CROWLEY ENVIRONMENTAL SERVICES

received, 11-2-93

October 29, 1993

Mr. Thomas Peacock
Supervising Hazardous Materials Specialist
Hazardous Material Division
Department of Environmental Health
Alameda County Health Care Service Agency
80 Swan Way, Room 200
Oakland, California 94621

Reference: **Quarterly Groundwater Monitoring Report for Pacific Dry Dock and Repair Yard I**

Dear Mr. Peacock:

Enclosed for your review, please find one copy of the results of the first groundwater sampling event at the Pacific Dry Dock and Repair Yard I facility located at 1441 Embarcadero in Oakland. The sampling event was performed by Versar, Inc. on behalf of Crowley Marine Services, Inc.

As may be seen from the report, the contaminated soil at the facility is not impacting the groundwater. Crowley will continue to monitor the groundwater on a quarterly basis and will submit the results to you. Crowley is also proceeding with the investigation of the groundwater in the eastern section of the facility.

Please contact me at (206) 443-8042 with any questions or comments that you may have regarding this report.

Sincerely,

R. Stephen Wilson

R. Stephen Wilson
Manager, Site Remediation

Encl.

cc: 9208.2 w/encl
Dan Schoenholtz w/encl
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Versar INC. SACRAMENTO

QUARