2,000	57,000 / 2,000	72,000 / 2,000	92,000 / 2,000	5,000 / 2,000	6,000 / 2,000
4-Methylchrysene	14,000 / 2,000	50,000 / 2,000	73,000 / 2,000	84,000 / 2,000	3,000 / 2,000	5,000 / 2,000
7,12-Dimethylbenz(a)anthracene	ND	21,000 / 2,000	39,000 / 2,000	50,000 / 2,000	ND	ND
Benzo(b)fluoranthene	ND	12,000 / 2,000	21,000 / 2,000	19,000 / 2,000	ND	ND
Benzo(a)pyrene	ND	24,000 / 2,000	37,000 / 2,000	43,000 / 2,000	ND	ND
Dibenz(a,b)anthracene	ND	ND	14,000 / 2,000	15,000 / 2,000	ND	ND
bis(2-ethylhexyl)phthalate	ND	ND	37,000 / 2,000	ND	ND	40,000 / 2,000

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
VOCs = Volatile Organic Compounds
SVOCs = Semivolatile Organic Compounds
µg/kg = Microgram per kilogram = Parts per Billion

Table 3.9B
Analytical Results for
SWMU 18L

Sample Designation	18L-1-1	18L-1-2	18L-2-1	18L-2-2	18L-3-1	18L-3-2
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	N

PARAMETER	Analyte Concentration/Detection Limit					
	Mg/Kg					
Metals						
Antimony	ND	ND	ND	ND	4 / 3	ND
Arsenic	ND	16 / 3	21 / 3	20 / 3	3 / 3	3 / 3
Barium	15 / 0.5	23 / 0.5	26 / 0.5	28 / 0.5	11 / 0.5	6.2 / 0.5
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	1.2 / 0.3	ND	ND	ND	0.8 / 0.3	ND
Chromium	30 / 1	280 / 5	290 / 5	330 / 5	69 / 0.5	13 / 5
Cobalt	3.1 / 0.9	6.5 / 0.9	9.2 / 0.9	13 / 0.9	2.4 / 0.9	ND
Lead	17 / 5	410 / 5	570 / 10	520 / 5	25 / 5	10 / 5
Mercury	0.4 / 0.1	0.1 / 0.1	0.1 / 0.1	ND	0.3 / 0.1	ND
Nickel	110 / 2	30 / 2	25 / 2	27 / 2	66 / 2	ND
Selenium	ND	ND	ND	ND	ND	ND
Vanadium	32 / 0.5	45 / 5	43 / 5	49 / 0.5	28 / 0.5	ND
Other						
Cyanide	0.4 / 0.3	ND	ND	0.3 / 0.3	ND	ND
Organic Lead	ND	52 / 3	31 / 1	110 / 4	ND	3.2 / 0.5
Isobutyl Alcohol	ND	ND	ND	ND	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.10A
Analytical Results for
SWMU 19

Sample Designation	19-1-1	19-2-1	19-3-1
Sample Matrix	Soil	Soil	Soil
Sample Type	N	N	N

PARAMETER	Analyte Concentration/Detection Limit		
	µg/kg		
VOCs			
Benzene	ND	ND	4 / 5
Total Xylenes	8 / 5	3 / 5	5 / 5
MEK (2-Butanone)	10 / 10	5 / 10	40 / 10
SVOCs			
Pyrene	ND	ND	370 / 80
Chrysene	ND	ND	530 / 80
4-Methylchrysene	400 / 80	4,000 / 2,000	140 / 80
Benzo(a)pyrene	ND	ND	160 / 80

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
VOCs = Volatile Organic Compounds
SVOCs = SemiVolatile Organic Compounds
µg/kg = Microgram per Kilogram = Parts per Billion

Table 3.10B
Analytical Results for
SWMU 19

Sample Designation	19-1-1	19-2-1	19-3-1
Sample Matrix	Soil	Soil	Soil
Sample Type	N	N	N

PARAMETER	Analyte Concentration/Detection Limit Mg/Kg		
Metals			
Antimony	ND	ND	ND
Arsenic	6 / 3	42 / 3	38 / 3
Barium	15 / 0.5	12 / 0.5	19 / 0.5
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	47 / 5	24 / 5	50 / 5
Cobalt	13 / 0.9	5.7 / 0.9	5.8 / 0.9
Lead	22 / 5	33 / 5	88 / 5
Mercury	ND	ND	0.1 / 0.1
Nickel	98 / 2	37 / 2	45 / 2
Selenium	ND	ND	ND
Vanadium	49 / 5	22 / 5	34 / 5
Other			
Cyanide	0.3 / 0.3	0.5 / 0.3	0.7 / 0.3
Organic Lead	ND	ND	ND
Isobutyl Alcohol	ND	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.11A
Analytical Results for
SWMU 20

Sample Designation	20–1–0.5	20–2–0.5	20–2D–0.5	20–3–0.5
Sample Matrix	Soil	Soil	Soil	Soil
Sample Type	N	N	R	N

PARAMETER	Analyte Concentration/Detection Limit			
	µg/kg			
SVOCs				
Benzenethiol	ND*	ND*	80 / 20	ND*
bis(2–ethylhexyl)phthalate	ND*	ND*	140 / 20	ND*
4–Methylchrysene	ND*	ND*	20 / 20	ND*

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
R = Resample of 20–2–0.5
N = Normal Sample
SVOCs = Semivolatile Organic Compounds

µg/kg = Microgram per kilogram = Parts per Billion
* = Run for Original Skinner List of Analytes

Table 3.11B
Analytical Results for
SWMU 20

Sample Designation	20-1-0.5	20-2-0.5	20-2D-0.5	20-3-0.5
Sample Matrix	Soil	Soil	Soil	Soil
Sample Type	N	N	R	N

PARAMETER	Analyte Concentration/Detection Limit Mg/Kg			
Metals				
Antimony	4 / 3	ND	7 / 3	4 / 3
Arsenic	7 / 3	14 / 3	10 / 3	13 / 3
Barium	10 / 0.5	17 / 0.5	37 / 0.5	35 / 0.5
Beryllium	ND	0.1 / 0.1	ND	ND
Cadmium	0.3 / 0.3	0.6 / 0.3	ND	0.6 / 0.3
Chromium	35 / 0.9	25 / 0.5	43 / 0.5	52 / 0.5
Cobalt	5.5 / 0.9	2.1 / 0.9	4.2 / 0.9	6.4 / 0.9
Lead	24 / 3	90 / 3	15 / 3	120 / 3
Mercury	ND	ND	ND	ND
Nickel	26 / 2	16 / 2	30 / 2	40 / 2
Selenium	ND	ND	ND	ND
Vanadium	26 / 0.5	16 / 0.5	35 / 0.5	36 / 0.5
Other				
Cyanide	0.4 / 0.3	0.6 / 0.3	ND	1.2 / 0.3
Organic Lead	ND	ND	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
R = Resample of 20-2-0.5
N = Normal Sample

Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.12A
Analytical Results for
SWMU 21

Sample Designation	21-1-0.5	21-2-0.5
Sample Matrix	Soil	Soil
Sample Type	N	N

PARAMETER	Analyte Concentration/ Detection Limit	
	µg/kg	
VOCs		
Total Xylenes	ND	200 / 100
SVOCs		
Chrysene	900 / 80	360 / 80
4-Methylchrysene	2,200 / 80	950 / 80
Phenanthrene	ND	520 / 80
Pyrene	ND	350 / 80
bis(2-ethylhexyl)phthalate	ND	1,100 / 80

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
SVOCs = Semivolatile Organic Compounds
VOCs = Volatile Organic Compounds
µg/kg = Microgram per Kilogram = Parts per Billion

Table 3.12B
Analytical Results for
SWMU 21

Sample Designation	21-1-0.5	21-2-0.5
Sample Matrix	Soil	Soil
Sample Type	N	N

PARAMETER	Analyte Concentration/ Detection Limit Mg/Kg	
Metals		
Antimony	ND	ND
Arsenic	4 / 3	ND
Barium	21 / 0.3	12 / 0.5
Beryllium	ND	ND
Cadmium	0.6 / 0.3	1.3 / 0.3
Chromium	65 / 5	53 / 5
Cobalt	4.7 / 0.9	5.9 / 0.9
Lead	60 / 10	50 / 10
Mercury	0.8 / 0.1	0.6 / 0.1
Nickel	50 / 2	140 / 2
Selenium	4 / 3	5 / 3
Vanadium	37 / 0.5	66 / 0.5
Other		
Cyanide	0.6 / 0.3	0.5 / 0.3
Organic Lead	ND	ND
Isobutyl Alcohol	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.13A
Analytical Results for
SWMU 22

Sample Designation	22-1-0.5	22-2-0.5	22-2D-0.5
Sample Matrix	Soil	Soil	Soil
Sample Type	N	N	D

PARAMETER	Analyte Concentration/Detection Limit µg/kg		
VOCs			
Ethyl Benzene	2,000 / 1,000	2,000 / 1,000	3,000 / 1,000
Total Xylenes	ND	14,000 / 1,000	16,000 / 1,000
SVOCs			
1-Methylnaphthalene	5,300 / 800	110,000 / 8,000	110,000 / 8,000
Phenanthrene	39,000 / 800	100,000 / 8,000	100,000 / 8,000
Benzenethiol	42,000 / 800	82,000 / 8,000	ND
Flouranthene	2,200 / 80	4,500 / 800	4,200 / 800
Pyrene	1,900 / 80	16,000 / 800	16,000 / 800
Butylbenzylphthatlate	130 / 80	ND	ND
bis(2-ethylhexyl)phthalate	2,500 / 80	15,000 / 800	22,000 / 800
chrysene	4,900 / 800	ND	ND
4-Methylchrysene	17,000 / 800	13,000 / 800	8,800 / 800

North Ocean Pond

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
D = Duplicate Sample
N = Normal Sample
SVOCs = Semivolatile Organic Compounds
VOCs = Volatile Organic Compounds
µg/kg = Microgram per Kilogram = Parts per Billion

Table 3.13B
Analytical Results for
SWMU 22

Sample Designation	22-1-0.5	22-2-0.5	22-2D-0.5
Sample Matrix	Soil	Soil	Soil
Sample Type	N	N	D

PARAMETER	Analyte Concentration/Detection Limit Mg/Kg		
Metals			
Antimony	ND	ND	ND
Arsenic	3 / 3	4 / 3	4 / 3
Barium	14 / 0.5	28 / 0.5	33 / 0.5
Beryllium	ND	ND	ND
Cadmium	0.6 / 0.3	1.1 / 0.3	1.3 / 0.3
Chromium	28 / 5	53 / 0.5	44 / 0.5
Cobalt	6.2 / 0.5	9.5 / 0.9	44 / 0.9
Lead	40 / 10	210 / 10	100 / 10
Mercury	0.5 / 0.1	4.8 / 0.1	2.3 / 0.1
Nickel	510 / 2	340 / 2	420 / 2
Selenium	3 / 3	5 / 3	3 / 3
Vanadium	120 / 0.5	110 / 0.5	160 / 0.5
Other			
Cyanide	ND	ND	ND
Organic Lead	ND	1.4 / 0 5	2.0 / 0.5
Isobutyl Alcohol	ND	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
D = Duplicate Sample
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.14A
Analytical Results for
SWMU 25

Sample Designation	25-1-0.5	25-2-0.5	25-3-0.5
Sample Matrix	Soil	Soil	Soil
Sample Type	N	N	N

PARAMETER	Analyte Concentration/ Detection Limit		
	µg/kg		
SVOCs	ND*	ND*	ND*

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
SVOCs = Semivolatile Organic Compounds
µg/kg = Microgram per kilogram = Parts per Billion
* = Run for Original Skinner List of Analytes

Table 3.14B
Analytical Results for
SWMU 25

Sample Designation	25-1-0.5	25-2-0.5	25-3-0.5
Sample Matrix	Soil	Soil	Soil
Sample Type	N	N	N

PARAMETER	**Analyte Concentration/ Detection Limit**		
	Mg/Kg		
Metals			
Antimony	20 / 3	ND	4 / 3
Arsenic	14 / 3	12 / 3	13 / 3
Barium	26 / 0.5	32 / 0.5	50 / 0.5
Beryllium	ND	ND	ND
Cadmium	2.1 / 0.3	0.4 / 0.3	0.5 / 0.3
Chromium	60 / 0.5	120 / 0.5	87 / 0.5
Cobalt	3.4 / 0.9	8.1 / 0.9	23 / 0.9
Lead	51 / 3	78 / 3	60 / 3
Mercury	0.4 / 0.1	0.8 / 0.1	0.2 / 0.1
Nickel	114 / 2	170 / 2	84 / 2
Selenium	ND	ND	ND
Vanadium	200 / 0.5	89 / 0.5	80 / 0.5
Other			
Cyanide	ND	4.0 / 0.3	4.2 / 0.3
Organic Lead	ND	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.15A
Analytical Results for
SWMU 27

Sample Designation	27-1-0.5	27-1R-0.5	27-2-0.5	27-3-0.5	27-3R-0.5	27-4-0.5	27-5-0.5	27-5R-0.5	27-5D-0.5
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	R	N	N	R	N	N	R	D

PARAMETER	Analyte Concentration/Detection Limit								
	µg/kg								
SVOCs*									
Dimethylphthalate	ND*	20 / 20	ND*	ND*	ND	ND*	ND*	ND	NA
1-Methylnaphthalene	ND*	ND	ND*	ND*	ND	ND*	ND*	190 / 200	NA
Phenanthrene	ND*	17/ 20	ND*	ND*	ND	ND*	ND*	ND	NA
Chrysene	ND*	17/ 20	ND*	ND*	ND	ND*	ND*	ND	NA
bis(2-ethylhexyl)phthalate	ND*	50 / 20	ND*	ND*	ND	ND*	ND*	ND	NA
4-Methylchrysene	ND*	20 / 20	ND*	ND*	ND	ND*	ND*	ND	NA
Di-n-octylphthalate	ND*	40 / 20	ND*	ND*	ND	ND*	ND*	ND	NA

NOTES:

SWMU = Solid Waste Management Unit
NA = Not Analyzed
ND = Not Detected
D = Duplicate Sample
R = Resample
N = Normal Sample
SVOCs = Semivolatile Organic Compounds
µg/kg = Microgram per kilogram = Parts per Billion
* = Run for Orginal Skinner List of Analytes

Table 3.15B
Analytical Results for
SWMU 27

Sample Designation	27-1-0.5	27-2-0.5	27-3-0.5	27-4-0.5	27-5-0.5	27-5D-0.5
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	N	D

PARAMETER	Analyte Concentration/Detection Limit					
	Mg/Kg					
Metals						
Antimony	5 / 3	5 / 3	3 / 3	ND	5 / 3	4 / 3
Arsenic	25 / 5	39 / 5	17 / 3	20 / 3	25 / 5	21 / 5
Barium	63 / 0.5	72 / 0.5	38 / 0.5	50 / 0.5	30 / 0.5	30 / 0.5
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	1.4 / 0.3	2.7 / 0.3	2.8 / 0.3	8.0 / 0.3	1.6 / 0.3	1.1 / 0.3
Chromium	22 / 0.5	26 / 0.5	20 / 0.5	22 / 0.5	22 / 0.5	21 / 0.5
Cobalt	7.5 / 0.9	8.7 / 0.9	4.6 / 0.9	4.3 / 0.9	4.0 / 0.9	4.4 / 0.9
Lead	55 / 3	61 / 3	44 / 3	63 / 3	61 / 3	61 / 3
Mercury	0.2 / 0.1	0.9 / 0.1	1.4 / 0.1	60 / 4	ND	ND
Nickel	39 / 2	55 / 2	37 / 2	68 / 2	41 / 2	42 / 2
Selenium	ND	ND	ND	ND	ND	ND
Vanadium	94 / 0.5	140 / 0.5	96 / 0.5	160 / 0.5	83 / 0.5	89 / 0.5
Other						
Cyanide	0.6 / 0.3	0.9 / 0.3	1.4 / 0.3	0.7 / 0.3	2.3 / 0.3	NA
Organic Lead	ND	ND	ND	ND	ND	NA

NOTES:

SWMU = Solid Waste Management Unit
NA = Not Analyzed
ND = Not Detected
D = Duplicate Sample
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.16A
Analytical Results for
SWMU 28

Sample Designation	28-1-0.5	28-2-0.5	28-3-0.5	28-4-0.5
Sample Matrix	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N

PARAMETER	Analyte Concentration/Detection Limit			
	µg/kg			
SVOCs	ND*	ND*	ND*	ND*

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
SVOCs = Semivolatile Organic Compounds
µg/Kg = Microgram per Kilogram = Parts per Billion
* = Run for Original Skinner List of Analytes

Table 3.16B
Analytical Results for
SWMU 28

Sample Designation	28-1-0.5	28-2-0.5	28-3-0.5	28-4-0.5
Sample Matrix	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N

PARAMETER	Analyte Concentration/Detection Limit			
	Mg/Kg			
Metals				
Antimony	5 / 3	3 / 3	5 / 3	4 / 3
Arsenic	23 / 5	11 / 3	6 / 3	7 / 3
Barium	23 / 0.5	67 / 0.5	17 / 0.5	32 / 0.5
Beryllium	ND	ND	ND	0.1 / 0.1
Cadmium	1.3 / 0.3	1.4 / 0.3	1.6 / 0.3	1.0 / 0.3
Chromium	34 / 0.5	34 / 0.5	14 / 0.5	20 / 0.5
Cobalt	8.6 / 0.9	5.6 / 0.9	1.6 / 0.9	2.9 / 0.9
Lead	59 / 3	62 / 3	19 / 3	40 / 3
Mercury	0.3 / 0.1	ND	ND	ND
Nickel	29 / 2	45 / 2	11 / 2	28 / 2
Selenium	ND	ND	ND	ND
Vanadium	19 / 0.3	23 / 0.3	14 / 0.3	13 / 0.3
Other				
Cyanide	0.3 / 0.3	ND	ND	ND
Organic Lead	ND	ND	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.17
Analytical Results for
SWMU 32

Sample Designation	32-1-3	32-2
Sample Matrix	Soil	Water
Sample Type	N	N

PARAMETER	Analyte Concentration/ Detection Limit	
	Mg/Kg	µg/L
Metals		
Antimony	ND	ND
Arsenic	ND	70 / 5
Barium	15 / 0.5	290 / 5
Beryllium	ND	ND
Cadmium	ND	ND
Chromium	25 / 5	920 / 500
Cobalt	2.8 / 0.9	54 / 18
Lead	14 / 5	410 / 30
Mercury	ND	ND
Nickel	14 / 16	170 / 32
Selenium	ND	ND
Vanadium	15 / 5	530 / 500
Other		
Sulfate	1,100 mg/Kg	1,800 mg/L
pH	7.5	7.3

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million
µg/L = Microgram per Liter is approximately equal to Parts per Billion
mg/L = Milligram per Liter is approximately equal to Parts per Million

Table 3–18A
Analytical Results for
SWMU 35

Sample Designation	35–1–0.5	35–2–0.5
Sample Matrix	Soil	Soil
Sample Type	N	N

PARAMETER	Analyte Concentration/ Detection Limit	
	µg/kg	
SVOCs	ND*	ND*

NOTES:

SWMU = Solid Waste Management Unit
ND = Not detected
N = Normal Sample
SVOCs = Semivolatile Organic Compounds
µg/kg = Microgram per Kilogram = Parts per Billion
* = Run for Original Skinner List of Analytes

Table 3.18B
Analytical Results for
SWMU 35

Sample Designation	35–1–0.5	35–2–0.5
Sample Matrix	Soil	Soil
Sample Type	N	N

PARAMETER	Analyte Concentration/ Detection Limit	
	Mg/Kg	
Metals		
Antimony	5 / 3	ND
Arsenic	17 / 3	11 / 3
Barium	46 / 0.5	43 / 0.5
Beryllium	0.7 / 0.1	2.2 / 0.1
Cadmium	0.9 / 0.3	0.5 / 0.3
Chromium	48 / 0.5	33 / 0.5
Cobalt	12 / 0.9	12 / 0.9
Lead	93 / 3	23 / 3
Mercury	0.9 / 0.1	0.5 / 0.1
Nickel	130 / 2	41 / 2
Selenium	ND	ND
Vanadium	120 / 0.5	67 / 0.5
Other		
Cyanide	0.7 / 0.3	ND
Organic Lead	ND	ND

NOTES:

SWMU = Solid Waste Management Unit
ND = Not Detected
N = Normal Sample
Mg/Kg = Milligram per Kilogram = Parts per Million

Table 3.19
Analytical Results for
MEK Paint Pits

Sample Designation	MEK 1–0.5	MEK 1–2–0.5	MEK 2–0.5	MEK 2–2–0.5	MEK 2–2D–0.5	MEK A&B (Comp)
Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type	N	N	N	N	D	C

PARAMETER	Analyte Concentration/Detection Limit					
	μg/kg					μg/L
MEK by EPA Method 8240						
2–Butanone (MEK)	ND	ND	ND	ND	ND	NA
TCLP MEK by EPA Method 8240						
2–Butanone (MEK)	NA	NA	NA	NA	NA	ND

NOTES:

SWMU = Solid Waste Management Unit
NA = Not Analyzed
ND = Not Detected
D = Duplicate Sample
N = Normal Sample
C = Composite Sample
μg/kg = Microgram per kilogram = Parts per Billion
μg/L = Microgram per Liter is approximatly equal to Parts per Billion
MEK = Methyl Ethyl Ketone = 2–Butanone
TCLP = Toxicity Characteristic Leaching Procedure

Table 3.20A
Analytical Results for
Field Quality Control Samples

Sample Designation	BKG-1-0.5	BKG-2-1	EQRB-1	EQRB-2	TB-1	TB-4	TB-6	TB-7	TB-8	TB-9
Sample Matrix	Soil	Soil	Water	Water	Water	Water	Water	Water	Water	Water
Sample Type	BKG	BKG	ERB	ERB	TB	TB	TB	TB	TB	TB

PARAMETER	Analyte Concentration/Detection Limit									
	μg/kg		μg/L							
VOCs										
MEK (2-Butanone)	ND	8 / 10	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	3 / 5	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	130 / 5	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	ND	11 / 5	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	ND	51 / 5	ND	ND	ND	ND	ND	ND	ND	ND
SVOCs										
1-Methylnaphthalate	ND	23 / 7	ND	NA	NA	NA	NA	NA	NA	NA
bis(2-ethylhexyl)phthalate	ND	250 / 7	ND	NA	NA	NA	NA	NA	NA	NA
di-n-octylphthalate	ND	10 / 7	ND	NA	NA	NA	NA	NA	NA	NA
Benzenethiol	70 / 20	ND	ND	NA	NA	NA	NA	NA	NA	NA

NOTES:

BKG = Background Location
TB = Trip Blank
ERB = Equipment Rinse Blank
NA = Not Analyzed
ND = Not Detected

SVOCs = Semivolatile Organic Compounds
VOCs = Volatile Organic Compounds
MEK = Methyl Ethyl Ketone = 2-Butanone
μg/kg = Microgram per Kilogram = Parts per Billion
μg/L = Microgram per Liter is approximately equal to Parts per Billion

Table 3.20B
Analytical Results for
Field Quality Control Samples

Sample Designation	BKG-1-0.5	BKG-2-1	EQRB-1	EQRB-2
Sample Matrix	Soil	Soil	Water	Water
Sample Type	BKG	BKG	ERB	ERB

PARAMETER	Analyte Concentration/Detection Limit			
	Mg/Kg		μg/L	
Metals				
Antimony	3 / 3	ND	NA	ND
Arsenic	35 / 5	ND	NA	ND
Barium	45 / 0.5	21 / 0.5	NA	ND
Beryllium	0.3 / 0.1	ND	NA	ND
Cadmium	ND	ND	NA	ND
Chromium	36 / 0.5	35 / 5	NA	ND
Cobalt	20 / 0.9	1.5 / 0.89	NA	ND
Lead	15 / 3	ND	NA	ND
Mercury	ND	0.12 / 0.1	NA	ND
Nickel	46 / 2	11 / 1.6	NA	ND
Selenium	ND	ND	NA	ND
Vanadium	46 / 0.5	16 / 5	NA	ND
Other				
Cyanide	1.6 / 0.3	0.5 / 0.3	NA	ND
Organic Lead	ND	ND	ND	ND
Isobutyl Alcohol	NA	ND	NA	ND

NOTES:

BKG = Background Location
ERB = Equipment Rinse Blank
NA = Not Analyzed
ND = Not Detected
mg/kg = Milligram per kilogram = Parts per Million (ppm)
μg/L = Microgram per Liter is approximately equal to Parts per Billion (ppb)

Complete laboratory data reports including case narratives and chain-of-custody forms, are contained in Appendix A. References containing State of Hawaii recommended soil cleanup guidelines, and To-Be-Considered (TBC) soil cleanup guidelines utilized to evaluate the analytical data for this RFI, are presented in Appendix B. These include cleanup guidelines from two sources. The first source is the State of Hawaii Department of Health (DOH) Technical Guidance Manual for Underground Storage Tank Closure and Release Response, Table 5.1, Interim Recommended Cleanup Criteria for Soil and Groundwater (DOH, August, 1992). The second source is a summary of Appropriate, Relevant, and Applicable Regulations (ARARs) and TBCs Relating to the Development of (Hawaii) Statewide Cleanup Criteria (North Shore Consulting and Design, February, 1992).

Table 3.21 presents a summary of the compiled State of Hawaii cleanup guidelines for analytes relevant to this RFI.

Background concentrations of organics and metals as determined from two background samples collected during this RFI were also utilized to evaluate data for this RFI.

3.2.1.1 VOC and SVOC Results

The State of Hawaii cleanup guidelines summarized on Table 3.21 were utilized to evaluate VOC and SVOC analytical results for each SWMU.

The background levels of VOCs and SVOCs (Table 3.20A) were also utilized to evaluate the analytical data. The background levels of organics were mostly below the method detection limits for background sample BKG-1-0.5, however several VOC and SVOC detections occurred in the second background sample BKG-2-1. For this RFI it has been assumed that the detections of organics in the second background sample are anomalous and that the background levels of organics can be considered to be very close to detection limits by standard laboratory methods.

SWMU 9

SWMU 9 VOC and SVOC results are summarized in Table 3.2A. A total of one VOC and 6 SVOCs were detected in the 3.5 foot deep samples collected at this inactive unit. Contaminant concentrations above Table 3.21 State cleanup guidelines for specific SWMU 9 samples are shown in Figure 3.1. Due to an analytical laboratory error, the 1.5 foot depth samples collected at SWMU 9 were not analyzed for VOCs or SVOCs, as requested on the corresponding chain-of-custody form.

SWMU 10

SWMU 10 VOC and SVOC results are summarized in Table 3.3A. A total of 2 VOCs and one SVOC were detected in the 3.5 foot deep samples. All SWMU 10 VOC and SVOC detections are below Table 3.21 State cleanup guidelines. Due to the absence of significant detections of organic compounds in the 3.5 foot depth samples, VOC and SVOC analyses were not required for SWMU 10 samples collected from the 1.5 foot depth.

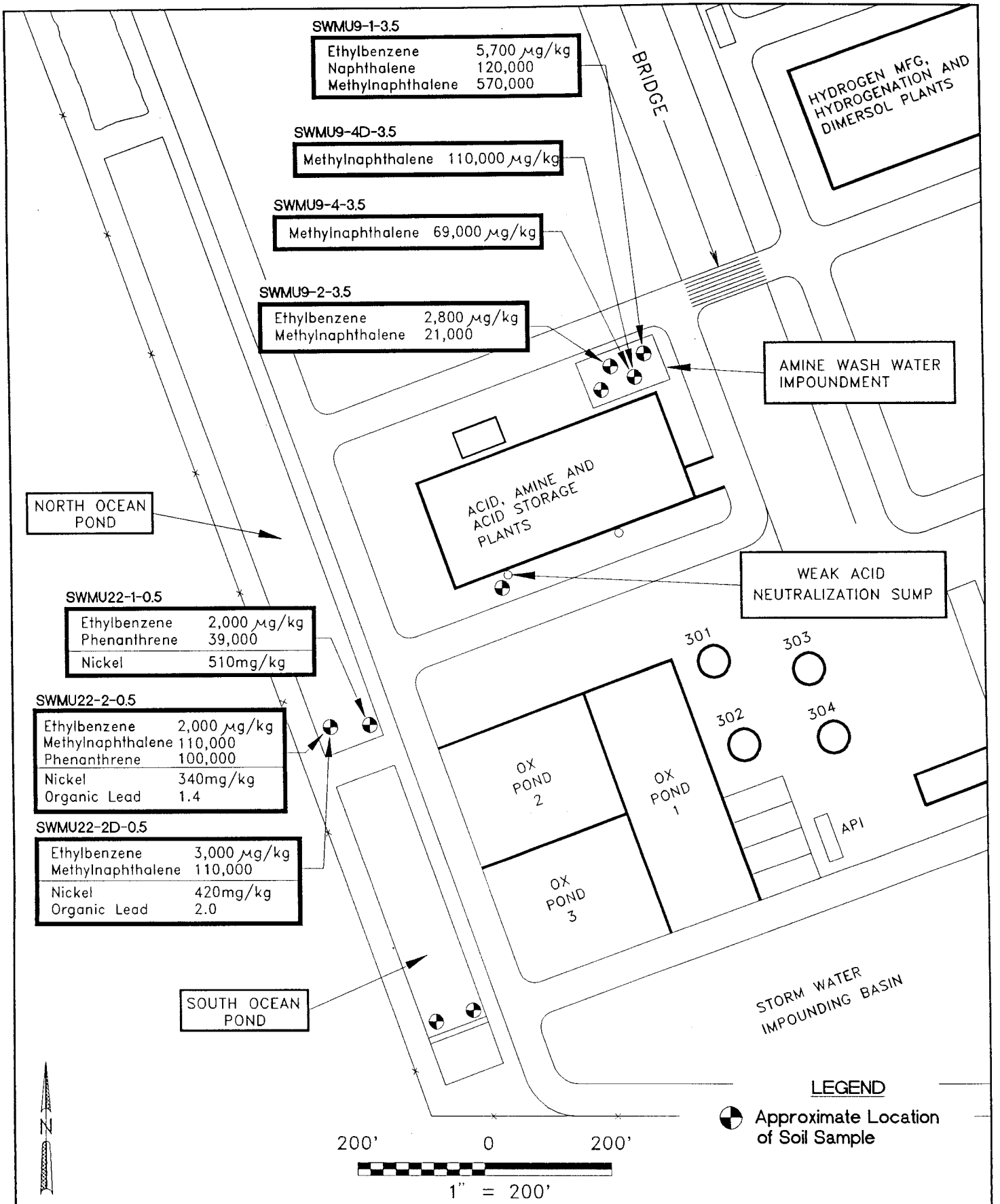
Table 3.21
State of Hawaii
Soil Cleanup Guidelines

VOCs	Cleanup Guideline
Benzene	1.7 ppm [1]
Ethylbenzene	1.4 ppm [1]
Toluene	21.0 ppm [1]
Total Xylenes	100.0 ppm [2]
SVOCs	
Benzo(a)pyrene	1.0 ppm [1]
Acenaphthene	100.0 ppm [1]
Fluoranthene	500.0 ppm [1]
Naphthalene	100.0 ppm [1]
Me–Naphthalenes	20 ppm [2]
Phenanthrene	20 ppm [2]
Pyrene	20 ppm [2]
Metals	
Arsenic	100 ppm [2]
Barium	4000 ppm [2]
Cadmium	2.0 ppm [1]
Chromium	1.0 ppm [2]
Cobalt	200 ppm [2]
Lead	400 ppm [1]
Mercury	24 ppm [2]
Nickel	100 ppm [2]
Vanadium	500 ppm [2]
Organic Lead	ND [2]

NOTES:

[1] – DOH Interim Recommended Soil Cleanup Guidelines (DOH, 1992)
[2] – Summary of Hawaii ARARs and TBCs (North Shore Consulting and Design, 1992)
ND – Not Detected

FIGURE 3.1



Concentrations of Contaminants at or Above State of Hawaii Soil Cleanup Guidelines SWMU9 and SWMU22

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SWMU 15

As stated in the approved RFI Work Plan (Engineering-Science, 1992a). SWMU 15 samples were not analyzed for VOCs or SVOCs.

SWMU 16

As stated in the approved RFI Work Plan (Engineering-Science, 1992a). SWMU 16 samples were not analyzed for VOCs or SVOCs.

SWMU 17

SWMU 17 SVOCs results are summarized in Table 3.6A. No SVOCs were detected at concentrations above the method reporting limits.

SWMU 18

SWMU 18 VOC and SVOC results for the small (S), medium (M) and large (L) ponds are summarized in Tables 3.7A, 3.8A and 3.9A, respectively. A total of 4 VOCs and 19 SVOCs were detected in samples collected from SWMU 18S. A total of 6 VOCs and 18 SVOCs were detected in samples collected from SWMU 18M. A total of 4 VOCs and 18 SVOCs were detected in samples collected from SWMU 18L.

Contaminant concentrations above the Table 3.21 State cleanup guidelines for specific SWMU 18S, 18M and 18L samples are shown on Figure 3.2.

SWMU 19

SWMU 19 VOC and SVOC results are summarized in Table 3.10A. A total of 3 VOCs and 4 SVOCs were detected in samples collected at this inactive unit.

All SWMU 19 VOC and SVOC detections are below State cleanup guidelines listed in Table 3.21.

SWMU 20

SWMU 20 SVOC results are summarized in Table 3.11A. A total of 3 SVOCs were detected in sample 20-2D-0.5 All SWMU 20 SVOC detections are below the Table 3.21 State cleanup guidelines.

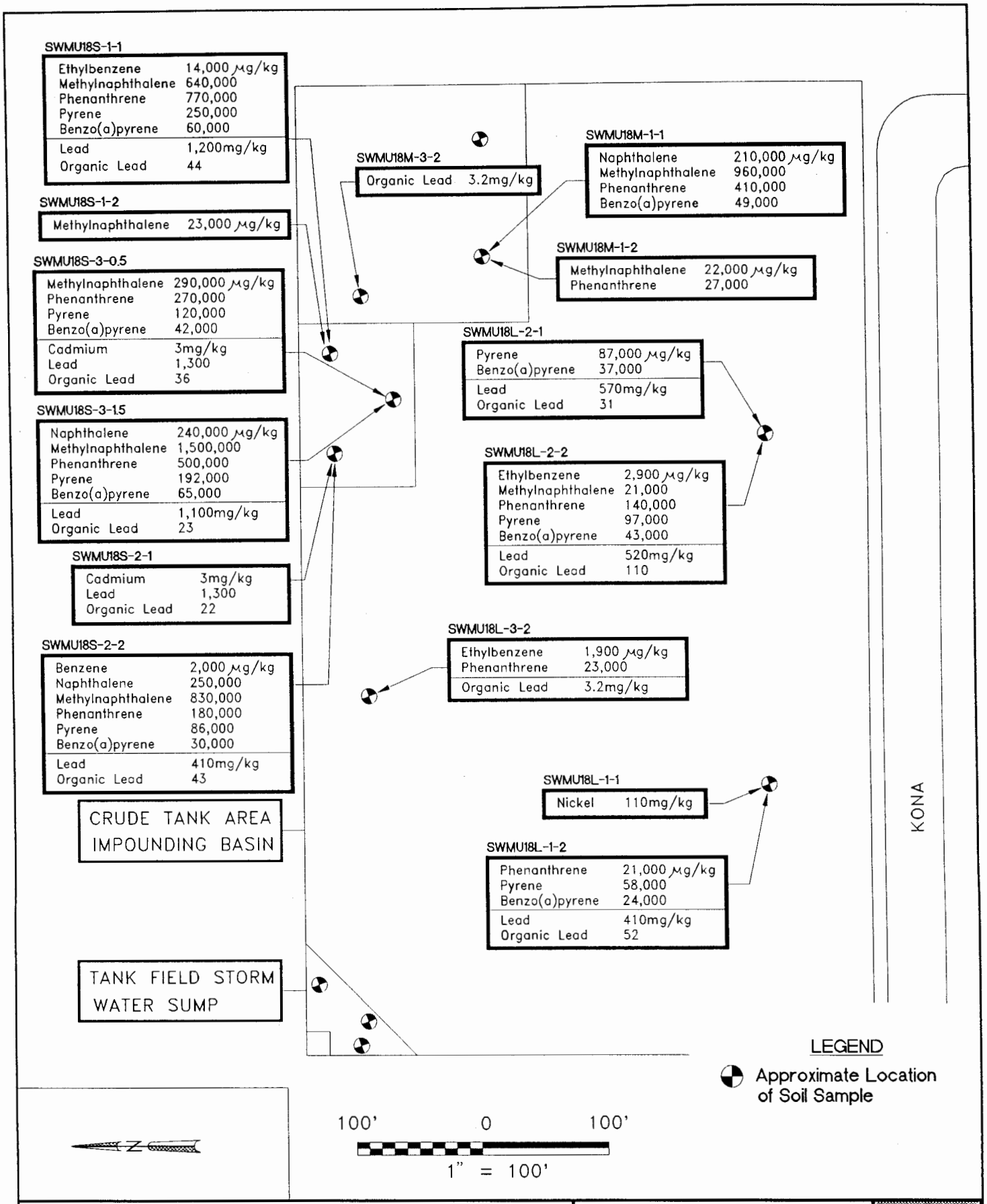
SWMU 21

SWMU 21 VOC and SVOC results are summarized in Table 3.12A. A total of one VOC and 5 SVOCs were detected in samples collected from SWMU 21. All SWMU 21 VOC and SVOC detections are below the Table 3.21 State cleanup guidelines.

SWMU 22

SWMU 22 VOC and SVOC results are summarized in Table 3.13A. A total of 2 VOCs and 9 SVOCs were detected in samples collected form SWMU 22. Contaminant concentrations above the Table 3.21 State cleanup guidelines for specific SWMU 22 samples are shown in Figure 3.1.

FIGURE 3.2



Concentrations of Contaminants at or Above State of Hawaii Soil Cleanup Guidelines SWMU18 and SWMU19

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SWMU 25

SWMU 25 SVOC results are summarized in Table 3.14A. No SVOCs were detected at concentrations above the method reporting limits.

SWMU 27

SWMU 27 SVOC results are summarized in Table 3.15A. A total of 7 SVOCs were detected in SWMU 27 samples. All SWMU 27 SVOC detections are below the Table 3.21 State cleanup guidelines.

SWMU 28

SWMU 28 SVOC results are summarized in Table 3.16A. No SVOCs were detected at concentrations above the method reporting limits.

SWMU 32

SWMU 32 samples were not analyzed for VOCs or SVOCs.

SWMU 35

SWMU 35 SVOC results are summarized in Table 3.18A. No SVOCs were detected at concentrations above the method reporting limits.

MEK PAINT PITS

MEK Paint Pit samples were analyzed for methyl ethyl ketone and the analytical results are summarized in Table 3.19. Methyl ethyl ketone was not detected at concentrations above the method reporting limits of 10 ug/kg.

FIELD QC SAMPLES

Field QC sample VOC and SVOC analytical results are summarized on Table 3.20A. No VOCs and only one SVOC were detected in background sample BKG-1-0.5. Five VOCs and 3 SVOCs were detected in background sample BKG-2-1.

There were no detections of VOCs or SVOCs in equipment rinsate blanks or trip blanks.

Due to laboratory error sample EQRB-2 was not analyzed for SVOCs.

3.2.1.2 Metals and Other Analyte Results

The State of Hawaii cleanup guidelines summarized on Table 3.21 were utilized to evaluate metals analytical results for each SWMU. The background levels of metals (Table 3.20B) were also utilized to evaluate the analytical data. To provide a perspective on the concentrations of metals detected in Chevron RFI SWMUs, they are compared to the background levels of metals detected in background samples BKG-1-0.5 and BKG-2-1.

For purposes of discussion of the metals results, ES has defined an elevated metal concentration as a concentration which is greater than the maximum detected background concentration by 100 per cent or more. The number has been established by ES to be used only as a reference point for data discussion. For example, the

highest background concentration of lead was detected in sample BKG-1-0.5, at a reported concentration of 15 milligrams per kilogram (mg/kg). Based on this maximum detected concentration, lead concentrations above 30 mg/kg are considered by ES to be elevated. For metals where the maximum reported background concentration is less than 5.0 mg/kg, or is reported as not detected (ND) at the laboratory reporting limits, then a concentration of 10 mg/kg or greater is herein classified as an elevated concentration, and is discussed below.

SWMU 9

SWMU 9 metals, cyanide, organic lead, isobutyl alcohol and pH analytical results are summarized in Table 3.2B.

None of the reported metals concentrations detected in SWMU 9 samples were greater than twice the maximum detected background concentrations.

Although several SWMU 9 samples have concentrations of chromium that exceeded the 1.0 ppm chromium State cleanup guideline listed on Table 3.21, none of the reported concentrations were greater than twice the demonstrated background concentration of chromium (72 mg/kg).

Cyanide was detected in 3 out of 9 SWMU 9 samples. All detections were reported at concentrations below the maximum demonstrated background concentration (1.6 mg/kg).

There were no reported detections of organic lead or isobutyl alcohol in SWMU 9 samples. The reported average pH of all SWMU 9 samples is 8.46.

SWMU 10

SWMU 10 metals, cyanide, organic lead and isobutyl alcohol are summarized in Table 3.3B. With the exception of antimony, none of the reported metals concentrations detected in SWMU 10 samples were greater than twice the maximum demonstrated background concentrations. In sample 10-3-1.5 the detected concentration of antimony (33 mg/kg) was greater than twice the maximum demonstrated background concentration of antimony (6 mg/kg).

Although several SWMU 10 samples have reported concentrations of chromium that exceeded the 1.0 ppm chromium State cleanup guideline listed on Table 3.21, it should be noted that the reported concentrations were not greater than twice the demonstrated background concentration of chromium (72 mg/kg).

Cyanide was detected in 6 out of 9 SWMU 10 samples. All detections were reported at concentrations below the maximum demonstrated background concentration (1.6 mg/kg).

There were no detections of organic lead or isobutyl alcohol in SWMU 10 samples.

SWMU 15

SWMU 15 metals, cyanide, and pH analytical results are summarized in Table 3.4. None of the metals concentrations detected in SWMU 15 samples were greater than twice the maximum demonstrated background concentrations.

Although several SWMU 15 samples had reported concentrations of chromium that exceeded the 1.0 ppm chromium State cleanup guideline listed on Table 3.21, it should be noted that the reported concentrations were not greater than twice the maximum demonstrated background concentration of chromium (72 mg/kg).

Cyanide was not detected in the SWMU 15 samples.

The average pH of all SWMU 15 samples is 8.32.

SWMU 16

SWMU 16 metals, cyanide, organic lead and pH analytical results are summarized in Table 3.5. With the exception of lead, none of the metals concentrations detected in SWMU 16 samples were greater than twice the maximum detected background concentrations. In duplicate sample 16-4D-0.5 the reported concentration of lead (230 mg/kg) was greater than twice the maximum demonstrated background concentration of lead (30 mg/kg). The State cleanup guideline for lead (400 ppm), as presented on Table 3.21 was not exceeded. An explanation of this duplicate detection is presented in Section 3.2.3.

Although several SWMU 16 samples had reported concentrations of chromium which were greater than the 1.0 ppm chromium State cleanup guideline listed on Table 3.21, it should be noted that the reported concentrations were not greater than twice the maximum background concentration of chromium (72 mg/kg).

Cyanide and organic lead were not detected in the SWMU 16 samples.

The average pH of all SWMU 16 samples is 8.22.

SWMU 17

SWMU 17 metals, cyanide, and organic lead analytical results are summarized in Table 3.6B. With the exception of lead, none of the reported metals concentrations detected in SWMU 17 samples was greater than twice the maximum detected background concentrations. The reported concentrations of lead in sample 17-1-0.5 (48 mg/kg) and sample 17-3-0.5 (72 mg/kg) was greater than twice the background concentration of lead (30 mg/kg). The State cleanup guideline for lead (400 ppm) listed on Table 3.21 was not exceeded.

Although several SWMU 17 samples had reported concentrations of chromium that exceeded the 1.0 ppm chromium State cleanup guideline listed on Table 3.21, it should be noted that the reported concentrations were not greater than twice the maximum demonstrated background concentration of chromium (72 mg/kg).

Cyanide was reported as detected in one out of four SWMU 17 samples, at a concentration below the maximum detected background concentration (1.6 mg/kg).

Organic lead was not detected in SWMU 17 samples.

SWMU 18 (S, M, and L)

SWMU 18S

SWMU 18S metals, cyanide, organic lead and isobutyl alcohol analytical results are summarized in Table 3.7B. Concentrations of chromium, lead and cadmium were reported in SWMU 18S samples. Chromium was greater than twice the maximum demonstrated background concentration (72 mg/kg) in 6 out of 7 SWMU 18S samples. Lead exceeded the Table 3.21 State cleanup guideline (400 ppm) in 5 out of 7 samples. Cadmium exceeded the Table 3.21 State cleanup guideline (2 ppm) in 2 samples.

SWMU 18S concentrations of lead and cadmium that are greater than State cleanup guidelines are shown graphically on Figure 3.2.

Cyanide was detected in one out of 2 SWMU 18S samples, at concentrations below the maximum demonstrated background concentration (1.6 mg/kg).

Organic lead was reported as detected in 6 out of 7 SWMU 18S samples. The Table 3.21 State cleanup guideline for organic lead is ND. The concentrations of organic lead for SWMU 18S samples are also shown graphically on Figure 3.2.

There were no reported detections of isobutyl alcohol in SWMU 18S samples.

SWMU 18M

SWMU 18M metals, cyanide, organic lead and isobutyl alcohol analytical results are summarized in Table 3.8B.

Concentrations of lead and chromium were reported as detected in SWMU 18M samples. Chromium concentrations reportedly were greater than twice the maximum demonstrated background concentration (72 mg/kg) in 3 out of 6 SWMU 18M samples. Reported lead concentrations also were greater than twice the maximum demonstrated background concentration (30 mg/kg) in 6 out of 6 samples.

Cyanide was reported as detected in 3 out of 6 SWMU 18M samples, at concentrations below the maximum demonstrated background concentration (1.6 mg/kg).

Organic lead was detected in one out of 6 SWMU 18M samples. The Table 3.21 State cleanup guideline for organic lead is ND. The concentration of organic lead is shown graphically in Figure 3.2.

There were no reported detections of isobutyl alcohol in SWMU 18M samples.

SWMU 18L

SWMU 18L metals, cyanide, organic lead and isobutyl alcohol analytical results are summarized in Table 3.9B.

Concentrations of chromium, lead and nickel were reported as detected in SWMU 18L samples. Reported chromium concentrations were greater than twice the maximum demonstrated background concentration (72 mg/kg) in 3 out of 6 SWMU

18L samples. Reported lead concentrations exceeded the Table 3.21 State cleanup guideline (400 ppm) in 3 out of 6 samples. The reported nickel concentration in one sample exceeded the Table 3.21 cleanup guideline (100 ppm).

Reported SWMU 18L concentrations of lead and nickel that are greater than cleanup guidelines are shown graphically in Figure 3.2.

Cyanide was reported as detected in 2 out of 6 SWMU 18L samples at concentrations below the maximum demonstrated background concentration (1.6 mg/kg).

Organic lead was reported as detected in 4 out of 6 SWMU 18L samples. The Table 3.21 State cleanup guideline for organic lead is ND. The reported concentrations of organic lead for SWMU 18L samples are shown graphically in Figure 3.2.

There were no reported detections of isobutyl alcohol in SWMU 18L samples.

SWMU 19

SWMU 19 metals, cyanide, organic lead and isobutyl alcohol analytical results are summarized in Table 3.10B.

With the exception of lead and nickel, none of the metals concentrations reported as detected in SWMU 19 samples were greater than twice the maximum demonstrated background concentrations. The reported concentrations of lead in sample 19-2-1 (33 mg/kg) and sample 19-3-1 (88 mg/kg) were greater than twice the demonstrated background concentration of lead (30 mg/kg). The reported concentration of nickel in sample 19-1-1 (98 mg/kg) was greater than twice the demonstrated background concentration of nickel (92 mg/kg). The State cleanup guideline for lead (400 ppm) and nickel (100 ppm) listed on Table 3.21 were not exceeded.

Although several SWMU 19 samples have reported concentrations of chromium that are greater than the 1.0 ppm chromium State cleanup guidelines listed on Table 3.21, it should be noted that the reported concentrations were not greater than twice the maximum demonstrated background concentration of chromium (72 mg/kg).

Cyanide was detected in 3 out of 3 SWMU 19 samples at concentrations below the maximum demonstrated background concentration (1.6 mg/kg).

Organic lead and isobutyl alcohol were not detected in SWMU 19 samples.

SWMU 20

SWMU 20 metals, cyanide, and organic lead analytical results are summarized in Table 3.11B.

None of the metals concentrations reported as detected in SWMU 20 samples were greater than twice the maximum demonstrated background concentrations.

Although all four SWMU 20 samples had reported concentrations of chromium that were greater than the 1.0 ppm chromium State cleanup guidelines listed on Table 3.21, it should be noted that the reported concentrations were not greater than twice the maximum demonstrated background concentration of chromium (72 mg/kg).

Cyanide was detected in 3 out of 4 SWMU 20 samples at concentrations below the maximum demonstrated background concentration, (1.6 mg/kg).

Organic lead was not detected in SWMU 20 samples.

SWMU 21

SWMU 21 metals, cyanide, organic lead and isobutyl alcohol analytical results are summarized in Table 3.12B.

With the exception of lead, none of the metals concentrations reported as detected in SWMU 21 samples were greater than twice the maximum demonstrated background concentrations. The reported concentrations of lead in sample 21-1-0.5 (60 mg/kg) and sample 21-2-0.5 (50 mg/kg) were greater than twice the demonstrated background concentration of lead (30 mg/kg). The State cleanup guideline for lead (400 ppm) listed on Table 3.21 was not exceeded.

Although both SWMU 21 samples had reported concentrations of chromium that were greater than the 1.0 ppm chromium State cleanup guidelines listed on Table 3.21, it should be noted that the reported concentrations were not greater than twice the maximum demonstrated background concentration of chromium (72 mg/kg).

Cyanide was detected in 2 out of 2 SWMU 21 samples at concentrations below the maximum demonstrated background concentration (1.6 mg/kg).

Organic lead and isobutyl alcohol were not detected in SWMU 21 samples.

SWMU 22

SWMU 22 metals, cyanide, organic lead and isobutyl alcohol analytical results are summarized in Table 3.13B.

With the exception of cobalt, lead and nickel, none of the metals concentrations reported as detected in SWMU 20 samples were greater than twice the maximum demonstrated background concentrations. The reported concentration of cobalt in sample 22-2D-0.5 (44 mg/kg) exceeded twice the background concentration of cobalt (40 mg/kg). The reported concentrations of lead in sample 22-1-0.5 (40 mg/kg), sample 22-2-0.5 (210 mg/kg) and sample 2-2D-0.5 (100 mg/kg) were greater than twice the demonstrated background concentration of lead (30 mg/kg). The State cleanup guidelines for cobalt (200 ppm) and lead (400 ppm) listed on Table 3.21 were not exceeded. The reported concentrations of nickel in sample 22-1-0.5 (510 mg/kg), sample 22-2-0.5 (340 mg/kg) and sample 22-2D-0.5 (420 mg/kg) were greater than twice the demonstrated background concentration of nickel (92 mg/kg). The reported nickel concentrations in the SWMU 22 samples exceeded the Table 3.21 State cleanup guidelines (100 ppm).

Reported SWMU 22 concentrations of nickel that exceed the State cleanup guidelines are shown graphically in Figure 3.1.

Although all three SWMU 22 samples had reported concentrations of chromium that were greater than the 1.0 ppm chromium State cleanup guideline listed on Table

3.21, it should be noted that the reported concentrations were not greater than twice the maximum demonstrated background concentration of chromium (72 mg/kg).

Cyanide was not detected SWMU 22 samples.

Organic lead was reported as detected in 2 out of 3 SWMU 22 samples. The Table 3.21 State cleanup guideline for organic lead is ND. The reported concentrations of organic lead for SWMU 22 samples are shown graphically in Figure 3.1.

SWMU 25

SWMU 25 metals, cyanide and organic lead analytical results are summarized in Table 3.14B.

Concentrations of antimony, cadmium, chromium, lead, nickel, and vanadium were reported as detected in SWMU 25 samples.

The reported concentrations of antimony (one sample), chromium (one sample), lead (three samples), and vanadium (one sample) were greater than twice the maximum demonstrated background concentrations of these analytes however the Table 3.21 State cleanup guidelines, where applicable, were not exceeded.

The reported concentration of cadmium in sample 25-1-0.5 (2.1 mg/kg) exceeded the Table 3.21 State cleanup guidelines for cadmium (2.0 ppm). The reported concentrations of nickel in sample 25-1-0.5 (114 mg/kg) and sample 25-2-0.5 (170 mg/kg) exceeded the Table 3.21 State cleanup guidelines for nickel (100 ppm).

Reported SWMU 25 concentrations of cadmium and nickel that exceed the State cleanup guidelines are shown graphically in Figure 3.3.

Cyanide was detected in 2 out of 3 SWMU 25 samples at concentrations above twice the maximum background concentration of 3.2 mg/kg.

Organic lead was not detected in SWMU 25 samples.

SWMU 27

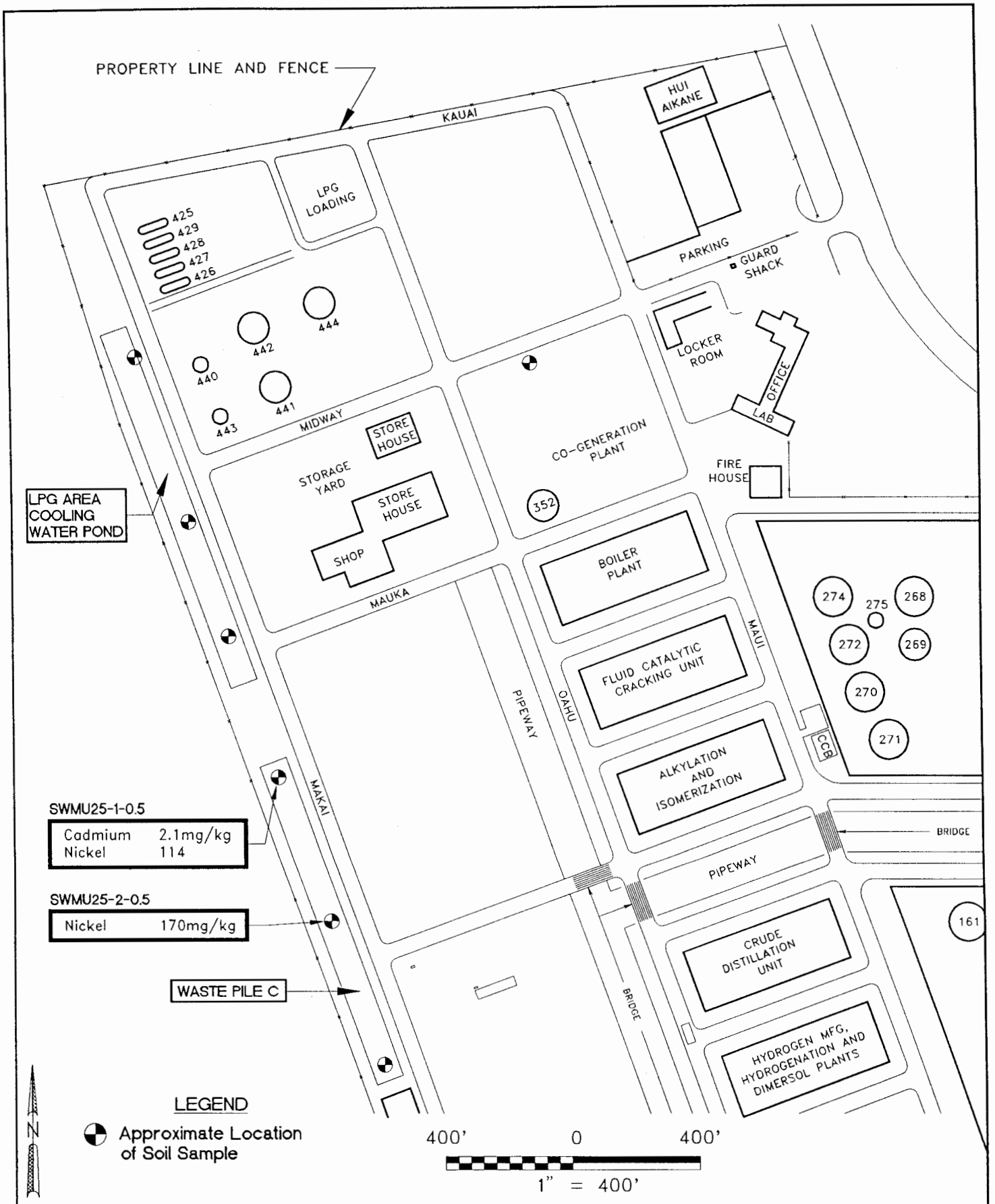
SWMU 27 metals, cyanide and organic lead analytical results are summarized in Table 3.15B.

Concentrations of cadmium, lead, mercury, vanadium and cyanide were reported as detected in SWMU 27 samples.

The reported concentrations of lead (six samples), and vanadium (four samples) were greater than twice the maximum demonstrated background concentrations of these analytes however the Table 3.21 State cleanup guidelines, were not exceeded.

The reported concentrations of cadmium in sample 27-2-0.5 (2.7 mg/kg), sample 27-3-0.3 (2.8 mg/kg) and sample 27-3-0.5 (8.0 mg/kg) exceeded the Table 3.21 State cleanup guidelines for cadmium (2.0 ppm). The reported concentration of mercury in sample 27-4-0.5 (60 mg/kg) exceeded the Table 3.21 State cleanup guideline for mercury (24.0 ppm).

FIGURE 3.3



Concentrations of Contaminants at or Above State of Hawaii Soil Cleanup Guidelines SWMU25

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C:\CHEV\FIG22

Reported SWMU 27 concentrations of cadmium and mercury that exceed the State cleanup guideline are shown graphically in Figure 3.4.

Although all SWMU 27 samples had reported concentrations of chromium that exceeded the 1.0 ppm chromium State cleanup guideline listed on Table 3.21, it should be noted that the reported concentrations were not greater than twice the maximum demonstrated background concentration of chromium (72 mg/kg).

Cyanide was detected in 5 out of 6 SWMU 27 samples at concentrations below twice the maximum background concentration of 3.2 mg/kg.

Organic lead was not detected in SWMU 27 samples.

SWMU 28

SWMU 28 metals, cyanide, and organic lead analytical results are summarized in Table 3.16B.

With the exception of lead, none of the metals concentrations reported as detected in SWMU 28 samples were greater than twice the maximum demonstrated background concentrations. The reported concentrations of lead in sample 28-1-0.5 (59 mg/kg) sample 28-2-0.5 (62 mg/kg) and sample 28-4-0.5 (40 mg/kg) were greater than twice the demonstrated background concentration of lead (30 mg/kg). The State cleanup guideline for lead (400 ppm) listed on Table 3.21 was not exceeded.

Although all SWMU 28 samples had reported concentrations of chromium that exceeded the 1.0 ppm chromium State cleanup guideline listed on Table 3.21, it should be noted that the reported concentrations were not greater than twice the maximum demonstrated background concentration of chromium (72 mg/kg).

Cyanide was detected in one out of 4 SWMU 28 samples at a concentration below the maximum background concentration (1.6 mg/kg).

Organic lead was not detected in SWMU 28 samples.

SWMU 32

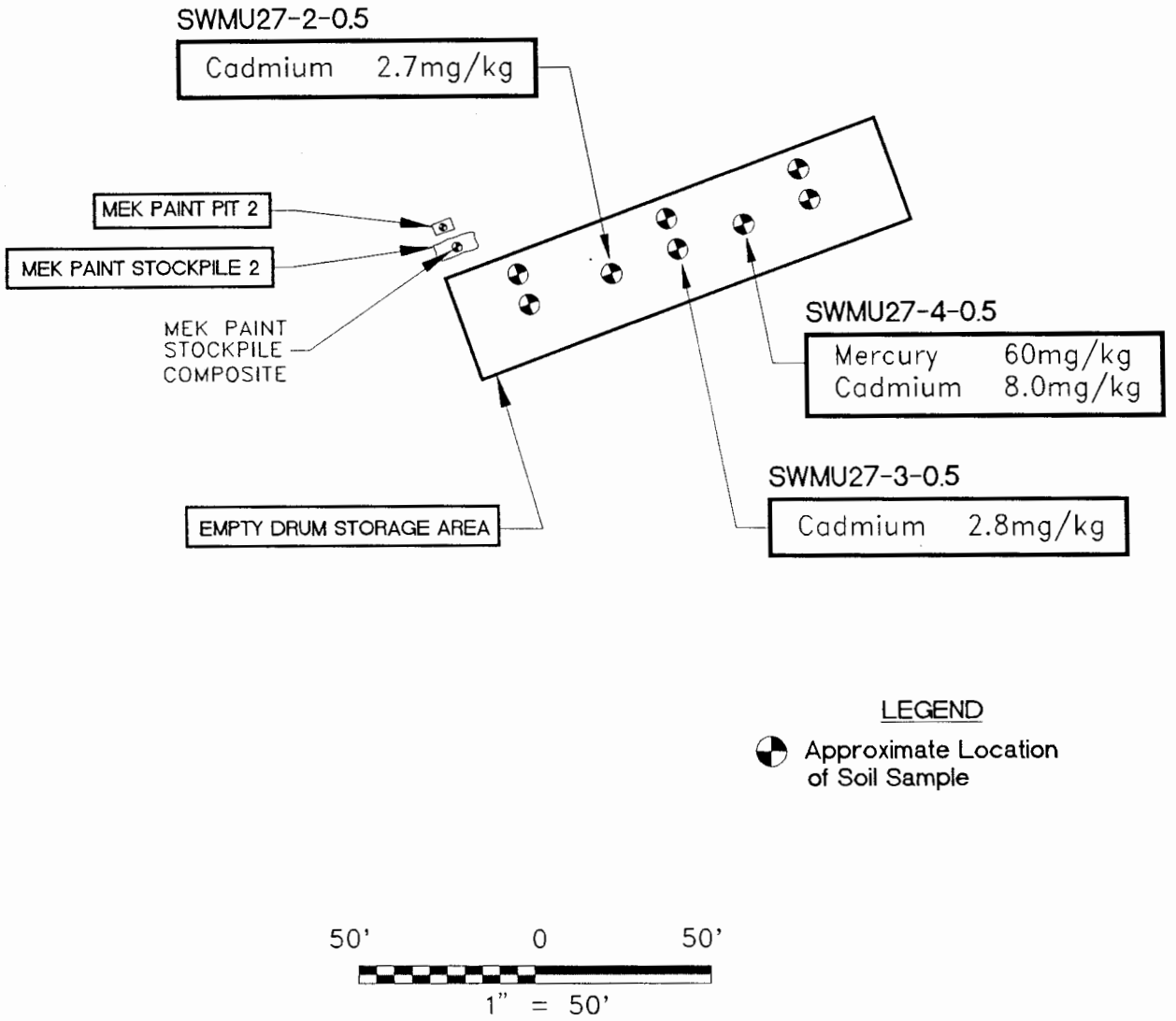
SWMU 32 metals, sulfate and pH analytical results for one soil sample (32-1-3) and one groundwater sample (32-2) are summarized in Table 3.17. The units for the soil sample metals are in mg/kg (ppm) while the units for the groundwater sample metals are reported in ug/L (ppb).

None of the reported metals concentrations detected in SWMU 32 soil sample were greater than twice the maximum detected background concentrations.

Although the SWMU 32 soil sample had a concentration of chromium that exceeded the 1.0 ppm chromium cleanup guideline listed on Table 3.21, the reported concentration was not greater than twice the demonstrated background concentration of chromium (72 mg/kg).

The reported concentration of chromium detected in the groundwater sample from SWMU 32 is 920 ug/L, which is approximately equal to 0.92 ppm. The State cleanup guideline for chromium in water listed in Appendix B is 0.1 ppm ($\pm$1000 μg/L).

FIGURE 3.4



Concentrations of Contaminants at or Above State of Hawaii Soil Cleanup Guidelines SWMU27

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

C:\CHEX\1634

Moderate levels of sulfates 1,100 mg/kg for soil and 1,800 mg/L for groundwater were detected in the SWMU 32 samples.

The pH of the soil sample is 7.5 and the pH of the groundwater is 7.3.

SWMU 35

SWMU 35 metals, cyanide and organic lead analytical results are summarized in Table 3.18B.

Concentrations of lead, nickel and vanadium were reported as detected in SWMU 35 samples.

The reported concentrations of lead (93 mg/kg), nickel (130 mg/kg) and vanadium (120 mg/kg) in sample 35-1-0.5 were greater than twice the maximum demonstrated background concentrations of these analytes. Nickel exceeded its Table 3.21 State cleanup guideline of 100 ppm.

The reported SWMU 35 concentration of nickel that exceeded the State cleanup guideline is shown graphically in Figure 3.5.

Although both SWMU 35 samples had reported concentrations of chromium that exceeded the 1.0 ppm chromium State cleanup guideline listed on Table 3.21, it should be noted that the reported concentrations were not greater than twice the maximum demonstrated background concentration of chromium (72 mg/kg).

Cyanide was detected in one out of 2 SWMU 35 samples at a concentration below the maximum background concentration (1.6 mg/kg).

Organic lead was not detected in SWMU 35 samples.

MEK PAINT PITS

As required by the RFI Work Plan (Engineering-Science, 1992a), the MEK Paint Pits soil samples were only analyzed for methyl ethyl ketone (see Section 3.2.1.1).

FIELD QC SAMPLES

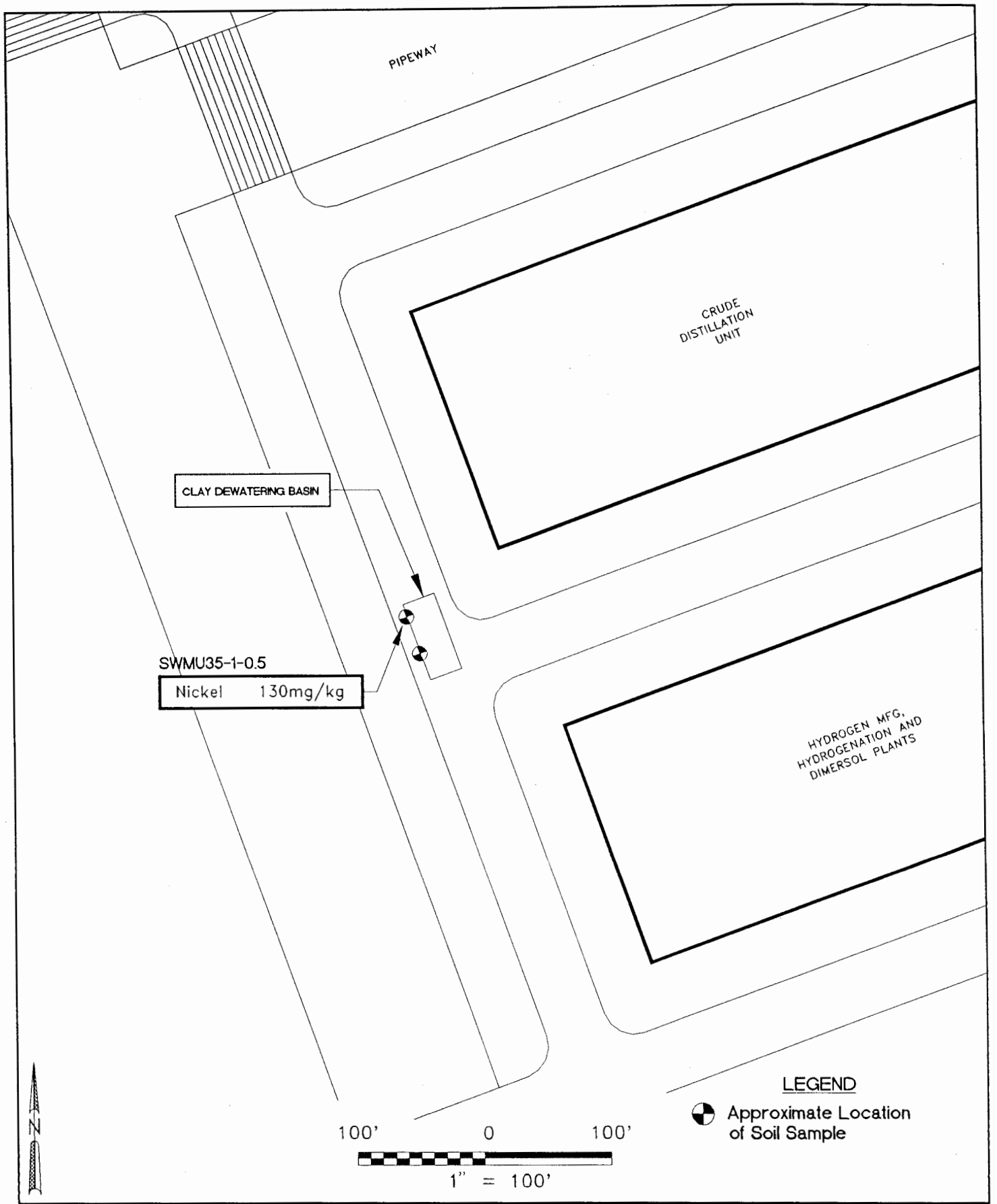
Field Quality Control metals, cyanide, organic lead and isobutyl alcohol analytical results are summarized in Table 3.20B.

Background soil sample BKG-1-0.5 had higher concentrations of metals than background sample BKG-2-1. Organic lead and isobutyl alcohol were not detected in the background samples.

Equipment rinsate blank EQRB-1 was not analyzed for metals, cyanide or isobutyl alcohol. These analytical methods were inadvertently omitted on the chain-of-custody form submitted to the analytical laboratory. Organic lead was not detected in EQRB-1.

Equipment rinsate blank EQRB-2 had no detections of metals, VOCs, cyanide, organic lead or isobutyl alcohol. Due to an omission by the analytical laboratory, EQRB-2 was not analyzed for SVOCs, as requested on the chain-of-custody form.

FIGURE 3.5



Concentrations of Contaminants at or Above State of Hawaii Soil Cleanup Guidelines SWMU35

ENGINEERING-SCIENCE, INC.
1357 Kapiolani Blvd.
Honolulu, Hawai'i 96814

C:\CHEX\FIG35

3.2.2 Potential Sources/Pathways/Receptors

Sources

The primary source of contaminants detected in the various Hawaii Refinery SWMUs would be past waste handling practices. Refinery waste handling practices have been revised to minimize SWMU contamination.

The following SWMUs are no longer in use: SWMU 9 - the Amine Wash Water Impoundment, SWMU 10 - the Tetraethyl Lead Weathering Area, SWMU15 - the Neutralization Pond, SWMU16 - the Settling Basin, SWMU 17 - the North Surge Pond SWMU 20 - the LPG Area Cooling Water Pond, SWMU 25 - Waste Pile C, SWMU27 - the Empty Drum Storage Area, SWMU 28 - the API Separator, and the MEK Paint Pits Area. Of these inactive units VOC and SVOC contaminants above State guidelines were detected only at SWMU 9 and (excluding chromium) metals at concentrations above State guidelines were detected only at SWMU 25.

In the case of SWMU 25 it is probable that the sources of the detected metals are spent jet filter clays and fluid catalytic cracker catalyst fines that were formally received by this unit.

In the case of SWMU 9, the former impoundment received rinse water from periodic maintenance cleaning of the amine regeneration tower. The rinse water contained trace amounts of sulfur compounds and amine solutions. The possibility exists that the rinse water could have been hydrocarbon contaminated, however, the subsurface recovery of oil is in progress in this area. More likely, petroleum hydrocarbons from the recovery project could be contributing to the high VOCs and SVOCs detected in this area.

For active units VOC and SVOC contaminants above State guidelines were detected at SWMU 18 and SWMU 22, and (excluding chromium) metals concentrations above State guidelines were detected at SWMUs 18, 22, 25, 27 and 35.

In the case of these active SWMUs it is probable that the sources of detected contaminants are from past waste handling practices.

Pathways

Contaminant routes of exposure from releases to potential receptors involve air, soil/sediment, and water pathways.

Air Pathway

The primary route of exposure to potential receptors from the air pathway is via inhalation of airborne dust. A secondary route of exposure is via inhalation of volatilized vapors in close proximity to highly contaminated soils. In high wind conditions airborne fugitive dust can be borne to workers at the refinery. The majority of such material would be blown into the adjacent ocean with the prevailing northeasterly trade winds, with a small percentage potentially impacting the Brewer Chemical facility to the south of the refinery property. In southerly ("Kona") wind conditions such fugitive dust can be borne inland from the refinery and widely

dispersed over large areas. Inhalation of volatilized vapors from highly contaminated soils would only occur if refinery workers or visitors were in close proximity to such materials, such as working with manual excavation activities. Indigenous and transient fauna might also be exposed in proximity to such excavations.

Soil/Sediment Pathway

The primary routes of exposure to human receptors from the soil/sediment pathway are dermal adsorption and ingestion. Such exposures could occur if a receptor has direct contact with contaminated materials. Exposure could also occur from incidental ingestion of soils or sediments. Indigenous and transient fauna are also potential receptors, as are incidental plant species rooting in such soils.

Water Pathway

The primary routes of exposure to human receptors from the soil/sediment pathway are dermal adsorption and ingestion. Water pathway exposures could occur if the receptor has direct dermal contact with contaminated water, ingests contaminated water, or if the receptor consumes such things as fish or shell fish taken from contaminated water. The only use of groundwater at the Chevron Refinery is for process cooling purposes. Brine water is pumped from the ground and used as non-contact cooling water. It is then discharged to the ocean under the refinery NPDES permit. The one groundwater sample retrieved in this investigation had levels of chromium above the State guideline. It should be noted that: a) the chromium concentration in one background soil sample was above the State guideline, and b) this guideline is a To-Be-Considered value only (Appendix B). It should be noted that groundwater at the refinery site is brackish in nature, non-potable, and is not utilized for human or animal consumption.

Receptors

Potential receptors at the refinery site include humans, aquatic and terrestrial fauna, and other food chain species. A protected species, the Hawaiian Stilt, seasonally inhabits the large crude tank area impounding basin, SWMU 18L. This pond is considered an endangered species habitat. Potential human receptors include refinery personnel, visiting workers and other incidental visitors. Individuals working in open excavations, wherein dermal exposure or ingestion of fugitive dust or inhalation of volatilized hydrocarbons could potentially be at a higher risk of exposure to contaminants. The refinery site is fenced and security is maintained against incidental human incursion.

Future potential human receptors include refinery workers, visiting workers, and incidental visitors, as no change in the land use for the site is planned at this time.

3.2.3 Discussion of Field QA/QC Effectiveness

Discussion of Field QA/QC Effectiveness

Field QA/QC for this investigation included collection of equipment rinsate blanks, duplicate samples, and with the exception of the cooler shipped with samples collected

from SWMUs 21 and 22, inclusion of trip blanks inside each sample cooler containing samples for volatile organic compounds analyses.

Two equipment rinsate blanks were collected during the field sampling activities. Both blanks were reported by the analytical laboratory to be free of any analytes of concern at the laboratory detection limits, indicating that field equipment decontamination procedures were effective in preventing cross-contamination of samples.

Six trip blanks were included with sample shipment coolers. All six trip blanks were reported by the analytical laboratory to be free of any analytes of concern at the laboratory detection limits, indicating that no cross contamination of samples analyzed for volatile organic compounds occurred during sample handling or shipment.

The trip blank for the sample cooler shipped on May 6, 1993 was inadvertently omitted. Five samples were contained in this cooler; two from SWMU 21 and three from SWMU 22. Ethylbenzene was detected in all three samples from SWMU 22, but not in either sample from SWMU 21. Total xylenes were reported as detected in two of the three samples from SWMU 22, including a normal sample and its duplicate. Total xylenes were reported as detected at 200 ug/kg, at a laboratory detection limit of 100 ug/kg in sample SWMU21-2-0.5 in this cooler. It is considered only remotely possible that cross contamination of the SWMU 21 sample occurred during shipment, as the reported result was very near the detection limit.

Seven duplicate samples were collected during the field sampling effort. These samples include soil samples SWMU9-4D-3.5, SWMU10-4D-3.5, SWMU15-4D-1, SWMU16-4D-0.5, SWMU22-2D-0.5, SWMU27-5D-0.5, and MEK Paint Pit-2D-2-0.5.

Sample 18S-3D-1.5 was labeled as a duplicate, but this was in fact a re-sample of the test pit taken approximately four inches away from sample 18S-3D-1.5. This sample was taken to investigate the micro-scale lateral variations in analyte concentrations in the pond sludge from this SWMU. Sample SWMU20D-2D-0.5 was also a re-sample, not a true duplicate, as it was taken at a different time than the original sample, SWMU20-2-0.5.

It should be noted that duplicate sample SWMU27-5D-0.5 was not tested for semi-volatile compounds.

Duplicate sample results which vary greatly from a one-to-one correspondence are summarized as follows:

Sample Number	Analyte	Concentration/ Detection Limit
SWMU16-4-0.5	Lead	4ppm/3ppm
SWMU16-4D-0.5	Lead	230ppm/3ppm
SWMU22-2-0.5	Benzenethiol	82,000ppb/8,000ppb
SWMU22-2D-0.5	Benzenethiol	ND/8,000ppb

These listed results are the only results for which there was not essential duplication in the sample duplicate pair. The lead in sample SWMU16-4D-0.5 probably reflects the non-homogenous distribution of granular lead in the soil. It should be noted that organic lead was not detected in either the sample or the duplicate.

The occurrence of benzenethiol in SWMU22-2-0.5 is one order of magnitude higher than the duplicate sample, insofar as the detection limit in both analyses was 8,000 ppb. This is the only anomalous organic compound result found in the duplicate sample analyses. In general, it appears from these results that field sampling and sample handling procedures were consistent and repeatable in this RFI.

3.2.4 Discussion of Laboratory QA/QC Effectiveness

Discussion of Laboratory QA/QC Effectiveness

Ten sets of laboratory data accompany this report. Discussions of laboratory QA/QC effectiveness are contained in case narratives provided by the analytical laboratory for each set of laboratory data. These narratives are presented in Appendix A at the beginning of each set of laboratory data. The case narratives for each set of laboratory data are also presented in Appendix C along with EPA Region IX laboratory QA/QC summary forms. The following discussion summarizing the laboratory QA/QC effectiveness is broken down for each laboratory test method where upset conditions or other exceptions occurred. All upset conditions are discussed below, and summarized in the EPA Region IX QA/QC summary forms in Appendix C.

Volatile Analyses

In the case of data set 112348 (Appendix A) very high spike surrogate recoveries occurred, as a result of co-elution of hydrocarbons in the extraction process. High levels of background toluene in one sample led to a high spike recovery of this compound. In data sets 109111 and 110834, poor surrogate recoveries resulted from the need for dilution of extracts due to the presence of high levels of interfering non-target analytes. These non-target analytes were composed of unknown hydrocarbons, possibly of biological origin, which appeared in sample extracts from various SWMU's. In the initial groups of samples sent to the laboratory during the first quarterly sampling period, the presence of these non-target compounds required sample

extract dilution to protect the laboratory Gas Chromatograph capillary columns, which in turn resulted in unacceptably high laboratory reporting (detection limits) in the samples analyzed during the first quarterly reporting period. Alternate sample extraction and cleanup methods were employed in subsequent analyses during the second, third and fourth reporting periods, as discussed in the second and third quarterly reports (see References, Appendix D.). In data set 109904 surrogate recoveries for two of three surrogates on sample BKG-1-0.5 were out of limits due to matrix interference.

Semi-Volatile Analyses

High levels of non-target organic compounds, as described above, were present in several samples in laboratory data set numbers 112348, 109099, 109904, and 112313. The laboratory case narratives state that the alternate sample extraction and sample cleanup methods employed to reduce the net detection limits in subsequent data sets resulted in poor recoveries or zero recoveries of acid fraction (phenol) surrogates in sets 112348 and 112313, and poor surrogate recoveries in most analyses in sets 109904 and 110154. One other upset condition was the poor reproducibility of surrogate recoveries of the semi-volatile 7,12 dimethylbenzo(a)anthracene, attributable to the instability of this compound.

Cyanide

Matrix interference caused low recoveries of spike surrogates in data sets 109099, 109111, 109430, 110154, and 110834. In these cases, duplicate sample relative percent differences were within precision criteria and laboratory control sample recovery data was within acceptable limits.

Isobutyl Alcohol

Poor recoveries of surrogates occurred in data sets 112348, 109904, and 112313. This is attributable to poor or inconsistent extraction of the compound due to the oily nature of the samples. The problem was persistent, for example, in all samples analyzed in data set 112348.

Graphite Furnace Analyses (Selenium and Arsenic)

One low matrix spike recovery (44%) occurred in data set 109430. All other QC for selenium and also for arsenic was within acceptance criteria.

Mercury

An out-of-limits relative percent difference occurred in batch B of data set 109770, but this result was considered by the laboratory to be acceptable insofar as the concentration of the compound was detected at 0.4 and 0.5 parts per million at a detection limit of 0.1 parts per million. A poor MS/MSD surrogate recovery occurred in data set 109904, but a non-project sample was used for these spikes, which may not be representative of project conditions.

Metals

The relative percent difference reported for Barium in data set 109430 was just over the limit at 21%. All other metals results in this data set were within acceptance criteria. In data sets 110834 and 109770 matrix interference led to low spike surrogate recoveries. An RPD failure occurred for Cadmium in batch B of data set 109770, but the results were very close to the reporting (detection) limit in both measurements. High background Chromium concentrations, as compared to the concentration of Chromium in the spike used, resulted in a spike recovery failure in this same data set. In data set 109971 the use of a non-project sample for spike recovery measurement resulted in a slightly out of limits (65%) surrogate recovery for Cadmium.

Lead

Poor reproducibility occurred in data set 112313. This is attributable to non-homogenous distribution of lead in the samples, as the laboratory control sample and spike recovery data were within acceptable limits.

SECTION 4

CONCLUSIONS AND RECOMMENDATIONS

4.1 SUMP INTEGRITY TESTING CONCLUSIONS

The integrity testing of SWMUs 33 and 34 indicated that these sumps were not sources of ongoing releases of hazardous wastes to the environment. Two failed integrity tests of SWMU 32 (Weak Acid Neutralization Sump) indicated that this unit was a potential source of sulfuric acid and metals releases to the surrounding soil and groundwater. As a result of the failed SWMU 32 integrity tests a shallow soil boring was drilled approximately 10 feet from the sump to collect soil and groundwater samples. The samples were analyzed for metals, sulfates and pH. The analytical results indicated that the groundwater sample had slightly elevated levels of chromium. The soil sample had relatively normal levels of metals and the pH of both the water and soil was basic of neutral. It is expected that acid releases from the sump would be buffered by calcium carbonate found in subsurface coral formations. The sulfates concentrations in the soil and groundwater appear to be slightly elevated. Chevron U.S.A. has since placed a new custom manufactured fiberglass sump liner in SWMU 32 to eliminate any further releases from this unit.

4.2 SUMP INTEGRITY TESTING RECOMMENDATIONS

No further investigation of SWMUs 32, 33 and 34 are recommended at this time.

4.3 SWMU SAMPLING CONCLUSIONS

With the exceptions of SWMU 28 and SWMU 35, the sampling completed for this RFI has provided data concerning the concentrations of target analytes contained in the shallow soils within the boundaries of each investigated SWMU. The locations and depths of these samples do not provide information as to the lateral and vertical extent of potential releases from the SWMUs. The SWMU 28 (API Separator) and SWMU 35 (Clay Dewatering Basin) samples were collected adjacent to the walls of those active units.

The total number of samples collected from the small SWMUs (SWMUs 9, 10, 15, 16, 17, 18S, 19, 27, 28, and 35) are considered to be sufficient to adequately provide characterization of shallow soils for those units. The total number of samples collected from the large SWMUs (SWMUs 18M, 18L, 20, 21, and 25) are considered to provide

only preliminary characterization of shallow soils for those units. Chevron is providing additional data for SWMU 18L in order to assist with characterization of that unit.

4.4 SWMU SAMPLING RECOMMENDATIONS

No Further Investigation Recommended

Based on the historical information and the RFI analytical results presented herein, ES believes that SWMUs from which soil sample analytical data indicated little or no contamination, have been sufficiently characterized. Our recommendations for no further action includes SWMUs 10, 15, 16, 17, 20, 21, 28 and the MEK Paint Pits.

No further characterization of SWMU 9 is recommended. ES believes that the detected contamination may have traveled beneath this site via groundwater. The contamination may be from the adjacent subsurface oil recovery project.

Due to its inactive status and evenly spaced RFI sample locations, characterization of SWMU 25 is considered by ES to be adequate.

Due to their small size and the numbers of samples collected, characterization of SWMUs 27 and 35 is considered by ES to be adequate.

Further Investigation Recommended

SWMU 18

Due to the high concentrations of metals and organics reported as detected, and the limited number of samples collected relative to the size of the units, further characterization of SWMU 18S, 18M and 18L are recommended by ES. Chevron has provided additional data for SWMU 18L.

SWMU 19

Due to its proximity to SWMU 18 and reported detections of both organics and elevated concentrations of metals, further investigation of SWMU 19 is recommended by ES.

SWMU 21

Due to the reported detections of organics and elevated concentrations of lead, and due to the limited number of samples collected, further investigation of SWMU 21 is recommended by ES.

SWMU 22

Due to the elevated concentrations of organics, nickel and organic lead, and due to the limited number of samples collected, further investigation of SWMU 22 is recommended by ES.

APPENDIX A

LABORATORY ANALYTICAL DATA

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

DATE RECEIVED: 10/28/92
DATE REPORTED: 11/12/92

LABORATORY NUMBER: 109099

CLIENT: ENGINEERING SCIENCE

PROJECT ID: PE375.01

LOCATION: CHEVRON

RESULTS: SEE ATTACHED

Reviewed by

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Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE REPORTED: 11/12/92
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 19 soil samples for analysis of the revised Skinner list semivolatiles, cyanide and organic lead.

All data quality objectives were met for the organic lead analysis.

Cyanide sample spike recovery was low for one of the two batches of data. Laboratory control standard recovery for this batch is acceptable indicating that the matrix is the source of the bias.

The semivolatiles analysis resulted in no hits for target analytes, but the detection limits for many of the samples were raised because the samples were diluted due to the presence of hydrocarbons. Refer to the letter dated November 30, 1992 for more information on this phenomenon.

The semivolatile spike used for this batch of samples contained a subset of the Skinner list target analytes, not the eleven compounds listed in EPA 8270 (some of which are not target compounds for this project. Data quality objectives in the form of control limits for the spiked compounds are not available, but review of the results does indicate that the 7,12-dimethylbenzo(a)anthracene recovery in the spikes (none recovered) is unacceptable. As the compound is recovered in the laboratory control standardit appears that matrix interference is the source of the problem.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099
CLIENT: ENGINEERING SCIENCE
PROJECT: PE375.01
LOCATION: CHEVRON

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE ANALYZED: 11/02/92
DATE REPORTED: 11/12/92

ANALYSIS: ORGANIC LEAD
ANALYSIS METHOD: CA DHS METHOD, LUFT MANUAL OCT 1989

LAB ID	CLIENT ID	RESULT	UNITS	REPORTING LIMIT
109099-1	SWMU-20-1-0.5	ND	mg/Kg	0.5
109099-2	SWMU-20-2-0.5	ND	mg/Kg	0.5
109099-3	SWMU-20-3-0.5	ND	mg/Kg	0.5
109099-4	SWMU-25-1-0.5	ND	mg/Kg	0.5
109099-5	SWMU-25-2-0.5	ND	mg/Kg	0.5
109099-6	SWMU-25-3-0.5	ND	mg/Kg	0.5
109099-7	SWMU-27-1-0.5	ND	mg/Kg	0.5
109099-8	SWMU-27-2-0.5	ND	mg/Kg	0.5
109099-9	SWMU-27-3-0.5	ND	mg/Kg	0.5
109099-10	SWMU-27-4-0.5	ND	mg/Kg	0.5
109099-11	SWMU-27-5-0.5	ND	mg/Kg	0.5
109099-12	SWMU-28-1-0.5	ND	mg/Kg	0.5
109099-13	SWMU-28-2-0.5	ND	mg/Kg	0.5
109099-14	SWMU-23-3-0.5	ND	mg/Kg	0.5
109099-15	SWMU-28-4-0.5	ND	mg/Kg	0.5
109099-16	SWMU-17-1-0.5	ND	mg/Kg	0.5
109099-17	SWMU-17-2-0.5	ND	mg/Kg	0.5
109099-18	SWMU-17-3-0.5	ND	mg/Kg	0.5
109099-19	SWMU-17-4-0.5	ND	mg/Kg	0.5

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

RPD, %	<1
LCS RECOVERY, %	95
MATRIX SPIKE, %	97

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099
CLIENT: ENGINEERING SCIENCE
PROJECT: PE375.01
LOCATION: CHEVRON

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE ANALYZED: 11/06/92
DATE REPORTED: 11/12/92

ANALYSIS: CYANIDE
ANALYSIS METHOD: EPA 335.2 (Modified)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
109099-1	SWMU-20-1-0.5	0.4	mg/Kg	0.3
109099-2	SWMU-20-2-0.5	0.6	mg/Kg	0.3
109099-3	SWMU-20-3-0.5	1.2	mg/Kg	0.3
109099-4	SWMU-25-1-0.5	ND	mg/Kg	0.3
109099-5	SWMU-25-2-0.5	4.0	mg/Kg	0.3
109099-6	SWMU-25-3-0.5	4.2	mg/Kg	0.3
109099-7	SWMU-27-1-0.5	0.6	mg/Kg	0.3
109099-8	SWMU-27-2-0.5	0.9	mg/Kg	0.3
109099-9	SWMU-27-3-0.5	1.4	mg/Kg	0.3

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

RPD, %	<1
LCS RECOVERY, %	92
MATRIX SPIKE RECOVERY, %	50

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099
CLIENT: ENGINEERING SCIENCE
PROJECT: PE375.01
LOCATION: CHEVRON

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE ANALYZED: 11/09/92
DATE REPORTED: 11/12/92

ANALYSIS: CYANIDE
ANALYSIS METHOD: EPA 335.2 (Modified)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
109099-10	SWMU-27-4-0.5	0.7	mg/Kg	0.3
109099-11	SWMU-27-5-0.5	2.3	mg/Kg	0.3
109099-12	SWMU-28-1-0.5	0.3	mg/Kg	0.3
109099-13	SWMU-28-2-0.5	ND	mg/Kg	0.3
109099-14	SWMU-28-3-0.5	ND	mg/Kg	0.3
109099-15	SWMU-28-4-0.5	ND	mg/Kg	0.3
109099-16	SWMU-17-1-0.5	ND	mg/Kg	0.3
109099-17	SWMU-17-2-0.5	0.3	mg/Kg	0.3
109099-18	SWMU-17-3-0.5	ND	mg/Kg	0.3
109099-19	SWMU-17-4-0.5	ND	mg/Kg	0.3

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

RPD, %	13
LCS RECOVERY, %	98
MATRIX SPIKE RECOVERY, %	75

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-1
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-20-1-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/06/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	113	Nitrobenzene-d5	81
Phenol-d6	115	2-Fluorobiphenyl	84
2,4,6-Tribromophenol	53	Terphenyl-d14	93

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-2
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-20-2-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/07/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	300
2-Chlorophenol	ND	300
2,4-Dimethylphenol	ND	300
2,4-Dinitrophenol	ND	2,000
4-Nitrophenol	ND	2,000
4,6-Dinitro-2-methylphenol	ND	2,000
Nitrobenzene	ND	300
Naphthalene	ND	300
Dimethylphthalate	ND	300
2,4-Dinitrotoluene	ND	300
Fluoranthene	ND	300
Benzo(a)anthracene	ND	300
Chrysene	ND	300
Benzo(b)fluoranthene	ND	300
Benzo(a)pyrene	ND	300
Indeno(1,2,3-cd)pyrene	ND	300
Dibenzo(a,h)anthracene	ND	300
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	300
Dibenz (a,h) acridine	ND	300
Dibenz (a,j) acridine	ND	300
7H-Dibenzo (c,g) carbazole	ND	300
7,12-Dimethylbenzo (a) anthracene	ND	300
Dibenzo (a,e) pyrene	ND	300
Dibenzo (a,h) pyrene	ND	300
Dibenzo (a,i) pyrene	ND	300
Cresol	ND	300
Aniline	ND	300
Pyridine	ND	300

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	69	Nitrobenzene-d5	76
Phenol-d6	83	2-Fluorobiphenyl	71
2,4,6-Tribromophenol	49	Terphenyl-d14	86

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-3
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-20-3-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/07/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	300
2-Chlorophenol	ND	300
2,4-Dimethylphenol	ND	300
2,4-Dinitrophenol	ND	2,000
4-Nitrophenol	ND	2,000
4,6-Dinitro-2-methylphenol	ND	2,000
Nitrobenzene	ND	300
Naphthalene	ND	300
Dimethylphthalate	ND	300
2,4-Dinitrotoluene	ND	300
Fluoranthene	ND	300
Benzo(a)anthracene	ND	300
Chrysene	ND	300
Benzo(b)fluoranthene	ND	300
Benzo(a)pyrene	ND	300
Indeno(1,2,3-cd)pyrene	ND	300
Dibenzo(a,h)anthracene	ND	300
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	300
Dibenz (a,h) acridine	ND	300
Dibenz (a,j) acridine	ND	300
7H-Dibenzo (c,g) carbazole	ND	300
7,12-Dimethylbenzo (a) anthracene	ND	300
Dibenzo (a,e) pyrene	ND	300
Dibenzo (a,h) pyrene	ND	300
Dibenzo (a,i) pyrene	ND	300
Cresol	ND	300
Aniline	ND	300
Pyridine	ND	300

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	106	Nitrobenzene-d5	82
Phenol-d6	118	2-Fluorobiphenyl	82
2,4,6-Tribromophenol	98	Terphenyl-d14	97

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-4
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-25-1-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/10/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	122	Nitrobenzene-d5	99
Phenol-d6	132	2-Fluorobiphenyl	92
2,4,6-Tribromophenol	50	Terphenyl-d14	110

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-5
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-25-2-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/09/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	125	Nitrobenzene-d5	91
Phenol-d6	130	2-Fluorobiphenyl	92
2,4,6-Tribromophenol	98	Terphenyl-d14	104

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-6
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-25-3-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/06/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	113	Nitrobenzene-d5	81
Phenol-d6	115	2-Fluorobiphenyl	81
2,4,6-Tribromophenol	94	Terphenyl-d14	95

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-7
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-27-1-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/07/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	30,000
2-Chlorophenol	ND	30,000
2,4-Dimethylphenol	ND	30,000
2,4-Dinitrophenol	ND	200,000
4-Nitrophenol	ND	200,000
4,6-Dinitro-2-methylphenol	ND	200,000
Nitrobenzene	ND	30,000
Naphthalene	ND	30,000
Dimethylphthalate	ND	30,000
2,4-Dinitrotoluene	ND	30,000
Fluoranthene	ND	30,000
Benzo(a)anthracene	ND	30,000
Chrysene	ND	30,000
Benzo(b)fluoranthene	ND	30,000
Benzo(a)pyrene	ND	30,000
Indeno(1,2,3-cd)pyrene	ND	30,000
Dibenzo(a,h)anthracene	ND	30,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	30,000
Dibenz (a,h) acridine	ND	30,000
Dibenz (a,j) acridine	ND	30,000
7H-Dibenzo (c,g) carbazole	ND	30,000
7,12-Dimethylbenzo (a) anthracene	ND	30,000
Dibenzo (a,e) pyrene	ND	30,000
Dibenzo (a,h) pyrene	ND	30,000
Dibenzo (a,i) pyrene	ND	30,000
Cresol	ND	30,000
Aniline	ND	30,000
Pyridine	ND	30,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	61	Nitrobenzene-d5	**
Phenol-d6	**	2-Fluorobiphenyl	**
2,4,6-Tribromophenol	**	Terphenyl-d14	**

**Surrogates diluted out.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-8
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-27-2-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/07/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	30,000
2-Chlorophenol	ND	30,000
2,4-Dimethylphenol	ND	30,000
2,4-Dinitrophenol	ND	200,000
4-Nitrophenol	ND	200,000
4,6-Dinitro-2-methylphenol	ND	200,000
Nitrobenzene	ND	30,000
Naphthalene	ND	30,000
Dimethylphthalate	ND	30,000
2,4-Dinitrotoluene	ND	30,000
Fluoranthene	ND	30,000
Benzo(a)anthracene	ND	30,000
Chrysene	ND	30,000
Benzo(b)fluoranthene	ND	30,000
Benzo(a)pyrene	ND	30,000
Indeno(1,2,3-cd)pyrene	ND	30,000
Dibenzo(a,h)anthracene	ND	30,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	30,000
Dibenz (a,h) acridine	ND	30,000
Dibenz (a,j) acridine	ND	30,000
7H-Dibenzo (c,g) carbazole	ND	30,000
7,12-Dimethylbenzo (a) anthracene	ND	30,000
Dibenzo (a,e) pyrene	ND	30,000
Dibenzo (a,h) pyrene	ND	30,000
Dibenzo (a,i) pyrene	ND	30,000
Cresol	ND	30,000
Aniline	ND	30,000
Pyridine	ND	30,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	66	Nitrobenzene-d5	**
Phenol-d6	63	2-Fluorobiphenyl	**
2,4,6-Tribromophenol	**	Terphenyl-d14	**

**Surrogates diluted out.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-9
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-27-3-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/07/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	30,000
2-Chlorophenol	ND	30,000
2,4-Dimethylphenol	ND	30,000
2,4-Dinitrophenol	ND	200,000
4-Nitrophenol	ND	200,000
4,6-Dinitro-2-methylphenol	ND	200,000
Nitrobenzene	ND	30,000
Naphthalene	ND	30,000
Dimethylphthalate	ND	30,000
2,4-Dinitrotoluene	ND	30,000
Fluoranthene	ND	30,000
Benzo(a)anthracene	ND	30,000
Chrysene	ND	30,000
Benzo(b)fluoranthene	ND	30,000
Benzo(a)pyrene	ND	30,000
Indeno(1,2,3-cd)pyrene	ND	30,000
Dibenzo(a,h)anthracene	ND	30,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	30,000
Dibenz (a,h) acridine	ND	30,000
Dibenz (a,j) acridine	ND	30,000
7H-Dibenzo (c,g) carbazole	ND	30,000
7,12-Dimethylbenzo (a) anthracene	ND	30,000
Dibenzo (a,e) pyrene	ND	30,000
Dibenzo (a,h) pyrene	ND	30,000
Dibenzo (a,i) pyrene	ND	30,000
Cresol	ND	30,000
Aniline	ND	30,000
Pyridine	ND	30,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	**	Nitrobenzene-d5	**
Phenol-d6	**	2-Fluorobiphenyl	**
2,4,6-Tribromophenol	**	Terphenyl-d14	**

**Surrogates diluted out.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-10
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-27-4-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/07/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	30,000
2-Chlorophenol	ND	30,000
2,4-Dimethylphenol	ND	30,000
2,4-Dinitrophenol	ND	200,000
4-Nitrophenol	ND	200,000
4,6-Dinitro-2-methylphenol	ND	200,000
Nitrobenzene	ND	30,000
Naphthalene	ND	30,000
Dimethylphthalate	ND	30,000
2,4-Dinitrotoluene	ND	30,000
Fluoranthene	ND	30,000
Benzo(a)anthracene	ND	30,000
Chrysene	ND	30,000
Benzo(b)fluoranthene	ND	30,000
Benzo(a)pyrene	ND	30,000
Indeno(1,2,3-cd)pyrene	ND	30,000
Dibenzo(a,h)anthracene	ND	30,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	30,000
Dibenz (a,h) acridine	ND	30,000
Dibenz (a,j) acridine	ND	30,000
7H-Dibenzo (c,g) carbazole	ND	30,000
7,12-Dimethylbenzo (a) anthracene	ND	30,000
Dibenzo (a,e) pyrene	ND	30,000
Dibenzo (a,h) pyrene	ND	30,000
Dibenzo (a,i) pyrene	ND	30,000
Cresol	ND	30,000
Aniline	ND	30,000
Pyridine	ND	30,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	**	Nitrobenzene-d5	**
Phenol-d6	**	2-Fluorobiphenyl	**
2,4,6-Tribromophenol	**	Terphenyl-d14	**

**Surrogates diluted out.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-11
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-27-5-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/09/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	111	Nitrobenzene-d5	85
Phenol-d6	115	2-Fluorobiphenyl	80
2,4,6-Tribromophenol	95	Terphenyl-d14	94

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-12
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-28-1-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/06/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	125	Nitrobenzene-d5	86
Phenol-d6	122	2-Fluorobiphenyl	89
2,4,6-Tribromophenol	88	Terphenyl-d14	93

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-13
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-28-2-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/10/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	124	Nitrobenzene-d5	81
Phenol-d6	130	2-Fluorobiphenyl	85
2,4,6-Tribromophenol	23	Terphenyl-d14	99

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-14
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-28-3-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/07/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	114	Nitrobenzene-d5	72
Phenol-d6	114	2-Fluorobiphenyl	78
2,4,6-Tribromophenol	94	Terphenyl-d14	91

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-15
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-28-4-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/07/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	123	Nitrobenzene-d5	81
Phenol-d6	121	2-Fluorobiphenyl	84
2,4,6-Tribromophenol	95	Terphenyl-d14	99

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-16
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-17-1-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/06/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	30,000
2-Chlorophenol	ND	30,000
2,4-Dimethylphenol	ND	30,000
2,4-Dinitrophenol	ND	200,000
4-Nitrophenol	ND	200,000
4,6-Dinitro-2-methylphenol	ND	200,000
Nitrobenzene	ND	30,000
Naphthalene	ND	30,000
Dimethylphthalate	ND	30,000
2,4-Dinitrotoluene	ND	30,000
Fluoranthene	ND	30,000
Benzo(a)anthracene	ND	30,000
Chrysene	ND	30,000
Benzo(b)fluoranthene	ND	30,000
Benzo(a)pyrene	ND	30,000
Indeno(1,2,3-cd)pyrene	ND	30,000
Dibenzo(a,h)anthracene	ND	30,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	30,000
Dibenz (a,h) acridine	ND	30,000
Dibenz (a,j) acridine	ND	30,000
7H-Dibenzo (c,g) carbazole	ND	30,000
7,12-Dimethylbenzo (a) anthracene	ND	30,000
Dibenzo (a,e) pyrene	ND	30,000
Dibenzo (a,h) pyrene	ND	30,000
Dibenzo (a,i) pyrene	ND	30,000
Cresol	ND	30,000
Aniline	ND	30,000
Pyridine	ND	30,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	63	Nitrobenzene-d5	**
Phenol-d6	62	2-Fluorobiphenyl	**
2,4,6-Tribromophenol	**	Terphenyl-d14	**

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-17
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-17-2-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/07/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	111	Nitrobenzene-d5	80
Phenol-d6	114	2-Fluorobiphenyl	80
2,4,6-Tribromophenol	81	Terphenyl-d14	87

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-18
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-17-3-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/10/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	111	Nitrobenzene-d5	83
Phenol-d6	117	2-Fluorobiphenyl	83
2,4,6-Tribromophenol	86	Terphenyl-d14	93

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099-19
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-17-4-0.5

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE EXTRACTED: 10/30/92
DATE ANALYZED: 11/07/92
DATE REPORTED: 11/12/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	119	Nitrobenzene-d5	82
Phenol-d6	119	2-Fluorobiphenyl	85
2,4,6-Tribromophenol	84	Terphenyl-d14	92

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8270

Client: Engineering Science
Analysis Date: 11/09/92
Sample Matrix: Soil LCS file: LCS_7262.d

LABORATORY CONTROL SAMPLE DATA

SPIKE COMPOUNDS	Reading	%Recovery
7,12-Dimethylbenzo(a)anthracene	109.2	109
Benzo(j)anthracene	95.7	96
Dibenz(a,h)acridine	98.7	99
Dibenz(a,j)acridine	99.7	100
7H-Dibenz(c,g)carbazole	101.8	102
Dibenz(a,e)pyrene	104.7	105
Dibenz(a,h)pyrene	95.3	191
Dibenz(a,i)pyrene	90.4	181

Curtis & Tompkins, Ltd.

MS/MSD SUMMARY SHEET FOR EPA 8270

Client: Engineering Science
Analysis Date: 11/09/92 Spike file: ms_7262.d
Sample Matrix: Soil Spike dup file: msd_7262.d

SPIKE DATA

SPIKE COMPOUNDS	Reading	%Recovery
7,12-Dimethylbenzo(a)anthracene	0.0	0
Benzo(j)anthracene	93.6	94
Dibenz(a,h)acridine	96.0	96
Dibenz(a,j)acridine	93.9	94
7H-Dibenz(c,g)carbazole	93.1	93
Dibenz(a,e)pyrene	80.3	80
Dibenz(a,h)pyrene	63.6	64
Dibenz(a,i)pyrene	46.9	47

SPIKE DUP DATA

SPIKE COMPOUNDS	Reading	%Recovery
7,12-Dimethylbenzo(a)anthracene	0.0	0
Benzo(j)anthracene	106.2	106
Dibenz(a,h)acridine	106.5	107
Dibenz(a,j)acridine	103.0	103
7H-Dibenz(c,g)carbazole	102.9	103
Dibenz(a,e)pyrene	87.0	87
Dibenz(a,h)pyrene	69.4	69
Dibenz(a,i)pyrene	52.7	53

109099

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
PE375.01	CHEVRON

SAMPLERS (Signatures): K. Caskey / C. Kelly / Kyle Caskey

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	EPA 8240	EPA 8270	EPA 9010	DHS-LUFT						REMARKS
-27-92	0845	SOIL	SWMU-20-1-0.5 1	1		X	X	X						SEE WORK PLAN
-27-92	0845	SOIL	SWMU-20-2-0.5 2	1		X	X	X						FOR Futher Details.
-27-92	0845	SOIL	SWMU-20-3-0.5 3	1		X	X	X						
-27-92	1000	SOIL	SWMU-25-1-0.5 4	1		X	X	X						
-27-92	1000	SOIL	SWMU-25-2-0.5 5	1		X	X	X						
-27-92	1000	SOIL	SWMU-25-3-0.5 6	1		X	X	X						
-27-92	1030	SOIL	SWMU-27-1-0.5 7	1		X	X	X						
-27-92	1030	SOIL	SWMU-27-2-0.5 8	1		X	X	X						
-27-92	1030	SOIL	SWMU-27-3-0.5 9	1		X	X	X						
-27-92	1030	SOIL	SWMU-27-4-0.5 10	1		X	X	X						
-27-92	1030	SOIL	SWMU-27-5-0.5 11	1		X	X	X						

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	DATE / TIME	PRESERVATIVES
Christopher E. Kelly	DATE 27 OCT 92 TIME 1430	PHL	DATE TIME	NONE
RELINQUISHED BY (SIGNATURE)	DATE TIME	RECEIVED BY: (SIGNATURE) [signature]	DATE 10/28/92 TIME 9:07	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE TIME	RECEIVED BY: (SIGNATURE)	DATE TIME	

Custody Seals Intact upon arrival to Lab NJW

White: laboratory returns with data, yellow: laboratory copy, pink: sampler copy

ENGINEERING-SCIENCE, INC. 211 0858/YO

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
PE375.01	CHEVRON

SAMPLERS (Signatures): K. Caskey / C. Kelly

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	EPA 8270	EPA 9010	DHS-LUST	REMARKS
7-92	11:45	SOIL	SWMU-28-1-0.5 12	1	X	X	X	See work plan
7-92	11:45	SOIL	SWMU-28-2-0.5 13	1	X	X	X	for Further Details
7-92	11:45	SOIL	SWMU-28-3-0.5 14	1	X	X	X	
7-92	11:45	SOIL	SWMU-28-4-0.5 15	1	X	X	X	
7-92	1200	SOIL	SWMU-17-1-0.5 16	1	X	X	X	
7-92	1200	SOIL	SWMU-17-2-0.5 17	1	X	X	X	
7-92	1200	SOIL	SWMU-17-3-0.5 18	1	X	X	X	
7-92	1200	SOIL	SWMU-17-4-0.5 19	1	X	X	X	

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
Christopher E. Kelly	27 OCT 92	PHL		NONE
	TIME 1430		TIME	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE 10/28/92	SEND RESULTS TO:
	TIME	[illegible]	TIME 9:07	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	

custody seals Intact upon arrival to lab WSW

ENGINEERING-SCIENCE, INC. 211.0858/YO

White: laboratory returns with data, yellow: laboratory copy, pink: sampler copy

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

DATE RECEIVED: 10/29/92
DATE REPORTED: 11/16/92

LABORATORY NUMBER: 109111

CLIENT: ENGINEERING SCIENCE, INC.

PROJECT ID: PE375.01

LOCATION: CHEVRON

RESULTS: SEE ATTACHED

Joanne Heath
Reviewed by

Kathy O'Brien
Reviewed by

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Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE REPORTED: 11/16/92
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received eleven soil samples and two water samples on October 29, 1992. Seven of the soil samples were analyzed for volatiles using EPA 8240. A TCLP extraction was performed on one of the other soil samples followed by analysis for MEK. The other three soil samples were analyzed for the revised Skinner list semivolatiles, cyanide and organic lead. The water samples (one was a trip blank, the other a rinsate) were analyzed for the Skinner list volatiles. The equipment rinsate was also analyzed for organic lead and the revised Skinner list semivolatiles.

Organic lead in both soil and water met all data quality objectives.

Cyanide sample spike recovery was low (58%) but the sample duplicates were within the precision criteria and the laboratory control standard recovery was acceptable so the data was reported.

The EPA 8240 for the water samples met all data quality objectives. For the soil samples the hydrocarbon background resulted in dilutions and elevated detection limits (refer to the report). The hydrocarbon background in sample SWMU-35-2-0.5' resulted in elevated detection limits and poor surrogate recoveries. Matrix spikes for the soils were inadvertently omitted from the original report. The attached reports indicate that the spikes are acceptable except for a low surrogate recovery which does not impact the data. The TCLP volatile QC is entirely acceptable.

The semivolatiles analysis was spiked with a subset of the Skinner list. Data quality objectives for recovery of these compounds is not provided in the project plan. For the water sample the laboratory analyzed two LCSs because insufficient sample was available for a matrix spike/matrix spike duplicate. Reviewing the data for possible problems it is apparent that the dibenzo (a,i) pyrene recovery is low, and the 7,12-dimethylbenzo (a) anthracene recovery is not as reproducible as the other compounds (this is probably due to the stability of the compound). The soil spike recovery also indicates that reproducibility is a problem with the latter compound, although all other analytes were adequately recovered and reproducible.

Curtis & Tompkins, Ltd

MS/MSD Report

Curtis & Tompkins, Ltd.

Matrix Sample Number: 109186-006
Lab No: QC36800 QC36801
Matrix: SOIL
Batch No: 7376 928954 928956 928952

Date Analyzed: 10-NOV-92
Spike File: >BKA07
Spike Dup File: >BKA08
Analyst: CW

	Instrdg	SpikeAmt	% Rec	Limits	
MS RESULTS					
1,1-Dichloroethene	45.27	50	87 %	59-172%	
Trichloroethene	61.73	50	91 %	62-137%	
Benzene	47.81	50	96 %	66-142%	
Toluene	50.07	50	99 %	59-139%	
Chlorobenzene	49.79	50	100 %	60-133%	
Surrogate Recoveries					
1,2-Dichloroethane-d4	52.2	50	104 %	70-121%	
Toluene-d8	50.34	50	101 %	81-117%	
Bromofluorobenzene	44.71	50	89 %	74-121%	
MSD RESULTS					
1,1-Dichloroethene	53.34	50	103 %	59-172%	
Trichloroethene	62.79	50	93 %	62-137%	
Benzene	48.52	50	97 %	66-142%	
Toluene	51.94	50	102 %	59-139%	
Chlorobenzene	49.28	50	99 %	60-133%	
Surrogate Recoveries					
1,2-Dichloroethane-d4	54.56	50	109 %	70-121%	
Toluene-d8	55.83	50	112 %	81-117%	
Bromofluorobenzene	33.42	50	67 %	74-121%	*
MATRIX RESULTS					
1,1-Dichloroethene	1.69				
Trichloroethene	16.44				
Benzene	0				
Toluene	.811				
Chlorobenzene	0				
RPD DATA					
1,1-Dichloroethene	16 %			< 22%	
Trichloroethene	2 %			< 24%	
Benzene	1 %			< 21%	
Toluene	4 %			< 21%	
Chlorobenzene	1 %			< 21%	

** Result is out of limits

Curtis & Tompkins, Ltd

MS/MSD Report

Curtis & Tompkins, Ltd.

Matrix Sample Number: 109111-007
Lab No: QC36755 QC36756
Matrix: SOIL
Batch No: 7365 928934 928936 928922

Date Analyzed: 10-NOV-92
Spike File: >BK921
Spike Dup File: >BK922
Analyst: CW

	Instrdg	SpikeAmt	% Rec	Limits	
MS RESULTS					
1,1-Dichloroethene	41.44	50	83 %	59-172%	
Trichloroethene	57.36	50	115 %	62-137%	
Benzene	52.89	50	106 %	66-142%	
Toluene	58.93	50	118 %	59-139%	
Chlorobenzene	59.85	50	120 %	60-133%	
Surrogate Recoveries					
1,2-Dichloroethane-d4	60.04	50	120 %	70-121%	
Toluene-d8	55.53	50	111 %	81-117%	
Bromofluorobenzene	42.14	50	84 %	74-121%	
MSD RESULTS					
1,1-Dichloroethene	31.91	50	64 %	59-172%	
Trichloroethene	48.33	50	97 %	62-137%	
Benzene	44.36	50	89 %	66-142%	
Toluene	52.87	50	106 %	59-139%	
Chlorobenzene	58.36	50	117 %	60-133%	
Surrogate Recoveries					
1,2-Dichloroethane-d4	55.16	50	110 %	70-121%	
Toluene-d8	55.68	50	111 %	81-117%	
Bromofluorobenzene	36.42	50	73 %	74-121%	*
MATRIX RESULTS					
1,1-Dichloroethene	0				
Trichloroethene	0				
Benzene	0				
Toluene	0				
Chlorobenzene	0				
RPD DATA					
1,1-Dichloroethene	26 %			< 22%	*
Trichloroethene	17 %			< 24%	
Benzene	18 %			< 21%	
Toluene	11 %			< 21%	
Chlorobenzene	3 %			< 21%	

** Result is out of limits

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111-1
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: EQUIPMENT RINSATE #1

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE ANALYZED: 11/10/92
DATE REPORTED: 11/16/92

VOLATILE ORGANICS IN WATER
BY EPA 8240

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Methylene chloride	ND	20
Carbon disulfide	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
trans-1,2-Dichloroethene	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	ND	5
Trichloroethene	ND	5
Benzene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethylenedibromide	ND	5

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	104 %
Toluene-d8	100 %
Bromofluorobenzene	102 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111-1
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: EQUIPMENT RINSATE #1

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE EXTRACTED: 11/04/92
DATE ANALYZED: 11/10/92
DATE REPORTED: 11/13/92

EPA 8270: Base/Neutral and Acid Extractables in Water
Extraction Method: EPA 3520 Continous liquid-liquid

PRIORITY POLLUTANTS	RESULT ug/L	REPORTING LIMIT ug/L
Phenol	ND	5
2-Chlorophenol	ND	5
2,4-Dimethylphenol	ND	5
2,4-Dinitrophenol	ND	5
4-Nitrophenol	ND	30
4,6-Dinitro-2-methylphenol	ND	30
Nitrobenzene	ND	5
Naphthalene	ND	5
Dimethylphthalate	ND	5
2,4-Dinitrotoluene	ND	5
Fluoranthene	ND	5
Benzo(a)anthracene	ND	5
Chrysene	ND	5
Benzo(b)fluoranthene	ND	5
Benzo(a)pyrene	ND	5
Indeno(1,2,3-cd)pyrene	ND	5
Dibenzo(a,h)anthracene	ND	5
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	5
Benz (c) acridine	ND	5
Dibenz (a,h) acridine	ND	5
Dibenz (a,j) acridine	ND	5
7H-Dibenzo (c,g) carbazole	ND	5
7,12-Dimethylbenzo (a) anthracene	ND	5
Dibenzo (a,e) pyrene	ND	5
Dibenzo (a,h) pyrene	ND	5
Dibenzo (a,j) pyrene	ND	5
Cresol	ND	5
Aniline	ND	5
Pyridine	ND	5

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	79	Nitrobenzene-d5	71
Phenol-d6	87	2-Fluorobiphenyl	67
2,4,6-Tribromophenol	80	Terphenyl-d14	86

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111-2
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-35-1-0.5'

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE EXTRACTED: 11/06/92
DATE ANALYZED: 11/11/92
DATE REPORTED: 11/13/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	93	Nitrobenzene-d5	86
Phenol-d6	93	2-Fluorobiphenyl	77
2,4,6-Tribromophenol	64	Terphenyl-d14	95

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111-3
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-35-2-0.5'

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE EXTRACTED: 11/06/92
DATE ANALYZED: 11/11/92
DATE REPORTED: 11/13/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	3,000
2-Chlorophenol	ND	3,000
2,4-Dimethylphenol	ND	3,000
2,4-Dinitrophenol	ND	20,000
4-Nitrophenol	ND	20,000
4,6-Dinitro-2-methylphenol	ND	20,000
Nitrobenzene	ND	3,000
Naphthalene	ND	3,000
Dimethylphthalate	ND	3,000
2,4-Dinitrotoluene	ND	3,000
Fluoranthene	ND	3,000
Benzo(a)anthracene	ND	3,000
Chrysene	ND	3,000
Benzo(b)fluoranthene	ND	3,000
Benzo(a)pyrene	ND	3,000
Indeno(1,2,3-cd)pyrene	ND	3,000
Dibenzo(a,h)anthracene	ND	3,000
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	3,000
Dibenz (a,h) acridine	ND	3,000
Dibenz (a,j) acridine	ND	3,000
7H-Dibenzo (c,g) carbazole	ND	3,000
7,12-Dimethylbenzo (a) anthracene	ND	3,000
Dibenzo (a,e) pyrene	ND	3,000
Dibenzo (a,h) pyrene	ND	3,000
Dibenzo (a,i) pyrene	ND	3,000
Cresol	ND	3,000
Aniline	ND	3,000
Pyridine	ND	3,000

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	80	Nitrobenzene-d5	78
Phenol-d6	83	2-Fluorobiphenyl	71
2,4,6-Tribromophenol	59	Terphenyl-d14	83

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111-4
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: BKG-1-0.5'

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE EXTRACTED: 11/06/92
DATE ANALYZED: 11/11/92
DATE REPORTED: 11/13/92

EPA 8270: Base/Neutral and Acid Extractables in Soils & Wastes
Extraction Method: EPA 3550 Sonication

PRIORITY POLLUTANTS	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Phenol	ND	300
2-Chlorophenol	ND	300
2,4-Dimethylphenol	ND	300
2,4-Dinitrophenol	ND	2,000
4-Nitrophenol	ND	2,000
4,6-Dinitro-2-methylphenol	ND	2,000
Nitrobenzene	ND	300
Naphthalene	ND	300
Dimethylphthalate	ND	300
2,4-Dinitrotoluene	ND	300
Fluoranthene	ND	300
Benzo(a)anthracene	ND	300
Chrysene	ND	300
Benzo(b)fluoranthene	ND	300
Benzo(a)pyrene	ND	300
Indeno(1,2,3-cd)pyrene	ND	300
Dibenzo(a,h)anthracene	ND	300
NON-PRIORITY POLLUTANTS		
Benzo (j) fluroanthene	ND	300
Dibenz (a,h) acridine	ND	300
Dibenz (a,j) acridine	ND	300
7H-Dibenzo (c,g) carbazole	ND	300
7,12-Dimethylbenzo (a) anthracene	ND	300
Dibenzo (a,e) pyrene	ND	300
Dibenzo (a,h) pyrene	ND	300
Dibenzo (a,i) pyrene	ND	300
Cresol	ND	300
Aniline	ND	300
Pyridine	ND	300

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	75	Nitrobenzene-d5	66
Phenol-d6	80	2-Fluorobiphenyl	68
2,4,6-Tribromophenol	75	Terphenyl-d14	78

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: METHOD BLANK

DATE ANALYZED: 11/10/92
DATE REPORTED: 11/16/92

VOLATILE ORGANICS IN SOILS & WASTES
BY EPA 8240

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Methylene chloride	ND	20
Carbon disulfide	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
trans-1,2-Dichloroethene	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	DETECTED(3)	5
Trichloroethene	ND	5
Benzene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethylenedibromide	ND	5

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	99 %
Toluene-d8	98 %
Bromofluorobenzene	98 %

Curtis & Tompkins, Ltd

Curtis & Tompkins, Ltd.

8240 Laboratory Control Sample Report

Lab No: QC36798
Date Analyzed: 10-NOV-92
Matrix: SOIL
Batch No: 7376 928945

LCS Datafile: >BKA03
Operator: CW

Compound	Instrdg	SpikeAmt	% Rec	Limits
1,1-Dichloroethene	36.54	50	73 %	59-172%
Trichloroethene	51.23	50	102 %	62-137%
Benzene	49.62	50	99 %	66-142%
Toluene	48.89	50	98 %	59-139%
Chlorobenzene	51.02	50	102 %	60-133%

Surrogate Recoveries

1,2-Dichloroethane-d4	48.62	50	97 %	70-121%
Toluene-d8	48.51	50	97 %	81-117%
Bromofluorobenzene	48.9	50	98 %	74-121%

Results within Specifications - PASS

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT: PE375.01
LOCATION: CHEVRON

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE ANALYZED: 11/09/92
DATE REPORTED: 11/16/92

ANALYSIS: METHYL ETHYL KETONE
ANALYSIS METHOD: EPA 8240

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
109111-5	MEK PAINT PIT-1-0.5'	ND	ug/Kg	10
109111-7	MEK PAINT PIT-1-2-0.5'	ND	ug/Kg	10
109111-8	MEK PAINT PIT-2-0.5'	ND	ug/Kg	20
109111-9	MEK PAINT PIT-2-2-0.5'	ND	ug/Kg	10
109111-10	MEK PAINT PIT-2D-2-0.5	ND	ug/Kg	10
109111	METHOD BLANK	ND	ug/Kg	10

ND = Not detected at or above reporting limit.

NA=QA/QC data not available due to hydrocarbon interference.

QA/QC SUMMARY: SURROGATE RECOVERIES, %

Lab No.	-5	-7	-8	-9	-10	MB
1,2-Dichloroethane-d4	108	104	116	101	106	107
Toluene-d8	106	97	102	113	110	101
Bromofluorobenzene	93	93	97	NA	114	100

Curtis & Tompkins, Ltd

Curtis & Tompkins, Ltd.

8240 Laboratory Control Sample Report

Lab No: QC36753
Date Analyzed: 09-NOV-92
Matrix: SOIL
Batch No: 7365 928917

LCS Datafile: >BK912
Operator: CW

Compound	Instrdg	SpikeAmt	% Rec	Limits
1,1-Dichloroethene	36.3	50	73 %	59-172%
Trichloroethene	46.85	50	94 %	62-137%
Benzene	43.93	50	88 %	66-142%
Toluene	52.33	50	105 %	59-139%
Chlorobenzene	54.87	50	110 %	60-133%
Surrogate Recoveries				
1,2-Dichloroethane-d4	50.64	50	101 %	70-121%
Toluene-d8	51.17	50	102 %	81-117%
Bromofluorobenzene	52.62	50	105 %	74-121%

Results within Specifications - PASS

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT: PE375.01
LOCATION: CHEVRON

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE ANALYZED: 11/06/92
DATE REPORTED: 11/16/92

ANALYSIS: TCLP METHYL ETHYL KETONE
ANALYSIS METHOD: EPA 8240

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
109111-6	STOCKPILE A + B COMP	ND	ug/L	1,000
109111	METHOD BLANK	ND	ug/L	10

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: SURROGATE RECOVERY, %

LAB NO.	109111-1	METHOD BLANK
1,2-Dichloroethane-d4	98	99
Toluene-d8	99	100
Bromofluorobenzene	101	102

Curtis & Tompkins, Ltd.

LABORATORY CONTROL SAMPLE SUMMARY SHEET FOR EPA 8240

Laboratory Number: 109111
Analysis date:11/06/92
Sample type: TCLP LCS file: >AK608

COMPOUND	READING	RECOVERY	STATUS	LIMITS
Methyl Ethyl Ketone	57.13	114 %	OK	50 - 150
SURROGATES				
Bromofluorobenzene	51.19	102 %	OK	86 - 115
1,2-Dichloroethane-d4	50.75	102 %	OK	76 - 114
Toluene-d8	50.63	101 %	OK	88 - 110

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT: PE375.01
LOCATION: CHEVRON

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE ANALYZED: 11/04/92
DATE REPORTED: 11/13/92

ANALYSIS: CYANIDE
ANALYSIS METHOD: EPA 335.2 (Modified)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
109111-2	SWMU-35-1-0.5'	0.7	mg/Kg	0.3
109111-3	SWMU-35-2-0.5'	ND	mg/Kg	0.3
109111-4	BKG-1-0.5'	1.6	mg/Kg	0.3

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

RPD, %	5
RECOVERY, %	92

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT: PE375.01
LOCATION: CHEVRON

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE REPORTED: 11/16/92

ANALYSIS: ORGANIC LEAD
ANALYSIS METHOD: CA DHS METHOD, LUFT MANUAL OCT 1989

LAB ID	CLIENT ID	RESULT	UNITS	REPORTING LIMIT
109111-2	SWMU-35-1-0.5'	ND	mg/Kg	0.5
109111-3	SWMU-35-2-0.5'	ND	mg/Kg	0.5
109111-4	BKG-1-0.5'	ND	mg/Kg	0.5

ND = Not detected at or above reporting limit.

QA/QC SUMMARY	RPD, %	RECOVERY, %	DATE ANALYZED
109111-2 & -3	2	87	11/11/92
109111-4	1	101	11/16/92

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111-11
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-35-1-0.5'

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE ANALYZED: 11/10/92
DATE REPORTED: 11/16/92

VOLATILE ORGANICS IN SOILS & WASTES BY EPA 8240

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Methylene chloride	ND	100
Carbon disulfide	ND	30
1,1-Dichloroethene	ND	30
1,1-Dichloroethane	ND	30
trans-1,2-Dichloroethene	ND	30
Chloroform	ND	30
1,2-Dichloroethane	ND	30
2-Butanone	ND	50
1,1,1-Trichloroethane	ND	30
Trichloroethene	ND	30
Benzene	ND	30
1,1,2,2-Tetrachloroethane	ND	30
Toluene	ND	30
Chlorobenzene	ND	30
Ethylenedibromide	ND	30

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	101 %
Toluene-d8	117 %
Bromofluorobenzene	116 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111-12
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-35-2-0.5'

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE ANALYZED: 11/10/92
DATE REPORTED: 11/16/92

VOLATILE ORGANICS IN SOILS & WASTES
BY EPA 8240

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Methylene chloride	ND	100
Carbon disulfide	ND	30
1,1-Dichloroethene	ND	30
1,1-Dichloroethane	ND	30
trans-1,2-Dichloroethene	ND	30
Chloroform	ND	30
1,2-Dichloroethane	ND	30
2-Butanone	ND	50
1,1,1-Trichloroethane	ND	30
Trichloroethene	ND	30
Benzene	ND	30
1,1,2,2-Tetrachloroethane	ND	30
Toluene	ND	30
Chlorobenzene	ND	30
Ethylenedibromide	ND	30

ND = Not detected at or above reporting limit

NOTE: NO QA/QC SUMMARY DUE TO HYDROCARBON INTERFERENCE.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111-13
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: TB-1

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE ANALYZED: 11/10/92
DATE REPORTED: 11/16/92

VOLATILE ORGANICS IN WATER
BY EPA 8240

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Methylene chloride	ND	20
Carbon disulfide	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
trans-1,2-Dichloroethene	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	ND	5
Trichloroethene	ND	5
Benzene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyldibromide	ND	5

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	105 %
Toluene-d8	101 %
Bromofluorobenzene	101 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: METHOD BLANK

DATE ANALYZED: 11/10/92
DATE REPORTED: 11/16/92

VOLATILE ORGANICS IN WATER
BY EPA 8240

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Methylene chloride	ND	10
Carbon disulfide	ND	10
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
trans-1,2-Dichloroethene	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	ND	5
Trichloroethene	ND	5
Benzene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyldibromide	ND	5

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	106 %
Toluene-d8	101 %
Bromofluorobenzene	101 %

Curtis & Tompkins, Ltd

Curtis & Tompkins, Ltd.

8240 Laboratory Control Sample Report

Lab No: QC36768
Date Analyzed: 09-NOV-92
Matrix: WATER
Batch No: 7369 928925

LCS Datafile: >AK914
Operator: AL

Compound	Instrdg	SpikeAmt	% Rec	Limits
1,1-Dichloroethene	50.63	50	101 %	61-145%
Trichloroethene	46.53	50	93 %	71-120%
Benzene	47.31	50	95 %	76-127%
Toluene	47.1	50	94 %	76-125%
Chlorobenzene	48.03	50	96 %	75-130%

Surrogate Recoveries

1,2-Dichloroethane-d4	53.09	50	106 %	76-114%
Toluene-d8	50.65	50	101 %	88-110%
Bromofluorobenzene	51.59	50	103 %	86-115%

Results within Specifications - PASS

Curtis & Tompkins, Ltd.

Curtis & Tompkins, Ltd

MS/MSD Report

Matrix Sample Number: 109130-001
Lab No: QC36770 QC36771
Matrix: WATER
Batch No: 7369 928939 928940 928941

Date Analyzed: 10-NOV-92
Spike File: >AK921
Spike Dup File: >AK922
Analyst: AL

	Instrdg	SpikeAmt	% Rec	Limits
MS RESULTS				
1,1-Dichloroethene	45.7	50	91 %	61-145%
Trichloroethene	46.91	50	94 %	71-120%
Benzene	48.16	50	96 %	76-127%
Toluene	46.1	50	92 %	76-125%
Chlorobenzene	48.5	50	97 %	75-130%
Surrogate Recoveries				
1,2-Dichloroethane-d4	51.84	50	104 %	76-114%
Toluene-d8	49.06	50	98 %	88-110%
Bromofluorobenzene	50.82	50	102 %	86-115%
MSD RESULTS				
1,1-Dichloroethene	46.55	50	93 %	61-145%
Trichloroethene	47.82	50	96 %	71-120%
Benzene	49.61	50	99 %	76-127%
Toluene	47.47	50	95 %	76-125%
Chlorobenzene	49.7	50	99 %	75-130%
Surrogate Recoveries				
1,2-Dichloroethane-d4	52.07	50	104 %	76-114%
Toluene-d8	49.34	50	99 %	88-110%
Bromofluorobenzene	50.32	50	101 %	86-115%
MATRIX RESULTS				
1,1-Dichloroethene	0			
Trichloroethene	0			
Benzene	0			
Toluene	0			
Chlorobenzene	0			

RPD DATA		
1,1-Dichloroethene	2 %	< 14%
Trichloroethene	2 %	< 14%
Benzene	3 %	< 11%
Toluene	3 %	< 13%
Chlorobenzene	2 %	< 13%

Results within Specifications - PASS

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT: PE375.01
LOCATION: CHEVRON

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE ANALYZED: 11/11/92
DATE REPORTED: 11/13/92

ANALYSIS: ORGANIC LEAD
ANALYSIS METHOD: CA DHS METHOD, LUFT MANUAL OCT 1989

LAB ID	CLIENT ID	RESULT	UNITS	REPORTING LIMIT
109111-1	EQUIPMENT RINSATE	ND	ug/L	100

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

RPD, %	1
RECOVERY, %	92

MS/MSD SUMMARY SHEET FOR EPA 8270

Curtis & Tompkins, Ltd.

Client: Engineering Science
Analysis Date: 11/09/92 Spike file: bs_7314.d
Sample Matrix: Water Spike dup file: bsd_7314.d

SPIKE DATA

SPIKE COMPOUNDS	Reading	%Recovery
7,12-Dimethylbenzo(a)anthracene	35.7	36
Benzo(j)anthracene	93.7	94
Dibenz(a,h)acridine	91.0	91
Dibenz(a,j)acridine	85.7	86
7H-Dibenz(c,g)carbazole	79.5	79
Dibenz(a,e)pyrene	78.2	78
Dibenz(a,h)pyrene	50.7	51
Dibenz(a,i)pyrene	2.3	2

SPIKE DUP DATA

SPIKE COMPOUNDS	Reading	%Recovery
7,12-Dimethylbenzo(a)anthracene	23.8	24
Benzo(j)anthracene	104.0	104
Dibenz(a,h)acridine	100.2	100
Dibenz(a,j)acridine	92.3	92
7H-Dibenz(c,g)carbazole	86.0	86
Dibenz(a,e)pyrene	84.2	84
Dibenz(a,h)pyrene	42.4	42
Dibenz(a,i)pyrene	0.0	0

RELATIVE PERCENT DEVIATION

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD
7,12-Dimethylbenzo(a)anthracene	35.7	23.8	40
Benzo(j)anthracene	93.7	104.0	10
Dibenz(a,h)acridine	91.0	100.2	10
Dibenz(a,j)acridine	85.7	92.3	7
7H-Dibenz(c,g)carbazole	79.5	86.0	8
Dibenz(a,e)pyrene	78.2	84.2	7
Dibenz(a,h)pyrene	50.7	42.4	18
Dibenz(a,i)pyrene	2.3	0.0	NC

NC = Not calculable.

MS/MSD SUMMARY SHEET FOR EPA 8270

Curtis & Tompkins, Ltd.

Client: Engineering Science
Analysis Date: 11/10/92 Spike file: ms_7346.d
Sample Matrix: Soil Spike dup file: msd_7346.d

SPIKE DATA

SPIKE COMPOUNDS	Reading	%Recovery
7,12-Dimethylbenzo(a)anthracene	106.3	106
Benzo(j)anthracene	88.56	89
Dibenz(a,h)acridine	91.8	92
Dibenz(a,j)acridine	88.6	89
7H-Dibenz(c,g)carbazole	88.4	88
Dibenz(a,e)pyrene	84.5	84
Dibenz(a,h)pyrene	76.2	76
Dibenz(a,i)pyrene	57.5	58

SPIKE DUP DATA

SPIKE COMPOUNDS	Reading	%Recovery
7,12-Dimethylbenzo(a)anthracene	192.5	192
Benzo(j)anthracene	90.6	91
Dibenz(a,h)acridine	91.4	91
Dibenz(a,j)acridine	87.9	88
7H-Dibenz(c,g)carbazole	78.9	79
Dibenz(a,e)pyrene	84.0	84
Dibenz(a,h)pyrene	75.6	76
Dibenz(a,i)pyrene	61.1	61

RELATIVE PERCENT DEVIATION

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD
7,12-Dimethylbenzo(a)anthracene	106.3	192.5	58
Benzo(j)anthracene	88.6	90.6	2
Dibenz(a,h)acridine	91.8	91.4	<1
Dibenz(a,j)acridine	88.6	87.9	1
7H-Dibenz(c,g)carbazole	88.4	78.9	11
Dibenz(a,e)pyrene	84.5	84.0	<1
Dibenz(a,h)pyrene	76.2	75.6	1
Dibenz(a,i)pyrene	57.5	61.1	6

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8270

Client: Engineering Science
Analysis Date: 11/10/92
Sample Matrix: Soil LCS file: lcs_7346.d

LABORATORY CONTROL SAMPLE DATA

SPIKE COMPOUNDS	Reading	%Recovery
7,12-Dimethylbenzo(a)anthracene	53.0	53
Benzo(j)anthracene	88.51	89
Dibenz(a,h)acridine	89.8	90
Dibenz(a,j)acridine	88.1	88
7H-Dibenz(c,g)carbazole	88.0	88
Dibenz(a,e)pyrene	88.8	89
Dibenz(a,h)pyrene	80.4	161
Dibenz(a,i)pyrene	55.4	111

CHAIN OF CUS[illegible]DY RECORD

PROJECT NO.	PROJECT NAME
PE375.01	CHEVRON

SAMPLERS (Signatures): [signature] [signature] CHAS KELLY

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	ANALYTICAL METHOD: EPA8240										REMARKS
8-2 8-92		H_2O	T.B-1		X										

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
[signature]	10-28-92	DHL		
	TIME 1330		TIME	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	

ENGINEERING-SCIENCE, INC. 211.0858/YO

White: laboratory returns with data, **yellow:** laboratory copy, **pink:** sampler copy

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
PE375.01	CHEVRON

SAMPLERS (Signatures): Kyle Corkery / Chris Kelly

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	EPA 8240	EPA 8270	EPA 9010	DHS-LUFT							REMARKS
-28-92	1200	H2O	EQUIPMENT RINSATE #1	6	X	X	X	X							
-28-92	0800	SOIL	SWMU-35-1-.5'	1		X	X	X							
-28-92	0800	SOIL	SWMU-35-2-.5'	1		X	X	X							
-28-92	0845	SOIL	~~[illegible]~~-BKG-1-0.5'	1		X	X	X							
-28-92	0915	SOIL	MEK PAINT PIT-1-0.5'	1	X										
-28-92	0930	SOIL	MEK PAINT STOCKPILE A+B COMP	1	X										
-28-92	0915	SOIL	MEK PAINT PIT-1-2-0.5	1	X										(SAMPLE 2)
-28-92	0915	SOIL	MEK PAINT PIT-2-0.5	1	X										
-28-92	0915	SOIL	MEK PAINT PIT-2-2-0.5	1	X										(SAMPLE 2)
-28-92	0915	SOIL	MEK PAINT PIT 2D-2-0.5	1	X										(DUP OF SAMPLE 2)
-28-92	0800	SOIL	SWMU-35-1-0.5'	1	X										
-28-92	0800	SOIL	SWMU-35-2-0.5'	1	X										

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	PRESERVATIVES
Kyle Corkery	10-28-92	1330	DHL			
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	SEND RESULTS TO: Please send back blue ice
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	

ENGINEERING-SCIENCE, INC. 211.0858/YO

White: laboratory returns with data, yellow: laboratory copy, pink: sampler copy

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Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

DATE RECEIVED: 12/04/92
DATE REPORTED: 12/09/92

LABORATORY NUMBER: 109430

CLIENT: ENGINEERING SCIENCE

PROJECT ID: PE375.01

LOCATION: CHEVRON

RESULTS: SEE ATTACHED

Reviewed by

Reviewed by

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Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109430
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 12/03/92
DATE RECEIVED: 12/04/92
DATE REPORTED: 12/08/92
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 5 soil samples for analysis of the Skinner list metals, cyanide and pH (pH was not run on the field duplicate).

Cyanide was analyzed using a modified EPA 9010. Recovery for the matrix spike and matrix spike duplicate was 54 and 52 percent (RPD of 4 percent). The recovery of the laboratory control standard was within acceptance criteria indicating that the sample matrix interference is causing the low recovery.

The matrix spike recovery for selenium was 44 percent. All other QC for selenium and arsenic (graphite furnace analyses) was within acceptance criteria.

The analyst inadvertently failed to add the spiking solution to the matrix spike for the EPA 6010 metals. The laboratory control standards (run in duplicate) met all QC criteria so the data was released. The duplicated sample (SWMU-15-1-1', Lab Id. 109430-001) had acceptable RPD for all metals except for barium which had an RDP of 21 percent.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109430-1
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-15-1-1'

DATE SAMPLED: 12/03/92
DATE RECEIVED: 12/04/92
DATE REPORTED: 12/08/92
DATE REVISED: 12/09/92

PARAMETER	RESULT	UNITS	REPORTING LIMIT	METHOD
Antimony	4	mg/Kg	3	EPA 6010
Arsenic	ND	mg/Kg	3	EPA 7060
Barium	13	mg/Kg	0.5	EPA 6010
Beryllium	ND	mg/Kg	0.2	EPA 6010
Cadmium	ND	mg/Kg	0.3	EPA 6010
Chromium	11	mg/Kg	0.5	EPA 6010
Cobalt	1.6	mg/Kg	0.9	EPA 6010
Cyanide	ND	mg/Kg	0.3	EPA 335.2
Lead	7	mg/Kg	3	EPA 7420
Mercury	ND	mg/Kg	0.1	EPA 7471
Nickel	7	mg/Kg	2	EPA 6010
Selenium	ND	mg/Kg	3	EPA 7740
Vanadium	6.2	mg/Kg	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

	RPD,%	Recovery,%	Date Analyzed
Antimony	7	94	12/08/92
Arsenic	3	113	12/08/92
Barium	<1	103	12/08/92
Beryllium	<1	106	12/08/92
Cadmium	9	101	12/08/92
Chromium	<1	102	12/08/92
Cobalt	1	100	12/08/92
Cyanide	<1	98	12/08/92
Lead	7	93	12/09/92
Mercury	<1	101	12/07/92
Nickel	<1	100	12/08/92
Selenium	1	100	12/08/92
Vanadium	<1	101	12/08/92

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109430-2
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-15-2-1'

DATE SAMPLED: 12/03/92
DATE RECEIVED: 12/04/92
DATE REPORTED: 12/08/92
DATE REVISED: 12/09/92

PARAMETER	RESULT	UNITS	REPORTING LIMIT	METHOD
Antimony	ND	mg/Kg	3	EPA 6010
Arsenic	ND	mg/Kg	3	EPA 7060
Barium	9.1	mg/Kg	0.5	EPA 6010
Beryllium	ND	mg/Kg	0.2	EPA 6010
Cadmium	0.4	mg/Kg	0.3	EPA 6010
Chromium	11	mg/Kg	0.5	EPA 6010
Cobalt	1.3	mg/Kg	0.9	EPA 6010
Cyanide	ND	mg/Kg	0.3	EPA 335.2
Lead	5	mg/Kg	3	EPA 7420
Mercury	ND	mg/Kg	0.1	EPA 7471
Nickel	4	mg/Kg	2	EPA 6010
Selenium	ND	mg/Kg	3	EPA 7740
Vanadium	6.0	mg/Kg	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

	RPD,%	Recovery,%	Date Analyzed
Antimony	7	94	12/08/92
Arsenic	3	113	12/08/92
Barium	<1	103	12/08/92
Beryllium	<1	106	12/08/92
Cadmium	9	101	12/08/92
Chromium	<1	102	12/08/92
Cobalt	1	100	12/08/92
Cyanide	<1	98	12/08/92
Lead	7	93	12/09/92
Mercury	<1	101	12/07/92
Nickel	<1	100	12/08/92
Selenium	1	100	12/08/92
Vanadium	<1	101	12/08/92

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109430-3
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-15-3-1'

DATE SAMPLED: 12/03/92
DATE RECEIVED: 12/04/92
DATE REPORTED: 12/08/92
DATE REVISED: 12/09/92

PARAMETER	RESULT	UNITS	REPORTING LIMIT	METHOD
Antimony	4.9	mg/Kg	3	EPA 6010
Arsenic	ND	mg/Kg	3	EPA 7060
Barium	10	mg/Kg	0.5	EPA 6010
Beryllium	0.2	mg/Kg	0.2	EPA 6010
Cadmium	ND	mg/Kg	0.3	EPA 6010
Chromium	13	mg/Kg	0.5	EPA 6010
Cobalt	5.6	mg/Kg	0.9	EPA 6010
Cyanide	ND	mg/Kg	0.3	EPA 335.2
Lead	ND	mg/Kg	3	EPA 7420
Mercury	ND	mg/Kg	0.1	EPA 7471
Nickel	8	mg/Kg	2	EPA 6010
Selenium	ND	mg/Kg	3	EPA 7740
Vanadium	19	mg/Kg	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

	RPD,%	Recovery,%	Date Analyzed
Antimony	7	94	12/08/92
Arsenic	3	113	12/08/92
Barium	<1	103	12/08/92
Beryllium	<1	106	12/08/92
Cadmium	9	101	12/08/92
Chromium	<1	102	12/08/92
Cobalt	1	100	12/08/92
Cyanide	<1	98	12/08/92
Lead	7	93	12/09/92
Mercury	<1	101	12/07/92
Nickel	<1	100	12/08/92
Selenium	1	100	12/08/92
Vanadium	<1	101	12/08/92

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109430-4
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-15-4-1

DATE SAMPLED: 12/03/92
DATE RECEIVED: 12/04/92
DATE REPORTED: 12/08/92
DATE REVISED: 12/09/92

PARAMETER	RESULT	UNITS	REPORTING LIMIT	METHOD
Antimony	3	mg/Kg	3	EPA 6010
Arsenic	ND	mg/Kg	3	EPA 7060
Barium	14	mg/Kg	0.5	EPA 6010
Beryllium	ND	mg/Kg	0.2	EPA 6010
Cadmium	ND	mg/Kg	0.3	EPA 6010
Chromium	9.7	mg/Kg	0.5	EPA 6010
Cobalt	1.0	mg/Kg	0.9	EPA 6010
Cyanide	ND	mg/Kg	0.3	EPA 335.2
Lead	3	mg/Kg	3	EPA 7420
Mercury	ND	mg/Kg	0.1	EPA 7471
Nickel	3	mg/Kg	2	EPA 6010
Selenium	ND	mg/Kg	3	EPA 7740
Vanadium	6.6	mg/Kg	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

	RPD,%	Recovery,%	Date Analyzed
Antimony	7	94	12/08/92
Arsenic	3	113	12/08/92
Barium	<1	103	12/08/92
Beryllium	<1	106	12/08/92
Cadmium	9	101	12/08/92
Chromium	<1	102	12/08/92
Cobalt	1	100	12/08/92
Cyanide	<1	98	12/08/92
Lead	7	93	12/09/92
Mercury	<1	101	12/07/92
Nickel	<1	100	12/08/92
Selenium	1	100	12/08/92
Vanadium	<1	101	12/08/92

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109430-5
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-15Dup(4)-1'

DATE SAMPLED: 12/03/92
DATE RECEIVED: 12/04/92
DATE REPORTED: 12/08/92
DATE REVISED: 12/09/92

PARAMETER	RESULT	UNITS	REPORTING LIMIT	METHOD
Antimony	ND	mg/Kg	3	EPA 6010
Arsenic	ND	mg/Kg	3	EPA 7060
Barium	13	mg/Kg	0.5	EPA 6010
Beryllium	ND	mg/Kg	0.2	EPA 6010
Cadmium	ND	mg/Kg	0.3	EPA 6010
Chromium	9.2	mg/Kg	0.5	EPA 6010
Cobalt	1.3	mg/Kg	0.9	EPA 6010
Cyanide	ND	mg/Kg	0.3	EPA 335.2
Lead	7	mg/Kg	3	EPA 7420
Mercury	ND	mg/Kg	0.1	EPA 7471
Nickel	4	mg/Kg	2	EPA 6010
Selenium	ND	mg/Kg	3	EPA 7740
Vanadium	7.9	mg/Kg	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

	RPD,%	Recovery,%	Date Analyzed
Antimony	7	94	12/08/92
Arsenic	3	113	12/08/92
Barium	<1	103	12/08/92
Beryllium	<1	106	12/08/92
Cadmium	9	101	12/08/92
Chromium	<1	102	12/08/92
Cobalt	1	100	12/08/92
Cyanide	<1	98	12/08/92
Lead	7	93	12/09/92
Mercury	<1	101	12/07/92
Nickel	<1	100	12/08/92
Selenium	1	100	12/08/92
Vanadium	<1	101	12/08/92

Curtis & Tompkins, Ltd.

Client: **Engineering Science, Inc.** **Laboratory Login Number: 109430**

Project Name: Chevron Hawaiian Refinery Report Date: 08 December 92
Project Number: PE375.01

ANALYSIS: pH

Lab ID	Sample ID	Matrix	Sampled	Received	Analyzed	Result	Units	Method	Analyst	QC Batch
109430-001	SWMU-15-1-1'	Soil	03-DEC-92	04-DEC-92	07-DEC-92	8.1	SU *	EPA 9045	TR	7662
109430-002	SWMU-15-2-1'	Soil	03-DEC-92	04-DEC-92	07-DEC-92	8.5	SU *	EPA 9045	TR	7662
109430-003	SWMU-15-3-1'	Soil	03-DEC-92	04-DEC-92	07-DEC-92	8.4	SU *	EPA 9045	TR	7662
109430-004	SWMU-15-4-1'	Soil	03-DEC-92	04-DEC-92	07-DEC-92	8.3	SU *	EPA 9045	TR	7662

* Soil pH measured as water

Curtis & Tompkins, Ltd.

Q C B a t c h R e p o r t

Client: Engineering Science, Inc.
Project Name: Chevron Hawaiian Refinery
Project Number: PE375.01

Laboratory Login Number: 109430
Report Date: 08 December 92

ANALYSIS: pH

QC Batch Number: 7662

Calibration Verification Results

Sample	Result	TV	Difference	Limit	Analyzed
ICV	10.02	10.00	.02	< 0.10	07-DEC-92
CCV	7.02	7.00	.02	< 0.10	07-DEC-92
CCV	7.00	7.00	.00	< 0.10	07-DEC-92

Sample Duplicate Results

Sample	Duplicate	RPD	Analyzed
7.74	7.74	0%	07-DEC-92

CHAIN OF CUSTODY RECORD

PROJECT NO.: PE37501

PROJECT NAME: CHEVRON

SAMPLERS (Signatures): Kyle Caskey, Kyle Caskey

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	EPA 9010	EPA 9045	EPA 1010	EPA 7060	EPA 7420	EPA 7740	EPA 7471				REMARKS
1-3-92	1100	SOIL	SWMU-15-1-1'	2	X	X	X	X	X	X	X				WORK PLAN STATES -
2-3-92	1100	SOIL	SWMU-15-2-1'	2	X	X	X	X	X	X	X				SOIL SAMPLES WILL
2-3-92	1100	SOIL	SWMU-15-3-1'	2	X	X	X	X	X	X	X				BE ANALYZED FOR
2-3-92	1100	SOIL	SWMU-15-4-1'	2	X	X	X	X	X	X	X				pH & the SKINNER
2-3-92	1100	SOIL	SWMU-15 DUP(4)-1'	1	X		X	X	X	X	X				LIST OF INORGANIC
															COMPOUNDS, except
															the DUP. does NOT
															need pH RAN. IF
															you have quest on. please
															refer to the work plan
															or give myself A CALL.

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
Kyle Caskey	12-3-92			NONE.
	TIME 1300		TIME	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	

ENGINEERING-SCIENCE, INC. 211.0858/YO

White: laboratory returns with data, yellow: laboratory copy, pink: sampler copy

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

DATE RECEIVED: 01/15/93
DATE REPORTED: 02/09/93

LABORATORY NUMBER: 109770

CLIENT: ENGINEERING SCIENCE, INC.

PROJECT ID: PE 375.01

LOCATION: CHEVRON HAWAII REFINERY

RESULTS: SEE ATTACHED

Tuesa K. Morrison
Reviewed by

Reviewed by

This report may be reproduced only in its entirety.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93
DATE REPORTED: 02/09/93
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 24 soil samples on January 15, 1993 for analysis of the Skinner list metals. Five of the samples were all so to be analyzed for cyanide and pH.

Cyanide and pH analysis met all project data quality objectives.

The RPD for mercury batch B is 29 percent. The sample and sample duplicated results are 0.4 and 0.5 mg/Kg (the detection limit is 0.1 mg/Kg) which results in an unacceptable RPD but is clearly acceptable data.

The EPA 6010 sample spike recovery for both batches indicates that the matrix may be causing interferences. The sample spiked in batch A has very high levels of calcium which might contribute to some of the low recoveries (the ICP is set up to compensate for calcium interference, but each sample is different). The RPD failure for cadmium in batch B is due to two measurements near the detection limit. Spike recovery failure for chromium in batch A is a result of the sample background containing a high amount of chromium compared to the spike used. No other sources of failures can be determined positively.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93
DATE ANALYZED: 01/27/93

ANALYSIS: CYANIDE
ANALYSIS METHOD: EPA 335.2

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
109770-020	SWMU-16-1-0.5	ND	mg/Kg	0.3
109770-021	SWMU-16-2-0.5	ND	mg/Kg	0.3
109770-022	SWMU-16-3-0.5	ND	mg/Kg	0.3
109770-023	SWMU-16-4-0.5	ND	mg/Kg	0.3
109770-024	SWMU-16-4D-0.5	ND	mg/Kg	0.3

ND = Not detected at or above the reporting limit.

QA/QC SUMMARY:

LCS RECOVERY, %	92
MS/MSD RECOVERY, %	70
MS/MSD RPD, %	12

Curtis & Tompkins, Ltd.

Client: Engineering Science, Inc.

Laboratory Login Number: 109770

Project Name: Chevron Hawaiian Refinery

Report Date: 09 February 93

Project Number: PE375.01

ANALYSIS: pH

Lab ID	Sample ID	Matrix	Sampled	Received	Analyzed	Result	Units	Method	Analyst	QC Batch
109770-020	SWMU-16-1-0.5	Soil	14-JAN-93	15-JAN-93	22-JAN-93	8.3	SU *	EPA 9045	TR	8093
109770-021	SWMU-16-2-0.5	Soil	14-JAN-93	15-JAN-93	22-JAN-93	8.2	SU *	EPA 9045	TR	8093
109770-022	SWMU-16-3-0.5	Soil	14-JAN-93	15-JAN-93	22-JAN-93	8.1	SU *	EPA 9045	TR	8093
109770-023	SWMU-16-4-0.5	Soil	14-JAN-93	15-JAN-93	22-JAN-93	8.2	SU *	EPA 9045	TR	8093
109770-024	SWMU-16-4D-0.5	Soil	14-JAN-93	15-JAN-93	22-JAN-93	8.3	SU *	EPA 9045	TR	8093

* Soil pH measured as water

Curtis & Tompkins, Ltd.

QC Batch Report

Client: Engineering Science, Inc.
Project Name: Chevron Hawaiian Refinery
Project Number: PE375.01

Laboratory Login Number: 109770
Report Date: 09 February 93

ANALYSIS: pH

QC Batch Number: 8093

Calibration Verification Results

Sample	Result	TV	Difference	Limit	Analyzed
ICV	8.01	8.00	.01	< 0.10	22-JAN-93
CCV	7.01	7.00	.01	< 0.10	22-JAN-93

Sample Duplicate Results

Sample	Duplicate	RPD	Analyzed
8.20	8.23	.4%	22-JAN-93

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-001
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-20-1-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	4	3	EPA 6010
Arsenic	7	3	EPA 7060
Barium	10	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.3	0.3	EPA 6010
Chromium (total)	35	0.5	EPA 6010
Cobalt	5.5	0.9	EPA 6010
Lead	24	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	26	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	26	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-002
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-20-2-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	14	3	EPA 7060
Barium	17	0.5	EPA 6010
Beryllium	0.1	0.1	EPA 6010
Cadmium	0.6	0.3	EPA 6010
Chromium (total)	25	0.5	EPA 6010
Cobalt	2.1	0.9	EPA 6010
Lead	90	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	16	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	16	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-003
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-20-3-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	4	3	EPA 6010
Arsenic	13	3	EPA 7060
Barium	35	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.6	0.3	EPA 6010
Chromium (total)	52	0.5	EPA 6010
Cobalt	6.4	0.9	EPA 6010
Lead	120	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	40	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	36	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-004
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-25-1-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	20	3	EPA 6010
Arsenic	14	3	EPA 7060
Barium	26	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	2.1	0.3	EPA 6010
Chromium (total)	60	0.5	EPA 6010
Cobalt	3.4	0.9	EPA 6010
Lead	51	3	EPA 7420
Mercury	0.4	0.1	EPA 7471
Nickel	114	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	200	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-005
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-25-2-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	12	3	EPA 7060
Barium	32	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.4	0.3	EPA 6010
Chromium (total)	120	0.5	EPA 6010
Cobalt	8.1	0.9	EPA 6010
Lead	78	3	EPA 7420
Mercury	0.8	0.1	EPA 7471
Nickel	170	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	89	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-006
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-25-3-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	4	3	EPA 6010
Arsenic	13	3	EPA 7060
Barium	50	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.5	0.3	EPA 6010
Chromium (total)	87	0.5	EPA 6010
Cobalt	23	0.9	EPA 6010
Lead	60	3	EPA 7420
Mercury	0.2	0.1	EPA 7471
Nickel	84	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	80	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-007
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-27-1-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	5	3	EPA 6010
Arsenic	25	5	EPA 7060
Barium	63	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.4	0.3	EPA 6010
Chromium (total)	22	0.5	EPA 6010
Cobalt	7.5	0.9	EPA 6010
Lead	55	3	EPA 7420
Mercury	0.2	0.1	EPA 7471
Nickel	39	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	94	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-008
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-27-2-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	5	3	EPA 6010
Arsenic	39	5	EPA 7060
Barium	72	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	2.7	0.3	EPA 6010
Chromium (total)	26	0.5	EPA 6010
Cobalt	8.7	0.9	EPA 6010
Lead	61	3	EPA 7420
Mercury	0.9	0.1	EPA 7471
Nickel	55	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	140	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-009
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-27-3-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	3	3	EPA 6010
Arsenic	17	3	EPA 7060
Barium	38	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	2.8	0.3	EPA 6010
Chromium (total)	20	0.5	EPA 6010
Cobalt	4.6	0.9	EPA 6010
Lead	44	3	EPA 7420
Mercury	1.4	0.1	EPA 7471
Nickel	37	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	96	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-010
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-27-4-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	20	3	EPA 7060
Barium	50	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	8.0	0.3	EPA 6010
Chromium (total)	22	0.5	EPA 6010
Cobalt	4.3	0.9	EPA 6010
Lead	63	3	EPA 7420
Mercury	60	4	EPA 7471
Nickel	68	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	160	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = B
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-011
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-27-5-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	5	3	EPA 6010
Arsenic	25	5	EPA 7060
Barium	30	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.6	0.3	EPA 6010
Chromium (total)	22	0.5	EPA 6010
Cobalt	4.0	0.9	EPA 6010
Lead	61	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	41	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	83	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-012
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-27-5D-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	4	3	EPA 6010
Arsenic	21	5	EPA 7060
Barium	30	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.1	0.3	EPA 6010
Chromium (total)	21	0.5	EPA 6010
Cobalt	4.4	0.9	EPA 6010
Lead	61	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	42	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	89	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-013
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-28-1-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	5	3	EPA 6010
Arsenic	23	5	EPA 7060
Barium	23	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.3	0.3	EPA 6010
Chromium (total)	34	0.5	EPA 6010
Cobalt	8.6	0.9	EPA 6010
Lead	59	3	EPA 7420
Mercury	0.3	0.1	EPA 7471
Nickel	29	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	19	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-014
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-28-2-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	3	3	EPA 6010
Arsenic	11	3	EPA 7060
Barium	67	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.4	0.3	EPA 6010
Chromium (total)	34	0.5	EPA 6010
Cobalt	5.6	0.9	EPA 6010
Lead	62	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	45	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	23	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-015
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-28-3-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	5	3	EPA 6010
Arsenic	6	3	EPA 7060
Barium	17	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.6	0.3	EPA 6010
Chromium (total)	14	0.5	EPA 6010
Cobalt	1.6	0.9	EPA 6010
Lead	19	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	11	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	14	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-016
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-28-4-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	4	3	EPA 6010
Arsenic	7	3	EPA 7060
Barium	32	0.5	EPA 6010
Beryllium	0.1	0.1	EPA 6010
Cadmium	1.0	0.3	EPA 6010
Chromium (total)	20	0.5	EPA 6010
Cobalt	2.9	0.9	EPA 6010
Lead	40	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	28	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	13	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-017
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-35-1-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	5	3	EPA 6010
Arsenic	17	3	EPA 7060
Barium	46	0.5	EPA 6010
Beryllium	0.7	0.1	EPA 6010
Cadmium	0.9	0.3	EPA 6010
Chromium (total)	48	0.5	EPA 6010
Cobalt	12	0.9	EPA 6010
Lead	93	3	EPA 7420
Mercury	0.9	0.1	EPA 7471
Nickel	130	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	120	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = A
As,Se Batch = A
Hg Batch = A
Pb Batch = A

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-018
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-35-2-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	11	3	EPA 7060
Barium	43	0.5	EPA 6010
Beryllium	2.2	0.1	EPA 6010
Cadmium	0.5	0.3	EPA 6010
Chromium (total)	33	0.5	EPA 6010
Cobalt	12	0.9	EPA 6010
Lead	23	3	EPA 7420
Mercury	0.5	0.1	EPA 7471
Nickel	41	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	67	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = B
As,Se Batch = A
Hg Batch = B
Pb Batch = B

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-019
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-20-2D-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	7	3	EPA 6010
Arsenic	10	3	EPA 7060
Barium	37	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	43	0.5	EPA 6010
Cobalt	4.2	0.9	EPA 6010
Lead	15	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	30	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	35	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = B
As,Se Batch = A
Hg Batch = B
Pb Batch = B

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-020
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-16-1-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	11	3	EPA 7060
Barium	27	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	13	0.5	EPA 6010
Cobalt	1.6	0.9	EPA 6010
Lead	10	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	5	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	7.5	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = B
As,Se Batch = A
Hg Batch = B
Pb Batch = B

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-021
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-16-2-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	4	3	EPA 6010
Arsenic	9	3	EPA 7060
Barium	20	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.3	0.3	EPA 6010
Chromium (total)	12	0.5	EPA 6010
Cobalt	1.4	0.9	EPA 6010
Lead	12	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	5	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	6.2	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = B
As,Se Batch = A
Hg Batch = B
Pb Batch = B

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-022
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-16-3-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	4	3	EPA 6010
Arsenic	13	3	EPA 7060
Barium	19	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.4	0.3	EPA 6010
Chromium (total)	12	0.5	EPA 6010
Cobalt	2.0	0.9	EPA 6010
Lead	5	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	5	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	15	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = B
As,Se Batch = A
Hg Batch = B
Pb Batch = B

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-023
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-16-4-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	3	3	EPA 6010
Arsenic	4	3	EPA 7060
Barium	24	0.5	EPA 6010
Beryllium	0.1	0.1	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	11	0.5	EPA 6010
Cobalt	1.9	0.9	EPA 6010
Lead	4	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	8	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	9.1	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = B
As,Se Batch = A
Hg Batch = B
Pb Batch = B

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770-024
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY
SAMPLE ID: SWMU-16-4D-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93

Metals in Soil & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	4	3	EPA 7060
Barium	23	0.5	EPA 6010
Beryllium	0.1	0.1	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	12	0.5	EPA 6010
Cobalt	2.1	0.9	EPA 6010
Lead	230	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	6	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	9.7	0.5	EPA 6010

ND = Not detected at or above reporting limit.

QC INFORMATION

ICP Batch = B
As,Se Batch = A
Hg Batch = B
Pb Batch = B

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAII REFINERY

QC for Metals in Soil & Wastes

	BATCH	LCS RECOVERY,%	SAMPLE DUP RPD,%	SAMPLE SPIKE RECOVERY,%	DATE ANALYZED
Antimony	A	90	NC	31	01/20/93
	B	96	NC	21	01/21/93
Arsenic	A	99	8	86	01/18/93
	B	86	2	80	01/18/93
Barium	A	97	11	80	01/20/93
	B	98	3	80	01/21/93
Beryllium	A	100	NC	78	01/20/93
	B	104	9	66	01/21/93
Cadmium	A	114	NC	124	01/20/93
	B	120	52	114	01/21/93
Chromium	A	94	61	0	01/20/93
	B	98	9	83	01/21/93
Cobalt	A	94	32	71	01/20/93
	B	97	3	70	01/21/93
Lead	A	86	24	88	01/19/93
	B	90	39	230	01/19/93
Mercury	A	96	NC	80	01/20/93
	B	102	29	81	01/20/93
Nickel	A	92	6	73	01/20/93
	B	95	11	99	01/21/93
Selenium	A	97	NC	80	01/18/93
	B	98	NC	66	01/18/93
Vanadium	A	95	12	0	01/20/93
	B	97	17	93	01/21/93

NC = Not Calculable

CHAIN OF CUSTODY RECORD

PROJECT NO.: PE375.01

PROJECT NAME: CHEVRON

SAMPLERS (Signatures): Kyle Caskey, Kyle Caskey

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	METALS	CYANIDE	pH								REMARKS
1-14-93	1300	SOIL	SWMU-16-1-0.5	1	X	X	X								
1-14-93	1305	SOIL	SWMU-16-2-0.5	1	X	X	X								
1-14-93	1310	SOIL	SWMU-16-3-0.5	1	X	X	X								
1-14-93	1315	SOIL	SWMU-16-4-0.5	1	X	X	X								
1-14-93	1315	SOIL	SWMU-16-4D-0.5	1	X	X	X								DUPLICATE

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	PRESERVATIVES
Kyle Caskey	1-14-93	1700	[illegible]	1/15/93	9:30 am	NONE
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	

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CHAIN OF CUSTODY RECORD

PROJECT NO.: PE375.01

PROJECT NAME: CHEVRON

SAMPLERS (Signatures): Kyle Caskey, Kyle Caskey

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	METALS	REMARKS
1-14-93	1100	SOIL	SWMU-28-1-0.5	1	X	
1-14-93	1105	SOIL	SWMU-28-2-0.5	1	X	
1-14-93	1110	SOIL	SWMU-28-3-0.5	1	X	
1-14-93	1120	SOIL	SWMU-28-4-0.5	1	X	
1-14-93	1200	SOIL	SWMU-35-1-0.5	1	X	
1-14-93	1205	SOIL	SWMU-35-2-0.5	1	X	
1-14-93	0930	SOIL	SWMU-20-2D-0.5	1	X	DUPLICATE

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
Kyle Caskey	1-14-93	[illegible]	1/15/93	
	TIME 1700		TIME 9:30	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	

ENGINEERING-SCIENCE, INC. 211.0858/YO

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CHAIN OF CUSTODY RECORD

PROJECT NO.: PE375.01

PROJECT NAME: CHEVRON

SAMPLERS (Signatures): Kyle Caskey, Kyle Caskey

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	METALS										REMARKS
1-14-93	0920	SOIL	SWMU-20-1-0.5	1	X										
1-14-93	0930	SOIL	SWMU-20-2-0.5	1	X										
1-14-93	0940	SOIL	SWMU-20-3-0.5	1	X										
1-14-93	0950	SOIL	SWMU-25-1-0.5	1	X										
1-14-93	1000	SOIL	SWMU-25-2-0.5	1	X										
1-14-93	1010	SOIL	SWMU-25-3-0.5	1	X										
1-14-93	1015	SOIL	SWMU-27-1-0.5	1	X										
1-14-93	1026	SOIL	SWMU-27-2-0.5	1	X										
1-14-93	1030	SOIL	SWMU-27-3-0.5	1	X										
1-14-93	1040	SOIL	SWMU-27-4-0.5	1	X										
1-14-93	1050	SOIL	SWMU-27-5-0.5	1	X										
1-14-93	1050	SOIL	SWMU-27-5D-0.5	1	X										DUPLICATE

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
Kyle Caskey	1-14-93	[illegible]	1/15/93	
	TIME 1700		TIME 9:30	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	

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DATE RECEIVED: 01/19/93
DATE REPORTED: 02/16/93

LABORATORY NUMBER: 109791

CLIENT: ENGINEERING SCIENCE, INC.

PROJECT ID: PE375.01

LOCATION: CHEVRON HAWAIIAN REFINERY

RESULTS: SEE ATTACHED

Reviewed by

Reviewed by

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Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109791
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/18/93
DATE RECEIVED: 01/19/93
DATE REPORTED: 02/16/93
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 4 soil samples for analysis of the Skinner list metals.

Cadmium sample spike recovery for the batch was 65 percent (the spiked sample was not one of the project related samples). All other data quality objectives for the EPA 6010 analysis were met.

Data quality objectives for all graphite furnace and the mercury analysis were met.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109791-1
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWIIAN REFINERY
SAMPLE ID: SWMU-17-1-0.5

DATE SAMPLED: 01/18/93
DATE RECEIVED: 01/19/93
DATE ANALYZED: 01/22-26,02/05/93
DATE REPORTED: 02/16/93

Metals in Soils and Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	5	3	EPA 7060
Barium	23	5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	25	5	EPA 6010
Cobalt	ND	9	EPA 6010
Lead	48	3	EPA 7420
Mercury	0.1	0.1	EPA 7471
Nickel	30	20	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	42	5	EPA 6010

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

	RPD,%	RECOVERY,%		RPD,%	RECOVERY,%
Antimony	17	88	Cobalt	<1	94
Arsenic	NA	100	Lead	<1	96
Barium	<1	97	Mercury	<1	100
Beryllium	<1	105	Nickel	<1	92
Cadmium	<1	81	Selenium	14	91
Chromium (total)	2	98	Vanadium	<1	97

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109791-2
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWIIAN REFINERY
SAMPLE ID: SWMU-17-2-0.5

DATE SAMPLED: 01/18/93
DATE RECEIVED: 01/19/93
DATE ANALYZED: 01/22-26,02/05/93
DATE REPORTED: 02/16/93

Metals in Soils and Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	5	3	EPA 7060
Barium	16	5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	21	5	EPA 6010
Cobalt	ND	9	EPA 6010
Lead	22	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	ND	20	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	22	5	EPA 6010

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

	RPD,%	RECOVERY,%		RPD,%	RECOVERY,%
Antimony	17	88	Cobalt	<1	94
Arsenic	NA	100	Lead	<1	96
Barium	<1	97	Mercury	<1	100
Beryllium	<1	105	Nickel	<1	92
Cadmium	<1	81	Selenium	14	91
Chromium (total)	2	98	Vanadium	<1	97

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109791-3
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWIIAN REFINERY
SAMPLE ID: SWMU-17-3-0.5

DATE SAMPLED: 01/18/93
DATE RECEIVED: 01/19/93
DATE ANALYZED: 01/22-26,02/05/93
DATE REPORTED: 02/16/93

Metals in Soils and Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	7	3	EPA 7060
Barium	34	5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	27	5	EPA 6010
Cobalt	ND	9	EPA 6010
Lead	72	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	40	20	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	48	5	EPA 6010

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

	RPD,%	RECOVERY,%		RPD,%	RECOVERY,%
Antimony	17	88	Cobalt	<1	94
Arsenic	NA	100	Lead	<1	96
Barium	<1	97	Mercury	<1	100
Beryllium	<1	105	Nickel	<1	92
Cadmium	<1	81	Selenium	14	91
Chromium (total)	2	98	Vanadium	<1	97

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109791-4
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWIIAN REFINERY
SAMPLE ID: SWMU-17-4-0.5

DATE SAMPLED: 01/18/93
DATE RECEIVED: 01/19/93
DATE ANALYZED: 01/22-26,02/05/93
DATE REPORTED: 02/16/93

Metals in Soils and Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	3	3	EPA 7060
Barium	16	5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	19	5	EPA 6010
Cobalt	ND	9	EPA 6010
Lead	13	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	ND	20	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	15	5	EPA 6010

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

	RPD,%	RECOVERY,%		RPD,%	RECOVERY,%
Antimony	17	88	Cobalt	<1	94
Arsenic	NA	100	Lead	<1	96
Barium	<1	97	Mercury	<1	100
Beryllium	<1	105	Nickel	<1	92
Cadmium	<1	81	Selenium	14	91
Chromium (total)	2	98	Vanadium	<1	97

109791

CHAIN OF CUSTO. RECORD

PROJECT NO.	PROJECT NAME
PE375.01	CHEVRON

SAMPLERS (Signatures): Kyle Cosby

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	METALS										REMARKS
1-18-93	0930	SOIL	SWMU-17-1-0.5	1	X										
1-18-93	0935	SOIL	SWMU-17-2-0.5	1	X										
1-18-93	0940	SOIL	SWMU-17-3-0.5	1	X										
1-18-93	0945	SOIL	SWMU-17-4-0.5	1	X										

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
Kyle Cosby	1-18-93	Norman Hilton	1/19/93	
	TIME 1400		TIME 9:15 am	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	

ENGINEERING-SCIENCE, INC. 211.0858/YO

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DATE RECEIVED: 01/29/93
DATE REPORTED: 03/08/93

LABORATORY NUMBER: 109904

CLIENT: ENGINEERING SCIENCE, INC.

PROJECT ID: PE375.01

LOCATION: CHEVRON HAWAIIAN REFINERY

RESULTS: SEE ATTACHED

Teresa K. Morrison
Reviewed by

Reviewed by

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LABORATORY NUMBER: 109904
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/29/93
DATE RECEIVED: 01/29/93
DATE REPORTED: 02/23/93
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 4 soil samples on January 29, 1993. All four of the samples were for analysis of the revised Skinner list semivolatiles. One sample (BKG-1-1.5) was also analyzed for other Skinner list analytes.

For the semivolatiles analysis, the samples were extracted by EPA 3550 followed by silica gel cleanup with dichloromethane as the final solvent. Samples were then analyzed by EPA 8270 using selective ion monitoring to reduce the interference from the hydrocarbons present in the background. Two extracts had to be diluted due to the background and surrogates were diluted out. The other two samples and the matrix spikes have low surrogate recoveries. Method blank and laboratory control standard (LCS) surrogates are acceptable as are the analyte recoveries in the LCS. The method blank was contaminated with bis-(2-ethylhexyl)phthalate at approximately the same level as the samples.

Spike recovery for isobutyl alcohol averaged 50 percent in the matrix indicating that the extraction procedure may not be adequate. Precision is good (4 % RPD) and the blank spike recoveries are acceptable indicating that laboratory error is not a likely source of the low recoveries. No data quality objectives for isobutyl alcohol were determined for this project.

The mercury LCS recovery is acceptable indicating that instrument calibration, reagents and procedures used in the analysis met QC specifications, but the sample spike and duplicate data did not meet project specifications. The sample used in this mercury batch is not from this project and the performance of the method on this sample may not be representative of recovery for the associated samples.

The EPA 6010 sample spike recoveries for antimony, cadmium, chromium, nickel and vanadium did not meet project data quality objectives. Precision data for nickel also exceeded the acceptance criteria. Laboratory control standards for all elements was acceptable so the data were reported. The sample spiked and duplicated was not associated with this project.

Surrogate recoveries for EPA 8240 were out of limits for two of the three surrogates for sample BKG-1-0.5 (Lab ID. 1099044-001). This failure was confirmed through re-analysis and is due to the sample matrix.

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Eric Chase
Engineering Science, Inc.
1357 Kapiolani Boulevard
Suite 1120
Honolulu, HI 96814

March 9, 1993

re: Skinner list semivolatiles analysis (C&T # 109904, 110154)

Dear Mr. Chase:

Curtis & Tompkins, Ltd. received four soil samples on January 29, 1993 to be analyzed for the revised Skinner semivolatiles list. These samples were extracted by EPA method 3550 (sonication) followed by a silica gel cleanup procedure to remove as much of the hydrocarbon background as possible. The initial request was to do a non-activated silica gel cleanup with hexane as the final solvent, but the revised Skinner list includes pyridine, which elutes before hexane. Dichloromethane was used as the final solvent. The samples were then analyzed by EPA method 8270 using selected ion monitoring (SIM) to further reduce the hydrocarbon interferences. Two of the extracts were analyzed at a 1:10 dilution because of the high hydrocarbon background. No surrogate recoveries are reported for these two samples due to this dilution. The remaining two samples and the matrix spikes have lower surrogate recoveries than do the method blank and laboratory check sample, suggesting that matrix effects are interfering with the recoveries. The laboratory check sample has much better spike recoveries than the matrix spikes, which exhibit both poor recoveries and poor duplication of the recoveries, confirming that this is a matrix problem.

Also analyzed with these samples was one soil (C&T #110154) which was sampled on January 14 and which did not have the matrix problem described above.

If you have any questions, please call me at (510)-486-0900.

Sincerely,

Teresa K. Morrison

Teresa K. Morrison
Project Manager

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904-001
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: BKG-1-0.5

DATE SAMPLED: 01/27/93
DATE RECEIVED: 01/29/93
DATE EXTRACTED: 02/10/93
DATE ANALYZED: 03/02/93
DATE REPORTED: 03/08/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Pyridine	ND	20
Phenol	ND	20
1,3-Dichlorobenzene	ND	20
1,4-Dichlorobenzene	ND	20
1,2-Dichlorobenzene	ND	20
Indene	ND	20
2-Methylphenol	ND	20
4-Methylphenol	ND	20
2,4-Dimethylphenol	ND	20
Quinoline	ND	20
Naphthalene	ND	20
1-Methylnaphthalene	ND	20
Dimethylphthalate	ND	20
2,4-Dinitrophenol	ND	20
4-Nitrophenol	ND	20
Diethylphthalate	ND	20
Phenanthrene	ND	20
Anthracene	ND	20
Benzenethiol	70	20
Di-n-butylphthalate	ND	20
Fluoranthene	ND	20
Pyrene	ND	20
Butylbenzylphthalate	ND	20
Benzo(a)anthracene	ND	20
bis(2-ethylhexyl)phthalate	ND	20
Chrysene	ND	20
4-Methylchrysene	ND	20
Di-n-octylphthalate	ND	20
7,12-Dimethylbenz(a)anthracene	ND	20
Benzo(b)fluoranthene	ND	20
Benzo(k)fluoranthene	ND	20
Benzo(a)pyrene	ND	20
Dibenz(a,h)anthracene	ND	20
Dibenz(a,h)acridine	ND	20

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	26	Nitrobenzene-d5	27
Phenol-d6	27	2-Fluorobiphenyl	29
2,4,6-Tribromophenol	27	Terphenyl-d14	30

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904-002
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-27-1R-0.5

DATE SAMPLED: 01/27/93
DATE RECEIVED: 01/29/93
DATE EXTRACTED: 02/10/93
DATE ANALYZED: 03/03/93
DATE REPORTED: 03/08/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Pyridine	ND	20
Phenol	ND	20
1,3-Dichlorobenzene	ND	20
1,4-Dichlorobenzene	ND	20
1,2-Dichlorobenzene	ND	20
Indene	ND	20
2-Methylphenol	ND	20
4-Methylphenol	ND	20
2,4-Dimethylphenol	ND	20
Quinoline	ND	20
Naphthalene	ND	20
1-Methylnaphthalene	ND	20
Dimethylphthalate	20	20
2,4-Dinitrophenol	ND	20
4-Nitrophenol	ND	20
Diethylphthalate	ND	20
Phenanthrene	detected(17)	20
Anthracene	ND	20
Benzenethiol	ND	20
Di-n-butylphthalate	ND	20
Fluoranthene	ND	20
Pyrene	ND	20
Butylbenzylphthalate	ND	20
Benzo(a)anthracene	ND	20
bis(2-ethylhexyl)phthalate	50	20
Chrysene	detected(17)	20
4-Methylchrysene	20	20
Di-n-octylphthalate	40	20
7,12-Dimethylbenz(a)anthracene	ND	20
Benzo(b)fluoranthene	ND	20
Benzo(k)fluoranthene	ND	20
Benzo(a)pyrene	ND	20
Dibenz(a,h)anthracene	ND	20
Dibenz(a,h)acridine	ND	20

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	15	Nitrobenzene-d5	15
Phenol-d6	15	2-Fluorobiphenyl	15
2,4,6-Tribromophenol	16	Terphenyl-d14	19

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904-003
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-27-3R-0.5

DATE SAMPLED: 01/27/93
DATE RECEIVED: 01/29/93
DATE EXTRACTED: 02/10/93
DATE ANALYZED: 03/03/93
DATE REPORTED: 03/08/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Pyridine	ND	200
Phenol	ND	200
1,3-Dichlorobenzene	ND	200
1,4-Dichlorobenzene	ND	200
1,2-Dichlorobenzene	ND	200
Indene	ND	200
2-Methylphenol	ND	200
4-Methylphenol	ND	200
2,4-Dimethylphenol	ND	200
Quinoline	ND	200
Naphthalene	ND	200
1-Methylnaphthalene	ND	200
Dimethylphthalate	ND	200
2,4-Dinitrophenol	ND	200
4-Nitrophenol	ND	200
Diethylphthalate	ND	200
Phenanthrene	ND	200
Anthracene	ND	200
Benzenethiol	ND	200
Di-n-butylphthalate	ND	200
Fluoranthene	ND	200
Pyrene	ND	200
Butylbenzylphthalate	ND	200
Benzo(a)anthracene	ND	200
bis(2-ethylhexyl)phthalate	ND	200
Chrysene	ND	200
4-Methylchrysene	ND	200
Di-n-octylphthalate	ND	200
7,12-Dimethylbenz(a)anthracene	ND	200
Benzo(b)fluoranthene	ND	200
Benzo(k)fluoranthene	ND	200
Benzo(a)pyrene	ND	200
Dibenz(a,h)anthracene	ND	200
Dibenz(a,h)acridine	ND	200

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	- diluted out -	Nitrobenzene-d5	- diluted out-
Phenol-d6	- diluted out -	2-Fluorobiphenyl	- diluted out-
2,4,6-Tribromophenol	- diluted out -	Terphenyl-d14	- diluted out-

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904-004
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-27-5R-0.5

DATE SAMPLED: 01/27/93
DATE RECEIVED: 01/29/93
DATE EXTRACTED: 02/10/93
DATE ANALYZED: 03/03/93
DATE REPORTED: 03/08/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Pyridine	ND	200
Phenol	ND	200
1,3-Dichlorobenzene	ND	200
1,4-Dichlorobenzene	ND	200
1,2-Dichlorobenzene	ND	200
Indene	ND	200
2-Methylphenol	ND	200
4-Methylphenol	ND	200
2,4-Dimethylphenol	ND	200
Quinoline	ND	200
Naphthalene	ND	200
1-Methylnaphthalene	detected(190)	200
Dimethylphthalate	ND	200
2,4-Dinitrophenol	ND	200
4-Nitrophenol	ND	200
Diethylphthalate	ND	200
Phenanthrene	ND	200
Anthracene	ND	200
Benzenethiol	ND	200
Di-n-butylphthalate	ND	200
Fluoranthene	ND	200
Pyrene	ND	200
Butylbenzylphthalate	ND	200
Benzo(a)anthracene	ND	200
bis(2-ethylhexyl)phthalate	ND	200
Chrysene	ND	200
4-Methylchrysene	ND	200
Di-n-octylphthalate	ND	200
7,12-Dimethylbenz(a)anthracene	ND	200
Benzo(b)fluoranthene	ND	200
Benzo(k)fluoranthene	ND	200
Benzo(a)pyrene	ND	200
Dibenz(a,h)anthracene	ND	200
Dibenz(a,h)acridine	ND	200

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	-diluted out -	Nitrobenzene-d5	- diluted out -
Phenol-d6	-diluted out -	2-Fluorobiphenyl	- diluted out -
2,4,6-Tribromophenol	- diluted out-	Terphenyl-d14	- diluted out -

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904-METHOD BLANK
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE EXTRACTED: 02/10/93
DATE ANALYZED: 03/02/93
DATE REPORTED: 03/08/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Pyridine	ND	20
Phenol	ND	20
1,3-Dichlorobenzene	ND	20
1,4-Dichlorobenzene	ND	20
1,2-Dichlorobenzene	ND	20
Indene	ND	20
2-Methylphenol	ND	20
4-Methylphenol	ND	20
2,4-Dimethylphenol	ND	20
Quinoline	ND	20
Naphthalene	ND	20
1-Methylnaphthalene	ND	20
Dimethylphthalate	ND	20
2,4-Dinitrophenol	ND	20
4-Nitrophenol	ND	20
Diethylphthalate	ND	20
Phenanthrene	ND	20
Anthracene	ND	20
Benzenethiol	ND	20
Di-n-butylphthalate	ND	20
Fluoranthene	ND	20
Pyrene	ND	20
Butylbenzylphthalate	ND	20
Benzo(a)anthracene	ND	20
bis(2-ethylhexyl)phthalate	70	20
Chrysene	ND	20
4-Methylchrysene	ND	20
Di-n-octylphthalate	ND	20
7,12-Dimethylbenz(a)anthracene	ND	20
Benzo(b)fluoranthene	ND	20
Benzo(k)fluoranthene	ND	20
Benzo(a)pyrene	ND	20
Dibenz(a,h)anthracene	ND	20
Dibenz(a,h)acridine	ND	20

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	62	Nitrobenzene-d5	65
Phenol-d6	66	2-Fluorobiphenyl	70
2,4,6-Tribromophenol	42	Terphenyl-d14	75

Curtis & Tompkins, Ltd.

MS/MSD SUMMARY SHEET FOR EPA 8270 - page 1 of 2

Laboratory Number: 109904
Client: ENGINEERING SCIENCE
Matrix Sample Number: 109904-002
Sample type: SOIL

Date Extracted: 02/10/93
Date Analyzed: 03/03/93
Spike File: MS_8292
Spike Dup File: MSD_8292

MATRIX SPIKE DATA

SPIKE COMPOUNDS	READING(ng)	RECOVERY
Naphthalene	0.93	18.6 %
Phenanthrene	1.43	18.6 %
Anthracene	1.00	20.0 %
Fluoranthene	1.02	20.4 %
Pyrene	1.17	23.4 %
Benzo(a)anthracene	1.06	21.2 %
Chrysene	1.21	13.8 %
Benzo(b)fluoranthene	1.11	22.2 %
Benzo(k)fluoranthene	0.96	19.2 %
Benzo(a)pyrene	1.08	21.6 %
Dibenz(a,h)anthracene	0.83	16.6 %
SURROGATES		
2-Fluorophenol	1.14	15.2 %
Phenol-d5	1.15	15.3 %
2,4,6-Tribromophenol	1.27	16.9 %
Nitrobenzene-d5	0.80	16.0 %
2-Fluorobiphenyl	0.92	18.4 %
Terphenyl-d14	0.95	19.0 %

MATRIX SPIKE DUP DATA

SPIKE DUP COMPOUNDS	READING(ng)	RECOVERY
Naphthalene	1.63	32.6 %
Phenanthrene	2.43	38.6 %
Anthracene	1.77	35.4 %
Fluoranthene	1.88	37.6 %
Pyrene	2.08	41.6 %
Benzo(a)anthracene	1.73	34.6 %
Chrysene	2.23	34.2 %
Benzo(b)fluoranthene	2.08	41.6 %
Benzo(k)fluoranthene	1.74	34.8 %
Benzo(a)pyrene	1.95	39.0 %
Dibenz(a,h)anthracene	1.49	29.8 %
SURROGATES		
2-Fluorophenol	2.10	28.0 %
Phenol-d5	2.17	28.9 %
2,4,6-Tribromophenol	2.19	29.2 %
Nitrobenzene-d5	1.41	28.2 %
2-Fluorobiphenyl	1.56	31.2 %
Terphenyl-d14	1.64	32.8 %

Curtis & Tompkins, Ltd.

MS/MSD SUMMARY SHEET FOR EPA 8270 - page 2 of 2

Laboratory Number: 109904
Client: ENGINEERING SCIENCE

MATRIX DATA	Sample Conc.(ng)
Naphthalene	0
Phenanthrene	0.50
Anthracene	0
Fluoranthene	0
Pyrene	0
Benzo(a)anthracene	0
Chrysene	0.52
Benzo(b)fluoranthene	0
Benzo(k)fluoranthene	0
Benzo(a)pyrene	0
Dibenz(a,h)anthracene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD
Naphthalene	18.6	32.6	55 %
Phenanthrene	18.6	38.6	70 %
Anthracene	20.0	35.4	56 %
Fluoranthene	20.4	37.6	59 %
Pyrene	23.4	41.6	56 %
Benzo(a)anthracene	21.2	34.6	48 %
Chrysene	13.8	34.2	85 %
Benzo(b)fluoranthene	22.2	41.6	61 %
Benzo(k)fluoranthene	19.2	34.8	58 %
Benzo(a)pyrene	21.6	39.0	57 %
Dibenz(a,h)anthracene	16.6	29.8	57 %

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8270 - page 1 of 1

Laboratory Number: 109904
Client: ENGINEERING SCIENCE
Sample type: SOIL

Date Extracted: 02/10/93
Date Analyzed: 03/02/93
Spike File: LCS_8292

BLANK SPIKE DATA

SPIKE COMPOUNDS	READING(ng)	RECOVERY
Naphthalene	2.89	57.8 %
Phenanthrene	3.10	62.0 %
Anthracene	2.86	57.2 %
Fluoranthene	3.03	60.6 %
Pyrene	3.01	60.2 %
Benzo(a)anthracene	2.97	59.4 %
Chrysene	3.05	61.0 %
Benzo(b)fluoranthene	3.01	60.2 %
Benzo(k)fluoranthene	3.65	73.0 %
Benzo(a)pyrene	3.05	61.0 %
Dibenz(a,h)anthracene	3.36	67.2 %
SURROGATES		
2-Fluorophenol	4.77	63.6 %
Phenol-d5	4.87	64.9 %
2,4,6-Tribromophenol	4.49	59.9 %
Nitrobenzene-d5	3.16	63.2 %
2-Fluorobiphenyl	3.31	66.2 %
Terphenyl-d14	3.46	69.2 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/27/93
DATE RECEIVED: 01/29/93
DATE ANALYZED: 02/03/93
DATE REPORTED: 02/23/93

ANALYSIS: ORGANIC LEAD
ANALYSIS METHOD: EPA 7420

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
109904-001	BKG-1-0.5	ND	mg/Kg	0.5
PREP BLANK	N/A	ND	mg/Kg	0.5

ND = Not detected at or above the reporting limit.
NC = Not Calculable

QA/QC SUMMARY:

BLANK SPIKE RECOVERY, %	107
SAMPLE SPIKE RECOVERY, %	107
SAMPLE DUP RPD, %	NC

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/27/93
DATE RECEIVED: 01/29/93
DATE ANALYZED: 02/08/93
DATE REPORTED: 02/23/93

ANALYSIS: CYANIDE
ANALYSIS METHOD: EPA 335.2

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
109904-001	BKG-1-0.5	0.4	mg/Kg	0.3
METHOD BLANK	N/A	ND	mg/Kg	0.3

ND = Not detected at or above the reporting limit.

QA/QC SUMMARY:

BLANK SPIKE RECOVERY, %	99
MS/MSD RECOVERY, %	78
SAMPLE DUP RPD, %	<1

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/27/93
DATE RECEIVED: 01/29/93
DATE ANALYZED: 02/09/93
DATE REPORTED: 02/23/93

ANALYSIS: ISOBUTYL ALCOHOL
ANALYSIS METHOD: EPA 8015 (MODIFIED)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
109904-001	BKG-1-0.5	ND	mg/Kg	1
METHOD BLANK	N/A	ND	mg/Kg	1

ND = Not detected at or above the reporting limit.

QA/QC SUMMARY:

BLANK SPIKE RECOVERY, %	117
MS/MSD RECOVERY, %	50
MS/MSD RPD, %	4

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904-001
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: BKG-1-0.5

DATE SAMPLED: 01/27/93
DATE RECEIVED: 01/29/93

Metals in Soils & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	3	3	EPA 6010
Arsenic	35	5	EPA 7060
Barium	45	0.5	EPA 6010
Beryllium	0.3	0.1	EPA 6010
Cadmium	ND	0.2	EPA 6010
Chromium (total)	36	0.5	EPA 6010
Cobalt	20	0.9	EPA 6010
Lead	15	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	46	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	46	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904 - PREP BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

Metals in Soils & Wastes

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	ND	3	EPA 7060
Barium	ND	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	ND	0.5	EPA 6010
Cobalt	ND	0.9	EPA 6010
Lead	ND	3	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	ND	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	ND	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

QC for Metals in Soils & Wastes

	LCS RECOVERY,%	SAMPLE DUP RPD,%	SAMPLE SPIKE RECOVERY,%	DATE ANALYZED
Antimony	89	NC	62	02/03/93
Arsenic	103	2	115	02/03/93
Barium	95	13	119	02/03/93
Beryllium	100	17	93	02/03/93
Cadmium	87	NC	74	02/03/93
Chromium (total)	91	16	203	02/03/93
Cobalt	89	NC	94	02/03/93
Lead	108	8	94	02/03/93
Mercury	97	31	56	02/01/93
Nickel	89	26	135	02/03/93
Selenium	104	NC	59	02/03/93
Vanadium	89	17	137	02/03/93

NC = Not Calculable

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904-001
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: BKG-1-0.5

DATE SAMPLED: 01/27/93
DATE RECEIVED: 01/29/93
DATE ANALYZED: 02/09/93
DATE REPORTED: 02/23/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	108 %
Toluene-d8	128 %
Bromofluorobenzene	72 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904 - METHOD BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE ANALYZED: 02/09/93
DATE REPORTED: 02/23/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	107 %
Toluene-d8	99 %
Bromofluorobenzene	99 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904-005
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: TB-4

DATE SAMPLED: 01/27/93
DATE RECEIVED: 01/29/93
DATE ANALYZED: 02/09/93
DATE REPORTED: 02/23/93

EPA METHOD 8240: VOLATILE ORGANICS IN AQUEOUS SOLUTIONS

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	108 %
Toluene-d8	104 %
Bromofluorobenzene	99 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904 - METHOD BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE ANALYZED: 02/09/93
DATE REPORTED: 02/23/93

EPA METHOD 8240: VOLATILE ORGANICS IN AQUEOUS SOLUTIONS

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	113 %
Toluene-d8	104 %
Bromofluorobenzene	100 %

Curtis & Tompkins, Ltd.

MS/MSD SUMMARY SHEET FOR EPA 8240

Laboratory Number: 109904
Client: ENGINEERING SCIENCE
Matrix Sample Number: 109904-005
Sample type: WATER

Date Analyzed: 09-FEB-93
Spike File: AB906
Spike Dup File: AB907

MATRIX SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS *
1,1-Dichloroethene	58.36	117 %	OK	61 - 145
Trichloroethene	51.13	102 %	OK	71 - 120
Benzene	53.13	106 %	OK	76 - 127
Toluene	50.40	101 %	OK	76 - 125
Chlorobenzene	51.87	104 %	OK	75 - 130
SURROGATES				
1,2-Dichloroethane-d4	55.88	112 %	OK	76 - 114
Toluene-d8	52.29	105 %	OK	88 - 110
Bromofluorobenzene	50.78	102 %	OK	86 - 115

MATRIX SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	60.39	121 %	OK	61 - 145
Trichloroethene	54.89	110 %	OK	71 - 120
Benzene	56.75	114 %	OK	76 - 127
Toluene	54.22	108 %	OK	76 - 125
Chlorobenzene	55.57	111 %	OK	75 - 130
SURROGATES				
1,2-Dichloroethane-d4	55.24	110 %	OK	76 - 114
Toluene-d8	52.80	106 %	OK	88 - 110
Bromofluorobenzene	50.88	102 %	OK	86 - 115

MATRIX DATA

1,1-Dichloroethene	0
Trichloroethene	0
Benzene	0
Toluene	0
Chlorobenzene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS *
1,1-Dichloroethene	58.36	60.39	3 %	OK	< 14
Trichloroethene	51.13	54.89	7 %	OK	< 14
Benzene	53.13	56.75	7 %	OK	< 11
Toluene	50.40	54.22	7 %	OK	< 13
Chlorobenzene	51.87	55.57	7 %	OK	< 13

* Limits from CLP SOW 3/90

CHAIN OF CUST. DY RECORD

PROJECT NO.	PROJECT NAME
PE375.01	CHEVRON

SAMPLERS (Signatures): Kyle Caskey, Kyle Caskey

109904

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	EPA 8270	EPA 8240	EPA MOD 8015	METALS *	EPA 335.2	DHS-LUFT					REMARKS
-27-93	1700	SOIL	BKG-1-0.5		X	X	X	X	X	X					*PLEASE RUN REVISED
															SKINNER LIST ON METALS.
-27-93	1730	SOIL	SWMU-27-1R-0.5	1	X										ALSO, PLEASE RUN 8270
-27-93	1735	SOIL	SWMU-27-3R-0.5	1	X										W/ SILICA GEL CLEAN-UP
-27-93	1740	SOIL	SWMU-27-5R-0.5	1	X										OF ALL EXTRACTS, THEN
-28-93		H_2O	TB-4	2		X									GC/MS USING SELECT
															ION MONITORING, FOR
															ALL REVISED SKINNER
															LIST COMPOUNDS ON
															SWMU-27-1R, 3R & 5R.
															ANY QUESTIONS, CONTACT
															Kyle CASKEY.

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
Kyle Caskey	1-28-93			NONE
	TIME 11:00		TIME	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE 1-29-93	
	TIME		TIME 0930	

ENGINEERING-SCIENCE, INC. 211.0858/YO

White: laboratory returns with data, yellow: laboratory copy, pink: sampler copy

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2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

DATE RECEIVED: 01/15/93
DATE REQUESTED: 02/24/93
DATE REPORTED: 03/08/93

LABORATORY NUMBER: 110154

CLIENT: ENGINEERING SCIENCE, INC.

PROJECT ID: PE375.01

LOCATION: CHEVRON HAWAIIAN REFINERY

RESULTS: SEE ATTACHED

Teresa K. Morrison
Reviewed by

Reviewed by

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Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110154
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93
DATE REQUESTED: 02/24/93
DATE REPORTED: 03/08/93
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Additional analyses were requested on six of the 24 soil samples received on January 14, 1993. The additional analysis included organic lead on all six samples and cyanide and the revised Skinner list semivolatiles on one of the six.

The sample requiring semi-volatiles analysis was batched with another set of samples from the same project. The matrix QC performed on one of these samples had low recoveries as did the surrogates in all the other samples. The method blank and laboratory control standard had acceptable surrogate recoveries, as did sample SWMU-20-2D-0.5 (110154-006). The method blank for the analysis was contaminated with bis (2-ethylhexyl)phthalate at approximately the same level as the sample.

Organic lead analysis met all project data quality objectives.

Cyanide sample spike recovery was below the acceptance limit but the blank spike recovery is acceptable indicating that matrix interference is resulting in the low recovery.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110154-006
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-20-2D-0.5

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93
DATE REQUESTED: 02/24/93
DATE EXTRACTED: 02/25/93
DATE ANALYZED: 03/03/93
DATE REPORTED: 03/08/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Pyridine	ND	20
Phenol	ND	20
1,3-Dichlorobenzene	ND	20
1,4-Dichlorobenzene	ND	20
1,2-Dichlorobenzene	ND	20
Indene	ND	20
2-Methylphenol	ND	20
4-Methylphenol	ND	20
2,4-Dimethylphenol	20	20
Quinoline	ND	20
Naphthalene	ND	20
1-Methylnaphthalene	ND	20
Dimethylphthalate	ND	20
2,4-Dinitrophenol	ND	20
4-Nitrophenol	ND	20
Diethylphthalate	ND	20
Phenanthrene	ND	20
Anthracene	ND	20
Benzenethiol	80	20
Di-n-butylphthalate	ND	20
Fluoranthene	ND	20
Pyrene	ND	20
Butylbenzylphthalate	ND	20
Benzo(a)anthracene	ND	20
bis(2-ethylhexyl)phthalate	140	20
Chrysene	detected(19)	20
4-Methylchrysene	20	20
Di-n-octylphthalate	ND	20
7,12-Dimethylbenz(a)anthracene	ND	20
Benzo(b)fluoranthene	detected(18)	20
Benzo(k)fluoranthene	ND	20
Benzo(a)pyrene	detected(17)	20
Dibenz(a,h)anthracene	ND	20
Dibenz(a,h)acridine	ND	20

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	60	Nitrobenzene-d5	58
Phenol-d6	61	2-Fluorobiphenyl	61
2,4,6-Tribromophenol	66	Terphenyl-d14	68

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LABORATORY NUMBER: 110154-METHOD BLANK
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE EXTRACTED: 02/25/93
DATE ANALYZED: 03/03/93
DATE REPORTED: 03/08/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT ug/Kg
Pyridine	ND	20
Phenol	ND	20
1,3-Dichlorobenzene	ND	20
1,4-Dichlorobenzene	ND	20
1,2-Dichlorobenzene	ND	20
Indene	ND	20
2-Methylphenol	ND	20
4-Methylphenol	ND	20
2,4-Dimethylphenol	ND	20
Quinoline	ND	20
Naphthalene	ND	20
1-Methylnaphthalene	ND	20
Dimethylphthalate	ND	20
2,4-Dinitrophenol	ND	20
4-Nitrophenol	ND	20
Diethylphthalate	ND	20
Phenanthrene	ND	20
Anthracene	ND	20
Benzenethiol	ND	20
Di-n-butylphthalate	ND	20
Fluoranthene	ND	20
Pyrene	ND	20
Butylbenzylphthalate	ND	20
Benzo(a)anthracene	ND	20
bis(2-ethylhexyl)phthalate	110	20
Chrysene	ND	20
4-Methylchrysene	ND	20
Di-n-octylphthalate	ND	20
7,12-Dimethylbenz(a)anthracene	ND	20
Benzo(b)fluoranthene	ND	20
Benzo(k)fluoranthene	ND	20
Benzo(a)pyrene	ND	20
Dibenz(a,h)anthracene	ND	20
Dibenz(a,h)acridine	ND	20

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	66	Nitrobenzene-d5	67
Phenol-d6	69	2-Fluorobiphenyl	73
2,4,6-Tribromophenol	60	Terphenyl-d14	76

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LABORATORY NUMBER: 110154
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93
DATE REQUESTED: 02/24/93
DATE ANALYZED: 03/01/93
DATE REPORTED: 03/08/93

ANALYSIS: ORGANIC LEAD
ANALYSIS METHOD: CA DHS METHOD, LUFT MANUAL OCT 1989

LAB ID	CLIENT ID	RESULT	UNITS	REPORTING LIMIT
109770-001	SWMU-16-1-0.5	ND	mg/Kg	0.5
109770-002	SWMU-16-2-0.5	ND	mg/Kg	0.5
109770-003	SWMU-16-3-0.5	ND	mg/Kg	0.5
109770-004	SWMU-16-4-0.5	ND	mg/Kg	0.5
109770-005	SWMU-16-4D-0.5	ND	mg/Kg	0.5
109770-006	SWMU-20-2D-0.5	ND	mg/Kg	0.5

ND = Not detected at or above reporting limit.
NC = Not calculable

QA/QC SUMMARY

BLANK SPIKE RECOVERY, %	110
SAMPLE SPIKE RECOVERY, %	114
SAMPLE DUPLICATE RPD, %	NC

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110154
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93
DATE REQUESTED: 02/24/93
DATE ANALYZED: 03/03/93
DATE REPORTED: 03/08/93

ANALYSIS: CYANIDE
ANALYSIS METHOD: EEPA 335.2

LAB ID	CLIENT ID	RESULT	UNITS	REPORTING LIMIT
110154-001	SWMU-20-2D-0.5	ND	mg/Kg	0.3

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

BLANK SPIKE RECOVERY, %	98
SAMPLE SPIKE RECOVERY, %	63
SAMPLE SPIKE DUPLICATE RPD, %	15

Curtis & Tompkins, Ltd.

VERBAL ADDITIONS/CANCELLATIONS TO ANALYSIS REQUEST SHEET

Client: ES Hawaii Date: 2/24/93

Requested By: Kyle Time: _____ AM ~5 PM

Recorded By: [illegible]

Current Lab ID (Previous Lab ID)	Client ID	Circle Matrix	Specify add or cancel	Analysis	Due Date
110154-6 (109770-19)		water soil waste oil other	+	8270+ CN Org Pb.	
110154-1 (109770-20)		water soil waste oil other	+	Org Pb	
110154-2 (-21)		water soil waste oil other	+	↓	
110154-3 (-22)		water soil waste oil other	+	↓	
110154-4 (-23)		water soil waste oil other	+	↓	
110154-5 (-24)		water soil waste oil other	+	↓	

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DATE RECEIVED: 05/07/93
DATE REPORTED: 06/09/93

LABORATORY NUMBER: 110834

CLIENT: ENGINEERING SCIENCE, INC.

PROJECT ID: PE375.01

LOCATION: CHEVRON HAWAIIAN REFINERY

RESULTS: SEE ATTACHED

Reviewed by

Reviewed by

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LABORATORY NUMBER: 110834
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE REPORTED: 06/09/93
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 5 soil samples on May 7, 1993 for the Chevron Hawaiian Refinery investigation. All samples were analyzed for volatiles, semivolatiles, cyanide, organic lead, isobutyl alcohol and total metals as specified in the project plan.

Refer to the original report for a complete narrative concerning the semivolatile analysis.

Cyanide matrix spike recovery did not meet project data quality objectives. The laboratory control standard was acceptable indicating that the sample matrix was the source of the error.

Isobutyl alcohol, organic lead, mercury, arsenic and selenium analyses all met project data quality objectives.

Analysis for metals by EPA 6010 resulted in several QC failures for matrix spike and sample duplicate for several elements. The laboratory control sample was acceptable for all elements indicating that the sample matrix is causing the unacceptable recoveries.

Hydrocarbon background causes surrogate failures for samples SWMU-21-1-0.5′ and SWMU-21-2-0.5′ in the volatiles analysis. All surrogate failures are confirmed as matrix associated by analyzing the samples a second time to confirm that laboratory error was not the source of the problem.

The matrix spike for the samples which required methanol extraction prior to analysis for volatiles did not meet project data quality objectives. The sample was SWMU-21-2-0.5′ which also failed surrogate recovery limits. The hydrocarbon background causes these failures as is demonstrated by the acceptable recoveries in the laboratory control standard. Sample SWMU-21-1-0.5′ is not associated with the spike failure as it was not extracted with methanol prior to analysis.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834 DATE RECEIVED: 05/07/93
CLIENT: ENGINEERING SCIENCES, INC. DATE REPORTED: 06/09/93
PROJECT: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

CASE NARRATIVE

SEMI-VOLATILES BY EPA 8270; EXTRACTED BY EPA 3550 (SONICATION) WITH SILICA GEL CLEANUP

On May 7, 1993 Curtis & Tompkins (C&T) received five soil samples for analysis by the above referenced method (as well as other analyses). Analytical problems were encountered during the semi-volatile analyses which seemed to indicate that an the extraction was inadequate. Instrument difficulties were also encountered because the sample matrix is high in interfering organic components.

Preliminary data for these samples was provided on May 26, 1993. The quality control data associated with the batch indicated that several questions concerning the data needed to be answered. Of most concern was contamination in the method blank at a level similar to that seen in several of the samples. In addition, the matrix spikes and laboratory control standard recoveries were not within acceptable limits. The matrix spikes could be explained by the interfering organic components, but these are not present in the laboratory control sample which indicates that the extraction procedure was possibly the source of the error. The need to reanalyze was apparent and C&T initiated the process, even though the regulatory holding time had expired.

Final results were reported on June 9, 1993 for all five samples. Only di-n-butylphthalate was detected in the method blank for the re-extraction which indicates that laboratory contamination was under control. The recovery data also demonstrated improvement. Comparability between the two sets of data is not good, possibly due to the heterogeneous nature of the samples. C&T is reporting the second set of data because the quality control parameters indicate the data is more reliable, even though the method specified holding time had passed prior to extraction.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-001
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-21-1-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE EXTRACTED: 05/27/93
DATE ANALYZED: 06/05/93
DATE REPORTED: 06/09/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT (ug/Kg)
Pyridine	ND	80
Phenol	ND	80
1,3-Dichlorobenzene	ND	80
1,4-Dichlorobenzene	ND	80
1,2-Dichlorobenzene	ND	80
Indene	ND	80
2-Methylphenol	ND	80
4-Methylphenol	ND	80
2,4-Dimethylphenol	ND	80
Quinoline	ND	80
Naphthalene	ND	80
1-Methylnaphthalene	ND	80
Dimethylphthalate	ND	80
2,4-Dinitrophenol	ND	80
4-Nitrophenol	ND	80
Diethylphthalate	ND	80
Phenanthrene	ND	80
Anthracene	ND	80
Benzenethiol	ND	80
Di-n-butylphthalate	ND	80
Fluoranthene	ND	80
Pyrene	ND	80
Butylbenzylphthalate	ND	80
Benzo(a)anthracene	ND	80
bis(2-ethylhexyl)phthalate	ND	80
Chrysene	900	80
4-Methylchrysene	2,200	80
Di-n-octylphthalate	ND	80
7,12-Dimethylbenz(a)anthracene	ND	80
Benzo(b)fluoranthene	ND	80
Benzo(k)fluoranthene	ND	80
Benzo(a)pyrene	ND	80
Dibenz(a,h)anthracene	ND	80
Dibenz(a,h)acridine	ND	80

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	-diluted out-	Nitrobenzene-d5	-diluted out-
Phenol-d6	-diluted out-	2-Fluorobiphenyl	-diluted out-
2,4,6-Tribromophenol	-diluted out-	Terphenyl-d14	-diluted out-

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-002
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-21-2-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE EXTRACTED: 05/27/93
DATE ANALYZED: 06/03/93
DATE REPORTED: 06/09/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT (ug/Kg)
Pyridine	ND	80
Phenol	ND	80
1,3-Dichlorobenzene	ND	80
1,4-Dichlorobenzene	ND	80
1,2-Dichlorobenzene	ND	80
Indene	ND	80
2-Methylphenol	ND	80
4-Methylphenol	ND	80
2,4-Dimethylphenol	ND	80
Quinoline	ND	80
Naphthalene	ND	80
1-Methylnaphthalene	ND	80
Dimethylphthalate	ND	80
2,4-Dinitrophenol	ND	80
4-Nitrophenol	ND	80
Diethylphthalate	ND	80
Phenanthrene	520	80
Anthracene	ND	80
Benzenethiol	ND	80
Di-n-butylphthalate	ND	80
Fluoranthene	ND	80
Pyrene	350	80
Butylbenzylphthalate	ND	80
Benzo(a)anthracene	ND	80
bis(2-ethylhexyl)phthalate	1,100	80
Chrysene	360	80
4-Methylchrysene	950	80
Di-n-octylphthalate	ND	80
7,12-Dimethylbenz(a)anthracene	ND	80
Benzo(b)fluoranthene	ND	80
Benzo(k)fluoranthene	ND	80
Benzo(a)pyrene	ND	80
Dibenz(a,h)anthracene	ND	80
Dibenz(a,h)acridine	ND	80

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	-diluted out-	Nitrobenzene-d5	-diluted out-
Phenol-d6	-diluted out-	2-Fluorobiphenyl	-diluted out-
2,4,6-Tribromophenol	-diluted out-	Terphenyl-d14	-diluted out-

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-003
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-22-1-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE EXTRACTED: 05/27/93
DATE ANALYZED: 06/05/93
DATE REPORTED: 06/09/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT (ug/Kg)
Pyridine	ND	80
Phenol	ND	80
1,3-Dichlorobenzene	ND	80
1,4-Dichlorobenzene	ND	80
1,2-Dichlorobenzene	ND	80
Indene	ND	80
2-Methylphenol	ND	80
4-Methylphenol	ND	80
2,4-Dimethylphenol	ND	80
Quinoline	ND	80
Naphthalene	ND	80
1-Methylnaphthalene	5,300	800 *
Dimethylphthalate	ND	80
2,4-Dinitrophenol	ND	80
4-Nitrophenol	ND	80
Diethylphthalate	ND	80
Phenanthrene	39,000	800 *
Anthracene	ND	80
Benzenethiol	42,000	800 *
Di-n-butylphthalate	ND	80
Fluoranthene	2,200	80
Pyrene	1,900	80
Butylbenzylphthalate	130	80
Benzo(a)anthracene	ND	80
bis(2-ethylhexyl)phthalate	2,500	80
Chrysene	4,900	800 *
4-Methylchrysene	17,000	800 *
Di-n-octylphthalate	ND	80
7,12-Dimethylbenz(a)anthracene	ND	80
Benzo(b)fluoranthene	ND	80
Benzo(k)fluoranthene	ND	80
Benzo(a)pyrene	ND	80
Dibenz(a,h)anthracene	ND	80
Dibenz(a,h)acridine	ND	80

* Quantitated from a 1:100 dilution on 6/03/93.
ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	-diluted out-	Nitrobenzene-d5	-diluted out-
Phenol-d6	-diluted out-	2-Fluorobiphenyl	-diluted out-
2,4,6-Tribromophenol	-diluted out-	Terphenyl-d14	-diluted out-

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-004
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-22-2-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE EXTRACTED: 05/27/93
DATE ANALYZED: 06/03/93
DATE REPORTED: 06/09/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT (ug/Kg)
Pyridine	ND	800
Phenol	ND	800
1,3-Dichlorobenzene	ND	800
1,4-Dichlorobenzene	ND	800
1,2-Dichlorobenzene	ND	800
Indene	ND	800
2-Methylphenol	ND	800
4-Methylphenol	ND	800
2,4-Dimethylphenol	ND	800
Quinoline	ND	800
Naphthalene	ND	800
1-Methylnaphthalene	110,000	8,000 *
Dimethylphthalate	ND	800
2,4-Dinitrophenol	ND	800
4-Nitrophenol	ND	800
Diethylphthalate	ND	800
Phenanthrene	100,000	8,000 *
Anthracene	ND	800
Benzenethiol	82,000	8,000 *
Di-n-butylphthalate	ND	800
Fluoranthene	4,500	800
Pyrene	16,000	800
Butylbenzylphthalate	ND	800
Benzo(a)anthracene	ND	800
bis(2-ethylhexyl)phthalate	15,000	800
Chrysene	ND	800
4-Methylchrysene	13,000	800
Di-n-octylphthalate	ND	800
7,12-Dimethylbenz(a)anthracene	ND	800
Benzo(b)fluoranthene	ND	800
Benzo(k)fluoranthene	ND	800
Benzo(a)pyrene	ND	800
Dibenz(a,h)anthracene	ND	800
Dibenz(a,h)acridine	ND	800

* Quantitated from a 1:1000 dilution on 6/05/93.
ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	-diluted out-	Nitrobenzene-d5	-diluted out-
Phenol-d6	-diluted out-	2-Fluorobiphenyl	-diluted out-
2,4,6-Tribromophenol	-diluted out-	Terphenyl-d14	-diluted out-

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-005
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-22-2D-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE EXTRACTED: 05/27/93
DATE ANALYZED: 06/03/93
DATE REPORTED: 06/09/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT (ug/Kg)
Pyridine	ND	800
Phenol	ND	800
1,3-Dichlorobenzene	ND	800
1,4-Dichlorobenzene	ND	800
1,2-Dichlorobenzene	ND	800
Indene	ND	800
2-Methylphenol	ND	800
4-Methylphenol	ND	800
2,4-Dimethylphenol	ND	800
Quinoline	ND	800
Naphthalene	ND	800
1-Methylnaphthalene	110,000	8,000 *
Dimethylphthalate	ND	800
2,4-Dinitrophenol	ND	800
4-Nitrophenol	ND	800
Diethylphthalate	ND	800
Phenanthrene	100,000	8,000 *
Anthracene	ND	800
Benzenethiol	ND	800
Di-n-butylphthalate	ND	800
Fluoranthene	4,200	800
Pyrene	16,000	800
Butylbenzylphthalate	ND	800
Benzo(a)anthracene	ND	800
bis(2-ethylhexyl)phthalate	22,000	800
Chrysene	ND	800
4-Methylchrysene	8,800	800
Di-n-octylphthalate	ND	800
7,12-Dimethylbenz(a)anthracene	ND	800
Benzo(b)fluoranthene	ND	800
Benzo(k)fluoranthene	ND	800
Benzo(a)pyrene	ND	800
Dibenz(a,h)anthracene	ND	800
Dibenz(a,h)acridine	ND	800

* Quantitated from a 1:1000 dilution on 6/05/93.
ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	-diluted out-	Nitrobenzene-d5	-diluted out-
Phenol-d6	-diluted out-	2-Fluorobiphenyl	-diluted out-
2,4,6-Tribromophenol	-diluted out-	Terphenyl-d14	-diluted out-

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-METHOD BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE EXTRACTED: 05/27/93
DATE ANALYZED: 06/03/93
DATE REPORTED: 06/09/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT ug/Kg	REPORTING LIMIT (ug/Kg)
Pyridine	ND	8
Phenol	ND	8
1,3-Dichlorobenzene	ND	8
1,4-Dichlorobenzene	ND	8
1,2-Dichlorobenzene	ND	8
Indene	ND	8
2-Methylphenol	ND	8
4-Methylphenol	ND	8
2,4-Dimethylphenol	ND	8
Quinoline	ND	8
Naphthalene	ND	8
1-Methylnaphthalene	ND	8
Dimethylphthalate	ND	8
2,4-Dinitrophenol	ND	8
4-Nitrophenol	ND	8
Diethylphthalate	ND	8
Phenanthrene	ND	8
Anthracene	ND	8
Benzenethiol	ND	8
Di-n-butylphthalate	220	8
Fluoranthene	ND	8
Pyrene	ND	8
Butylbenzylphthalate	ND	8
Benzo(a)anthracene	ND	8
bis(2-ethylhexyl)phthalate	ND	8
Chrysene	ND	8
4-Methylchrysene	ND	8
Di-n-octylphthalate	ND	8
7,12-Dimethylbenz(a)anthracene	ND	8
Benzo(b)fluoranthene	ND	8
Benzo(k)fluoranthene	ND	8
Benzo(a)pyrene	ND	8
Dibenz(a,h)anthracene	ND	8
Dibenz(a,h)acridine	ND	8

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

2-Fluorophenol	25	Nitrobenzene-d5	37
Phenol-d6	32	2-Fluorobiphenyl	38
2,4,6-Tribromophenol	11	Terphenyl-d14	38

Curtis & Tompkins, Ltd.

LABORATORY CHECK SAMPLE SUMMARY - SEMIVOLATILES

Laboratory Number: 110834
Client: Engineering Science
Sample Matrix: soil

Analysis date: 6/03/93
Spike: /0603a.b/lcs,qc44648.d

MATRIX SPIKE DATA

SPIKE COMPOUNDS	Recovery	Status	LIMITS
Phenol	39	OK	26 - 90
4-Nitrophenol	56	OK	11 -114
1,4-Dichlorobenzene	38	OK	28 -104
Pyrene	33	NOT OK	35 -142
SURROGATES			
2-Fluorophenol	36	OK	25 -121
Phenol-d6	34	OK	24 -113
2,4,6-Tribromophenol	26	OK	19 -122
Nitrobenzene-d5	36	OK	23 -120
2-Fluorobiphenyl	34	OK	30 -115
Terphenyl-d14	35	OK	18 -137

Curtis & Tompkins, Ltd.

MATRIX SPIKE/ SPIKE DUPLICATE SUMMARY - SEMIVOLATILES

Laboratory Number: 110834
Client: Engineering Science
Spiked Sample: 110834-001
Sample Matrix: soil

Analysis date: 6/03/93
Spike: /0604b.b/dl10_ms,qc44646.d
Dup: /0604b.b/dl10_msd,qc44647.d

MATRIX SPIKE DATA

SPIKE COMPOUNDS	Recovery	Status	LIMITS
Phenol	86	OK	26 - 90
4-Nitrophenol	20	OK	11 -114
1,4-Dichlorobenzene	107	NOT OK	28 -104
Pyrene	111	OK	35 -142
SURROGATES			
2-Fluorophenol	25	OK	25 -121
Phenol-d6	28	OK	24 -113
2,4,6-Tribromophenol	41	OK	19 -122
Nitrobenzene-d5	114	OK	23 -120
2-Fluorobiphenyl	40	OK	30 -115
Terphenyl-d14	280	NOT OK	18 -137

MATRIX SPIKE DUPLICATE DATA

SPIKE COMPOUNDS	Recovery	Status	LIMITS
Phenol	112	NOT OK	26 - 90
4-Nitrophenol	61	OK	11 -114
1,4-Dichlorobenzene	127	NOT OK	28 -104
Pyrene	125	OK	35 -142
SURROGATES			
2-Fluorophenol	35	OK	25 -121
Phenol-d6	24	OK	24 -113
2,4,6-Tribromophenol	55	OK	19 -122
Nitrobenzene-d5	110	OK	23 -120
2-Fluorobiphenyl	52	OK	30 -115
Terphenyl-d14	166	NOT OK	18 -137

RELATIVE PERCENT DIFFERENCE

SPIKE COMPOUNDS	SPIKE	SPIKE	RPD,%	STATUS	LIMITS
Phenol	86	112	26	OK	< 35
4-Nitrophenol	20	61	101	NOT OK	< 50
1,4-Dichlorobenzene	107	127	17	OK	< 27
Pyrene	111	125	12	OK	< 36

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/19/93
DATE REPORTED: 05/21/93

ANALYSIS: CYANIDE
ANALYSIS METHOD: EPA 335.2

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
110834-1	SWMU-21-1-0.5	0.6	mg/Kg	0.3
110834-2	SWMU-21-2-0.5	0.5	mg/Kg	0.3
110834-3	SWMU-22-1-0.5	ND	mg/Kg	0.3
110834-4	SWMU-22-2-0.5	ND	mg/Kg	0.3
110834-5	SWMU-22-2D-0.5	ND	mg/Kg	0.3
METHOD BLANK	N/A	ND	mg/Kg	0.3

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

BLANK SPIKE RECOVERY, %	95
MS/MSD RECOVERY, %	58
SAMPLE DUP RPD, %	11

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/11/93
DATE REPORTED: 05/21/93

ANALYSIS: ISOBUTYL ALCOHOL
ANALYSIS METHOD: EPA 8015 (MODIFIED)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
110834-1	SWMU-21-1-0.5	ND	mg/Kg	1
110834-2	SWMU-21-2-0.5	ND	mg/Kg	1
110834-3	SWMU-22-1-0.5	ND	mg/Kg	1
110834-4	SWMU-22-2-0.5	ND	mg/Kg	1
110834-5	SWMU-22-2D-0.5	ND	mg/Kg	1
METHOD BLANK	N/A	ND	mg/Kg	1

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

BS/BSD RECOVERY, %	107
BS/BSD RPD, %	14

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/07/93
DATE REPORTED: 05/21/93

ANALYSIS: ORGANIC LEAD
ANALYSIS METHOD: CA DHS METHOD, LUFT MANUAL OCT 1989

LAB ID	CLIENT ID	RESULT	UNITS	REPORTING LIMIT
110834-1	SWMU-21-1-0.5	ND	mg/Kg	0.5
110834-2	SWMU-21-2-0.5	ND	mg/Kg	0.5
110834-3	SWMU-22-1-0.5	ND	mg/Kg	0.5
110834-4	SWMU-22-2-0.5	1.4	mg/Kg	0.5
110834-5	SWMU-22-2D-0.5	2.0	mg/Kg	0.5
METHOD BLANK	N/A	ND	mg/Kg	0.5

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

BLANK SPIKE RECOVERY, %	100
SAMPLE SPIKE RECOVERY, %	105
SAMPLE DUP RPD, %	2

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-1
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-21-1-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	4	3	EPA 7060
Barium	21	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.6	0.3	EPA 6010
Chromium (total)	65	5	EPA 6010
Cobalt	4.7	0.9	EPA 6010
Lead	60	10	EPA 6010
Mercury	0.8	0.1	EPA 7471
Nickel	50	2	EPA 6010
Selenium	4	3	EPA 7740
Vanadium	37	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-2
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-21-2-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/10-11/93
DATE REPORTED: 05/21/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	ND	3	EPA 7060
Barium	12	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.3	0.3	EPA 6010
Chromium (total)	53	5	EPA 6010
Cobalt	5.9	0.9	EPA 6010
Lead	50	10	EPA 6010
Mercury	0.6	0.1	EPA 7471
Nickel	140	2	EPA 6010
Selenium	5	3	EPA 7740
Vanadium	66	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-3
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-22-1-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/10-11/93
DATE REPORTED: 05/21/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	3	3	EPA 7060
Barium	14	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.6	0.3	EPA 6010
Chromium (total)	28	5	EPA 6010
Cobalt	6.2	0.9	EPA 6010
Lead	40	10	EPA 6010
Mercury	0.5	0.1	EPA 7471
Nickel	510	2	EPA 6010
Selenium	3	3	EPA 7740
Vanadium	120	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-4
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-22-2-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/10-11/93
DATE REPORTED: 05/21/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	4	3	EPA 7060
Barium	28	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.1	0.3	EPA 6010
Chromium (total)	53	0.5	EPA 6010
Cobalt	9.5	0.9	EPA 6010
Lead	210	10	EPA 6010
Mercury	4.8	0.1	EPA 7471
Nickel	340	2	EPA 6010
Selenium	5	3	EPA 7740
Vanadium	110	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-5
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY
SAMPLE ID: SWMU-22-2D-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/10-11/93
DATE REPORTED: 05/21/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	4	3	EPA 7060
Barium	33	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.3	0.3	EPA 6010
Chromium (total)	44	0.5	EPA 6010
Cobalt	11	0.9	EPA 6010
Lead	100	10	EPA 6010
Mercury	2.3	0.1	EPA 7471
Nickel	420	2	EPA 6010
Selenium	3	3	EPA 7740
Vanadium	160	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-METHOD BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE ANALYZED: 05/10-11/93
DATE REPORTED: 05/21/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	ND	3	EPA 7060
Barium	ND	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	ND	0.5	EPA 6010
Cobalt	ND	0.9	EPA 6010
Lead	ND	10	EPA 6010
Mercury	ND	0.1	EPA 7471
Nickel	ND	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	ND	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

QC for Metals in Soils & Wastes

	LCS RECOVERY,%	SAMPLE DUP RPD,%	SAMPLE SPIKE RECOVERY,%	DATE ANALYZED
Antimony	95	NC	16	05/11/93
Arsenic	95	11	92	05/10/93
Barium	97	24	88	05/11/93
Beryllium	96	NC	86	05/11/93
Cadmium	92	45	93	05/11/93
Chromium (total)	101	31	155	05/11/93
Cobalt	98	1	78	05/11/93
Lead	95	31	69	05/11/93
Mercury	107	<1	89	05/10/93
Nickel	99	11	143	05/11/93
Selenium	112	NC	88	05/10/93
Vanadium	98	11	111	05/11/93

NC = Not Calculable

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-1
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-21-1-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/17/93
DATE REPORTED: 05/21/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	85 %
Toluene-d8	120 %
Bromofluorobenzene	78 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-2
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-21-2-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/19/93
DATE REPORTED: 05/21/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	100
Chloroform	ND	100
1,2-Dichloroethane	ND	100
2-Butanone	ND	200
Benzene	ND	100
Toluene	ND	100
Chlorobenzene	ND	100
Ethyl benzene	ND	100
Styrene	ND	100
Total xylenes	200	100
1,2-Dibromoethane	ND	100
1,4-Dioxane	ND	2,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	51 %
Toluene-d8	40 %
Bromofluorobenzene	38 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-3
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-22-1-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/19/93
DATE REPORTED: 05/21/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	1,000
Chloroform	ND	1,000
1,2-Dichloroethane	ND	1,000
2-Butanone	ND	2,000
Benzene	ND	1,000
Toluene	ND	1,000
Chlorobenzene	ND	1,000
Ethyl benzene	ND	1,000
Styrene	ND	1,000
Total xylenes	2,000	1,000
1,2-Dibromoethane	ND	1,000
1,4-Dioxane	ND	20,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	95 %
Toluene-d8	97 %
Bromofluorobenzene	98 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-4
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-22-2-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/19/93
DATE REPORTED: 05/21/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	1,000
Chloroform	ND	1,000
1,2-Dichloroethane	ND	1,000
2-Butanone	ND	2,000
Benzene	ND	1,000
Toluene	ND	1,000
Chlorobenzene	ND	1,000
Ethyl benzene	2,000	1,000
Styrene	ND	1,000
Total xylenes	14,000	1,000
1,2-Dibromoethane	ND	1,000
1,4-Dioxane	ND	20,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	95 %
Toluene-d8	96 %
Bromofluorobenzene	92 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-5
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON
SAMPLE ID: SWMU-22-2D-0.5

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE ANALYZED: 05/19/93
DATE REPORTED: 05/21/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	1,000
Chloroform	ND	1,000
1,2-Dichloroethane	ND	1,000
2-Butanone	ND	2,000
Benzene	ND	1,000
Toluene	ND	1,000
Chlorobenzene	ND	1,000
Ethyl benzene	3,000	1,000
Styrene	ND	1,000
Total xylenes	16,000	1,000
1,2-Dibromoethane	ND	1,000
1,4-Dioxane	ND	20,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	93 %
Toluene-d8	98 %
Bromofluorobenzene	95 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-METHOD BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON

DATE ANALYZED: 05/17/93
DATE REPORTED: 05/21/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	91 %
Toluene-d8	101 %
Bromofluorobenzene	100 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834-METHOD BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON

DATE ANALYZED: 05/19/93
DATE REPORTED: 05/21/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	100
Chloroform	ND	100
1,2-Dichloroethane	ND	100
2-Butanone	ND	200
Benzene	ND	100
Toluene	ND	100
Chlorobenzene	ND	100
Ethyl benzene	ND	100
Styrene	ND	100
Total xylenes	ND	100
1,2-Dibromoethane	ND	100
1,4-Dioxane	ND	2,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	94 %
Toluene-d8	103 %
Bromofluorobenzene	95 %

Curtis & Tompkins, Ltd.

QC SUMMARY SHEET FOR EPA 8240

Laboratory Number:	110834		
Client:	Engineering Science	Spike file:	aeh21
Analysis date:	05/18/93	Spike dup file:	aeh22
Sample type:	Soil		
Sample spiked:	110865-2		

SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	66.54	133 %	OK	59 - 172
Trichloroethene	55.61	111 %	OK	62 - 137
Benzene	50.83	102 %	OK	66 - 142
Toluene	68.04	92 %	OK	59 - 139
Chlorobenzene	55.35	111 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	49.60	99 %	OK	70 - 121
Toluene-d8	50.49	101 %	OK	81 - 117
Bromofluorobenzene	50.21	100 %	OK	74 - 121

SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	70.42	141 %	OK	59 - 172
Trichloroethene	60.01	120 %	OK	62 - 137
Benzene	53.35	107 %	OK	66 - 142
Toluene	72.78	101 %	OK	59 - 139
Chlorobenzene	58.47	117 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	50.56	101 %	OK	70 - 121
Toluene-d8	51.49	103 %	OK	81 - 117
Bromofluorobenzene	49.53	99 %	OK	74 - 121

MATRIX RESULTS	
1,1-Dichloroethene	0
Trichloroethene	0
Benzene	0
Toluene	22.2
Chlorobenzene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS
1,1-Dichloroethene	66.54	70.42	6 %	OK	< 22
Trichloroethene	55.61	60.01	8 %	OK	< 24
Benzene	50.83	53.35	5 %	OK	< 21
Toluene	68.04	72.78	7 %	OK	< 21
Chlorobenzene	55.35	58.47	5 %	OK	< 21

Curtis & Tompkins, Ltd.

QC SUMMARY SHEET FOR EPA 8240

Laboratory Number:	110834		
Client:	Engineering Science	Spike file:	aej15
Analysis date:	05/20/93	Spike dup file:	aej16
Sample type:	SOIL (MeOH)		
Sample spiked:	110834-2		

SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	20.30	41 %	NOT OK	59 - 172
Trichloroethene	21.86	44 %	NOT OK	62 - 137
Benzene	22.62	45 %	NOT OK	66 - 142
Toluene	21.22	41 %	NOT OK	59 - 139
Chlorobenzene	24.72	49 %	NOT OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	25.47	51 %	NOT OK	70 - 121
Toluene-d8	22.15	44 %	NOT OK	81 - 117
Bromofluorobenzene	20.47	41 %	NOT OK	74 - 121

SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	13.02	26 %	NOT OK	59 - 172
Trichloroethene	19.35	39 %	NOT OK	62 - 137
Benzene	19.65	39 %	NOT OK	66 - 142
Toluene	18.75	36 %	NOT OK	59 - 139
Chlorobenzene	22.87	45 %	NOT OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	24.03	48 %	NOT OK	70 - 121
Toluene-d8	19.00	38 %	NOT OK	81 - 117
Bromofluorobenzene	19.20	38 %	NOT OK	74 - 121
MATRIX RESULTS				
1,1-Dichloroethene	0			
Trichloroethene	0			
Benzene	0			
Toluene	0.654			
Chlorobenzene	0.423			

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS
1,1-Dichloroethene	20.30	13.02	44 %	NOT OK	< 22
Trichloroethene	21.86	19.35	12 %	OK	< 24
Benzene	22.62	19.65	14 %	OK	< 21
Toluene	21.22	18.75	12 %	OK	< 21
Chlorobenzene	24.72	22.87	8 %	OK	< 21

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8240

Laboratory Number: 110834
Client: Engineering Science
Analysis date: 05/20/93 LCS file: aej08
Sample type: SOIL (MeOH)

LCS DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	64.10	128 %	OK	59 - 172
Benzene	54.83	110 %	OK	62 - 137
Trichloroethene	48.66	97 %	OK	66 - 142
Toluene	47.99	96 %	OK	59 - 139
Chlorobenzene	56.25	113 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	49.50	99 %	OK	70 - 121
Toluene-d8	49.90	100 %	OK	81 - 117
Bromofluorobenzene	49.39	99 %	OK	74 - 121

110734

CHAIN OF CUS. ODY RECORD

PROJECT NO.: PE375 01

PROJECT NAME: CHEVRON

SAMPLERS (Signatures): Kyle Caskey

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	METALS	SVOA	CYANIDE	ORGANIC LEAD	ISOBUTYL ALCOHOL	VOA					REMARKS
5-6-93	1330	SOIL	SWMU-21-1-0.5 1	3	X	X	X	X	X	X					NOTE: METAL ANALYSIS
5-6-93	1345	SOIL	SWMU-21-2-0.5 2	3	X	X	X	X	X	X					IS THE SKINNER LIST
5-6-93	1400	SOIL	SWMU-22-1-0.5 3	3	X	X	X	X	X	X					OF COMPOUNDS
5-6-93	1415	SOIL	SWMU-22-2-0.5 4	3	X	X	X	X	X	X					
5-6-93	1430	SOIL	SWMU-22-2D-0.5 5	3	X	X	X	X	X	X					

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
Kyle Caskey	5-6-93	Murray J. Williams	5/7/93	None
	TIME 1600		TIME 10:15	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	

ENGINEERING-SCIENCE, INC. 211.0858/YO

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Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

A N A L Y T I C A L R E P O R T

Prepared for:

Engineering Science, Inc.
1357 Kapiolani Boulevard
Suite 1120
Honolulu, HI 96814

Date: 04-OCT-93
Lab Job Number: 112313
Project ID: PE375.01
Location: Chevron Hawaiian Refinery

Reviewed by: _____

Reviewed by: _____

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Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313

CLIENT: ENGINEERING SCIENCE, INC.

PROJECT ID: PE 375

LOCATION: CHEVRON RFI

DATE SAMPLED: 09/16/93

DATE RECEIVED: 09/17/93

DATE REPORTED: 10/04/93

CASE NARRATIVE

Curtis & Tompkins received 22 soil samples and 2 water samples for the above referenced project on September 17, 1993 for analysis of volatiles, semi-volatiles, cyanide, organic lead, isobutyl alcohol and the Skinner list metals. The analytical results for this work are included in the accompanying report. The following items should be considered when interpreting the data.

The soils were analyzed in two batches for organic lead. The sample duplicate and sample spike in the second batch were performed on laboratory sample 112313-22 (ES sample id SWMU 18M-3-2). The results of the duplicate analysis had an RDP of 64% and the spike recovery was 284%. A post digestion spike on the same sample had a 97% recovery indicating that the instrumentation is not the source of the error. The laboratory control standard recovery substantiates this and also indicates that the extraction procedure is working. For these reasons it appears that the matrix is the source of variability which is not surprising given the oily nature of the samples.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313

CASE NARRATIVE

P2.

The soil samples were also analyzed by EPA 8270 for semi-volatile components. The method was modified to include silica gel cleanup and selective ion monitoring. Review of the surrogate recoveries indicates that the acid fraction surrogates (phenol compounds) were below method acceptance limits for recoveries. It is C&T's opinion that the loss of these compounds occurred during the cleanup procedure.

The samples were analyzed for isobutyl alcohol using a deionized water extraction followed by gas chromatography with flame ionization detection. Both precision and accuracy were not within usual recoveries for this analysis. Surrogate recoveries in the samples also indicate that due to the oily nature of the samples, the extraction technique was not producing accurate results (surrogate recoveries were in the range 24 to 74 percent with most of the recoveries falling in the thirty percent range).

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93
DATE REVISED: 11/19/93

CASE NARRATIVE
ADDENDUM

Volatile analyses was performed on all 22 soil samples and on two aqueous samples. Spike recovery for toluene in the soils was out of control due to the hydrocarbon background in the samples. This is evident in both spikes. Laboratory control standards for the analysis were all within acceptance criteria. All data quality objectives were met for the aqueous matrix.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/21/93
DATE REPORTED: 10/04/93

ANALYSIS: SULFATE
ANALYSIS METHOD: EPA 300.0

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112313-15	SWMU 18S-3-0.5	140	mg/Kg	20
112313-16	SWMU 18S-3-1.5	ND	mg/Kg	20
112313-17	SWMU 18M-1-1	1,200	mg/Kg	80
112313-18	SWMU 18M-1-2	40	mg/Kg	20
112313-19	SWMU 18M-2-1	330	mg/Kg	80
112313-20	SWMU 18M-2-2	170	mg/Kg	20
112313-21	SWMU 18M-3-1	320	mg/Kg	80
112313-22	SWMU 18M-3-2	100	mg/Kg	20
112313-24	SWMU 18S-3D-1.5	80	mg/Kg	20

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

SAMPLE DUPLICATE RPD, %	3
MATRIX SPIKE RECOVERY, %	66

Curtis & Tompkins, Ltd.

Client: **Engineering Science, Inc.** **Laboratory Login Number: 112313**

Project Name: Chevron Hawaiian Refinery Report Date: 05 October 93
Project Number: PE375.01

ANALYSIS: pH

Lab ID	Sample ID	Matrix	Sampled	Received	Analyzed	Result	Units	Method	Analyst	QC Batch
112313-015	SWMU-18S-3-0.5	Soil	16-SEP-93	17-SEP-93	29-SEP-93	8.1	SU *	EPA 9045	TR	10747
112313-016	SWMU-18S-3-1.5	Soil	16-SEP-93	17-SEP-93	29-SEP-93	8.2	SU *	EPA 9045	TR	10747
112313-017	SWMU-18M-1-1	Soil	16-SEP-93	17-SEP-93	29-SEP-93	8.0	SU *	EPA 9045	TR	10747
112313-018	SWMU-18M-1-2	Soil	16-SEP-93	17-SEP-93	29-SEP-93	8.4	SU *	EPA 9045	TR	10747
112313-019	SWMU-18M-2-1	Soil	16-SEP-93	17-SEP-93	29-SEP-93	8.3	SU *	EPA 9045	TR	10747
112313-020	SWMU-18M-2-2	Soil	16-SEP-93	17-SEP-93	29-SEP-93	8.4	SU *	EPA 9045	TR	10747
112313-021	SWMU-18M-3-1	Soil	16-SEP-93	17-SEP-93	29-SEP-93	8.3	SU *	EPA 9045	TR	10747
112313-022	SWMU-18M-3-2	Soil	16-SEP-93	17-SEP-93	29-SEP-93	8.4	SU *	EPA 9045	TR	10747
112313-024	SWMU-18S-3D-1.5	Soil	16-SEP-93	17-SEP-93	29-SEP-93	8.6	SU *	EPA 9045	TR	10747

* Soil pH measured as water

Curtis & Tompkins, Ltd.

QC Batch Report

Client: Engineering Science, Inc.
Project Name: Chevron Hawaiian Refinery
Project Number: PE375.01

Laboratory Login Number: 112313
Report Date: 05 October 93

ANALYSIS: pH

QC Batch Number: 10747

Calibration Verification Results

Sample	Result	TV	Difference	Limit	Analyzed
ICV	10.02	10.00	.02	< 0.10	29-SEP-93
CCV	10.02	10.00	.02	< 0.10	29-SEP-93
CCV	10.02	10.00	.02	< 0.10	29-SEP-93
CCV	10.01	10.00	.01	< 0.10	29-SEP-93

Sample Duplicate Results

Sample	Duplicate	RPD	Analyzed
8.58	8.52	.7%	29-SEP-93
8.61	8.56	.6%	29-SEP-93

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/23/93
DATE REPORTED: 10/04/93

ANALYSIS: ORGANIC LEAD
ANALYSIS METHOD: CA DHS METHOD, LUFT MANUAL OCT 1989

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112313-1	SWMU 18L-1-1	ND	mg/Kg	0.5
112313-2	SWMU 18L-1-2	52	mg/Kg	3
112313-3	SWMU 18L-2-1	31	mg/Kg	1
112313-4	SWMU 18L-2-2	110	mg/Kg	4
112313-5	SWMU 18L-3-1	ND	mg/Kg	0.5
112313-6	SWMU 18L-3-2	3.2	mg/Kg	0.5
112313-7	SWMU 19-1-1	ND	mg/Kg	0.5
112313-8	SWMU 19-2-1	ND	mg/Kg	0.5
112313-9	SWMU 19-3-1	ND	mg/Kg	0.5
112313-10	SWMU 18S-1-1	44	mg/Kg	1
112313-11	SWMU 18S-1-2	ND	mg/Kg	0.5
112313-12	SWMU 18S-2-1	22	mg/Kg	0.5
112313-13	SWMU 18S-2-2	43	mg/Kg	1
112313-15	SWMU 18S-3-0.5	36	mg/Kg	1
112313-16	SWMU 18S-3-1.5	23	mg/Kg	0.5
112313-17	SWMU 18M-1-1	ND	mg/Kg	0.5
112313-18	SWMU 18M-1-2	ND	mg/Kg	0.5
112313-19	SWMU 18M-2-1	ND	mg/Kg	0.5
112313-20	SWMU 18M-2-2	ND	mg/Kg	0.5
112313-21	SWMU 18M-3-1	ND	mg/Kg	0.5

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

SAMPLE DUPLICATE RPD, %	<1
MATRIX SPIKE RECOVERY, %	105

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/23/93
DATE REPORTED: 10/04/93

ANALYSIS: ORGANIC LEAD
ANALYSIS METHOD: CA DHS METHOD, LUFT MANUAL OCT 1989

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112313-22	SWMU 18M-3-2	3.2	mg/Kg	0.5
112313-24	SWMU 18S-3D-1.5	170	mg/Kg	5

QA/QC SUMMARY:

SAMPLE DUPLICATE RPD, %	63
MATRIX SPIKE RECOVERY, %	284
LABORATORY CONTROL SAMPLE RECOVERY, %	107

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/04/93

ANALYSIS: CYANIDE
ANALYSIS METHOD: EPA 335.2 (Modified)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112313-1	SWMU 18L-1-1	0.4	mg/Kg	0.3
112313-2	SWMU 18L-1-2	ND	mg/Kg	0.3
112313-3	SWMU 18L-2-1	ND	mg/Kg	0.3
112313-4	SWMU 18L-2-2	0.3	mg/Kg	0.3
112313-5	SWMU 18L-3-1	ND	mg/Kg	0.3
112313-6	SWMU 18L-3-2	ND	mg/Kg	0.3
112313-7	SWMU 19-1-1	0.3	mg/Kg	0.3
112313-8	SWMU 19-2-1	0.5	mg/Kg	0.3
112313-9	SWMU 19-3-1	0.7	mg/Kg	0.3
112313-10	SWMU 18S-1-1	ND	mg/Kg	0.3
112313-11	SWMU 18S-1-2	ND	mg/Kg	0.3
112313-12	SWMU 18S-2-1	ND	mg/Kg	0.3

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

SAMPLE DUPLICATE RPD, %	29
MATRIX SPIKE RECOVERY, %	68

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/04/93

ANALYSIS: CYANIDE
ANALYSIS METHOD: EPA 335.2 (Modified)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112313-13	SWMU 18S-2-2	0.4	mg/Kg	0.3
112313-15	SWMU 18S-3-0.5	ND	mg/Kg	0.3
112313-16	SWMU 18S-3-1.5	ND	mg/Kg	0.3
112313-17	SWMU 18M-1-1	0.8	mg/Kg	0.3
112313-18	SWMU 18M-1-2	1.5	mg/Kg	0.3
112313-19	SWMU 18M-2-1	0.6	mg/Kg	0.3
112313-20	SWMU 18M-2-2	ND	mg/Kg	0.3
112313-21	SWMU 18M-3-1	ND	mg/Kg	0.3
112313-22	SWMU 18M-3-2	ND	mg/Kg	0.3
112313-24	SWMU 18S-3D-1.5	0.5	mg/Kg	0.3

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

SAMPLE DUPLICATE RPD, %	29
MATRIX SPIKE RECOVERY, %	72

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/29/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/04/93

ANALYSIS: ISOBUTYL ALCOHOL
ANALYSIS METHOD: EPA 8015 (Modified)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112313-1	SWMU 18L-1-1	ND	mg/Kg	1
112313-2	SWMU 18L-1-2	ND	mg/Kg	1
112313-3	SWMU 18L-2-1	ND	mg/Kg	1
112313-4	SWMU 18L-2-2	ND	mg/Kg	1
112313-5	SWMU 18L-3-1	ND	mg/Kg	1
112313-6	SWMU 18L-3-2	ND	mg/Kg	1
112313-7	SWMU 19-1-1	ND	mg/Kg	1
112313-8	SWMU 19-2-1	ND	mg/Kg	1
112313-9	SWMU 19-3-1	ND	mg/Kg	1
112313-10	SWMU 18S-1-1	ND	mg/Kg	1
112313-11	SWMU 18S-1-2	ND	mg/Kg	1
112313-12	SWMU 18S-2-1	ND	mg/Kg	1
112313-13	SWMU 18S-2-2	ND	mg/Kg	1
112313-15	SWMU 18S-3-0.5	ND	mg/Kg	1
112313-16	SWMU 18S-3-1.5	ND	mg/Kg	1
112313-17	SWMU 18M-1-1	ND	mg/Kg	1
112313-18	SWMU 18M-1-2	ND	mg/Kg	1
112313-19	SWMU 18M-2-1	ND	mg/Kg	1
112313-20	SWMU 18M-2-2	ND	mg/Kg	1
112313-21	SWMU 18M-3-1	ND	mg/Kg	1

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

MS/MSD, RPD, %	19
MS/MSD, AVERAGE RECOVERY, %	16
LABORATORY CONTROL SAMPLE RECOVERY, %	104

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/29/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/04/93

ANALYSIS: ISOBUTYL ALCOHOL
ANALYSIS METHOD: EPA 8015 (Modified)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112313-22	SWMU 18M-3-2	ND	mg/Kg	1
112313-24	SWMU 18S-3D-1.5	ND	mg/Kg	1

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

MS/MSD, RPD, %	18
MS/MSD, AVERAGE RECOVERY, %	14
LABORATORY CONTROL SAMPLE RECOVERY, %	18

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-10
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-1-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	8	3	EPA 7060
Barium	30	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	430	5	EPA 6010
Cobalt	13	0.9	EPA 6010
Lead	1,200	30	EPA 7420
Mercury	0.1	0.1	EPA 7471
Nickel	23	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	48	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-11
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-1-2
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	ND	3	EPA 7060
Barium	8.2	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	20	5	EPA 6010
Cobalt	ND	0.9	EPA 6010
Lead	30	5	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	2	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	7	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-12
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-2-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	7	3	EPA 7060
Barium	36	5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	3	3	EPA 6010
Chromium (total)	440	5	EPA 6010
Cobalt	14	0.9	EPA 6010
Lead	1,300	30	EPA 7420
Mercury	0.1	0.1	EPA 7471
Nickel	31	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	48	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-13
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-2-2
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	8	3	EPA 7060
Barium	24	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	210	5	EPA 6010
Cobalt	8.2	0.9	EPA 6010
Lead	410	5	EPA 7420
Mercury	0.2	0.1	EPA 7471
Nickel	14	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	24	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-15
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-3-0.5
BATCH A
BATCH B FOR SE AND AS

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	9	3	EPA 7060
Barium	32	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	3	3	EPA 6010
Chromium (total)	540	5	EPA 6010
Cobalt	15	0.9	EPA 6010
Lead	1,300	30	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	30	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	48	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-16
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-3-1.5
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	7	3	EPA 7060
Barium	38	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	500	5	EPA 6010
Cobalt	14	0.9	EPA 6010
Lead	1,100	30	EPA 7420
Mercury	0.2	0.1	EPA 7471
Nickel	28	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	51	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-24
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-3D-1.5
BATCH B

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	4	3	EPA 7060
Barium	5.7	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.9	0.3	EPA 6010
Chromium (total)	200	0.5	EPA 6010
Cobalt	5.0	0.9	EPA 6010
Lead	350	5	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	8	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	10	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-17
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-1-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	ND	3	EPA 7060
Barium	7.6	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.6	0.3	EPA 6010
Chromium (total)	36	0.5	EPA 6010
Cobalt	2.9	0.9	EPA 6010
Lead	32	5	EPA 7420
Mercury	0.6	0.1	EPA 7471
Nickel	76	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	36	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-18
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-1-2
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	3	3	EPA 7060
Barium	10	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	170	5	EPA 6010
Cobalt	4.9	0.9	EPA 6010
Lead	44	5	EPA 7420
Mercury	0.5	0.1	EPA 7471
Nickel	39	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	53	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-19
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-2-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	3	3	EPA 7060
Barium	10	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.3	0.3	EPA 6010
Chromium (total)	78	0.5	EPA 6010
Cobalt	5.2	0.9	EPA 6010
Lead	48	5	EPA 7420
Mercury	0.8	0.1	EPA 7471
Nickel	65	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	53	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-20
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-2-2
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	ND	3	EPA 7060
Barium	11	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.5	0.3	EPA 6010
Chromium (total)	47	0.5	EPA 6010
Cobalt	5.0	0.9	EPA 6010
Lead	36	5	EPA 7420
Mercury	0.6	0.1	EPA 7471
Nickel	75	2	EPA 6010
Selenium	3	3	EPA 7740
Vanadium	46	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-21
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-3-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	ND	3	EPA 7060
Barium	10	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.1	0.3	EPA 6010
Chromium (total)	48	0.5	EPA 6010
Cobalt	5.8	0.9	EPA 6010
Lead	40	5	EPA 7420
Mercury	0.7	0.1	EPA 7471
Nickel	52	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	46	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-22
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-3-2
BATCH B

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	7	3	EPA 7060
Barium	10	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	74	5	EPA 6010
Cobalt	3.2	0.9	EPA 6010
Lead	190	5	EPA 7420
Mercury	0.6	0.1	EPA 7471
Nickel	13	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	16	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-1
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-1-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	ND	3	EPA 7060
Barium	15	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	1.2	0.3	EPA 6010
Chromium (total)	30	1	EPA 6010
Cobalt	3.1	0.9	EPA 6010
Lead	17	5	EPA 7420
Mercury	0.4	0.1	EPA 7471
Nickel	110	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	32	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-2
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-1-2
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	16	3	EPA 7060
Barium	23	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	280	5	EPA 6010
Cobalt	6.5	0.9	EPA 6010
Lead	410	5	EPA 7420
Mercury	0.1	0.1	EPA 7471
Nickel	30	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	45	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-3
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-2-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	21	3	EPA 7060
Barium	26	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	290	5	EPA 6010
Cobalt	9.2	0.9	EPA 6010
Lead	570	10	EPA 7420
Mercury	0.1	0.1	EPA 7471
Nickel	25	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	43	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-4
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-2-2
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	20	3	EPA 7060
Barium	28	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	330	5	EPA 6010
Cobalt	13	0.9	EPA 6010
Lead	520	5	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	27	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	49	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-5
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-3-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	4	3	EPA 6010
Arsenic	3	3	EPA 7060
Barium	11	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	0.8	0.3	EPA 6010
Chromium (total)	69	0.5	EPA 6010
Cobalt	2.4	0.9	EPA 6010
Lead	25	5	EPA 7420
Mercury	0.3	0.1	EPA 7471
Nickel	66	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	28	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-6
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-3-2
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	3	3	EPA 7060
Barium	6.2	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	13	5	EPA 6010
Cobalt	ND	0.9	EPA 6010
Lead	10	5	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	ND	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	ND	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-7
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-19-1-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	6	3	EPA 7060
Barium	15	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	47	5	EPA 6010
Cobalt	13	0.9	EPA 6010
Lead	22	5	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	98	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	49	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-8
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-19-2-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	42	3	EPA 7060
Barium	12	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	24	5	EPA 6010
Cobalt	5.7	0.9	EPA 6010
Lead	33	5	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	37	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	22	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-9
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-19-3-1
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	30	EPA 6010
Arsenic	38	3	EPA 7060
Barium	19	0.5	EPA 6010
Beryllium	ND	1	EPA 6010
Cadmium	ND	3	EPA 6010
Chromium (total)	50	5	EPA 6010
Cobalt	5.8	0.9	EPA 6010
Lead	88	5	EPA 7420
Mercury	0.1	0.1	EPA 7471
Nickel	45	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	34	5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-PREP BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
BATCH A

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	ND	3	EPA 7060
Barium	ND	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	ND	5	EPA 6010
Cobalt	ND	0.9	EPA 6010
Lead	ND	5	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	ND	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	ND	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-PREP BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE 375
LOCATION: CHEVRON RFI
BATCH B

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93

Metals in Soils & Wastes
Digestion Method: EPA 3050

METAL	RESULT mg/Kg	REPORTING LIMIT mg/Kg	METHOD
Antimony	ND	3	EPA 6010
Arsenic	ND	3	EPA 7060
Barium	ND	0.5	EPA 6010
Beryllium	ND	0.1	EPA 6010
Cadmium	ND	0.3	EPA 6010
Chromium (total)	ND	5	EPA 6010
Cobalt	ND	0.9	EPA 6010
Lead	ND	5	EPA 7420
Mercury	ND	0.1	EPA 7471
Nickel	ND	2	EPA 6010
Selenium	ND	3	EPA 7740
Vanadium	ND	0.5	EPA 6010

ND = Not detected at or above reporting limit.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
BATCH A
QC SAMPLE: 112313-1

QC for Metals in Soils & Wastes

	LCS RECOVERY,%	SAMPLE DUP RPD,%	SAMPLE SPIKE RECOVERY,%	DATE ANALYZED
Antimony	94	NC	62	09/21/93
Arsenic	89	NC	77	09/22/93
Barium	98	3	88	09/21/93
Beryllium	100	NC	97	09/21/93
Cadmium	99	8	98	09/21/93
Chromium (total)	98	7	78	09/21/93
Cobalt	96	16	85	09/21/93
Lead	98	12	87	09/23/93
Mercury	103	20	85	09/20/93
Nickel	95	9	85	09/21/93
Selenium	83	17	85	09/21/93
Vanadium	96	3	81	09/21/93

NC = Not Calculable
NM = Not meaningful

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
BATCH B
QC SAMPLE: 112313-22
112313-15 for As and Se

QC for Metals in Soils & Wastes

	LCS RECOVERY,%	SAMPLE DUP RPD,%	SAMPLE SPIKE RECOVERY,%	DATE ANALYZED
Antimony	90	NC	78	09/22/93
Arsenic	100	26	127	09/22/93
Barium	96	5	77	09/22/93
Beryllium	91	NC	79	09/22/93
Cadmium	94	NC	84	09/22/93
Chromium (total)	99	7	NM	09/22/93
Cobalt	92	<1	74	09/22/93
Lead	84	26	NM	09/22/93
Mercury	108	1	83	09/20/93
Nickel	99	4	104	09/22/93
Selenium	109	NC	62	09/22/93
Vanadium	92	10	89	09/22/93

NC = Not Calculable
NM = Not meaningful

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-10
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-1-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/24/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	1,000
Chloroform	ND	1,000
1,2-Dichloroethane	ND	1,000
2-Butanone	ND	2,000
Benzene	1,000	1,000
Toluene	2,000	1,000
Chlorobenzene	ND	1,000
Ethyl benzene	14,000	1,000
Styrene	ND	1,000
Total xylenes	6,000	1,000
1,2-Dibromoethane	ND	1,000
1,4-Dioxane	ND	20,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	115 %
Toluene-d8	101 %
Bromofluorobenzene	102 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-11
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-1-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/24/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	300
Chloroform	ND	300
1,2-Dichloroethane	ND	300
2-Butanone	ND	500
Benzene	ND	300
Toluene	detected (200)	300
Chlorobenzene	ND	300
Ethyl benzene	2,700	300
Styrene	ND	300
Total xylenes	1,500	300
1,2-Dibromoethane	ND	300
1,4-Dioxane	ND	5,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	117 %
Toluene-d8	99 %
Bromofluorobenzene	107 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-12
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-2-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	1,000
Chloroform	ND	1,000
1,2-Dichloroethane	ND	1,000
2-Butanone	ND	2,000
Benzene	ND	1,000
Toluene	detected (900)	1,000
Chlorobenzene	ND	1,000
Ethyl benzene	18,000	1,000
Styrene	ND	1,000
Total xylenes	6,000	1,000
1,2-Dibromoethane	ND	1000
1,4-Dioxane	ND	20,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	118 %
Toluene-d8	98 %
Bromofluorobenzene	104 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-13
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-2-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	3,000
Chloroform	ND	3,000
1,2-Dichloroethane	ND	3,000
2-Butanone	ND	5,000
Benzene	detected (2,000)	3,000
Toluene	ND	3,000
Chlorobenzene	ND	3,000
Ethyl benzene	30,000	3,000
Styrene	ND	3,000
Total xylenes	11,000	3,000
1,2-Dibromoethane	ND	3,000
1,4-Dioxane	ND	50,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	113 %
Toluene-d8	100 %
Bromofluorobenzene	104 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-15
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-3-0.5

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	500
Chloroform	ND	500
1,2-Dichloroethane	ND	500
2-Butanone	ND	1,000
Benzene	detected (300)	500
Toluene	900	500
Chlorobenzene	ND	500
Ethyl benzene	5,600	500
Styrene	ND	500
Total xylenes	2,300	500
1,2-Dibromoethane	ND	500
1,4-Dioxane	ND	10,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	106 %
Toluene-d8	98 %
Bromofluorobenzene	101 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-16
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-3-1.5

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	3,000
Chloroform	ND	3,000
1,2-Dichloroethane	ND	3,000
2-Butanone	ND	5,000
Benzene	ND	3,000
Toluene	5,000	3,000
Chlorobenzene	ND	3,000
Ethyl benzene	39,000	3,000
Styrene	ND	3,000
Total xylenes	28,000	3,000
1,2-Dibromoethane	ND	3,000
1,4-Dioxane	ND	50,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	101 %
Toluene-d8	99 %
Bromofluorobenzene	102 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-24
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-3D-1.5

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	3,000
Chloroform	ND	3,000
1,2-Dichloroethane	ND	3,000
2-Butanone	ND	5,000
Benzene	ND	3,000
Toluene	12,000	3,000
Chlorobenzene	ND	3,000
Ethyl benzene	45,000	3,000
Styrene	ND	3,000
Total xylenes	53,000	3,000
1,2-Dibromoethane	ND	3,000
1,4-Dioxane	ND	50,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	101 %
Toluene-d8	98 %
Bromofluorobenzene	105 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-17
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-1-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/24/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	200
Chloroform	ND	200
1,2-Dichloroethane	ND	200
2-Butanone	detected (200)	300
Benzene	ND	200
Toluene	ND	200
Chlorobenzene	ND	200
Ethyl benzene	detected (100)	200
Styrene	ND	200
Total xylenes	500	200
1,2-Dibromoethane	ND	200
1,4-Dioxane	ND	3,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	111 %
Toluene-d8	103 %
Bromofluorobenzene	101 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-18
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-1-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	100
Chloroform	ND	100
1,2-Dichloroethane	ND	100
2-Butanone	ND	300
Benzene	ND	100
Toluene	200	100
Chlorobenzene	ND	100
Ethyl benzene	400	100
Styrene	ND	100
Total xylenes	1,900	100
1,2-Dibromoethane	ND	100
1,4-Dioxane	ND	3,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	104 %
Toluene-d8	99 %
Bromofluorobenzene	101 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-19
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-2-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	100
Chloroform	ND	100
1,2-Dichloroethane	ND	100
2-Butanone	ND	300
Benzene	ND	100
Toluene	detected (80)	100
Chlorobenzene	ND	100
Ethyl benzene	190	100
Styrene	ND	100
Total xylenes	1,000	100
1,2-Dibromoethane	ND	100
1,4-Dioxane	ND	3,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	58 %
Toluene-d8	36 %
Bromofluorobenzene	38 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-20
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-2-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	40	30
Chloroform	ND	30
1,2-Dichloroethane	ND	30
2-Butanone	140	60
Benzene	120	30
Toluene	130	30
Chlorobenzene	ND	30
Ethyl benzene	230	30
Styrene	ND	30
Total xylenes	1,100	30
1,2-Dibromoethane	ND	30
1,4-Dioxane	ND	600

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	108 %
Toluene-d8	106 %
Bromofluorobenzene	97 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-21
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-3-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	80	30
Chloroform	ND	30
1,2-Dichloroethane	ND	30
2-Butanone	190	50
Benzene	50	30
Toluene	120	30
Chlorobenzene	ND	30
Ethyl benzene	150	30
Styrene	ND	30
Total xylenes	1,500	30
1,2-Dibromoethane	ND	30
1,4-Dioxane	ND	500

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	101 %
Toluene-d8	113 %
Bromofluorobenzene	95 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-22
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-3-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/24/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	100
Chloroform	ND	100
1,2-Dichloroethane	ND	100
2-Butanone	ND	300
Benzene	detected (98)	100
Toluene	100	100
Chlorobenzene	ND	100
Ethyl benzene	700	100
Styrene	ND	100
Total xylenes	900	100
1,2-Dibromoethane	ND	100
1,4-Dioxane	ND	3,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	116 %
Toluene-d8	101 %
Bromofluorobenzene	102 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-1
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-1-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/23/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	100
Chloroform	ND	100
1,2-Dichloroethane	ND	100
2-Butanone	ND	300
Benzene	ND	100
Toluene	ND	100
Chlorobenzene	ND	100
Ethyl benzene	ND	100
Styrene	ND	100
Total xylenes	100	100
1,2-Dibromoethane	ND	100
1,4-Dioxane	ND	3,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	107 %
Toluene-d8	102 %
Bromofluorobenzene	104 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-2
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-1-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/23/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	100
Chloroform	ND	100
1,2-Dichloroethane	ND	100
2-Butanone	ND	300
Benzene	ND	100
Toluene	200	100
Chlorobenzene	ND	100
Ethyl benzene	100	100
Styrene	ND	100
Total xylenes	500	100
1,2-Dibromoethane	ND	100
1,4-Dioxane	ND	3,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	106 %
Toluene-d8	102 %
Bromofluorobenzene	102 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-3
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-2-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/21/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	detected (4)	5
Toluene	31	5
Chlorobenzene	ND	5
Ethyl benzene	14	5
Styrene	ND	5
Total xylenes	15	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	100 %
Toluene-d8	142 %
Bromofluorobenzene	68 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-4
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-2-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/23/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	100
Chloroform	ND	100
1,2-Dichloroethane	ND	100
2-Butanone	ND	300
Benzene	600	100
Toluene	4,800	100
Chlorobenzene	ND	100
Ethyl benzene	2,900	100
Styrene	ND	100
Total xylenes	3,300	100
1,2-Dibromoethane	ND	100
1,4-Dioxane	ND	3,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	104 %
Toluene-d8	103 %
Bromofluorobenzene	100 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-5
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-3-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	30
Chloroform	ND	30
1,2-Dichloroethane	ND	30
2-Butanone	ND	50
Benzene	ND	30
Toluene	40	30
Chlorobenzene	ND	30
Ethyl benzene	130	30
Styrene	ND	30
Total xylenes	600	30
1,2-Dibromoethane	ND	30
1,4-Dioxane	ND	500

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	109 %
Toluene-d8	110 %
Bromofluorobenzene	104 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-6
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-3-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/23/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	100
Chloroform	ND	100
1,2-Dichloroethane	ND	100
2-Butanone	ND	300
Benzene	300	100
Toluene	200	100
Chlorobenzene	ND	100
Ethyl benzene	1,900	100
Styrene	ND	100
Total xylenes	3,200	100
1,2-Dibromoethane	ND	100
1,4-Dioxane	ND	3,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	108 %
Toluene-d8	103 %
Bromofluorobenzene	103 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-7
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-19-1-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/21/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	10	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	8	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	104 %
Toluene-d8	123 %
Bromofluorobenzene	81 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-8
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-19-2-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/27/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	detected (5)	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	detected (3)	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	94 %
Toluene-d8	116 %
Bromofluorobenzene	96 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-9
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-19-3-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/21/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	40	10
Benzene	detected (4)	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	5	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	105 %
Toluene-d8	120 %
Bromofluorobenzene	84 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-14
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: TB-6

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/27/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN AQUEOUS SOLUTIONS

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	99 %
Toluene-d8	100 %
Bromofluorobenzene	94 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-23
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: TB-7

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE ANALYZED: 09/27/93
DATE REPORTED: 10/04/93

EPA METHOD 8240: VOLATILE ORGANICS IN AQUEOUS SOLUTIONS

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	102 %
Toluene-d8	102 %
Bromofluorobenzene	94 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-METHOD BLANK DATE ANALYZED: 09/21/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/04/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	109 %
Toluene-d8	102 %
Bromofluorobenzene	100 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-METHOD BLANK DATE ANALYZED: 09/23/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/04/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	104 %
Toluene-d8	102 %
Bromofluorobenzene	103 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-METHOD BLANK DATE ANALYZED: 09/24/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/04/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	118 %
Toluene-d8	103 %
Bromofluorobenzene	98 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-METHOD BLANK DATE ANALYZED: 09/27/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/04/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN AQUEOUS SOLUTIONS

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	100 %
Toluene-d8	99 %
Bromofluorobenzene	96 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-METHOD BLANK DATE ANALYZED: 09/28/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/04/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	105 %
Toluene-d8	101 %
Bromofluorobenzene	100 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-METHOD BLANK DATE ANALYZED: 09/29/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/04/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	114 %
Toluene-d8	101 %
Bromofluorobenzene	103 %

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8240

Laboratory Number: 112313
Client: Engineering Science
Analysis date: 09/21/93 LCS file: ail04
Sample type: Soil

LCS DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	51.01	102 %	OK	59 - 172
Trichloroethene	47.21	94 %	OK	62 - 137
Benzene	46.63	93 %	OK	66 - 142
Toluene	47.21	94 %	OK	59 - 139
Chlorobenzene	46.49	93 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	52.72	105 %	OK	70 - 121
Toluene-d8	51.43	103 %	OK	81 - 117
Bromofluorobenzene	50.28	101 %	OK	74 - 121

Curtis & Tompkins, Ltd.

QC SUMMARY SHEET FOR EPA 8240

Laboratory Number:	112313		
Client:	Engineering Science	Spike file:	ail14
Analysis date:	09/21/93	Spike dup file:	ail15
Sample type:	Soil		
Sample spiked:	112313-3		

SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	39.35	79 %	OK	59 - 172
Trichloroethene	35.14	70 %	OK	62 - 137
Benzene	66.79	127 %	OK	66 - 142
Toluene	206.88	352 %	NOT OK	59 - 139
Chlorobenzene	49.40	99 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	37.83	76 %	OK	70 - 121
Toluene-d8	82.45	165 %	NOT OK	81 - 117
Bromofluorobenzene	33.51	67 %	NOT OK	74 - 121

SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	35.68	71 %	OK	59 - 172
Trichloroethene	35.15	70 %	OK	62 - 137
Benzene	64.83	123 %	OK	66 - 142
Toluene	182.63	303 %	NOT OK	59 - 139
Chlorobenzene	49.21	98 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	41.68	83 %	OK	70 - 121
Toluene-d8	78.13	156 %	NOT OK	81 - 117
Bromofluorobenzene	34.39	69 %	NOT OK	74 - 121

MATRIX RESULTS	
1,1-Dichloroethene	0
Trichloroethene	0
Benzene	3.52
Toluene	30.97
Chlorobenzene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS
1,1-Dichloroethene	39.35	35.68	10 %	OK	< 22
Trichloroethene	35.14	35.15	0 %	OK	< 24
Benzene	66.79	64.83	3 %	OK	< 21
Toluene	206.88	182.63	12 %	OK	< 21
Chlorobenzene	49.40	49.21	0 %	OK	< 21

Curtis & Tompkins, Ltd.

QC SUMMARY SHEET FOR EPA 8240

Laboratory Number:	112313		
Client:	Engineering Science	Spike file:	ain12
Analysis date:	09/23/93	Spike dup file:	ain13
Sample type:	Soil		
Sample spiked:	112313-4		

SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	43.09	86 %	OK	59 - 172
Trichloroethene	38.30	77 %	OK	62 - 137
Benzene	58.65	69 %	OK	66 - 142
Toluene	203.47	19 %	NOT OK	59 - 139
Chlorobenzene	39.43	79 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	50.85	102 %	OK	70 - 121
Toluene-d8	52.44	105 %	OK	81 - 117
Bromofluorobenzene	52.81	106 %	OK	74 - 121

SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	40.21	80 %	OK	59 - 172
Trichloroethene	37.03	74 %	OK	62 - 137
Benzene	57.70	67 %	OK	66 - 142
Toluene	200.54	14 %	NOT OK	59 - 139
Chlorobenzene	36.95	74 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	49.00	98 %	OK	70 - 121
Toluene-d8	51.77	104 %	OK	81 - 117
Bromofluorobenzene	51.29	103 %	OK	74 - 121

MATRIX RESULTS	
1,1-Dichloroethene	0
Trichloroethene	0
Benzene	24.38
Toluene	193.77
Chlorobenzene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS
1,1-Dichloroethene	43.09	40.21	7 %	OK	< 22
Trichloroethene	38.30	37.03	3 %	OK	< 24
Benzene	58.65	57.70	2 %	OK	< 21
Toluene	203.47	200.54	1 %	OK	< 21
Chlorobenzene	39.43	36.95	6 %	OK	< 21

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8240

Laboratory Number: 112313
Client: Engineering Science
Analysis date: 09/23/93 LCS file: ain03
Sample type: Soil

LCS DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	62.49	125 %	OK	59 - 172
Trichloroethene	47.92	96 %	OK	62 - 137
Benzene	47.86	96 %	OK	66 - 142
Toluene	48.35	97 %	OK	59 - 139
Chlorobenzene	48.23	96 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	51.33	103 %	OK	70 - 121
Toluene-d8	50.90	102 %	OK	81 - 117
Bromofluorobenzene	50.55	101 %	OK	74 - 121

Curtis & Tompkins, Ltd.

QC SUMMARY SHEET FOR EPA 8240

Laboratory Number:	112313		
Client:	Engineering Science	Spike file:	cir13
Analysis date:	09/27/93	Spike dup file:	cir14
Sample type:	Water		

SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	52.07	104 %	OK	61 - 145
Trichloroethene	49.18	98 %	OK	71 - 120
Benzene	48.01	95 %	OK	76 - 127
Toluene	47.05	94 %	OK	76 - 125
Chlorobenzene	49.14	98 %	OK	75 - 130
SURROGATES				
1,2-Dichloroethane-d4	47.93	96 %	OK	76 - 114
Toluene-d8	49.55	99 %	OK	88 - 110
Bromofluorobenzene	47.75	96 %	OK	86 - 115

SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	50.85	102 %	OK	61 - 145
Trichloroethene	50.07	100 %	OK	71 - 120
Benzene	49.93	99 %	OK	76 - 127
Toluene	48.20	96 %	OK	76 - 125
Chlorobenzene	50.32	101 %	OK	75 - 130
SURROGATES				
1,2-Dichloroethane-d4	47.41	95 %	OK	76 - 114
Toluene-d8	49.76	100 %	OK	88 - 110
Bromofluorobenzene	49.07	98 %	OK	86 - 115

MATRIX RESULTS	
1,1-Dichloroethene	0
Trichloroethene	0
Benzene	0.603
Toluene	0
Chlorobenzene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS
1,1-Dichloroethene	52.07	50.85	2 %	OK	< 14
Trichloroethene	49.18	50.07	2 %	OK	< 14
Benzene	48.01	49.93	4 %	OK	< 11
Toluene	47.05	48.20	2 %	OK	< 13
Chlorobenzene	49.14	50.32	2 %	OK	< 13

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8240

Laboratory Number: 111980
Client: Anacomp, Inc.
Analysis date: 08/31/93 LCS file: chv03
Sample type: Water

LCS DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	48.56	97 %	OK	61 - 145
Trichloroethene	46.69	93 %	OK	71 - 120
Benzene	46.54	93 %	OK	76 - 127
Toluene	45.66	91 %	OK	76 - 125
Chlorobenzene	45.18	90 %	OK	75 - 130
SURROGATES				
1,2-Dichloroethane-d4	49.13	98 %	OK	76 - 114
Toluene-d8	49.92	100 %	OK	88 - 110
Bromofluorobenzene	46.92	94 %	OK	86 - 115

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-10
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-1-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	53	2
1-Methylnaphthalene	640	20 *
Dimethylphthalate	ND	2
2,4-Dinitrophenol	32	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	770	20 *
Anthracene	36	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	32	2
Pyrene	250	20 *
Butylbenzylphthalate	3	2
Benzo(a)anthracene	79	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	230	20 *
4-Methylchrysene	97	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	74	2
Benzo(b)fluoranthene	29	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	60	2
Dibenz(a,h)anthracene	15	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.
*Analyzed at a 1:10 dilution on 09/29/93
QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	47	Terphenyl-d14	49
2-Fluorobiphenyl	45		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-11
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-1-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	23	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	11	2
Anthracene	ND	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	ND	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	ND	2
4-Methylchrysene	4	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	37	2,4,6-Tribromophenol	0
Nitrobenzene-d5	17	Terphenyl-d14	0
2-Fluorobiphenyl	17		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-12
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-2-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	3	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	ND	2
Anthracene	ND	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	ND	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	38	2
Chrysene	5	2
4-Methylchrysene	4	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	32	Terphenyl-d14	37
2-Fluorobiphenyl	31		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-13
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-2-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	250	40 *
1-Methylnaphthalene	830	40 *
Dimethylphthalate	ND	10
2,4-Dinitrophenol	21	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	180	40 *
Anthracene	18	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	14	2
Pyrene	86	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	23	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	65	2
4-Methylchrysene	53	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	32	2
Benzo(b)fluoranthene	15	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	30	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.
* Analyzed at a 1:20 dilution on 09/29/93
QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	32	Terphenyl-d14	36
2-Fluorobiphenyl	35		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-15
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-3-0.5

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	31	2
1-Methylnaphthalene	290	20 *
Dimethylphthalate	3	2
2,4-Dinitrophenol	22	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	270	20 *
Anthracene	22	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	23	2
Pyrene	120	20 *
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	36	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	94	2
4-Methylchrysene	70	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	55	2
Benzo(b)fluoranthene	21	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	42	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.
* Analyzed at a 1:10 dilution on 09/29/93
QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	29	Terphenyl-d14	33
2-Fluorobiphenyl	33		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-16
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-3-1.5

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)	
Pyridine	ND	2	
Phenol	ND	2	
1,3-Dichlorobenzene	ND	2	
1,4-Dichlorobenzene	ND	2	
1,2-Dichlorobenzene	ND	2	
Indene	ND	2	
2-Methylphenol	ND	2	
4-Methylphenol	ND	2	
2,4-Dimethylphenol	ND	2	
Quinoline	ND	2	
Naphthalene	240	40	*
1-Methylnaphthalene	1,500	40	*
Dimethylphthalate	9	2	
2,4-Dinitrophenol	43	2	
4-Nitrophenol	ND	2	
Diethylphthalate	ND	2	
Phenanthrene	500	40	*
Anthracene	38	2	
Benzenethiol	ND	2	
Di-n-butylphthalate	16	2	
Fluoranthene	35	2	
Pyrene	192	2	
Butylbenzylphthalate	3	2	
Benzo(a)anthracene	75	2	
bis(2-ethylhexyl)phthalate	71	2	
Chrysene	150	2	
4-Methylchrysene	110	2	
Di-n-octylphthalate	ND	2	
7,12-Dimethylbenz(a)anthracene	75	2	
Benzo(b)fluoranthene	32	2	
Benzo(k)fluoranthene	ND	2	
Benzo(a)pyrene	65	2	
Dibenz(a,h)anthracene	16	2	
Dibenz(a,h)acridine	ND	2	

ND = Not detected at or above reporting limit.
* Analzyed at a 1:20 dilution on 09/29/93
QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	33	Terphenyl-d14	39
2-Fluorobiphenyl	34		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-24
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18S-3D-1.5

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/11/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.7
Phenol	ND	0.7
1,3-Dichlorobenzene	ND	0.7
1,4-Dichlorobenzene	ND	0.7
1,2-Dichlorobenzene	ND	0.7
Indene	ND	0.7
2-Methylphenol	ND	0.7
4-Methylphenol	ND	0.7
2,4-Dimethylphenol	ND	0.7
Quinoline	ND	0.7
Naphthalene	12	0.7
1-Methylnaphthalene	47	0.7
Dimethylphthalate	ND	0.7
2,4-Dinitrophenol	ND	0.7
4-Nitrophenol	ND	0.7
Diethylphthalate	ND	0.7
Phenanthrene	10	0.7
Anthracene	0.84	0.7
Benzenethiol	ND	0.7
Di-n-butylphthalate	ND	0.7
Fluoranthene	ND	0.7
Pyrene	5.4	0.7
Butylbenzylphthalate	ND	0.7
Benzo(a)anthracene	1.2	0.7
bis(2-ethylhexyl)phthalate	ND	0.7
Chrysene	4.3	0.7
4-Methylchrysene	3.6	0.7
Di-n-octylphthalate	ND	0.7
7,12-Dimethylbenz(a)anthracene	ND	0.7
Benzo(b)fluoranthene	ND	0.7
Benzo(k)fluoranthene	ND	0.7
Benzo(a)pyrene	ND	0.7
Dibenz(a,h)anthracene	ND	0.7
Dibenz(a,h)acridine	ND	0.7

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	-Diluted out-	2,4,6-Tribromophenol	-Diluted out
Nitrobenzene-d5	-Diluted out-	Terphenyl-d14	-Diluted out
2-Fluorobiphenyl	-Diluted out-		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-17
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-1-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	210	40 *
1-Methylnaphthalene	960	40 *
Dimethylphthalate	2	2
2,4-Dinitrophenol	40	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	410	40 *
Anthracene	32	2
Benzenethiol	ND	2
Di-n-butylphthalate	10	2
Fluoranthene	26	2
Pyrene	140	2
Butylbenzylphthalate	4	2
Benzo(a)anthracene	65	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	120	2
4-Methylchrysene	78	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	62	2
Benzo(b)fluoranthene	24	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	49	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.
* Analzyed at a 1:20 dilution on 09/29/93
QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	29	Terphenyl-d14	36
2-Fluorobiphenyl	35		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-18
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-1-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	9	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	22	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	3	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	27	2
Anthracene	3	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	11	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	120	2
Chrysene	ND	2
4-Methylchrysene	3	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	33	Terphenyl-d14	37
2-Fluorobiphenyl	38		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-19
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-2-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	ND	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	ND	2
Anthracene	ND	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	ND	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	ND	2
4-Methylchrysene	8	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	34	2,4,6-Tribromophenol	0
Nitrobenzene-d5	15	Terphenyl-d14	0
2-Fluorobiphenyl	16		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-20
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-2-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	3	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	ND	2
Anthracene	ND	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	ND	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	ND	2
4-Methylchrysene	4	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	32	2,4,6-Tribromophenol	43
Nitrobenzene-d5	11	Terphenyl-d14	0
2-Fluorobiphenyl	12		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-21
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-3-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/28/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	2	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	ND	2
Anthracene	ND	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	8	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	18	2
Chrysene	7	2
4-Methylchrysene	2	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	34	Terphenyl-d14	38
2-Fluorobiphenyl	39		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-22
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18M-3-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/11/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.07
Phenol	ND	0.07
1,3-Dichlorobenzene	ND	0.07
1,4-Dichlorobenzene	ND	0.07
1,2-Dichlorobenzene	ND	0.07
Indene	ND	0.07
2-Methylphenol	ND	0.07
4-Methylphenol	ND	0.07
2,4-Dimethylphenol	ND	0.07
Quinoline	ND	0.07
Naphthalene	ND	0.07
1-Methylnaphthalene	1.1	0.07
Dimethylphthalate	ND	0.07
2,4-Dinitrophenol	0.22	0.07
4-Nitrophenol	ND	0.07
Diethylphthalate	ND	0.07
Phenanthrene	0.98	0.07
Anthracene	0.23	0.07
Benzenethiol	ND	0.07
Di-n-butylphthalate	ND	0.07
Fluoranthene	ND	0.07
Pyrene	2.0	0.07
Butylbenzylphthalate	ND	0.07
Benzo(a)anthracene	0.64	0.07
bis(2-ethylhexyl)phthalate	ND	0.07
Chrysene	1.5	0.07
4-Methylchrysene	1.3	0.07
Di-n-octylphthalate	ND	0.07
7,12-Dimethylbenz(a)anthracene	0.63	0.07
Benzo(b)fluoranthene	0.26	0.07
Benzo(k)fluoranthene	ND	0.07
Benzo(a)pyrene	0.51	0.07
Dibenz(a,h)anthracene	ND	0.07
Dibenz(a,h)acridine	ND	0.07

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	-Diluted out-	2,4,6-Tribromophenol	-Diluted out
Nitrobenzene-d5	-Diluted out-	Terphenyl-d14	-Diluted out
2-Fluorobiphenyl	-Diluted out-		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-1
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-1-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	ND	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	ND	2
Anthracene	ND	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	ND	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	5	2
4-Methylchrysene	14	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	27	Terphenyl-d14	38
2-Fluorobiphenyl	32		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-2
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-1-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	9	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	3	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	21	2
Anthracene	4	2
Benzenethiol	ND	2
Di-n-butylphthalate	6	2
Fluoranthene	8	2
Pyrene	58	2
Butylbenzylphthalate	3	2
Benzo(a)anthracene	19	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	57	2
4-Methylchrysene	50	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	21	2
Benzo(b)fluoranthene	12	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	24	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	32	Terphenyl-d14	33
2-Fluorobiphenyl	34		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-3
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-2-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	ND	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	8	2
Anthracene	2	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	11	2
Pyrene	87	2
Butylbenzylphthalate	3	2
Benzo(a)anthracene	19	2
bis(2-ethylhexyl)phthalate	37	2
Chrysene	72	2
4-Methylchrysene	73	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	39	2
Benzo(b)fluoranthene	21	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	37	2
Dibenz(a,h)anthracene	14	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	36	Terphenyl-d14	38
2-Fluorobiphenyl	41		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-4
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-2-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	21	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	8	10
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	140	10 *
Anthracene	13	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	19	2
Pyrene	97	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	47	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	92	2
4-Methylchrysene	84	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	50	2
Benzo(b)fluoranthene	19	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	43	2
Dibenz(a,h)anthracene	15	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.
* Analyzed on 09/29/93 at a 1:5 dilution.
QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	34	Terphenyl-d14	38
2-Fluorobiphenyl	36		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-5
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-3-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	8	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	ND	2
Anthracene	ND	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	ND	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	5	2
4-Methylchrysene	3	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	33	Terphenyl-d14	37
2-Fluorobiphenyl	38		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-6
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-18L-3-2

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	12	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	23	2
Anthracene	ND	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	9	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	40	2
Chrysene	6	2
4-Methylchrysene	5	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	34	Terphenyl-d14	38
2-Fluorobiphenyl	39		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-7
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-19-1-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.08
Phenol	ND	0.08
1,3-Dichlorobenzene	ND	0.08
1,4-Dichlorobenzene	ND	0.08
1,2-Dichlorobenzene	ND	0.08
Indene	ND	0.08
2-Methylphenol	ND	0.08
4-Methylphenol	ND	0.08
2,4-Dimethylphenol	ND	0.08
Quinoline	ND	0.08
Naphthalene	ND	0.08
1-Methylnaphthalene	ND	0.08
Dimethylphthalate	ND	0.08
2,4-Dinitrophenol	ND	0.08
4-Nitrophenol	ND	0.08
Diethylphthalate	ND	0.08
Phenanthrene	ND	0.08
Anthracene	ND	0.08
Benzenethiol	ND	0.08
Di-n-butylphthalate	ND	0.08
Fluoranthene	ND	0.08
Pyrene	ND	0.08
Butylbenzylphthalate	ND	0.08
Benzo(a)anthracene	ND	0.08
bis(2-ethylhexyl)phthalate	ND	0.08
Chrysene	ND	0.08
4-Methylchrysene	0.4	0.08
Di-n-octylphthalate	ND	0.08
7,12-Dimethylbenz(a)anthracene	ND	0.08
Benzo(b)fluoranthene	ND	0.08
Benzo(k)fluoranthene	ND	0.08
Benzo(a)pyrene	ND	0.08
Dibenz(a,h)anthracene	ND	0.08
Dibenz(a,h)acridine	ND	0.08

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	27	2,4,6-Tribromophenol	0
Nitrobenzene-d5	13	Terphenyl-d14	12
2-Fluorobiphenyl	11		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-8
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-19-2-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	ND	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	ND	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	ND	2
Anthracene	ND	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	ND	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	ND	2
4-Methylchrysene	4	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	25	Terphenyl-d14	24
2-Fluorobiphenyl	26		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-9
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-19-3-1

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/26/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.08
Phenol	ND	0.08
1,3-Dichlorobenzene	ND	0.08
1,4-Dichlorobenzene	ND	0.08
1,2-Dichlorobenzene	ND	0.08
Indene	ND	0.08
2-Methylphenol	ND	0.08
4-Methylphenol	ND	0.08
2,4-Dimethylphenol	ND	0.08
Quinoline	ND	0.08
Naphthalene	ND	0.08
1-Methylnaphthalene	ND	0.08
Dimethylphthalate	ND	0.08
2,4-Dinitrophenol	ND	0.08
4-Nitrophenol	ND	0.08
Diethylphthalate	ND	0.08
Phenanthrene	ND	0.08
Anthracene	ND	0.08
Benzenethiol	ND	0.08
Di-n-butylphthalate	ND	0.08
Fluoranthene	ND	0.08
Pyrene	0.37	0.08
Butylbenzylphthalate	ND	0.08
Benzo(a)anthracene	ND	0.08
bis(2-ethylhexyl)phthalate	ND	0.08
Chrysene	0.53	0.08
4-Methylchrysene	0.14	0.08
Di-n-octylphthalate	ND	0.08
7,12-Dimethylbenz(a)anthracene	ND	0.08
Benzo(b)fluoranthene	ND	0.08
Benzo(k)fluoranthene	ND	0.08
Benzo(a)pyrene	0.16	0.08
Dibenz(a,h)anthracene	ND	0.08
Dibenz(a,h)acridine	ND	0.08

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	43	2,4,6-Tribromophenol	0
Nitrobenzene-d5	24	Terphenyl-d14	24
2-Fluorobiphenyl	22		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-METHOD BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE EXTRACTED: 09/24/93
DATE ANALYZED: 09/25/93
DATE REPORTED: 10/04/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	2
Phenol	ND	2
1,3-Dichlorobenzene	ND	2
1,4-Dichlorobenzene	ND	2
1,2-Dichlorobenzene	ND	2
Indene	7	2
2-Methylphenol	ND	2
4-Methylphenol	ND	2
2,4-Dimethylphenol	ND	2
Quinoline	ND	2
Naphthalene	ND	2
1-Methylnaphthalene	ND	2
Dimethylphthalate	ND	2
2,4-Dinitrophenol	ND	2
4-Nitrophenol	ND	2
Diethylphthalate	ND	2
Phenanthrene	ND	2
Anthracene	ND	2
Benzenethiol	ND	2
Di-n-butylphthalate	ND	2
Fluoranthene	ND	2
Pyrene	ND	2
Butylbenzylphthalate	ND	2
Benzo(a)anthracene	ND	2
bis(2-ethylhexyl)phthalate	ND	2
Chrysene	ND	2
4-Methylchrysene	ND	2
Di-n-octylphthalate	ND	2
7,12-Dimethylbenz(a)anthracene	ND	2
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	2
Benzo(a)pyrene	ND	2
Dibenz(a,h)anthracene	ND	2
Dibenz(a,h)acridine	ND	2

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	37	Terphenyl-d14	40
2-Fluorobiphenyl	39		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313-METHOD BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/11/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.007
Phenol	ND	0.007
1,3-Dichlorobenzene	ND	0.007
1,4-Dichlorobenzene	ND	0.007
1,2-Dichlorobenzene	ND	0.007
Indene	ND	0.007
2-Methylphenol	ND	0.007
4-Methylphenol	ND	0.007
2,4-Dimethylphenol	ND	0.007
Quinoline	ND	0.007
Naphthalene	ND	0.007
1-Methylnaphthalene	ND	0.007
Dimethylphthalate	ND	0.007
2,4-Dinitrophenol	ND	0.007
4-Nitrophenol	ND	0.007
Diethylphthalate	ND	0.007
Phenanthrene	ND	0.007
Anthracene	ND	0.007
Benzenethiol	ND	0.007
Di-n-butylphthalate	ND	0.007
Fluoranthene	ND	0.007
Pyrene	ND	0.007
Butylbenzylphthalate	ND	0.007
Benzo(a)anthracene	ND	0.007
bis(2-ethylhexyl)phthalate	ND	0.007
Chrysene	ND	0.007
4-Methylchrysene	ND	0.007
Di-n-octylphthalate	ND	0.007
7,12-Dimethylbenz(a)anthracene	ND	0.007
Benzo(b)fluoranthene	ND	0.007
Benzo(k)fluoranthene	ND	0.007
Benzo(a)pyrene	ND	0.007
Dibenz(a,h)anthracene	ND	0.007
Dibenz(a,h)acridine	ND	0.007

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d5	0	2,4,6-Tribromophenol	0
Nitrobenzene-d5	24	Terphenyl-d14	33
2-Fluorobiphenyl	29		

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MS/MSD SUMMARY SHEET FOR EPA 8270

Client: Engineering Science Sample Matrix: Soil
Analysis Date: 09/25/93

SPIKE DATA

SPIKE COMPOUNDS	Reading	%Recovery
Naphthalene	4.4	88
Phenanthrene	4.7	94
Anthracene	4.0	80
Fluoranthene	4.7	94
Pyrene	4.4	88
Benzo(a)anthracene	4.0	80
Crysene	4.2	84
Benzo(b)fluoranthene	4.7	94
Benzo(k)fluoranthene	4.9	98
Dibenz(a,h)anthracene	5.2	104

SPIKE DUP DATA

SPIKE COMPOUNDS	Reading	%Recovery
Naphthalene	2.6	52
Phenanthrene	4.4	88
Anthracene	3.9	78
Fluoranthene	4.4	88
Pyrene	4.4	88
Benzo(a)anthracene	4.2	84
Crysene	4.3	85
Benzo(b)fluoranthene	4.9	98
Benzo(k)fluoranthene	5.2	104
Dibenz(a,h)anthracene	5.9	118

Matrix Results

Naphthalene	0	Benzo(a)anthracene	0
Phenanthrene	0	Crysene	0
Anthracene	0	Benzo(b)fluoranthene	0
Fluoranthene	0	Benzo(k)fluoranthene	0
Pyrene	0	Dibenz(a,h)anthracene	0

RELATIVE PERCENT DEVIATION

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD
Naphthalene	88	52	51
Phenanthrene	94	88	7
Anthracene	80	78	3
Fluoranthene	94	88	7
Pyrene	88	88	0
Benzo(a)anthracene	80	84	5
Crysene	84	85	1
Benzo(b)fluoranthene	94	98	4
Benzo(k)fluoranthene	98	104	6
Dibenz(a,h)anthracene	104	118	13

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8270

Client: Engineering Science
Analysis Date: 11/09/92
Sample Matrix: Soil

LABORATORY CONTROL SAMPLE DATA

SPIKE COMPOUNDS	Reading	%Recovery
Naphthalene	4.3	86
Phenanthrene	4.2	84
Anthracene	4.0	80
Fluoranthene	4.2	84
Pyrene	4.1	82
Benzo(a)anthracene	3.9	78
Crysene	3.8	76
Benzo(b)fluoranthene	4.9	98
Benzo(k)fluoranthene	4.8	96
Dibenz(a,h)anthracene	4.4	88

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8270

Client: Engineering Science
Analysis Date: 11/09/92
Sample Matrix: Soil

LABORATORY CONTROL SAMPLE DATA

SPIKE COMPOUNDS	Reading	%Recovery
Naphthalene	27.4	55
Phenanthrene	32.5	65
Anthracene	29.6	59
Fluoranthene	33.4	67
Pyrene	32.5	65
Benzo(a)anthracene	31.5	63
Crysene	30.0	60
Benzo(b)fluoranthene	22.3	45
Benzo(k)fluoranthene	26.5	53
Dibenz(a,h)anthracene	27.0	54

112318

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
PE 375	Chevron RFI

SAMPLERS (Signatures): John Bridenbaugh / Craig Miller

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	Skinner Metals	SVOA	VOA	Cyanide	Organic Lead	Isobutyl Alcohol					REMARKS
9/16/93	9:50	Soil	SWMU 18L-1-1 1	2	X	X	X	X	X	X					
"	9:50	Soil	SWMU 18L-1-2 2	2	X	X	X	X	X	X					
"	10:50	Soil	SWMU 18L-2-1 3	2	X	X	X	X	X	X					
"	10:50	Soil	SWMU 18L-2-2 4	2	X	X	X	X	X	X					
"	11:20	Soil	SWMU 18L-3-1 5	2	X	X	X	X	X	X					
"	11:20	Soil	SWMU 18L-3-2 6	2	X	X	X	X	X	X					
"	12:00	Soil	SWMU 19-1-1 7	2	X	X	X	X	X	X					
"	12:00	Soil	SWMU 19-2-1 8	2	X	X	X	X	X	X					
"	12:00	Soil	SWMU 19-3-1 9	2	X	X	X	X	X	X					
"	13:20	Soil	SWMU 18S-1-1 10	2	X	X	X	X	X	X					
"	13:20	Soil	SWMU 18S-1-2 11	2	X	X	X	X	X	X					
"	13:30	Soil	SWMU 18S-2-1 12	2	X	X	X	X	X	X					

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
John Bridenbaugh	9/16/93	Nancy J Wilson	9/17/93	
	TIME 17:00		TIME 5:10 AM	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	ES - Honolulu
	TIME		TIME	

ENGINEERING-SCIENCE, INC. 211.0858/YO

White: laboratory returns with data, yellow: laboratory copy, pink: sampler copy

112315

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
PE3355	Chevron RFI

SAMPLERS (Signatures): John Bridenbaugh / Craig Miller

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	Skinner Metals	SVOA	VOA	Cyanide	Organic Lead	Isobutyl Alcohol					REMARKS
9/16/93	13:30	Soil	SWMU 18S-2-2	2	X	X	X	X	X	X					
"	1700	Water	TB-6	2			X								
~~"~~															
~~"~~															
~~"~~															
~~"~~															
~~"~~															
~~"~~															
~~"~~			~~SW~~												

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	PRESERVATIVES
John Bridenbaugh	9/16/93	17:00	Nancy [illegible]	9/17/93	[illegible]	
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	SEND RESULTS TO:
						ES-Honolulu
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	

ENGINEERING-SCIENCE, INC. 211.0858/YO

White: laboratory returns with data, **yellow**: laboratory copy, **pink**: sampler copy

1123

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CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
PE 888	Chevron RFI

SAMPLERS (Signatures): John Budenbaugh / Craig Miller

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	Skinner Metals	SVOA	VOA	Cyanide	Organic Lead	Isobutyl Alcohol	pH	Sulfates			REMARKS
9/16/93	13:50	Soil	SWMU 18S-3-0.5	2	X	X	X	X	X	X	X	X			
"	13:50	Soil	SWMU 18S-3-1.5	2	X	X	X	X	X	X	X	X			" 9/17/93
"	14:10	Soil	SWMU 18M-1-1	2	X	X	X	X	X	X	X	X			
"	14:10	Soil	SWMU 18M-1-2	2	X	X	X	X	X	X	X	X			
"	14:20	Soil	SWMU 18M-2-1	2	X	X	X	X	X	X	X	X			
"	14:20	Soil	SWMU 18M-2-2	2	X	X	X	X	X	X	X	X			
"	14:30	Soil	SWMU 18M-3-1	2	X	X	X	X	X	X	X	X			
"	14:30	Soil	SWMU 18M-3-2	2	X	X	X	X	X	X	X	X			
"	1700	Water	TB-7	2			X								
"	13:50	Soil	SWMU 18S-3D-1.5	2	X	X	X	X	X	X	X	X			

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
John Budenbaugh	9/16/93	Nancy [illegible]	9/17/93	
	TIME 17:00		TIME 8:50 am	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	ES-Honolulu
	TIME		TIME	

ENGINEERING-SCIENCE, INC. 211.0858/YO

White: laboratory returns with data, **yellow**: laboratory copy, **pink**: sampler copy

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Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

A N A L Y T I C A L R E P O R T

Prepared for:

Engineering Science, Inc.
1357 Kapiolani Boulevard
Suite 1120
Honolulu, HI 96814

Date: 18-OCT-93
Lab Job Number: 112348
Project ID: PE375.01
Location: Chevron Hawaiian Refinery

Reviewed by: _____

Reviewed by: _____

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Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE REPORTED: 10/18/93
DATE REVISED: 11/16/93

CASE NARRATIVE

Curtis & Tompkins (C&T) received 20 soil and 4 water samples on September 20, 1993 for the above referenced project. The following report details the results of the analyses performed by the laboratory. The following items should be considered when reviewing the data:

The semi-volatile extraction was performed using EPA 3550 (sonication) followed by a silica gel clean-up. Samples were then analyzed by GC/MS using selective ion monitoring to achieve low detection limits. The acid fraction surrogates (phenols) were not recovered in this process. The naphthalene and phenanthrene level in the spiked samples were high making it impossible to calculate meaningful spike recoveries. Reproducibility on the spikes was acceptable.

Hydrocarbons coeluted with some of the volatile (EPA 8240) surrogates resulting in high recoveries (samples SWMU-9-1-3.5, BKG-2-1). The spike recovery for laboratory sample Id. 112348-15 was out of control for toluene due to high background levels in the sample. All other spikes are within control limits.

Isobutyl alcohol spike recoveries in the soil samples were low, indicating that the extraction process may not be recovering all the isobutyl alcohol in the samples. Surrogate recoveries indicate that this is a consistent problems accross the entire batch of samples.

The sample identifed by ES as EQRB-2 was inadvertently not analyzed for Skinner List semi-volatiles.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE REPORTED: 10/18/93

CASE NARRATIVE

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Curtis & Tompkins, Ltd.

Client: **Engineering Science, Inc.** **Laboratory Login Number: 112348**

Project Name: Chevron Hawaiian Refinery Report Date: 18 October 93
Project Number: PE375.01

ANALYSIS: pH

Lab ID	Sample ID	Matrix	Sampled	Received	Analyzed	Result	Units	Method	Analyst	QC Batch
112348-001	SWMU 32-1-3	Soil	17-SEP-93	20-SEP-93	29-SEP-93	7.5	SU *	EPA 9045	TR	10747
112348-002	SWMU 32-2	Water	17-SEP-93	20-SEP-93	20-SEP-93	7.3	SU	EPA 9040	TR	10619
112348-003	SWMU 9-1-1.5	Soil	17-SEP-93	20-SEP-93	29-SEP-93	8.0	SU *	EPA 9045	TR	10747
112348-004	SWMU 9-1-3.5	Soil	17-SEP-93	20-SEP-93	29-SEP-93	8.3	SU *	EPA 9045	TR	10747
112348-005	SWMU 9-2-1.5	Soil	17-SEP-93	20-SEP-93	29-SEP-93	8.0	SU *	EPA 9045	TR	10747
112348-006	SWMU 9-2-3.5	Soil	17-SEP-93	20-SEP-93	29-SEP-93	7.8	SU *	EPA 9045	TR	10747
112348-007	SWMU 9-3-1.5	Soil	17-SEP-93	20-SEP-93	29-SEP-93	8.6	SU *	EPA 9045	TR	10747
112348-008	SWMU 9-3-3.5	Soil	17-SEP-93	20-SEP-93	29-SEP-93	8.4	SU *	EPA 9045	TR	10747
112348-009	SWMU 9-4-1.5	Soil	17-SEP-93	20-SEP-93	29-SEP-93	7.9	SU *	EPA 9045	TR	10747
112348-010	SWMU 9-4-3.5	Soil	17-SEP-93	20-SEP-93	29-SEP-93	9.6	SU *	EPA 9045	TR	10747
112348-011	SWMU 9-4D-3.5	Soil	17-SEP-93	20-SEP-93	29-SEP-93	9.6	SU *	EPA 9045	TR	10747

* Soil pH measured as water

Curtis & Tompkins, Ltd.

QC Batch Report

Client: Engineering Science, Inc.
Project Name: Chevron Hawaiian Refinery
Project Number: PE375.01

Laboratory Login Number: 112348
Report Date: 18 October 93

ANALYSIS: pH

QC Batch Number: 10619

Calibration Verification Results

Sample	Result	TV	Difference	Limit	Analyzed
ICV	10.05	10.00	.05	< 0.10	20-SEP-93
CCV	10.04	10.00	.04	< 0.10	20-SEP-93

Sample Duplicate Results

Sample	Duplicate	RPD	Analyzed
7.31	7.39	1.1%	20-SEP-93

Curtis & Tompkins, Ltd.

Q C B a t c h R e p o r t

Client: Engineering Science, Inc.
Project Name: Chevron Hawaiian Refinery
Project Number: PE375.01

Laboratory Login Number: 112348
Report Date: 18 October 93

ANALYSIS: pH

QC Batch Number: 10747

Calibration Verification Results

Sample	Result	TV	Difference	Limit	Analyzed
ICV	10.02	10.00	.02	< 0.10	29-SEP-93
CCV	10.02	10.00	.02	< 0.10	29-SEP-93
CCV	10.02	10.00	.02	< 0.10	29-SEP-93
CCV	10.01	10.00	.01	< 0.10	29-SEP-93

Sample Duplicate Results

Sample	Duplicate	RPD	Analyzed
8.58	8.52	.7%	29-SEP-93
8.61	8.56	.6%	29-SEP-93

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/18/93

ANALYSIS: CYANIDE
ANALYSIS METHOD: EPA 335.2 (Modified)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112348-3	SWMU9-1-1.5	ND	mg/Kg	0.3
112348-4	SWMU9-1-3.5	ND	mg/Kg	0.3
112348-5	SWMU9-2-1.5	0.8	mg/Kg	0.3
112348-6	SWMU9-2-3.5	ND	mg/Kg	0.3
112348-7	SWMU9-3-1.5	0.5	mg/Kg	0.3
112348-8	SWMU9-3-3.5	ND	mg/Kg	0.3
112348-9	SWMU9-4-1.5	1.1	mg/Kg	0.3
112348-10	SWMU9-4-3.5	ND	mg/Kg	0.3
112348-11	SWMU9-4D-3.5	ND	mg/Kg	0.3
112348-14	SWMU10-1-1.5	0.8	mg/Kg	0.3
112348-15	BKG-2-1	0.5	mg/Kg	0.3
112348-16	SWMU10-1-3.5	ND	mg/Kg	0.3
112348-17	SWMU10-2-1.5	0.6	mg/Kg	0.3
112348-18	SWMU10-2-3.5	0.3	mg/Kg	0.3
112348-19	SWMU10-3-1.5	0.4	mg/Kg	0.3
112348-20	SWMU10-3-3.5	ND	mg/Kg	0.3
112348-21	SWMU10-4-1.5	ND	mg/Kg	0.3
112348-22	SWMU10-4-3.5	0.4	mg/Kg	0.3
112348-23	SWMU10-4D-3.5	0.3	mg/Kg	0.3

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

RPD, %	6
RECOVERY, %	80

QC Sample: 112348-13

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/18/93

ANALYSIS: CYANIDE
ANALYSIS METHOD: EPA 335.2

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112348-13	EQRB-2	ND	ug/L	10

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

RPD, %	5
RECOVERY, %	95

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/21/93
DATE REPORTED: 10/18/93

ANALYSIS: ORGANIC LEAD
ANALYSIS METHOD: CA DHS METHOD, LUFT MANUAL OCT 1989

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112348-4	SWMU9-1-3.5	ND	mg/Kg	0.5
112348-6	SWMU9-2-3.5	ND	mg/Kg	0.5
112348-8	SWMU9-3-3.5	ND	mg/Kg	0.5
112348-10	SWMU9-4-3.5	ND	mg/Kg	0.5
112348-11	SWMU9-4D-3.5	ND	mg/Kg	0.5
112348-15	BKG-2-1	ND	mg/Kg	0.5
112348-16	SWMU10-1-3.5	ND	mg/Kg	0.5
112348-18	SWMU10-2-3.5	ND	mg/Kg	0.5
112348-20	SWMU10-3-3.5	ND	mg/Kg	0.5
112348-22	SWMU10-4-3.5	ND	mg/Kg	0.5
112348-23	SWMU10-4D-3.5	ND	mg/Kg	0.5

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

RPD, %	<1
RECOVERY, %	113

QC Sample: 112348-23

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/18/93

ANALYSIS: ORGANIC LEAD
ANALYSIS METHOD: CA DHS METHOD, LUFT MANUAL OCT 1989

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112348-13	EQRB-2	ND	ug/L	100

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

RPD, %	<1
RECOVERY, %	116

QC Sample: 112348-13

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/29/93
DATE ANALYZED: 09/30/93
DATE REPORTED: 10/18/93

ANALYSIS: ISOBUTYL ALCOHOL
ANALYSIS METHOD: EPA 8015 (Modified)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112348-3	SWMU9-1-1.5	ND	mg/Kg	1
112348-4	SWMU9-1-3.5	ND	mg/Kg	1
112348-5	SWMU9-2-1.5	ND	mg/Kg	1
112348-6	SWMU9-2-3.5	ND	mg/Kg	1
112348-7	SWMU9-3-1.5	ND	mg/Kg	1
112348-8	SWMU9-3-3.5	ND	mg/Kg	1
112348-9	SWMU9-4-1.5	ND	mg/Kg	1
112348-10	SWMU9-4-3.5	ND	mg/Kg	1
112348-11	SWMU9-4D-3.5	ND	mg/Kg	1
112348-14	SWMU10-1-1.5	ND	mg/Kg	1
112348-15	BKG-2-1	ND	mg/Kg	1
112348-16	SWMU10-1-3.5	ND	mg/Kg	1
112348-17	SWMU10-2-1.5	ND	mg/Kg	1
112348-18	SWMU10-2-3.5	ND	mg/Kg	1
112348-19	SWMU10-3-1.5	ND	mg/Kg	1
112348-20	SWMU10-3-3.5	ND	mg/Kg	1
112348-21	SWMU10-4-1.5	ND	mg/Kg	1
112348-22	SWMU10-4-3.5	ND	mg/Kg	1
112348-23	SWMU10-4D-3.5	ND	mg/Kg	1

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

RPD, %	14
RECOVERY, %	18

QC Sample: 112348-20

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/29/93
DATE ANALYZED: 09/30/93
DATE REPORTED: 10/18/93

ANALYSIS: ISOBUTYL ALCOHOL
ANALYSIS METHOD: EPA 8015 (Modified)

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112348-13	EQRB-2	ND	mg/L	1

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

RPD, %	19
RECOVERY, %	129

QC Sample: BS/BSD

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/21/93
DATE REPORTED: 10/18/93

ANALYSIS: SULFATE
ANALYSIS METHOD: EPA 300.0

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112348-2	SWMU-32-2	1,800	mg/L	50

QA/QC SUMMARY:

RPD, %	<1
RECOVERY, %	129

QC Sample: 112348-2

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/21/93
DATE REPORTED: 10/18/93

ANALYSIS: SULFATE
ANALYSIS METHOD: EPA 300.0

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
112348-1	SWMU-32-1-3	1,100	mg/Kg	80

ND = Not detected at or above reporting limit.

QA/QC SUMMARY:

RPD, %	3
RECOVERY, %	66

QC Sample: 112313-017

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Antimony Result (mg/Kg)	Antimony Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	ND	29	10636	EPA 6010	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	ND	29	10636	EPA 6010	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	ND	150	10636	EPA 6010	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	33	30	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Antimony Result (mg/Kg)	Antimony Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	ND	29	10636	EPA 6010	09/24/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	ND	30	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Arsenic Result (mg/Kg)	Arsenic Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	ND	2.5	10659	EPA 7060	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	ND	2.5	10659	EPA 7060	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	ND	2.5	10659	EPA 7060	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	ND	2.5	10659	EPA 7060	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	ND	2.5	10659	EPA 7060	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	2.8	2.5	10659	EPA 7060	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	ND	2.5	10659	EPA 7060	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	3.4	2.5	10659	EPA 7060	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	6.4	2.5	10659	EPA 7060	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	ND	2.5	10659	EPA 7060	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	11	2.5	10659	EPA 7060	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	ND	2.5	10659	EPA 7060	09/27/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	ND	2.5	10659	EPA 7060	09/27/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	4.9	2.5	10659	EPA 7060	09/27/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	3.5	2.5	10659	EPA 7060	09/27/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	8.6	2.5	10659	EPA 7060	09/27/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

				Arsenic				
Sample ID	Lab ID	Sample Date	Receive Date	Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	6.5	2.4	10659	EPA 7060	09/27/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	19	2.5	10659	EPA 7060	09/27/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	20	2.5	10659	EPA 7060	09/27/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	20	2.5	10659	EPA 7060	09/27/93

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Barium Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	15	0.50	10636	EPA 6010	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	8.2	0.50	10636	EPA 6010	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	13	0.50	10636	EPA 6010	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	8.2	0.50	10636	EPA 6010	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	7.2	0.49	10636	EPA 6010	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	6.6	0.49	10636	EPA 6010	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	7.9	0.50	10636	EPA 6010	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	9.0	0.50	10636	EPA 6010	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	22	0.50	10636	EPA 6010	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	34	0.50	10636	EPA 6010	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	9.4	0.50	10636	EPA 6010	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	21	0.50	10636	EPA 6010	09/24/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	6.8	0.50	10636	EPA 6010	09/24/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	9.0	0.50	10636	EPA 6010	09/24/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	12	0.49	10636	EPA 6010	09/24/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	7.1	0.50	10636	EPA 6010	09/24/93

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Barium Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	7.7	0.49	10636	EPA 6010	09/24/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	7.1	0.51	10636	EPA 6010	09/24/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	5.8	0.50	10636	EPA 6010	09/24/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	5.9	0.50	10636	EPA 6010	09/24/93

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Beryllium Result (mg/Kg)	Beryllium Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	ND	1.0	10636	EPA 6010	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	ND	1.0	10636	EPA 6010	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	ND	0.99	10636	EPA 6010	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	ND	1.0	10636	EPA 6010	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	ND	0.97	10636	EPA 6010	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	ND	0.98	10636	EPA 6010	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	ND	5.0	10636	EPA 6010	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	ND	0.99	10636	EPA 6010	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	ND	1.0	10636	EPA 6010	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	ND	1.0	10636	EPA 6010	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	ND	1.0	10636	EPA 6010	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	ND	0.99	10636	EPA 6010	09/24/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	ND	0.99	10636	EPA 6010	09/24/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	ND	1.0	10636	EPA 6010	09/24/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	ND	0.99	10636	EPA 6010	09/24/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	ND	1.0	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Beryllium Result (mg/Kg)	Beryllium Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	ND	0.98	10636	EPA 6010	09/24/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	ND	1.0	10636	EPA 6010	09/24/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	ND	0.99	10636	EPA 6010	09/24/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	ND	1.0	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Cadmium Result (mg/Kg)	Cadmium Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	ND	2.4	10636	EPA 6010	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	ND	2.4	10636	EPA 6010	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	ND	13	10636	EPA 6010	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Cadmium Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	ND	2.5	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Chromium (total) Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	25	5.0	10636	EPA 6010	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	9.7	5.0	10636	EPA 6010	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	16	5.0	10636	EPA 6010	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	12	5.0	10636	EPA 6010	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	8.9	4.9	10636	EPA 6010	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	9.0	4.9	10636	EPA 6010	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	ND	25	10636	EPA 6010	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	7.6	5.0	10636	EPA 6010	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	17	5.0	10636	EPA 6010	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	24	5.0	10636	EPA 6010	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	9.7	5.0	10636	EPA 6010	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	35	5.0	10636	EPA 6010	09/24/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	6.4	5.0	10636	EPA 6010	09/24/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	6.1	5.0	10636	EPA 6010	09/24/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	5.7	4.9	10636	EPA 6010	09/24/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	9.7	5.0	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Chromium (total) (total)

Sample ID	Lab ID	Sample Date	Receive Date	Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	8.1	4.9	10636	EPA 6010	09/24/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	6.7	5.1	10636	EPA 6010	09/24/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	ND	5.0	10636	EPA 6010	09/24/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	6.5	5.0	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Cobalt Result (mg/Kg)	Cobalt Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	2.8	0.90	10636	EPA 6010	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	ND	0.90	10636	EPA 6010	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	0.97	0.89	10636	EPA 6010	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	ND	0.90	10636	EPA 6010	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	ND	0.87	10636	EPA 6010	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	ND	0.88	10636	EPA 6010	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	ND	0.90	10636	EPA 6010	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	ND	0.89	10636	EPA 6010	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	3.2	0.90	10636	EPA 6010	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	3.3	0.90	10636	EPA 6010	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	ND	0.90	10636	EPA 6010	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	1.5	0.89	10636	EPA 6010	09/24/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	ND	0.89	10636	EPA 6010	09/24/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	ND	0.90	10636	EPA 6010	09/24/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	ND	0.89	10636	EPA 6010	09/24/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	ND	0.90	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

				Cobalt				
Sample ID	Lab ID	Sample Date	Receive Date	Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	ND	0.88	10636	EPA 6010	09/24/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	ND	0.91	10636	EPA 6010	09/24/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	ND	0.89	10636	EPA 6010	09/24/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	ND	0.90	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Lead Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	14	5.0	10636	EPA 7420	09/27/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	5.0	5.0	10636	EPA 7420	09/27/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	ND	5.0	10636	EPA 7420	09/27/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	13	5.0	10636	EPA 7420	09/27/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	ND	4.9	10636	EPA 7420	09/27/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	ND	4.9	10636	EPA 7420	09/27/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	ND	5.0	10636	EPA 7420	09/27/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	ND	5.0	10636	EPA 7420	09/27/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	ND	5.0	10636	EPA 7420	09/27/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	ND	5.0	10636	EPA 7420	09/27/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	15	5.0	10636	EPA 7420	09/27/93
BKG-2-1	112348-015	09/17/93	09/20/93	ND	5.0	10636	EPA 7420	09/27/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	ND	5.0	10636	EPA 7420	09/27/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	15	5.0	10636	EPA 7420	09/27/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	ND	4.9	10636	EPA 7420	09/27/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	11	5.0	10636	EPA 7420	09/27/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Lead Result (mg/Kg)	Lead Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	4.9	4.9	10636	EPA 7420	09/27/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	ND	5.1	10636	EPA 7420	09/27/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	ND	5.0	10636	EPA 7420	09/27/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	ND	5.0	10636	EPA 7420	09/27/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Mercury Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	ND	0.10	10666	EPA 7471	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	ND	0.095	10666	EPA 7471	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	ND	0.095	10666	EPA 7471	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	ND	0.10	10666	EPA 7471	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	ND	0.095	10666	EPA 7471	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	ND	0.091	10666	EPA 7471	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	ND	0.083	10666	EPA 7471	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	ND	0.10	10666	EPA 7471	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	ND	0.091	10666	EPA 7471	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	ND	0.087	10666	EPA 7471	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	ND	0.091	10666	EPA 7471	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	0.12	0.10	10666	EPA 7471	09/24/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	ND	0.10	10666	EPA 7471	09/24/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	ND	0.095	10666	EPA 7471	09/24/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	ND	0.10	10666	EPA 7471	09/24/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	ND	0.087	10666	EPA 7471	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

				Mercury				
Sample ID	Lab ID	Sample Date	Receive Date	Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	ND	0.091	10666	EPA 7471	09/24/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	ND	0.10	10666	EPA 7471	09/24/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	ND	0.091	10666	EPA 7471	09/24/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	ND	0.091	10666	EPA 7471	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Nickel Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	14	1.6	10636	EPA 6010	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	3.0	1.6	10636	EPA 6010	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	4.2	1.6	10636	EPA 6010	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	3.3	1.6	10636	EPA 6010	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	3.6	1.6	10636	EPA 6010	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	2.5	1.6	10636	EPA 6010	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	2.3	1.6	10636	EPA 6010	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	5.4	1.6	10636	EPA 6010	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	12	1.6	10636	EPA 6010	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	17	1.6	10636	EPA 6010	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	3.8	1.6	10636	EPA 6010	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	11	1.6	10636	EPA 6010	09/24/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	ND	1.6	10636	EPA 6010	09/24/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	2.3	1.6	10636	EPA 6010	09/24/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	ND	1.6	10636	EPA 6010	09/24/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	2.3	1.6	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Nickel Result (mg/Kg)	Nickel Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	1.9	1.6	10636	EPA 6010	09/24/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	1.9	1.6	10636	EPA 6010	09/24/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	1.9	1.6	10636	EPA 6010	09/24/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	2.4	1.6	10636	EPA 6010	09/24/93

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Selenium Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/27/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/27/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/27/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/27/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/27/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Selenium								
Sample ID	Lab ID	Sample Date	Receive Date	Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	ND	2.4	10659	EPA 7740	09/27/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/27/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/27/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	ND	2.5	10659	EPA 7740	09/27/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Vanadium Result (mg/Kg)	Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 32-1-3	112348-001	09/17/93	09/20/93	15	5.0	10636	EPA 6010	09/24/93
SWMU 9-1-1.5	112348-003	09/17/93	09/20/93	5.5	5.0	10636	EPA 6010	09/24/93
SWMU 9-1-3.5	112348-004	09/17/93	09/20/93	ND	5.0	10636	EPA 6010	09/24/93
SWMU 9-2-1.5	112348-005	09/17/93	09/20/93	5.4	5.0	10636	EPA 6010	09/24/93
SWMU 9-2-3.5	112348-006	09/17/93	09/20/93	ND	4.9	10636	EPA 6010	09/24/93
SWMU 9-3-1.5	112348-007	09/17/93	09/20/93	5.8	4.9	10636	EPA 6010	09/24/93
SWMU 9-3-3.5	112348-008	09/17/93	09/20/93	ND	25	10636	EPA 6010	09/24/93
SWMU 9-4-1.5	112348-009	09/17/93	09/20/93	5.8	5.0	10636	EPA 6010	09/24/93
SWMU 9-4-3.5	112348-010	09/17/93	09/20/93	9.8	5.0	10636	EPA 6010	09/24/93
SWMU 9-4D-3.5	112348-011	09/17/93	09/20/93	17	5.0	10636	EPA 6010	09/24/93
SWMU 10-1-1.5	112348-014	09/17/93	09/20/93	5.4	5.0	10636	EPA 6010	09/24/93
BKG-2-1	112348-015	09/17/93	09/20/93	16	5.0	10636	EPA 6010	09/24/93
SWMU 10-1-3.5	112348-016	09/17/93	09/20/93	ND	5.0	10636	EPA 6010	09/24/93
SWMU 10-2-1.5	112348-017	09/17/93	09/20/93	5.4	5.0	10636	EPA 6010	09/24/93
SWMU 10-2-3.5	112348-018	09/17/93	09/20/93	ND	4.9	10636	EPA 6010	09/24/93
SWMU 10-3-1.5	112348-019	09/17/93	09/20/93	6.2	5.0	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Soil

DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Sample ID	Lab ID	Sample Date	Receive Date	Vanadium Result (mg/Kg)	Vanadium Reporting Limit (mg/Kg)	QC Batch	Method	Analysis Date
SWMU 10-3-3.5	112348-020	09/17/93	09/20/93	5.1	4.9	10636	EPA 6010	09/24/93
SWMU 10-4-1.5	112348-021	09/17/93	09/20/93	ND	5.1	10636	EPA 6010	09/24/93
SWMU 10-4-3.5	112348-022	09/17/93	09/20/93	ND	5.0	10636	EPA 6010	09/24/93
SWMU 10-4D-3.5	112348-023	09/17/93	09/20/93	ND	5.0	10636	EPA 6010	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

Curtis & Tompkins, Ltd.

SAMPLE ID: SWMU 32-2
LAB ID: 112348-002
CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Water

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Compound	Result (ug/L)	Reporting Limit (ug/L)	QC Batch	Method	Analysis Date
Antimony	ND	3000	10638	EPA 6010	09/23/93
Arsenic	70	5.0	10637	EPA 7060	09/24/93
Barium	290	10	10638	EPA 6010	09/23/93
Beryllium	ND	100	10638	EPA 6010	09/23/93
Cadmium	ND	250	10638	EPA 6010	09/23/93
Chromium (total)	920	500	10638	EPA 6010	09/23/93
Cobalt	54	18	10638	EPA 6010	09/23/93
Lead	410	30	10637	EPA 7421	09/24/93
Mercury	ND	0.20	10649	EPA 7470	09/23/93
Nickel	170	32	10638	EPA 6010	09/23/93
Selenium	ND	5.0	10637	EPA 7740	09/24/93
Vanadium	530	500	10638	EPA 6010	09/23/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

SAMPLE ID: EQRB-2
LAB ID: 112348-013
CLIENT: Engineering Science, Inc.
PROJECT ID: PE375.01
LOCATION: Chevron Hawaiian Refinery
MATRIX: Water

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE REPORTED: 10/19/93

METALS ANALYTICAL REPORT

Compound	Result (ug/L)	Reporting Limit (ug/L)	QC Batch	Method	Analysis Date
Antimony	ND	60	10638	EPA 6010	09/23/93
Arsenic	ND	5.0	10637	EPA 7060	09/24/93
Barium	ND	10	10638	EPA 6010	09/23/93
Beryllium	ND	2.0	10638	EPA 6010	09/23/93
Cadmium	ND	5.0	10638	EPA 6010	09/23/93
Chromium (total)	ND	10	10638	EPA 6010	09/23/93
Cobalt	ND	18	10638	EPA 6010	09/23/93
Lead	ND	3.0	10637	EPA 7421	09/24/93
Mercury	ND	0.20	10649	EPA 7470	09/23/93
Nickel	ND	32	10638	EPA 6010	09/23/93
Selenium	ND	5.0	10637	EPA 7740	09/24/93
Vanadium	ND	10	10638	EPA 6010	09/23/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
JOB NUMBER: 112348

DATE REPORTED: 10/19/93

BATCH QC REPORT
SAMPLE DUPLICATE

Compound	Sample	Sample Result	Duplicate Result	Units	RPD	QC Batch	Method	Analysis Date
Antimony	112348-001	<29.3	<29.3	mg/Kg	NM	10636	EPA 6010	09/24/93
Barium	112348-001	14.91	24.322	mg/Kg	48	10636	EPA 6010	09/24/93
Beryllium	112348-001	<1.0	<1.0	mg/Kg	NM	10636	EPA 6010	09/24/93
Cadmium	112348-001	<2.4	<2.4	mg/Kg	NM	10636	EPA 6010	09/24/93
Chromium (total)	112348-001	25	28.146	mg/Kg	12	10636	EPA 6010	09/24/93
Cobalt	112348-001	2.83	3.99	mg/Kg	34	10636	EPA 6010	09/24/93
Lead	112348-001	13.5	25.366	mg/Kg	61	10636	EPA 7420	09/27/93
Nickel	112348-001	14.47	16.737	mg/Kg	15	10636	EPA 6010	09/24/93
Vanadium	112348-001	14.95	18.927	mg/Kg	23	10636	EPA 6010	09/24/93
Arsenic	112348-013	<5.0	<5.0	ug/L	NM	10637	EPA 7060	09/24/93
Lead	112348-013	<3.0	<3.0	ug/L	NM	10637	EPA 7421	09/24/93
Selenium	112348-013	<5.0	<5.0	ug/L	NM	10637	EPA 7740	09/24/93
Antimony	112348-013	<60.0	<60.0	ug/L	NM	10638	EPA 6010	09/23/93
Barium	112348-013	<10.0	<10.0	ug/L	NM	10638	EPA 6010	09/23/93
Beryllium	112348-013	<2.0	<2.0	ug/L	NM	10638	EPA 6010	09/23/93
Cadmium	112348-013	<5.0	<5.0	ug/L	NM	10638	EPA 6010	09/23/93
Chromium (total)	112348-013	<10.0	<10.0	ug/L	NM	10638	EPA 6010	09/23/93
Cobalt	112348-013	<18.0	<18.0	ug/L	NM	10638	EPA 6010	09/23/93
Nickel	112348-013	<32.0	<32.0	ug/L	NM	10638	EPA 6010	09/23/93
Vanadium	112348-013	<10.0	<10.0	ug/L	NM	10638	EPA 6010	09/23/93
Mercury	112348-002	<0.2	<0.2	ug/L	NM	10649	EPA 7470	09/23/93
Mercury	112293-056	ND	<2.0	ug/L	200	10649	EPA 7470	09/23/93
Arsenic	112348-001	<2.5	<2.5	mg/Kg	NM	10659	EPA 7060	09/24/93
Selenium	112348-001	<2.5	<2.5	mg/Kg	NM	10659	EPA 7740	09/24/93
Mercury	112348-001	<0.1	<0.1	mg/Kg	NM	10666	EPA 7471	09/24/93

NM = Not meaningful

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
JOB NUMBER: 112348

DATE REPORTED: 10/19/93

BATCH QC REPORT
SAMPLE SPIKE

Compound	Spike Amount	Sample	Sample Result	Spike Result	Units	Percent Rec.	QC Batch	Method	Analysis Date
Barium	100	112348-001	14.91	95.1	mg/Kg	80	10636	EPA 6010	09/24/93
Cobalt	25	112348-001	2.83	22.17	mg/Kg	77	10636	EPA 6010	09/24/93
Lead	25	112348-001	13.5	38	mg/Kg	98	10636	EPA 7420	09/27/93
Nickel	25	112348-001	14.47	36.49	mg/Kg	88	10636	EPA 6010	09/24/93
Arsenic	40	112348-013	<5.0	42.82	ug/L	107	10637	EPA 7060	09/24/93
Lead	30	112348-013	<3.0	27.72	ug/L	92	10637	EPA 7421	09/24/93
Selenium	30	112348-013	<5.0	26.23	ug/L	87	10637	EPA 7740	09/24/93
Antimony	500	112348-013	<60.0	465	ug/L	93	10638	EPA 6010	09/23/93
Barium	2000	112348-013	<10.0	2028	ug/L	101	10638	EPA 6010	09/23/93
Beryllium	50	112348-013	<2.0	49.1	ug/L	98	10638	EPA 6010	09/23/93
Cadmium	50	112348-013	<5.0	54.2	ug/L	108	10638	EPA 6010	09/23/93
Chromium (total)	200	112348-013	<10.0	206.9	ug/L	103	10638	EPA 6010	09/23/93
Cobalt	500	112348-013	<18.0	502.4	ug/L	100	10638	EPA 6010	09/23/93
Nickel	500	112348-013	<32.0	508.8	ug/L	102	10638	EPA 6010	09/23/93
Vanadium	500	112348-013	<10.0	498.4	ug/L	100	10638	EPA 6010	09/23/93
Mercury	4	112348-002	<0.2	3.251	ug/L	81	10649	EPA 7470	09/23/93
Mercury	40	112293-056	3.306	43.222	ug/L	100	10649	EPA 7470	09/23/93
Mercury	1.8	112348-001	<0.1	1.545	mg/Kg	85	10666	EPA 7471	09/24/93

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
JOB NUMBER: 112348

DATE REPORTED: 10/19/93

BATCH QC REPORT
BLANK SPIKE/BLANK SPIKE DUPLICATE

Compound	Spike Amount	BS Result	BSD Result	Units	BS % Recovery	BSD % Recovery	Average Recovery	RPD	QC Batch	Method	Analysis Date
Antimony	500	483.2	483.3	ug/L	97	97	97	0	10636	EPA 6010	09/24/93
Barium	2000	1930	1979	ug/L	97	99	98	3	10636	EPA 6010	09/24/93
Beryllium	50	46.8	47.5	ug/L	94	95	95	2	10636	EPA 6010	09/24/93
Cadmium	50	50.1	50.5	ug/L	100	101	101	1	10636	EPA 6010	09/24/93
Chromium (total)	200	195.2	202	ug/L	98	101	100	3	10636	EPA 6010	09/24/93
Cobalt	500	467.9	479	ug/L	94	96	95	2	10636	EPA 6010	09/24/93
Lead	500	450	440	ug/L	90	88	89	2	10636	EPA 7420	09/27/93
Nickel	500	461.5	475.4	ug/L	92	95	94	3	10636	EPA 6010	09/24/93
Vanadium	500	468.3	480.7	ug/L	94	96	95	3	10636	EPA 6010	09/24/93
Arsenic	40	41.48	40.87	ug/L	104	102	103	2	10637	EPA 7060	09/24/93
Lead	30	28.17	28.76	ug/L	94	96	95	2	10637	EPA 7421	09/24/93
Selenium	30	33.82	29.67	ug/L	113	99	106	13	10637	EPA 7740	09/24/93
Antimony	500	487.2	525.2	ug/L	97	105	101	8	10638	EPA 6010	09/23/93
Barium	2000	1962	2058	ug/L	98	103	101	5	10638	EPA 6010	09/23/93
Beryllium	50	46.9	49.8	ug/L	94	100	97	6	10638	EPA 6010	09/23/93
Cadmium	50	52.8	53.8	ug/L	106	108	107	2	10638	EPA 6010	09/23/93
Chromium (total)	200	201.2	210.2	ug/L	101	105	103	4	10638	EPA 6010	09/23/93
Cobalt	500	488.7	517.2	ug/L	98	103	101	6	10638	EPA 6010	09/23/93
Nickel	500	477.7	506.2	ug/L	96	101	99	6	10638	EPA 6010	09/23/93
Vanadium	500	483.1	506.8	ug/L	97	101	99	5	10638	EPA 6010	09/23/93
Mercury	4	4.371	4.614	ug/L	109	115	112	5	10649	EPA 7470	09/23/93
Arsenic	40	39.24	39.57	ug/L	98	99	99	1	10659	EPA 7060	09/24/93
Selenium	30	31.52	32.01	ug/L	105	107	106	2	10659	EPA 7740	09/24/93
Mercury	2	1.945	2.054	mg/Kg	97	103	100	5	10666	EPA 7471	09/24/93

Curtis & Tompkins, Ltd.

CLIENT: Engineering Science, Inc.
JOB NUMBER: 112348

DATE REPORTED: 10/19/93

BATCH QC REPORT
PREP BLANK

Compound	Result	Reporting Limit	Units	QC Batch	Method	Analysis Date
Antimony	ND	3	mg/Kg	10636	EPA 6010	09/24/93
Barium	ND	0.5	mg/Kg	10636	EPA 6010	09/24/93
Beryllium	ND	0.1	mg/Kg	10636	EPA 6010	09/24/93
Cadmium	ND	0.25	mg/Kg	10636	EPA 6010	09/24/93
Chromium (total)	ND	0.5	mg/Kg	10636	EPA 6010	09/24/93
Cobalt	ND	0.9	mg/Kg	10636	EPA 6010	09/24/93
Lead	ND	5	mg/Kg	10636	EPA 7420	09/27/93
Nickel	ND	1.6	mg/Kg	10636	EPA 6010	09/24/93
Vanadium	ND	0.5	mg/Kg	10636	EPA 6010	09/24/93
Arsenic	ND	5	ug/L	10637	EPA 7060	09/24/93
Lead	ND	3	ug/L	10637	EPA 7421	09/24/93
Selenium	ND	5	ug/L	10637	EPA 7740	09/24/93
Antimony	ND	60	ug/L	10638	EPA 6010	09/23/93
Barium	ND	10	ug/L	10638	EPA 6010	09/23/93
Beryllium	ND	2	ug/L	10638	EPA 6010	09/23/93
Cadmium	ND	5	ug/L	10638	EPA 6010	09/23/93
Chromium (total)	ND	10	ug/L	10638	EPA 6010	09/23/93
Cobalt	ND	18	ug/L	10638	EPA 6010	09/23/93
Nickel	ND	32	ug/L	10638	EPA 6010	09/23/93
Vanadium	ND	10	ug/L	10638	EPA 6010	09/23/93
Mercury	ND	0.2	ug/L	10649	EPA 7470	09/23/93
Arsenic	ND	2.5	mg/Kg	10659	EPA 7060	09/24/93
Selenium	ND	2.5	mg/Kg	10659	EPA 7740	09/24/93
Mercury	ND	0.1	mg/Kg	10666	EPA 7471	09/24/93

ND = Not detected at or above reporting limit

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-4
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU9-1-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	7
Phenol	ND	7
1,3-Dichlorobenzene	ND	7
1,4-Dichlorobenzene	ND	7
1,2-Dichlorobenzene	ND	7
Indene	ND	7
2-Methylphenol	ND	7
4-Methylphenol	ND	7
2,4-Dimethylphenol	ND	7
Quinoline	ND	7
Naphthalene	120	7
1-Methylnaphthalene	570	7
Dimethylphthalate	ND	7
2,4-Dinitrophenol	ND	7
4-Nitrophenol	ND	7
Diethylphthalate	ND	7
Phenanthrene	ND	7
Anthracene	ND	7
Benzenethiol	ND	7
Di-n-butylphthalate	ND	7
Fluoranthene	ND	7
Pyrene	ND	7
Butylbenzylphthalate	ND	7
Benzo(a)anthracene	ND	7
bis(2-ethylhexyl)phthalate	ND	7
Chrysene	ND	7
4-Methylchrysene	ND	7
Di-n-octylphthalate	ND	7
7,12-Dimethylbenz(a)anthracene	ND	7
Benzo(b)fluoranthene	ND	7
Benzo(k)fluoranthene	ND	7
Benzo(a)pyrene	ND	7
Dibenz(a,h)anthracene	ND	7
Dibenz(a,h)acridine	ND	7

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	-Diluted out-	2-Fluorobiphenyl	-Diluted out-
2,4,6-Tribromophenol	-Diluted out-	Terphenyl-d14	-Diluted out-
Nitrobenzene-d5	-Diluted out-		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-6
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU9-2-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.07
Phenol	ND	0.07
1,3-Dichlorobenzene	ND	0.07
1,4-Dichlorobenzene	ND	0.07
1,2-Dichlorobenzene	ND	0.07
Indene	ND	0.07
2-Methylphenol	ND	0.07
4-Methylphenol	ND	0.07
2,4-Dimethylphenol	ND	0.07
Quinoline	ND	0.07
Naphthalene	3.9	0.07
1-Methylnaphthalene	21	0.07
Dimethylphthalate	ND	0.07
2,4-Dinitrophenol	0.55	0.07
4-Nitrophenol	ND	0.07
Diethylphthalate	ND	0.07
Phenanthrene	2.8	0.07
Anthracene	0.14	0.07
Benzenethiol	ND	0.07
Di-n-butylphthalate	ND	0.07
Fluoranthene	ND	0.07
Pyrene	ND	0.07
Butylbenzylphthalate	ND	0.07
Benzo(a)anthracene	ND	0.07
bis(2-ethylhexyl)phthalate	ND	0.07
Chrysene	ND	0.07
4-Methylchrysene	0.52	0.07
Di-n-octylphthalate	ND	0.07
7,12-Dimethylbenz(a)anthracene	ND	0.07
Benzo(b)fluoranthene	ND	0.07
Benzo(k)fluoranthene	ND	0.07
Benzo(a)pyrene	ND	0.07
Dibenz(a,h)anthracene	ND	0.07
Dibenz(a,h)acridine	ND	0.07

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	-Diluted out-	2-Fluorobiphenyl	-Diluted out-
2,4,6-Tribromophenol	-Diluted out-	Terphenyl-d14	-Diluted out-
Nitrobenzene-d5	-Diluted out-		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-8
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU9-3-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/07/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.007
Phenol	ND	0.007
1,3-Dichlorobenzene	ND	0.007
1,4-Dichlorobenzene	ND	0.007
1,2-Dichlorobenzene	ND	0.007
Indene	ND	0.007
2-Methylphenol	ND	0.007
4-Methylphenol	ND	0.007
2,4-Dimethylphenol	ND	0.007
Quinoline	ND	0.007
Naphthalene	0.17	0.007
1-Methylnaphthalene	1.1	0.007
Dimethylphthalate	ND	0.007
2,4-Dinitrophenol	ND	0.007
4-Nitrophenol	ND	0.007
Diethylphthalate	ND	0.007
Phenanthrene	ND	0.007
Anthracene	ND	0.007
Benzenethiol	ND	0.007
Di-n-butylphthalate	ND	0.007
Fluoranthene	ND	0.007
Pyrene	ND	0.007
Butylbenzylphthalate	ND	0.007
Benzo(a)anthracene	ND	0.007
bis(2-ethylhexyl)phthalate	ND	0.007
Chrysene	ND	0.007
4-Methylchrysene	ND	0.007
Di-n-octylphthalate	ND	0.007
7,12-Dimethylbenz(a)anthracene	ND	0.007
Benzo(b)fluoranthene	ND	0.007
Benzo(k)fluoranthene	ND	0.007
Benzo(a)pyrene	ND	0.007
Dibenz(a,h)anthracene	ND	0.007
Dibenz(a,h)acridine	ND	0.007

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	0	2-Fluorobiphenyl	39
2,4,6-Tribromophenol	0	Terphenyl-d14	42
Nitrobenzene-d5	28		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-10
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU9-4-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	3
Phenol	ND	3
1,3-Dichlorobenzene	ND	3
1,4-Dichlorobenzene	ND	3
1,2-Dichlorobenzene	ND	3
Indene	ND	3
2-Methylphenol	ND	3
4-Methylphenol	ND	3
2,4-Dimethylphenol	ND	3
Quinoline	ND	3
Naphthalene	ND	3
1-Methylnaphthalene	69	3
Dimethylphthalate	ND	3
2,4-Dinitrophenol	ND	3
4-Nitrophenol	ND	3
Diethylphthalate	ND	3
Phenanthrene	ND	3
Anthracene	ND	3
Benzenethiol	ND	3
Di-n-butylphthalate	ND	3
Fluoranthene	ND	3
Pyrene	ND	3
Butylbenzylphthalate	ND	3
Benzo(a)anthracene	ND	3
bis(2-ethylhexyl)phthalate	ND	3
Chrysene	ND	3
4-Methylchrysene	ND	3
Di-n-octylphthalate	ND	3
7,12-Dimethylbenz(a)anthracene	ND	3
Benzo(b)fluoranthene	ND	3
Benzo(k)fluoranthene	ND	3
Benzo(a)pyrene	ND	3
Dibenz(a,h)anthracene	ND	3
Dibenz(a,h)acridine	ND	3

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	-Diluted out-	2-Fluorobiphenyl	-Diluted out-
2,4,6-Tribromophenol	-Diluted out-	Terphenyl-d14	-Diluted out-
Nitrobenzene-d5	-Diluted out-		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-11
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU9-4D-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	3
Phenol	ND	3
1,3-Dichlorobenzene	ND	3
1,4-Dichlorobenzene	ND	3
1,2-Dichlorobenzene	ND	3
Indene	ND	3
2-Methylphenol	ND	3
4-Methylphenol	ND	3
2,4-Dimethylphenol	ND	3
Quinoline	ND	3
Naphthalene	ND	3
1-Methylnaphthalene	110	3
Dimethylphthalate	ND	3
2,4-Dinitrophenol	ND	3
4-Nitrophenol	ND	3
Diethylphthalate	ND	3
Phenanthrene	ND	3
Anthracene	ND	3
Benzenethiol	ND	3
Di-n-butylphthalate	ND	3
Fluoranthene	ND	3
Pyrene	ND	3
Butylbenzylphthalate	ND	3
Benzo(a)anthracene	ND	3
bis(2-ethylhexyl)phthalate	ND	3
Chrysene	ND	3
4-Methylchrysene	ND	3
Di-n-octylphthalate	ND	3
7,12-Dimethylbenz(a)anthracene	ND	3
Benzo(b)fluoranthene	ND	3
Benzo(k)fluoranthene	ND	3
Benzo(a)pyrene	ND	3
Dibenz(a,h)anthracene	ND	3
Dibenz(a,h)acridine	ND	3

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	-Diluted out-	2-Fluorobiphenyl	-Diluted out-
2,4,6-Tribromophenol	-Diluted out-	Terphenyl-d14	-Diluted out-
Nitrobenzene-d5	-Diluted out-		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-16
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU10-1-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.007
Phenol	ND	0.007
1,3-Dichlorobenzene	ND	0.007
1,4-Dichlorobenzene	ND	0.007
1,2-Dichlorobenzene	ND	0.007
Indene	ND	0.007
2-Methylphenol	ND	0.007
4-Methylphenol	ND	0.007
2,4-Dimethylphenol	ND	0.007
Quinoline	ND	0.007
Naphthalene	ND	0.007
1-Methylnaphthalene	0.021	0.007
Dimethylphthalate	ND	0.007
2,4-Dinitrophenol	ND	0.007
4-Nitrophenol	ND	0.007
Diethylphthalate	ND	0.007
Phenanthrene	ND	0.007
Anthracene	ND	0.007
Benzenethiol	ND	0.007
Di-n-butylphthalate	ND	0.007
Fluoranthene	ND	0.007
Pyrene	ND	0.007
Butylbenzylphthalate	ND	0.007
Benzo(a)anthracene	ND	0.007
bis(2-ethylhexyl)phthalate	ND	0.007
Chrysene	ND	0.007
4-Methylchrysene	ND	0.007
Di-n-octylphthalate	ND	0.007
7,12-Dimethylbenz(a)anthracene	ND	0.007
Benzo(b)fluoranthene	ND	0.007
Benzo(k)fluoranthene	ND	0.007
Benzo(a)pyrene	ND	0.007
Dibenz(a,h)anthracene	ND	0.007
Dibenz(a,h)acridine	ND	0.007

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	0	2-Fluorobiphenyl	23
2,4,6-Tribromophenol	0	Terphenyl-d14	37
Nitrobenzene-d5	33		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-18
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU10-2-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.007
Phenol	ND	0.007
1,3-Dichlorobenzene	ND	0.007
1,4-Dichlorobenzene	ND	0.007
1,2-Dichlorobenzene	ND	0.007
Indene	ND	0.007
2-Methylphenol	ND	0.007
4-Methylphenol	ND	0.007
2,4-Dimethylphenol	ND	0.007
Quinoline	ND	0.007
Naphthalene	ND	0.007
1-Methylnaphthalene	0.025	0.007
Dimethylphthalate	ND	0.007
2,4-Dinitrophenol	ND	0.007
4-Nitrophenol	ND	0.007
Diethylphthalate	ND	0.007
Phenanthrene	ND	0.007
Anthracene	ND	0.007
Benzenethiol	ND	0.007
Di-n-butylphthalate	ND	0.007
Fluoranthene	ND	0.007
Pyrene	ND	0.007
Butylbenzylphthalate	ND	0.007
Benzo(a)anthracene	ND	0.007
bis(2-ethylhexyl)phthalate	ND	0.007
Chrysene	ND	0.007
4-Methylchrysene	ND	0.007
Di-n-octylphthalate	ND	0.007
7,12-Dimethylbenz(a)anthracene	ND	0.007
Benzo(b)fluoranthene	ND	0.007
Benzo(k)fluoranthene	ND	0.007
Benzo(a)pyrene	ND	0.007
Dibenz(a,h)anthracene	ND	0.007
Dibenz(a,h)acridine	ND	0.007

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	0	2-Fluorobiphenyl	34
2,4,6-Tribromophenol	0	Terphenyl-d14	37
Nitrobenzene-d5	31		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-20
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU10-3-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.007
Phenol	ND	0.007
1,3-Dichlorobenzene	ND	0.007
1,4-Dichlorobenzene	ND	0.007
1,2-Dichlorobenzene	ND	0.007
Indene	ND	0.007
2-Methylphenol	ND	0.007
4-Methylphenol	ND	0.007
2,4-Dimethylphenol	ND	0.007
Quinoline	ND	0.007
Naphthalene	ND	0.007
1-Methylnaphthalene	ND	0.007
Dimethylphthalate	ND	0.007
2,4-Dinitrophenol	ND	0.007
4-Nitrophenol	ND	0.007
Diethylphthalate	ND	0.007
Phenanthrene	ND	0.007
Anthracene	ND	0.007
Benzenethiol	ND	0.007
Di-n-butylphthalate	ND	0.007
Fluoranthene	ND	0.007
Pyrene	ND	0.007
Butylbenzylphthalate	ND	0.007
Benzo(a)anthracene	ND	0.007
bis(2-ethylhexyl)phthalate	ND	0.007
Chrysene	ND	0.007
4-Methylchrysene	ND	0.007
Di-n-octylphthalate	ND	0.007
7,12-Dimethylbenz(a)anthracene	ND	0.007
Benzo(b)fluoranthene	ND	0.007
Benzo(k)fluoranthene	ND	0.007
Benzo(a)pyrene	ND	0.007
Dibenz(a,h)anthracene	ND	0.007
Dibenz(a,h)acridine	ND	0.007

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	0	2-Fluorobiphenyl	27
2,4,6-Tribromophenol	0	Terphenyl-d14	28
Nitrobenzene-d5	24		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-22
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU10-4-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.007
Phenol	ND	0.007
1,3-Dichlorobenzene	ND	0.007
1,4-Dichlorobenzene	ND	0.007
1,2-Dichlorobenzene	ND	0.007
Indene	ND	0.007
2-Methylphenol	ND	0.007
4-Methylphenol	ND	0.007
2,4-Dimethylphenol	ND	0.007
Quinoline	ND	0.007
Naphthalene	ND	0.007
1-Methylnaphthalene	0.018	0.007
Dimethylphthalate	ND	0.007
2,4-Dinitrophenol	ND	0.007
4-Nitrophenol	ND	0.007
Diethylphthalate	ND	0.007
Phenanthrene	ND	0.007
Anthracene	ND	0.007
Benzenethiol	ND	0.007
Di-n-butylphthalate	ND	0.007
Fluoranthene	ND	0.007
Pyrene	ND	0.007
Butylbenzylphthalate	ND	0.007
Benzo(a)anthracene	ND	0.007
bis(2-ethylhexyl)phthalate	ND	0.007
Chrysene	ND	0.007
4-Methylchrysene	ND	0.007
Di-n-octylphthalate	ND	0.007
7,12-Dimethylbenz(a)anthracene	ND	0.007
Benzo(b)fluoranthene	ND	0.007
Benzo(k)fluoranthene	ND	0.007
Benzo(a)pyrene	ND	0.007
Dibenz(a,h)anthracene	ND	0.007
Dibenz(a,h)acridine	ND	0.007

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	0	2-Fluorobiphenyl	20
2,4,6-Tribromophenol	0	Terphenyl-d14	23
Nitrobenzene-d5	20		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-23
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU10-4D-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/08/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.007
Phenol	ND	0.007
1,3-Dichlorobenzene	ND	0.007
1,4-Dichlorobenzene	ND	0.007
1,2-Dichlorobenzene	ND	0.007
Indene	ND	0.007
2-Methylphenol	ND	0.007
4-Methylphenol	ND	0.007
2,4-Dimethylphenol	ND	0.007
Quinoline	ND	0.007
Naphthalene	ND	0.007
1-Methylnaphthalene	ND	0.007
Dimethylphthalate	ND	0.007
2,4-Dinitrophenol	ND	0.007
4-Nitrophenol	ND	0.007
Diethylphthalate	ND	0.007
Phenanthrene	ND	0.007
Anthracene	ND	0.007
Benzenethiol	ND	0.007
Di-n-butylphthalate	ND	0.007
Fluoranthene	ND	0.007
Pyrene	ND	0.007
Butylbenzylphthalate	ND	0.007
Benzo(a)anthracene	ND	0.007
bis(2-ethylhexyl)phthalate	ND	0.007
Chrysene	ND	0.007
4-Methylchrysene	ND	0.007
Di-n-octylphthalate	ND	0.007
7,12-Dimethylbenz(a)anthracene	ND	0.007
Benzo(b)fluoranthene	ND	0.007
Benzo(k)fluoranthene	ND	0.007
Benzo(a)pyrene	ND	0.007
Dibenz(a,h)anthracene	ND	0.007
Dibenz(a,h)acridine	ND	0.007

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	0	2-Fluorobiphenyl	30
2,4,6-Tribromophenol	0	Terphenyl-d14	33
Nitrobenzene-d5	21		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-15
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: BKG-2-1

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/07/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.007
Phenol	ND	0.007
1,3-Dichlorobenzene	ND	0.007
1,4-Dichlorobenzene	ND	0.007
1,2-Dichlorobenzene	ND	0.007
Indene	ND	0.007
2-Methylphenol	ND	0.007
4-Methylphenol	ND	0.007
2,4-Dimethylphenol	ND	0.007
Quinoline	ND	0.007
Naphthalene	ND	0.007
1-Methylnaphthalene	0.023	0.007
Dimethylphthalate	ND	0.007
2,4-Dinitrophenol	ND	0.007
4-Nitrophenol	ND	0.007
Diethylphthalate	ND	0.007
Phenanthrene	ND	0.007
Anthracene	ND	0.007
Benzenethiol	ND	0.007
Di-n-butylphthalate	ND	0.007
Fluoranthene	ND	0.007
Pyrene	ND	0.007
Butylbenzylphthalate	ND	0.007
Benzo(a)anthracene	ND	0.007
bis(2-ethylhexyl)phthalate	0.25	0.007
Chrysene	ND	0.007
4-Methylchrysene	ND	0.007
Di-n-octylphthalate	0.010	0.007
7,12-Dimethylbenz(a)anthracene	ND	0.007
Benzo(b)fluoranthene	ND	0.007
Benzo(k)fluoranthene	ND	0.007
Benzo(a)pyrene	ND	0.007
Dibenz(a,h)anthracene	ND	0.007
Dibenz(a,h)acridine	ND	0.007

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	0	2-Fluorobiphenyl	34
2,4,6-Tribromophenol	0	Terphenyl-d14	36
Nitrobenzene-d5	20		

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-METHOD BLANK
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE EXTRACTED: 09/27/93
DATE ANALYZED: 10/07/93
DATE REPORTED: 10/18/93

Revised Skinner List Extractables by EPA 8270 Selected Ion Monitoring
Extraction Method: EPA 3550 Sonication + Silica Gel Cleanup

	RESULT mg/Kg	REPORTING LIMIT (mg/Kg)
Pyridine	ND	0.007
Phenol	ND	0.007
1,3-Dichlorobenzene	ND	0.007
1,4-Dichlorobenzene	ND	0.007
1,2-Dichlorobenzene	ND	0.007
Indene	ND	0.007
2-Methylphenol	ND	0.007
4-Methylphenol	ND	0.007
2,4-Dimethylphenol	ND	0.007
Quinoline	ND	0.007
Naphthalene	ND	0.007
1-Methylnaphthalene	ND	0.007
Dimethylphthalate	ND	0.007
2,4-Dinitrophenol	ND	0.007
4-Nitrophenol	ND	0.007
Diethylphthalate	ND	0.007
Phenanthrene	ND	0.007
Anthracene	ND	0.007
Benzenethiol	ND	0.007
Di-n-butylphthalate	ND	0.007
Fluoranthene	ND	0.007
Pyrene	ND	0.007
Butylbenzylphthalate	ND	0.007
Benzo(a)anthracene	ND	0.007
bis(2-ethylhexyl)phthalate	ND	0.007
Chrysene	ND	0.007
4-Methylchrysene	ND	0.007
Di-n-octylphthalate	ND	0.007
7,12-Dimethylbenz(a)anthracene	ND	0.007
Benzo(b)fluoranthene	ND	0.007
Benzo(k)fluoranthene	ND	0.007
Benzo(a)pyrene	ND	0.007
Dibenz(a,h)anthracene	ND	0.007
Dibenz(a,h)acridine	ND	0.007

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: % SURROGATE RECOVERIES

Phenol-d6	0	2-Fluorobiphenyl	29
2,4,6-Tribromophenol	0	Terphenyl-d14	33
Nitrobenzene-d5	24		

Curtis & Tompkins, Ltd.

MS/MSD SUMMARY SHEET FOR EPA 8270

Client: Engineering Science Sample Matrix: Soil
Analysis Date: 10/07/93

SPIKE DATA

SPIKE COMPOUNDS	Reading	%Recovery
Naphthalene	547	NM
Phenanthrene	156	NM
Anthracene	39	56
Fluoranthene	36	64
Pyrene	50	64
Benzo(a)anthracene	37	64
Crysene	36	53
Benzo(b)fluoranthene	24	8
Benzo(k)fluoranthene	25	50
Dibenz(a,h)anthracene	23	45

SPIKE DUP DATA

SPIKE COMPOUNDS	Reading	%Recovery
Naphthalene	614	NM
Phenanthrene	176	NM
Anthracene	43	64
Fluoranthene	25	42
Pyrene	44	52
Benzo(a)anthracene	37	64
Crysene	37	55
Benzo(b)fluoranthene	21	2
Benzo(k)fluoranthene	22	44
Dibenz(a,h)anthracene	24	47

Matrix Results

Naphthalene	363	Benzo(a)anthracene	5
Phenanthrene	118	Crysene	9.5
Anthracene	11	Benzo(b)fluoranthene	20
Fluoranthene	4	Benzo(k)fluoranthene	0
Pyrene	18	Dibenz(a,h)anthracene	0.4

RELATIVE PERCENT DIFFERENCE

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD
Naphthalene	547	614	12
Phenanthrene	156	176	12
Anthracene	39	43	10
Fluoranthene	36	25	36
Pyrene	50	44	13
Benzo(a)anthracene	37	37	0
Crysene	36	37	3
Benzo(b)fluoranthene	24	21	13
Benzo(k)fluoranthene	25	22	13
Dibenz(a,h)anthracene	23	24	4

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8270

Client: Engineering Science
Analysis Date: 11/09/92
Sample Matrix: Soil LCS file: msd_7262.d

LABORATORY CONTROL SAMPLE DATA

SPIKE COMPOUNDS	Reading	%Recovery
Naphthalene	27.4	55
Phenanthrene	32.5	65
Anthracene	29.6	59
Fluoranthene	33.4	67
Pyrene	32.5	65
Benzo(a)anthracene	31.5	63
Crysene	30.0	60
Benzo(b)fluoranthene	22.3	45
Benzo(k)fluoranthene	26.5	53
Dibenz(a,h)anthracene	27.0	54

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-4
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-9-1-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	300
Chloroform	ND	300
1,2-Dichloroethane	ND	300
2-Butanone	ND	500
Benzene	ND	300
Toluene	ND	300
Chlorobenzene	ND	300
Ethyl benzene	5,700	300
Styrene	ND	300
Total xylenes	ND	300
1,2-Dibromoethane	ND	300
1,4-Dioxane	ND	5,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	81 %
Toluene-d8	98 %
Bromofluorobenzene	151 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-6
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-9-2-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	100
Chloroform	ND	100
1,2-Dichloroethane	ND	100
2-Butanone	ND	300
Benzene	ND	100
Toluene	ND	100
Chlorobenzene	ND	100
Ethyl benzene	2,800	100
Styrene	ND	100
Total xylenes	ND	100
1,2-Dibromoethane	ND	100
1,4-Dioxane	ND	3,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	81 %
Toluene-d8	81 %
Bromofluorobenzene	111 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-8
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-9-3-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	116 %
Toluene-d8	103 %
Bromofluorobenzene	98 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-10
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-9-4-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/30/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	3,000
Chloroform	ND	3,000
1,2-Dichloroethane	ND	3,000
2-Butanone	ND	5,000
Benzene	ND	3,000
Toluene	ND	3,000
Chlorobenzene	ND	3,000
Ethyl benzene	ND.	3,000
Styrene	ND	3,000
Total xylenes	ND	3,000
1,2-Dibromoethane	ND	3,000
1,4-Dioxane	ND	50,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	113 %
Toluene-d8	108 %
Bromofluorobenzene	112 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-11
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-9-4D-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5,000
Chloroform	ND	5,000
1,2-Dichloroethane	ND	5,000
2-Butanone	ND	10,000
Benzene	ND	5,000
Toluene	ND	5,000
Chlorobenzene	ND	5,000
Ethyl benzene	ND	5,000
Styrene	ND	5,000
Total xylenes	ND	5,000
1,2-Dibromoethane	ND	5000
1,4-Dioxane	ND	100,000

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	83 %
Toluene-d8	104 %
Bromofluorobenzene	113 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-16
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-10-1-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/29/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	20	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	111 %
Toluene-d8	106 %
Bromofluorobenzene	98 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-18
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-10-2-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	113 %
Toluene-d8	101 %
Bromofluorobenzene	98 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-20
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-10-3-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/27/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	10	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	6	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	116 %
Toluene-d8	105 %
Bromofluorobenzene	96 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-22
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-10-4-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/27/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	118 %
Toluene-d8	95 %
Bromofluorobenzene	94 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-23
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: SWMU-10-4D-3.5

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	111 %
Toluene-d8	102 %
Bromofluorobenzene	89 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-15
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: BKG-2-1

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/28/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	detected (8)	10
Benzene	detected (3)	5
Toluene	130	5
Chlorobenzene	ND	5
Ethyl benzene	11	5
Styrene	ND	5
Total xylenes	51	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	111 %
Toluene-d8	126 %
Bromofluorobenzene	76 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-13
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: EQRB-2

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/24/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN AQUEOUS SOLUTIONS

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	112 %
Toluene-d8	102 %
Bromofluorobenzene	97 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-12
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: TB-8

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/27/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN AQUEOUS SOLUTIONS

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	102 %
Toluene-d8	102 %
Bromofluorobenzene	96 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-24
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI
SAMPLE ID: TB9

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE ANALYZED: 09/27/93
DATE REPORTED: 10/18/93

EPA METHOD 8240: VOLATILE ORGANICS IN AQUEOUS SOLUTIONS

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	99 %
Toluene-d8	100 %
Bromofluorobenzene	96 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-METHOD BLANK DATE ANALYZED: 09/24/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/18/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN AQUEOUS SOLUTIONS

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	118 %
Toluene-d8	103 %
Bromofluorobenzene	98 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-METHOD BLANK DATE ANALYZED: 09/27/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/18/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN AQUEOUS SOLUTIONS

COMPOUND	Result ug/L	Reporting Limit (ug/L)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	100 %
Toluene-d8	100 %
Bromofluorobenzene	95 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-METHOD BLANK DATE ANALYZED: 09/28/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/18/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	105 %
Toluene-d8	101 %
Bromofluorobenzene	100 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-METHOD BLANK DATE ANALYZED: 09/29/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/18/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	114 %
Toluene-d8	101 %
Bromofluorobenzene	103 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-METHOD BLANK DATE ANALYZED: 09/30/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/18/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	105 %
Toluene-d8	100 %
Bromofluorobenzene	99 %

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348-METHOD BLANK DATE ANALYZED: 09/27/93
CLIENT: ENGINEERING SCIENCE, INC. DATE REPORTED: 10/18/93
PROJECT ID: PE375
LOCATION: CHEVRON RFI

EPA METHOD 8240: VOLATILE ORGANICS IN SOILS & WASTES

COMPOUND	Result ug/Kg	Reporting Limit (ug/Kg)
Carbon disulfide	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
Benzene	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethyl benzene	ND	5
Styrene	ND	5
Total xylenes	ND	5
1,2-Dibromoethane	ND	5
1,4-Dioxane	ND	100

2-Butanone = Methyl ethyl ketone
1,2-Dibromoethane = Ethylene dibromide

ND = Not detected at or above reporting limit

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	120 %
Toluene-d8	104 %
Bromofluorobenzene	98 %

Curtis & Tompkins, Ltd.

QC SUMMARY SHEET FOR EPA 8240

Laboratory Number:	112348		
Client:	Engineering Science	Spike file:	air12
Analysis date:	09/27/93	Spike dup file:	air13
Sample type:	Soil		
Sample spiked:	112348-018		

SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	56.13	112 %	OK	59 - 172
Trichloroethene	47.83	96 %	OK	62 - 137
Benzene	46.66	92 %	OK	66 - 142
Toluene	49.13	98 %	OK	59 - 139
Chlorobenzene	48.56	97 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	47.45	95 %	OK	70 - 121
Toluene-d8	51.86	104 %	OK	81 - 117
Bromofluorobenzene	48.85	98 %	OK	74 - 121

SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	58.73	117 %	OK	59 - 172
Trichloroethene	48.00	96 %	OK	62 - 137
Benzene	47.90	94 %	OK	66 - 142
Toluene	50.30	101 %	OK	59 - 139
Chlorobenzene	49.81	100 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	47.58	95 %	OK	70 - 121
Toluene-d8	52.19	104 %	OK	81 - 117
Bromofluorobenzene	48.62	97 %	OK	74 - 121

MATRIX RESULTS	
1,1-Dichloroethene	0
Trichloroethene	0
Benzene	0.826
Toluene	0
Chlorobenzene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS
1,1-Dichloroethene	56.13	58.73	5 %	OK	< 22
Trichloroethene	47.83	48.00	0 %	OK	< 24
Benzene	46.66	47.90	3 %	OK	< 21
Toluene	49.13	50.30	2 %	OK	< 21
Chlorobenzene	48.56	49.81	3 %	OK	< 21

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8240

Laboratory Number: 112348
Client: Engineering Science
Analysis date: 09/28/93 LCS file: ais03
Sample type: Soil

LCS DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	57.20	114 %	OK	59 - 172
Trichloroethene	44.46	89 %	OK	62 - 137
Benzene	45.44	91 %	OK	66 - 142
Toluene	45.90	92 %	OK	59 - 139
Chlorobenzene	46.49	93 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	40.84	82 %	OK	70 - 121
Toluene-d8	51.18	102 %	OK	81 - 117
Bromofluorobenzene	51.03	102 %	OK	74 - 121

Curtis & Tompkins, Ltd.

QC SUMMARY SHEET FOR EPA 8240

Laboratory Number:	112348		
Client:	Engineering Science	Spike file:	ais18
Analysis date:	09/29/93	Spike dup file:	ais19
Sample type:	Soil		
Sample spiked:	112348-015		

SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	68.33	137 %	OK	59 - 172
Trichloroethene	44.52	89 %	OK	62 - 137
Benzene	50.41	95 %	OK	66 - 142
Toluene	154.08	46 %	NOT OK	59 - 139
Chlorobenzene	50.52	101 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	55.32	111 %	OK	70 - 121
Toluene-d8	52.96	106 %	OK	81 - 117
Bromofluorobenzene	41.03	82 %	OK	74 - 121

SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	92.67	185 %	NOT OK	59 - 172
Trichloroethene	44.18	88 %	OK	62 - 137
Benzene	52.23	98 %	OK	66 - 142
Toluene	166.66	71 %	OK	59 - 139
Chlorobenzene	49.72	99 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	68.92	138 %	NOT OK	70 - 121
Toluene-d8	66.06	132 %	NOT OK	81 - 117
Bromofluorobenzene	39.23	78 %	OK	74 - 121

MATRIX RESULTS	
1,1-Dichloroethene	0
Trichloroethene	0
Benzene	3.12
Toluene	131.2
Chlorobenzene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS
1,1-Dichloroethene	68.33	92.67	30 %	NOT OK	< 22
Trichloroethene	44.52	44.18	1 %	OK	< 24
Benzene	50.41	52.23	4 %	OK	< 21
Toluene	154.08	166.66	8 %	OK	< 21
Chlorobenzene	50.52	49.72	2 %	OK	< 21

Curtis & Tompkins, Ltd.

QC SUMMARY SHEET FOR EPA 8240

Laboratory Number:	112348		
Client:	Engineering Science	Spike file:	ait18
Analysis date:	09/30/93	Spike dup file:	ait19
Sample type:	Soil		

SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	47.81	96 %	OK	59 - 172
Trichloroethene	43.99	88 %	OK	62 - 137
Benzene	47.96	94 %	OK	66 - 142
Toluene	46.53	93 %	OK	59 - 139
Chlorobenzene	49.22	98 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	55.46	111 %	OK	70 - 121
Toluene-d8	52.30	105 %	OK	81 - 117
Bromofluorobenzene	60.00	120 %	OK	74 - 121

SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	48.25	97 %	OK	59 - 172
Trichloroethene	44.60	89 %	OK	62 - 137
Benzene	48.21	95 %	OK	66 - 142
Toluene	46.82	94 %	OK	59 - 139
Chlorobenzene	49.84	100 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	40.68	81 %	OK	70 - 121
Toluene-d8	52.03	104 %	OK	81 - 117
Bromofluorobenzene	58.18	116 %	OK	74 - 121

MATRIX RESULTS	
1,1-Dichloroethene	0
Trichloroethene	0
Benzene	0.882
Toluene	0
Chlorobenzene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS
1,1-Dichloroethene	47.81	48.25	1 %	OK	< 22
Trichloroethene	43.99	44.60	1 %	OK	< 24
Benzene	47.96	48.21	1 %	OK	< 21
Toluene	46.53	46.82	1 %	OK	< 21
Chlorobenzene	49.22	49.84	1 %	OK	< 21

Curtis & Tompkins, Ltd.

QC SUMMARY SHEET FOR EPA 8240

Laboratory Number:	112348		
Client:	Engineering Science	Spike file:	aio11
Analysis date:	09/27/93	Spike dup file:	aio12
Sample type:	Water		

SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	54.62	109 %	OK	61 - 145
Trichloroethene	47.71	95 %	OK	71 - 120
Benzene	46.22	91 %	OK	76 - 127
Toluene	46.74	93 %	OK	76 - 125
Chlorobenzene	47.18	94 %	OK	75 - 130
SURROGATES				
1,2-Dichloroethane-d4	54.17	108 %	OK	76 - 114
Toluene-d8	50.78	102 %	OK	88 - 110
Bromofluorobenzene	48.13	96 %	OK	86 - 115

SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	53.99	108 %	OK	61 - 145
Trichloroethene	46.20	92 %	OK	71 - 120
Benzene	44.43	87 %	OK	76 - 127
Toluene	44.27	89 %	OK	76 - 125
Chlorobenzene	45.62	91 %	OK	75 - 130
SURROGATES				
1,2-Dichloroethane-d4	55.30	111 %	OK	76 - 114
Toluene-d8	50.26	101 %	OK	88 - 110
Bromofluorobenzene	48.10	96 %	OK	86 - 115

MATRIX RESULTS	
1,1-Dichloroethene	0
Trichloroethene	0
Benzene	0.814
Toluene	0
Chlorobenzene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS
1,1-Dichloroethene	54.62	53.99	1 %	OK	< 14
Trichloroethene	47.71	46.20	3 %	OK	< 14
Benzene	46.22	44.43	4 %	OK	< 11
Toluene	46.74	44.27	5 %	OK	< 13
Chlorobenzene	47.18	45.62	3 %	OK	< 13

Curtis & Tompkins, Ltd.

QC SUMMARY SHEET FOR EPA 8240

Laboratory Number:	112348		
Client:	Engineering Science	Spike file:	cir13
Analysis date:	09/27/93	Spike dup file:	cir14
Sample type:	Water		

SPIKE DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	52.07	104 %	OK	61 - 145
Trichloroethene	49.18	98 %	OK	71 - 120
Benzene	48.01	95 %	OK	76 - 127
Toluene	47.05	94 %	OK	76 - 125
Chlorobenzene	49.14	98 %	OK	75 - 130
SURROGATES				
1,2-Dichloroethane-d4	47.93	96 %	OK	76 - 114
Toluene-d8	49.55	99 %	OK	88 - 110
Bromofluorobenzene	47.75	96 %	OK	86 - 115

SPIKE DUP DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	50.85	102 %	OK	61 - 145
Trichloroethene	50.07	100 %	OK	71 - 120
Benzene	49.93	99 %	OK	76 - 127
Toluene	48.20	96 %	OK	76 - 125
Chlorobenzene	50.32	101 %	OK	75 - 130
SURROGATES				
1,2-Dichloroethane-d4	47.41	95 %	OK	76 - 114
Toluene-d8	49.76	100 %	OK	88 - 110
Bromofluorobenzene	49.07	98 %	OK	86 - 115

MATRIX RESULTS	
1,1-Dichloroethene	0
Trichloroethene	0
Benzene	0.603
Toluene	0
Chlorobenzene	0

RPD DATA

SPIKE COMPOUNDS	SPIKE	SPIKE DUP	RPD	STATUS	LIMITS
1,1-Dichloroethene	52.07	50.85	2 %	OK	< 14
Trichloroethene	49.18	50.07	2 %	OK	< 14
Benzene	48.01	49.93	4 %	OK	< 11
Toluene	47.05	48.20	2 %	OK	< 13
Chlorobenzene	49.14	50.32	2 %	OK	< 13

Curtis & Tompkins, Ltd.

LCS SUMMARY SHEET FOR EPA 8240

Laboratory Number: 112348
Client: Engineering Science
Analysis date: 09/30/93 LCS file: aiu04
Sample type: Soil

LCS DATA (spiked at 50 ppb)

SPIKE COMPOUNDS	READING	RECOVERY	STATUS	LIMITS
1,1-Dichloroethene	48.29	97 %	OK	59 - 172
Trichloroethene	47.76	96 %	OK	62 - 137
Benzene	48.22	96 %	OK	66 - 142
Toluene	47.32	95 %	OK	59 - 139
Chlorobenzene	47.70	95 %	OK	60 - 133
SURROGATES				
1,2-Dichloroethane-d4	53.21	106 %	OK	70 - 121
Toluene-d8	50.14	100 %	OK	81 - 117
Bromofluorobenzene	49.81	100 %	OK	74 - 121

CHAIN OF CUSTOD . RECORD

PROJECT NO.	PROJECT NAME
PE 375	Chevron RFI

SAMPLERS (Signatures): John Bridenbaugh / John Bridenbaugh / [illegible]

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	Skinner Metals	SVOA	VOA	Cyanide	Organic Lead	Isobutyl Alcohol	pH	Sulfates			REMARKS
9/17/93	10:20	Soil	SWMU 32-1-3	2	X						X	X			
"	10:50	Water	SWMU 32-2	3	X						X	X			
"	11:48	Soil	SWMU 9-1-1.5	2	X			X			X				Note: For SWMU 9 and SWMU 10 samples hold
"	11:58	Soil	SWMU 9-1-3.5	3	X	X	X	X	X	X	X				leftover soil from 1.5' depth. If
"	12:20	Soil	SWMU 9-2-1.5	2	X			X			X				3.5' depth samples have detections
"	12:30	Soil	SWMU 9-2-3.5	3	X	X	X	X	X	X	X				of organics, then notify ES for
"	12:40	Soil	SWMU 9-3-1.5	2	X			X			X				authorization to analyze corresponding
"	13:05	Soil	SWMU 9-3-3.5	3	X	X	X	X	X	X	X				1.5' samples for detected organics.
"	13:20	Soil	SWMU 9-4-1.5	2	X			X			X				
"	13:40	Soil	SWMU 9-4-3.5	3	X	X	X	X	X	X	X				
"	13:40	Soil	SWMU 9-4D-3.5	2	X	X	X	X	X	X	X				
"		Water	TB-8	1			X								

RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	PRESERVATIVES
John Bridenbaugh	9/17/93	[illegible]	[illegible]	
	TIME 17:00		TIME [illegible]	
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	
	TIME		TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE	RECEIVED BY: (SIGNATURE)	DATE	ES - Honolulu
	TIME		TIME	

ENGINEERING-SCIENCE, INC. 211.0858/YO

White: laboratory returns with data, yellow: laboratory copy, pink: sampler copy

112348

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME
PE 375	Chevron RFI

SAMPLERS (Signatures): John Bridenbaugh / Craig A Miller
John Bridenbaugh / Craig A Miller

DATE	TIME	MATRIX TYPE	SAMPLE I.D.	NO. OF CONTAINERS	Skinner Metals	SVOA	VOA	Cyanide	Organic Lead	Lebbury/Alcohol					REMARKS
9/17/93	2:15	Water	EQRB-2	8	X	X	X	X	X	X					For SWMU 10
"	14:55	Soil	SWMU 10-1-1.5	2	X			X							Note: Hold leftover 1.5' depth
"	14:56	Soil	BKG-2-1	3	X	X	X	X	X	X					soil samples. If the 3.5'
"	15:05	Soil	SWMU 10-1-3.5	3	X	X	X	X	X	X					depth samples have detections
"	15:25	Soil	SWMU 10-2-1.5	2	X			X							of organics, then notify
"	15:32	Soil	SWMU 10-2-3.5	3	X	X	X	X	X	X					ES for authorization to
"	15:45	Soil	SWMU 10-3-1.5	2	X			X							analyze corresponding 1.5'
"	15:50	Soil	SWMU 10-3-3.5	3	X	X	X	X	X	X					depth samples for detected
"	16:07	Soil	SWMU 10-4-1.5	2	X			X							organics.
"	16:10	Soil	SWMU 10-4-3.5	3	X	X	X	X	X	X					
"	16:10	Soil	SWMU 10-4D-3.5	3	X	X	X	X	X	X					
"		Water	TB9	1			X								

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	DATE / TIME	PRESERVATIVES
John Bridenbaugh	DATE 9/17/93 TIME 17:00	Nancy J Wilson	DATE 9/17/93 TIME 8:50	
RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	DATE / TIME	SEND RESULTS TO:
RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	DATE / TIME	ES - Honolulu

ENGINEERING-SCIENCE, INC. 211.0858/YO

White: laboratory returns with data, yellow: laboratory copy, pink: sampler copy

APPENDIX B

STATE OF HAWAII
RECOMMENDED AND TO-BE-CONSIDERED
SOIL CLEANUP CRITERIA

TECHNICAL GUIDANCE MANUAL

FOR

UNDERGROUND STORAGE TANK CLOSURE

AND

RELEASE RESPONSE

State of Hawai'i
Department of Health
Environmental Management Division
Solid and Hazardous Waste Branch
Underground Storage Tank Section
Five Waterfront Plaza, Suite 250
500 Ala Moana Boulevard
Honolulu, Hawai'i 96813
(808) 586-4228

August 1992
(First Edition)

Table 5.1 DOH's Interim Recommended Cleanup Criteria for Soil and Water

CONSTITUENT		Above the UIC Line (Mauka) (Drinking Water Source)		Below the UIC Line (Makai) (Non-Drinking Water Source)	
		Water (ppm)	Soil (ppm)	Water (ppm)	Soil (ppm)
Volatile Organic Compounds	Benzene*	0.005	0.05	1.7	1.7
	Ethylbenzene	0.7	7.0	0.14	1.4
	Toluene	1.0	10.0	2.1	21.0
Semi-volatile and Non-volatile Organic Compounds	Benzo (a) pyrene*	0.0002	1.0	NS	1.0
	Acenaphthene	NS	100	0.320	100
	Fluoranthene	NS	500	0.013	500
	Naphthalene	NS	100	0.78	100
Metals	Lead (total)	0.05	400	0.14 *[.0056]*	400
	Cadmium (total)	0.005	2.0, or natural background (whichaver is higher)	[0.0093]	2.0, or natural background (whichever is higher)
Halogenated Organic Compounds	Polychlor-inated biphenyls* (PCB)	0.0005	1.0	[0.00003]	1.0
	1,1,1 Trichloro-ethane (1,1,1-TCA)	0.2	2.0	10.4	10.4
	Tetrachloro-ethylene* (PCE)	0.005	0.05	[0.145]	0.145

* - Carcinogen; NS - No Standard; [ ] - Saltwater chronic surface water quality standard as established in Hawai'i Administrative Rules (HAR), Title 11, Chapter 54; *[ ]* - Currently proposed chronic standards in HAR 11-54 Revisions, April, 1992.

Note:

1. The recommended cleanup criteria for water at sites that are mauka of the UIC line are the existing or proposed MCL for that constituent. The recommended cleanup criteria for water at sites that are makai of the UIC line are based on the saltwater acute surface water quality standard (or chronic standard when available) as established in HAR Chapter 11-54.

2. The recommended cleanup criteria for volatile and halogenated organic compounds in soil at sites that are mauka of the UIC line are 10 times the existing or proposed MCL for that constituent with the exception of the criteria set for PCBs. The recommended cleanup criteria for PCBs in soil regardless of location are based on the required cleanup criteria for surface soils in non-restricted access areas as established under the Toxic Substances Control Act.

3. The recommended cleanup criteria for ethylbenzene and toluene in soil at sites that are makai of the UIC line is 10 times the saltwater acute surface water quality standards as established in HAR 11-54.

4. The recommended cleanup criteria for benzene, 1,1,1 TCA, and PCE in soil at sites that are makai of the UIC line are the same as the saltwater acute surface water quality standards (or chronic standards when available) as established in HAR 11-54 because of their degree of toxicity, pertinent physical and behavioral properties in the environment, and other health-related information.

5. The recommended cleanup criteria for semi-volatile and non-volatile organic compounds in soil regardless of their location relative to the UIC line are based on assessments of the physical and chemical characteristics of the compounds and the degradation, transformation, and toxicity of the constituents in the environment.

6. The recommended cleanup criteria for metals in soil regardless of their location relative to the UIC line are based on direct exposure to human and ecological receptors.

7. All sampling and analytical data intended to document or demonstrate that cleanup criteria (or other protective levels) have been attained should conform with appropriate field and laboratory quality assurance/quality control practices and should use appropriate methods for sample preparation, handling, and analysis. (See Section 7 on Sampling and Analysis.)

DRAFT

Summary of Hawaii ARARs and TBCs Relating to the Development of Statewide Cleanup Criteria

Prepared for:

Department of Health
Hazard Evaluation
and Emergency Response Office
Five Waterfront Plaza, Suite 250C
500 Ala Moana Boulevard
Honolulu, Hawaii 96813

Prepared by:

North Shore Consulting and Design
58-127 Iwia Place
Haleiwa, Hawaii 96712

January, 1992

DRAFT

SECTION C

TABLE 2
DEPARTMENT OF HEALTH
CHEMICAL-SPECIFIC TBCs

Solid and Hazardous Waste Branch
Underground Storage Tank Section
Soil and Ground Water Cleanup Goals
For Typical Petroleum Constituents
(Established 6 February 1991)

Constituent	Soil Cleanup Goal (ppm)	Water Cleanup Goal (ppm)
TPH as Gasoline	50.0	10.0
TPH as Diesel	50.0	10.0
TPH as Oil and Grease	50.0	10.0
Benzene	0.05	0.005
Ethylbenzene	7.0	0.7
Toluene	10.0	1.0
Total Xylenes	100.0	10.0
Organic Lead	ND	ND
Total Lead	0.5	0.05
Cadmium	0.05	0.005
Chromium	1.0	0.1

Notes:

If other constituents of concern are present, the water cleanup goal is the existing or proposed MCL for that constituent, and the soil cleanup goal is ten times the existing or proposed MCL.

For cases where contaminants are left in place at levels at or above these cleanup goals, such levels must be supported by a site-specific risk assessment, which is protective of human health and the environment. Similarly, contaminants taken off-site for disposal must also meet the cleanup goals or be supported by a site-specific risk assessment.

In addition, for the purposes of determining whether contaminated soil and ground water should be handled as hazardous waste, the EPA's Toxicity Characteristic Leaching Procedure (TCLP) should be used in determining whether RCRA standards are relevant and appropriate in handling such waste.

All sampling and analytical data intended to document or demonstrate that cleanup goals (or protective levels) are met must conform with acceptable field and laboratory quality assurance/quality control practices and must use acceptable methods for sample preparation and analysis.

Although these goals have been established for cleaning up contamination from regulated UST sources, they can be applied to other types of cleanups if no other mechanism for determining cleanup levels is selected.

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SECTION C

TABLE 2
DEPARTMENT OF HEALTH
CHEMICAL-SPECIFIC TBCs
(continued)

Solid and Hazardous Waste Branch
Past Hazardous Waste Clean Closures
Guidelines for Soil

Site	Constituent	Soil Cleanup Guidelines (ppm)	Date Approved
Hawaii Independent Refineries, Inc.	Arsenic	100.0	9/30/88
"	Cadmium	9.0	"
"	Lead	500.0	"
"	Phenanthrene	20.0	"
"	Pyrene	20.0	"
Safety Kleen	Benzene	5.0	11/25/91
"	TCLP Benzene	0.5	"
"	Ethylbenzene	75.0	"
"	PCBs (outdoors)	10.0	"
"	Toluene	20.0	"
"	TPH	100.0	"
Chevron	Arsenic	100.0	3/7/89
"	Cadmium	10.0	"
"	Lead	500.0	"
"	Phenanthrene	20.0	"
"	Pyrene	20.0	"
Pepper Industries	PCBs (indoor)	$10ug/100cm^2$	4/7/89
"	Lead (outdoor)	500.0	"

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SECTION C

TABLE 2
DEPARTMENT OF HEALTH
CHEMICAL-SPECIFIC TBCs
(continued)

Solid and Hazardous Waste Branch
Target Closure Cleanup Levels for Soil
(Adopted from RCRA Facilities Investigation Guidance Document, 1989
As Revised 5/10/90)

Constituent	Target Cleanup Level (ppm)
$Chromium^{III}$	80,000.0 (8%)
$Chromium^{IV}$	400.0
Mercury	24.0
MeNaphthalenes	20.0
Naphthalene	320.0 (1)
Vanadium	500.0 - 2,000.0
Cobalt	200.0 - 2,000.0
Nickel	100.0
Barium	4,000.0

Notes:
(1) Based on 0.004 ppm/day ingestion of soil for risk analysis 10^{-6}.

APPENDIX C

APPENDIX C

LABORATORY CASE NARRATIVES
AND
EPA REGION IX QA/QC SUMMARY FORMS

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109099
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 10/27/92
DATE RECEIVED: 10/28/92
DATE REPORTED: 11/12/92
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 19 soil samples for analysis of the revised Skinner list semivolatiles, cyanide and organic lead.

All data quality objectives were met for the organic lead analysis.

Cyanide sample spike recovery was low for one of the two batches of data. Laboratory control standard recovery for this batch is acceptable indicating that the matrix is the source of the bias.

The semivolatiles analysis resulted in no hits for target analytes, but the detection limits for many of the samples were raised because the samples were diluted due to the presence of hydrocarbons. Refer to the letter dated November 30, 1992 for more information on this phenomenon.

The semivolatile spike used for this batch of samples contained a subset of the Skinner list target analytes, not the eleven compounds listed in EPA 8270 (some of which are not target compounds for this project. Data quality objectives in the form of control limits for the spiked compounds are not available, but review of the results does indicate that the 7,12-dimethylbenzo(a)anthracene recovery in the spikes (none recovered) is unacceptable. As the compound is recovered in the laboratory control standardit appears that matrix interference is the source of the problem.

Check
Sample
dilution on
data reports
Math errors??

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109111
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 10/28/92
DATE RECEIVED: 10/29/92
DATE REPORTED: 11/16/92
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received eleven soil samples and two water samples on October 29, 1992. Seven of the soil samples were analyzed for volatiles using EPA 8240. A TCLP extraction was performed on one of the other soil samples followed by analysis for MEK. The other three soil samples were analyzed for the revised Skinner list semivolatiles, cyanide and organic lead. The water samples (one was a trip blank, the other a rinsate) were analyzed for the Skinner list volatiles. The equipment rinsate was also analyzed for organic lead and the revised Skinner list semivolatiles.

Organic lead in both soil and water met all data quality objectives.

Cyanide sample spike recovery was low (58%) but the sample duplicates were within the precision criteria and the laboratory control standard recovery was acceptable so the data was reported.

The EPA 8240 for the water samples met all data quality objectives. For the soil samples the hydrocarbon background resulted in dilutions and elevated detection limits (refer to the report). The hydrocarbon background in sample SWMU-35-2-0.5′ resulted in elevated detection limits and poor surrogate recoveries. Matrix spikes for the soils were inadvertently omitted from the original report. The attached reports indicate that the spikes are acceptable except for a low surrogate recovery which does not impact the data. The TCLP volatile QC is entirely acceptable.

The semivolatiles analysis was spiked with a subset of the Skinner list. Data quality objectives for recovery of these compounds is not provided in the project plan. For the water sample the laboratory analyzed two LCSs because insufficient sample was available for a matrix spike/matrix spike duplicate. Reviewing the data for possible problems it is apparent that the dibenzo (a,i) pyrene recovery is low, and the 7,12-dimethylbenzo (a) anthracene recovery is not as reproducible as the other compounds (this is probably due to the stability of the compound). The soil spike recovery also indicates that reproducibility is a problem with the latter compound, although all other analytes were adequately recovered and reproducible.

For
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samples
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Curtis & Tompkins, Ltd

MS/MSD Report

Curtis & Tompkins, Ltd.

Matrix Sample Number: 109186-006
Lab No: QC36800 QC36801
Matrix: SOIL
Batch No: 7376 928954 928956 928952

Date Analyzed: 10-NOV-92
Spike File: >BKA07
Spike Dup File: >BKA08
Analyst: CW

	Instrdg	SpikeAmt	% Rec	Limits	
MS RESULTS					
1,1-Dichloroethene	45.27	50	87 %	59-172%	
Trichloroethene	61.73	50	91 %	62-137%	
Benzene	47.81	50	96 %	66-142%	
Toluene	50.07	50	99 %	59-139%	
Chlorobenzene	49.79	50	100 %	60-133%	
Surrogate Recoveries					
1,2-Dichloroethane-d4	52.2	50	104 %	70-121%	
Toluene-d8	50.34	50	101 %	81-117%	
Bromofluorobenzene	44.71	50	89 %	74-121%	
MSD RESULTS					
1,1-Dichloroethene	53.34	50	103 %	59-172%	
Trichloroethene	62.79	50	93 %	62-137%	
Benzene	48.52	50	97 %	66-142%	
Toluene	51.94	50	102 %	59-139%	
Chlorobenzene	49.28	50	99 %	60-133%	
Surrogate Recoveries					
1,2-Dichloroethane-d4	54.56	50	109 %	70-121%	
Toluene-d8	55.83	50	112 %	81-117%	
Bromofluorobenzene	33.42	50	67 %	74-121%	*
MATRIX RESULTS					
1,1-Dichloroethene	1.69				
Trichloroethene	16.44				
Benzene	0				
Toluene	.811				
Chlorobenzene	0				
RPD DATA					
1,1-Dichloroethene	16 %			< 22%	
Trichloroethene	2 %			< 24%	
Benzene	1 %			< 21%	
Toluene	4 %			< 21%	
Chlorobenzene	1 %			< 21%	

** Result is out of limits

Curtis & Tompkins, Ltd

MS/MSD Report

Curtis & Tompkins, Ltd.

Matrix Sample Number: 109111-007
Lab No: QC36755 QC36756
Matrix: SOIL
Batch No: 7365 928934 928936 928922

Date Analyzed: 10-NOV-92
Spike File: >BK921
Spike Dup File: >BK922
Analyst: CW

	Instrdg	SpikeAmt	% Rec	Limits	
MS RESULTS					
1,1-Dichloroethene	41.44	50	83 %	59-172%	
Trichloroethene	57.36	50	115 %	62-137%	
Benzene	52.89	50	106 %	66-142%	
Toluene	58.93	50	118 %	59-139%	
Chlorobenzene	59.85	50	120 %	60-133%	
Surrogate Recoveries					
1,2-Dichloroethane-d4	60.04	50	120 %	70-121%	
Toluene-d8	55.53	50	111 %	81-117%	
Bromofluorobenzene	42.14	50	84 %	74-121%	
MSD RESULTS					
1,1-Dichloroethene	31.91	50	64 %	59-172%	
Trichloroethene	48.33	50	97 %	62-137%	
Benzene	44.36	50	89 %	66-142%	
Toluene	52.87	50	106 %	59-139%	
Chlorobenzene	58.36	50	117 %	60-133%	
Surrogate Recoveries					
1,2-Dichloroethane-d4	55.16	50	110 %	70-121%	
Toluene-d8	55.68	50	111 %	81-117%	
Bromofluorobenzene	36.42	50	73 %	74-121%	*
MATRIX RESULTS					
1,1-Dichloroethene	0				
Trichloroethene	0				
Benzene	0				
Toluene	0				
Chlorobenzene	0				
RPD DATA					
1,1-Dichloroethene	26 %			< 22%	*
Trichloroethene	17 %			< 24%	
Benzene	18 %			< 21%	
Toluene	11 %			< 21%	
Chlorobenzene	3 %			< 21%	

** Result is out of limits

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112348
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375
LOCATION: CHEVRON RFI

DATE SAMPLED: 09/17/93
DATE RECEIVED: 09/20/93
DATE REPORTED: 10/18/93
DATE REVISED: 11/16/93

CASE NARRATIVE

Curtis & Tompkins (C&T) received 20 soil and 4 water samples on September 20, 1993 for the above referenced project. The following report details the results of the analyses performed by the laboratory. The following items should be considered when reviewing the data:

The semi-volatile extraction was performed using EPA 3550 (sonication) followed by a silica gel clean-up. Samples were then analyzed by GC/MS using selective ion monitoring to achieve low detection limits. The acid fraction surrogates (phenols) were not recovered in this process. The naphthalene and phenanthrene level in the spiked samples were high making it impossible to calculate meaningful spike recoveries. Reproducibility on the spikes was acceptable.

Hydrocarbons coeluted with some of the volatile (EPA 8240) surrogates resulting in high recoveries (samples SWMU-9-1-3.5, BKG-2-1). The spike recovery for laboratory sample Id. 112348-15 was out of control for toluene due to high background levels in the sample. All other spikes are within control limits.

Isobutyl alcohol spike recoveries in the soil samples were low, indicating that the extraction process may not be recovering all the isobutyl alcohol in the samples. Surrogate recoveries indicate that this is a consistent problems accross the entire batch of samples.

The sample identifed by ES as EQRB-2 was inadvertently not analyzed for Skinner List semi-volatiles.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109430
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 12/03/92
DATE RECEIVED: 12/04/92
DATE REPORTED: 12/08/92
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 5 soil samples for analysis of the Skinner list metals, cyanide and pH (pH was not run on the field duplicate).

Cyanide was analyzed using a modified EPA 9010. Recovery for the matrix spike and matrix spike duplicate was 54 and 52 percent (RPD of 4 percent). The recovery of the laboratory control standard was within acceptance criteria indicating that the sample matrix interference is causing the low recovery.

The matrix spike recovery for selenium was 44 percent. All other QC for selenium and arsenic (graphite furnace analyses) was within acceptance criteria.

The analyst inadvertently failed to add the spiking solution to the matrix spike for the EPA 6010 metals. The laboratory control standards (run in duplicate) met all QC criteria so the data was released. The duplicated sample (SWMU-15-1-1', Lab Id. 109430-001) had acceptable RPD for all metals except for barium which had an RDP of 21 percent.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109791
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/18/93
DATE RECEIVED: 01/19/93
DATE REPORTED: 02/16/93
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 4 soil samples for analysis of the Skinner list metals.

Cadmium sample spike recovery for the batch was 65 percent (the spiked sample was not one of the project related samples). All other data quality objectives for the EPA 6010 analysis were met.

Data quality objectives for all graphite furnace and the mercury analysis were met.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109770
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93
DATE REPORTED: 02/09/93
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 24 soil samples on January 15, 1993 for analysis of the Skinner list metals. Five of the samples were all so to be analyzed for cyanide and pH.

Cyanide and pH analysis met all project data quality objectives.

The RPD for mercury batch B is 29 percent. The sample and sample duplicated results are 0.4 and 0.5 mg/Kg (the detection limit is 0.1 mg/Kg) which results in an unacceptable RPD but is clearly acceptable data.

The EPA 6010 sample spike recovery for both batches indicates that the matrix may be causing interferences. The sample spiked in batch A has very high levels of calcium which might contribute to some of the low recoveries (the ICP is set up to compensate for calcium interference, but each sample is different). The RPD failure for cadmium in batch B is due to two measurements near the detection limit. Spike recovery failure for chromium in batch A is a result of the sample background containing a high amount of chromium compared to the spike used. No other sources of failures can be determined positively.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 109904
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/29/93
DATE RECEIVED: 01/29/93
DATE REPORTED: 02/23/93
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 4 soil samples on January 29, 1993. All four of the samples were for analysis of the revised Skinner list semivolatiles. One sample (BKG-1-1.5) was also analyzed for other Skinner list analytes.

For the semivolatiles analysis, the samples were extracted by EPA 3550 followed by silica gel cleanup with dichloromethane as the final solvent. Samples were then analyzed by EPA 8270 using selective ion monitoring to reduce the interference from the hydrocarbons present in the background. Two extracts had to be diluted due to the background and surrogates were diluted out. The other two samples and the matrix spikes have low surrogate recoveries. Method blank and laboratory control standard (LCS) surrogates are acceptable as are the analyte recoveries in the LCS. The method blank was contaminated with bis-(2-ethylhexyl)phthalate at approximately the same level as the samples.

Spike recovery for isobutyl alcohol averaged 50 percent in the matrix indicating that the extraction procedure may not be adequate. Precision is good (4 % RPD) and the blank spike recoveries are acceptable indicating that laboratory error is not a likely source of the low recoveries. No data quality objectives for isobutyl alcohol were determined for this project.

The mercury LCS recovery is acceptable indicating that instrument calibration, reagents and procedures used in the analysis met QC specifications, but the sample spike and duplicate data did not meet project specifications. The sample used in this mercury batch is not from this project and the performance of the method on this sample may not be representative of recovery for the associated samples.

The EPA 6010 sample spike recoveries for antimony, cadmium, chromium, nickel and vanadium did not meet project data quality objectives. Precision data for nickel also exceeded the acceptance criteria. Laboratory control standards for all elements was acceptable so the data were reported. The sample spiked and duplicated was not associated with this project.

Surrogate recoveries for EPA 8240 were out of limits for two of the three surrogates for sample BKG-1-0.5 (Lab ID. 1099044-001). This failure was confirmed through re-analysis and is due to the sample matrix.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110154
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 01/14/93
DATE RECEIVED: 01/15/93
DATE REQUESTED: 02/24/93
DATE REPORTED: 03/08/93
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Additional analyses were requested on six of the 24 soil samples received on January 14, 1993. The additional analysis included organic lead on all six samples and cyanide and the revised Skinner list semivolatiles on one of the six.

The sample requiring semi-volatiles analysis was batched with another set of samples from the same project. The matrix QC performed on one of these samples had low recoveries as did the surrogates in all the other samples. The method blank and laboratory control standard had acceptable surrogate recoveries, as did sample SWMU-20-2D-0.5 (110154-006). The method blank for the analysis was contaminated with bis (2-ethylhexyl)phthalate at approximately the same level as the sample.

Organic lead analysis met all project data quality objectives.

Cyanide sample spike recovery was below the acceptance limit but the blank spike recovery is acceptable indicating that matrix interference is resulting in the low recovery.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 110834
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: PE375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 05/06/93
DATE RECEIVED: 05/07/93
DATE REPORTED: 06/09/93
CASE NARRATIVE: 11/18/93

CASE NARRATIVE

Curtis & Tompkins received 5 soil samples on May 7, 1993 for the Chevron Hawaiian Refinery investigation. All samples were analyzed for volatiles, semivolatiles, cyanide, organic lead, isobutyl alcohol and total metals as specified in the project plan.

Refer to the original report for a complete narrative concerning the semivolatile analysis.

Cyanide matrix spike recovery did not meet project data quality objectives. The laboratory control standard was acceptable indicating that the sample matrix was the source of the error.

Isobutyl alcohol, organic lead, mercury, arsenic and selenium analyses all met project data quality objectives.

Analysis for metals by EPA 6010 resulted in several QC failures for matrix spike and sample duplicate for several elements. The laboratory control sample was acceptable for all elements indicating that the sample matrix is causing the unacceptable recoveries.

Hydrocarbon background causes surrogate failures for samples SWMU-21-1-0.5′ and SWMU-21-2-0.5′ in the volatiles analysis. All surrogate failures are confirmed as matrix associated by analyzing the samples a second time to confirm that laboratory error was not the source of the problem.

The matrix spike for the samples which required methanol extraction prior to analysis for volatiles did not meet project data quality objectives. The sample was SWMU-21-2-0.5′ which also failed surrogate recovery limits. The hydrocarbon background causes these failures as is demonstrated by the acceptable recoveries in the laboratory control standard. Sample SWMU-21-1-0.5′ is not associated with the spike failure as it was not extracted with methanol prior to analysis.

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 112313
CLIENT: ENGINEERING SCIENCE
PROJECT ID: PE 375.01
LOCATION: CHEVRON HAWAIIAN REFINERY

DATE SAMPLED: 09/16/93
DATE RECEIVED: 09/17/93
DATE REPORTED: 10/04/93
DATE REVISED: 11/19/93

CASE NARRATIVE
ADDENDUM

Volatile analyses was performed on all 22 soil samples and on two aqueous samples. Spike recovery for toluene in the soils was out of control due to the hydrocarbon background in the samples. This is evident in both spikes. Laboratory control standards for the analysis were all within acceptance criteria. All data quality objectives were met for the aqueous matrix.

REGION 9 RCRA FACILITY INVESTIGATION QC SUMMARY
PART 1: SUMMARY OF QC LIMITS

Inorganic Analyses
Method: ICP Metals EPA 6010

LABORATORY: Curtis & Tompkins
SUBMITTED BY:
ORGANIZATION:
DATE:

SITE/PROJECT: Chevron Hawaiian Refinery
NUMBER OF SAMPLES:
MEDIA:

QC SUMMARY ELEMENT	LABORATORY CONTROL LIMITS	FREQUENCY PERFORMED
LABORATORY BLANKS	Reporting Limit	1 per batch
SAMPLE DUPLICATE %RPD	20%	1 per batch
LABORATORY CONTROL SAMPLE RECOVERY	50-125%	1 per batch
STANDARD ADDITION RESULTS*	N/A	N/A
ICP SERIAL DILUTION %D		
SPIKED SAMPLE RECOVERY	75-125%	1 per batch
INITIAL CALIBRATION VERIFICATION %D	10%	Daily
CONTINUING CALIBRATION VERIFICATION %D	10%	every 10 samples
INTERFERENCE CHECK SAMPLE RECOVERY	80%	1 per 8 hr Shift

* expressed as the correlation coefficient

Describe any method modifications or specific problem areas:

The laboratory uses Blank spike / Blank spike duplicates to control this analysis.

1. Does the laboratory have access to the RCRA Facility Investigation (RFI) Workplan? YES/NO
2. Are the Control Limits listed above the same as the limits in the RFI Workplan? YES/NO
3. Were there QC results outside the stated Control Limits or Frequency listed above? YES/NO
   Matrix spike and sample duplicates failed.
4. If yes to 3, report, in PART 2, all results outside QC limits or frequency listed above.
5. Describe any difficulties and/or deviations encountered during the analysis (attach additional sheet if needed)

All information reported on this form are certified true and correct.

Name: Kathy [illegible]

Title: QA Director

Date: 11/16/93

REGION 9 RCRA FACILITY INVESTIGATION QC SUMMARY
PART 1: SUMMARY OF QC LIMITS

Inorganic Analyses
Method: Graphite furnace metals

LABORATORY: Curtis & Tompkins
SUBMITTED BY:
ORGANIZATION:
DATE:

SITE/PROJECT: Chevron Hawaiian Refinery
NUMBER OF SAMPLES:
MEDIA:

QC SUMMARY ELEMENT	LABORATORY CONTROL LIMITS	FREQUENCY PERFORMED
LABORATORY BLANKS	Reporting Limit	1 per batch
SAMPLE DUPLICATE %RPD	20%	1 per batch
LABORATORY CONTROL SAMPLE RECOVERY	80-120	2 per batch
STANDARD ADDITION RESULTS*	N/A	N/A
ICP SERIAL DILUTION %D	N/A	N/A
SPIKED SAMPLE RECOVERY	80-120	1 per batch
INITIAL CALIBRATION VERIFICATION %D	10%	daily
CONTINUING CALIBRATION VERIFICATION %D	10%	every 10 samples
INTERFERENCE CHECK SAMPLE RECOVERY	N/A	N/A

* expressed as the correlation coefficient

Describe any method modifications or specific problem areas:

Matrix QC (sample duplicate and spike results) was outside the above limits. As described in the RFI workplan, the laboratory reported the data relying on the blank spike / blank spike duplicate to control the analysis. Matrix QC failure indicates that the method is not reproducible or accurate in the matrix, not that the laboratory failed to perform the analysis correctly.

1. Does the laboratory have access to the RCRA Facility Investigation (RFI) Workplan? YES/NO

2. Are the Control Limits listed above the same as the limits in the RFI Workplan? YES/NO
No QC limits for graphite furnace in the workplan

3. Were there QC results outside the stated Control Limits or Frequency listed above? YES/NO
Matrix QC failures were noted, but all BS/BSD results were acceptable.

4. If yes to 3, report, in PART 2, all results outside QC limits or frequency listed above.

5. Describe any difficulties and/or deviations encountered during the analysis (attach additional sheet if needed)

All information reported on this form are certified true and correct.

Name: [signature]

Title: QA Director

Date: 11/16/93

REGION 9 RCRA FACILITY INVESTIGATION QC SUMMARY
PART 1: SUMMARY OF QC LIMITS

Inorganic Analyses
Method: Mercury

LABORATORY: Curtis & Tompkins
SUBMITTED BY:
ORGANIZATION:
DATE:

SITE/PROJECT: Chevron Hawaiian Refinery
NUMBER OF SAMPLES:
MEDIA:

QC SUMMARY ELEMENT	LABORATORY CONTROL LIMITS	FREQUENCY PERFORMED
LABORATORY BLANKS	Reporting Limit	1 per batch
SAMPLE DUPLICATE %RPD	20%	1 per batch
LABORATORY CONTROL SAMPLE RECOVERY	80-125%	1 per batch
STANDARD ADDITION RESULTS*	N/A	N/A
ICP SERIAL DILUTION %D	N/A	N/A
SPIKED SAMPLE RECOVERY	75-125%	1 per batch
INITIAL CALIBRATION VERIFICATION %D	80%	1 per calibration
CONTINUING CALIBRATION VERIFICATION %D	80%	every 10 samples
INTERFERENCE CHECK SAMPLE RECOVERY	N/A	N/A

* expressed as the correlation coefficient

Describe any method modifications or specific problem areas:

1. Does the laboratory have access to the RCRA Facility Investigation (RFI) Workplan? YES/NO
2. Are the Control Limits listed above the same as the limits in the RFI Workplan? YES/NO
3. Were there QC results outside the stated Control Limits or Frequency listed above? YES/NO
4. If yes to 3, report, in PART 2, all results outside QC limits or frequency listed above.
5. Describe any difficulties and/or deviations encountered during the analysis (attach additional sheet if needed)

All information reported on this form are certified true and correct.

Name: Rachel O'B

Title: QA Director

Date: 11/16/93

REGION 9 RCRA FACILITY INVESTIGATION QC SUMMARY
PART 1: SUMMARY OF QC LIMITS

Inorganic Analyses
Method: Organic lead

LABORATORY: Curtis & Tompkins
SITE/PROJECT: Chevron Hawaiian Refinery
SUBMITTED BY:
NUMBER OF SAMPLES:
ORGANIZATION:
MEDIA:
DATE:

QC SUMMARY ELEMENT	LABORATORY CONTROL LIMITS	FREQUENCY PERFORMED
LABORATORY BLANKS	Reporting Limit	1 per batch
SAMPLE DUPLICATE %RPD	water 20% soil 30%	1 per batch
LABORATORY CONTROL SAMPLE RECOVERY	85-125	1 per batch
STANDARD ADDITION RESULTS*	N/A	N/A
ICP SERIAL DILUTION %D	N/A	N/A
SPIKED SAMPLE RECOVERY	water 75-125 soil 70-130	1 per batch
INITIAL CALIBRATION VERIFICATION %D	20%	as req
CONTINUING CALIBRATION VERIFICATION %D	20%	every 10 samples
INTERFERENCE CHECK SAMPLE RECOVERY	N/A	N/A

* expressed as the correlation coefficient

Describe any method modifications or specific problem areas:

1. Does the laboratory have access to the RCRA Facility Investigation (RFI) Workplan? YES/NO
2. Are the Control Limits listed above the same as the limits in the RFI Workplan? YES/NO
3. Were there QC results outside the stated Control Limits or Frequency listed above? YES/NO
4. If yes to 3, report, in PART 2, all results outside QC limits or frequency listed above.
   matrix spike recoveries for a batch containing 2 samples from job 112313 failed. A post digestion spike had 97% recovery indicating the matrix, not the instrument, is the source of the error.
5. Describe any difficulties and/or deviations encountered during the analysis (attach additional sheet if needed)

All information reported on this form are certified true and correct.

Name: [signature]

Title: QA Director

Date: 11/16/93

REGION 9 RCRA FACILITY INVESTIGATION QC SUMMARY
PART 1: SUMMARY OF QC LIMITS

Inorganic Analyses
Method: Sulfate by IC

LABORATORY: Curtis & Tompkins
SUBMITTED BY:
ORGANIZATION:
DATE:

SITE/PROJECT: Chevron Hawaiian Refinery
NUMBER OF SAMPLES:
MEDIA:

QC SUMMARY ELEMENT	LABORATORY CONTROL LIMITS	FREQUENCY PERFORMED
LABORATORY BLANKS	Reporting Limit	1 per batch
SAMPLE DUPLICATE %RPD	25 %	1 per batch
LABORATORY CONTROL SAMPLE RECOVERY	75 - 125 %	1 per batch
STANDARD ADDITION RESULTS*	N/A	N/A
ICP SERIAL DILUTION %D	N/A	N/A
SPIKED SAMPLE RECOVERY	70 - 130 %	1 per batch
INITIAL CALIBRATION VERIFICATION %D	10 %	Initially/daily
CONTINUING CALIBRATION VERIFICATION %D	10 %	every 10 samples
INTERFERENCE CHECK SAMPLE RECOVERY	N/A	N/A

* expressed as the correlation coefficient

Describe any method modifications or specific problem areas:

As with metals, the analysis is controlled with LCS recoveries, not matrix spikes.

1. Does the laboratory have access to the RCRA Facility Investigation (RFI) Workplan? YES/NO
2. Are the Control Limits listed above the same as the limits in the RFI Workplan? YES/NO
   No limits for sulfate in RFI workplan.
3. Were there QC results outside the stated Control Limits or Frequency listed above? YES/NO
   Matrix spike recovery low.
4. If yes to 3, report, in PART 2, all results outside QC limits or frequency listed above.
5. Describe any difficulties and/or deviations encountered during the analysis (attach additional sheet if needed)

All information reported on this form are certified true and correct.

Name: Kathy O'B

Title: QA Director

Date: 11/16/93

REGION 9 RCRA FACILITY INVESTIGATION QC SUMMARY
PART 1: SUMMARY OF QC LIMITS

Inorganic Analyses
Method: Cyanide

LABORATORY: Curtis & Tompkins
SUBMITTED BY:
ORGANIZATION:
DATE:

SITE/PROJECT: Chevron Hawaiian Refinery
NUMBER OF SAMPLES:
MEDIA:

QC SUMMARY ELEMENT	LABORATORY CONTROL LIMITS	FREQUENCY PERFORMED
LABORATORY BLANKS	Reporting Limit	1 per batch
SAMPLE DUPLICATE %RPD	water: 20% soil 30%	1 per batch
LABORATORY CONTROL SAMPLE RECOVERY	~~85-115%~~	~~1 per batch~~
STANDARD ADDITION RESULTS*	N/A	N/A
ICP SERIAL DILUTION %D	N/A	N/A
SPIKED SAMPLE RECOVERY	water: 75-125 soil 70-130	1 per batch
INITIAL CALIBRATION VERIFICATION %D	15%	1 per calibration
CONTINUING CALIBRATION VERIFICATION %D	20%	at beginning of day and every 10 samples
INTERFERENCE CHECK SAMPLE RECOVERY	N/A	N/A

* expressed as the correlation coefficient

Describe any method modifications or specific problem areas:

1. Does the laboratory have access to the RCRA Facility Investigation (RFI) Workplan? YES/NO
2. Are the Control Limits listed above the same as the limits in the RFI Workplan? YES/NO
3. Were there QC results outside the stated Control Limits or Frequency listed above? YES/NO
   Cyanide matrix spike recovery was 68% in one batch (Job # 112313)
4. If yes to 3, report, in PART 2, all results outside QC limits or frequency listed above.
5. Describe any difficulties and/or deviations encountered during the analysis (attach additional sheet if needed)

All information reported on this form are certified true and correct.

Name: Kathy O'Brien

Title: QA Director

Date: 11/16/93

REGION 9 RCRA FACILITY INVESTIGATION QC SUMMARY
PART 1: SUMMARY OF QC LIMITS

Organic Analyses
Method: 8270

LABORATORY: Curtis & Tompkins
SUBMITTED BY:
ORGANIZATION:
DATE:

SITE/PROJECT: Chevron Hawaiian Refinery
NUMBER OF SAMPLES:
MEDIA:

QC SUMMARY ELEMENT	LABORATORY CONTROL LIMITS	FREQUENCY PERFORMED
LABORATORY BLANKS	Reporting limit	1 per batch
INITIAL CALIBRATION-%RSD	per CLP	as required
CONTINUING CALIBRATION-%D	per CLP	Daily + 12 hr
MATRIX SPIKE/SPIKE DUPLICATE RECOVERY	per CLP	1 per batch
MATRIX SPIKE/SPIKE DUPLICATE %RPD	per CLP	1 per batch
SURROGATE PERCENT RECOVERY	per CLP	every sample
INTERNAL STANDARD AREA	50-200%	Every sample
SECOND COLUMN CONFIRMATION	NA	

1. Method surrogates used:

2-fluorophenol
phenol-d6
2,4,6-tribromophenol
Nitrobenzene-d5
2-fluorobiphenyl
Terphenyl-d14

2. Internal standards used:

1,4-Dichlorobenzene-d4
Naphthalene-d8
Acenaphthene-d10
phenanthrene-d10
Chrysene-d12
Perylene-d12

3. Describe any method modifications or specific problem areas:

The acid fraction surrogates and spikes did not have acceptable recoveries indicating that they were lost in the cleanup procedures.

1. Does the laboratory have access to the RCRA Facility Investigation (RFI) Workplan? YES/NO
2. Are the Control Limits listed above the same as the limits in the RFI Workplan? YES/NO
3. Were there QC results outside the stated Control Limits or Frequency listed above? YES/NO
4. If yes to 3, report, in PART 2, all results outside QC limits or frequency listed above.
5. Describe any difficulties and/or deviations encountered during the analysis (attach additional sheet if needed)

All information reported on this form are certified true and correct.

Name: Kathy O'B
Title: QA Director
Date: 11/16/93

REGION 9 RCRA FACILITY INVESTIGATION QC SUMMARY
PART 1: SUMMARY OF QC LIMITS

Organic Analyses
Method: 8240

LABORATORY: Curtis & Tompkins
SUBMITTED BY:
ORGANIZATION:
DATE:

SITE/PROJECT: Chevron Hawaiian Refinery
NUMBER OF SAMPLES:
MEDIA:

QC SUMMARY ELEMENT	LABORATORY CONTROL LIMITS	FREQUENCY PERFORMED
LABORATORY BLANKS	Reporting Limit	1 per batch
INITIAL CALIBRATION-%RSD	per CLP	as needed
CONTINUING CALIBRATION-%D	[illegible] per CLP	[illegible]
MATRIX SPIKE/SPIKE DUPLICATE RECOVERY	per CLP	1 per batch
MATRIX SPIKE/SPIKE DUPLICATE %RPD	per CLP	1 per batch
SURROGATE PERCENT RECOVERY	per CLP	Every sample
INTERNAL STANDARD AREA	50 - 200%	Every sample
SECOND COLUMN CONFIRMATION	NA	

1. Method surrogates used:

1,2-dichloroethane-d4
Toluene-d8
Bromo Fluorobenzene

2. Internal standards used:

Bromochloromethane
1,4-Difluorobenzene
Chlorobenzene-d5

3. Describe any method modifications or specific problem areas:

Hydrocarbons coeluted with surrogates resulting in recoveries above the acceptance limits. Hydrocarbon background interferred with matrix spike recoveries as well.

1. Does the laboratory have access to the RCRA Facility Investigation (RFI) Workplan? YES/NO
2. Are the Control Limits listed above the same as the limits in the RFI Workplan? YES/NO
3. Were there QC results outside the stated Control Limits or Frequency listed above? YES/NO
   See note above
4. If yes to 3, report, in PART 2, all results outside QC limits or frequency listed above.
5. Describe any difficulties and/or deviations encountered during the analysis (attach additional sheet if needed)

All information reported on this form are certified true and correct.

Name: Kathy [illegible]
Title: QA Director
Date: 11/16/93

REGION 9 RCRA FACILITY INVESTIGATION QC SUMMARY
PART 1: SUMMARY OF QC LIMITS

Organic Analyses
Method: Iso-butyl alcohol EPA 8015

LABORATORY: Curtis & Tompkins
SUBMITTED BY:
ORGANIZATION:
DATE:

SITE/PROJECT: Chevron Hawaiian Refinery
NUMBER OF SAMPLES:
MEDIA:

QC SUMMARY ELEMENT	LABORATORY CONTROL LIMITS	FREQUENCY PERFORMED
LABORATORY BLANKS	Reporting limit	1 per matrix
INITIAL CALIBRATION-%RSD	15%	as required
CONTINUING CALIBRATION-%D	25%	daily
MATRIX SPIKE/SPIKE DUPLICATE RECOVERY	80-120	1 per batch
MATRIX SPIKE/SPIKE DUPLICATE %RPD	20%	1 per batch
SURROGATE PERCENT RECOVERY	50-150	every sample
INTERNAL STANDARD AREA	N/A	N/A
SECOND COLUMN CONFIRMATION	NA	

1. Method surrogates used:

Methyl isobutyl Ketone

2. Internal standards used:

No internal standard used.

3. Describe any method modifications or specific problem areas:

Spike recoveries were low, indicating that the extraction process may not be recovering all the IBA in the samples. Surrogate recoveries indicate that this is a consistent problem accross the entire batch of samples.

1. Does the laboratory have access to the RCRA Facility Investigation (RFI) Workplan? YES/NO
2. Are the Control Limits listed above the same as the limits in the RFI Workplan? YES/NO
   No limits for this analysis in RFI workplan
3. Were there QC results outside the stated Control Limits or Frequency listed above? YES/NO
4. If yes to 3, report, in PART 2, all results outside QC limits or frequency listed above.
   Matrix spike results were <80%.
5. Describe any difficulties and/or deviations encountered during the analysis (attach additional sheet if needed)

All information reported on this form are certified true and correct.

Name: Kathy [illegible]

Title: QA Director

Date: 11/16/93

REGION 9 RCRA FACILITY INVESTIGATION QC SUMMARY
PART 2: SUMMARY OF QC RESULTS FOR INORGANIC ANALYSIS
Complete for all parameters which do not meet QC criteria specified in Part 1

LABORATORY: Curtis and Tompkins
SUBMITTED BY: EDC
DATE: 11-18-93
SITE/PROJECT: Chevron RFI

NUMBER OF SAMPLES:
MEDIA: Soil

ANALYSIS DATE	SAMPLE ID	COMPOUND/ ANALYTE	METHOD	BLANK RESULT	BLANK TYPE	PQL	SAMPLE DUPLICATE RPD	LCS PERCENT RECOVERY	STANDARD ADDITION R2	CONTINUING VERIFICATION PERCENT	SPIKED SAMPLE RECOVERY	ICS RECOVERY AREA
9-21-93	112313-1	Antimony	6010								62%	
9-24-93	112348-001	Barium	6010				48%					
9-23-93	112348-013	Cobalt	6010				34%					
9-23-93	112348-013	Vanadium	6010				23%					
1-20-93	109770-A	Chromium	6010				61%				0%	
1-20-93	↓	Cobalt	6010				32%				71%	
1-21-93	↓	Arsenic	6010								31%	
1-20-93	↓	Nickel	6010								73%	
1-20-93	↓	Vanadium	6010								0%	
1-21-93	109770-B	Cadmium	6010				52%					
1-21-93	↓	Arsenic	6010				21%					
1-20-93	↓	Beryllium	6010				66%					
1-21-93	↓	Cobalt	6010				70%					
2-3-93	109904	Nickel	6010				26%					
↓	↓	Antimony	6010								62%	
↓	↓	Cadmium	6010								74%	
↓	↓	Chromium	6010								203%	
↓	↓	Nickel	6010								135%	
↓	↓	Vanadium	6010								137%	
5-11-93	110834	Barium	6010				24%					
↓	↓	Cadmium	6010				45%					
↓	↓	Chromium	6010				31%					
↓	↓	Antimony	6010								16%	
9-23-93	112313-B	Organic Lead	CA DHS				63%					
9-21-93	112348-017	Sulfate by IC	300.0								66%	
9-28-93	112313	Cyanide	335.2 (Mod.)								68%	
11-06-93	109099	Cyanide	335.2 (Mod.)								50%	
3-03-93	110154	Cyanide	335.2 (Mod.)								63%	
5-19-93	110834	Cyanide	335.2 (Mod.)								58%	

APPENDIX D

APPENDIX D

REFERENCES

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DOH, 1992, State of Hawaii, Department of Health, Solid and Hazardous Waste Branch, Technical Guidance Manual For Underground Storage Tank Closure and Release Response, August

North Shore Consulting and Design, 1992, Summary of Hawaii ARARs and TBCs Relating to the Development of Statewide Cleanup Criteria, January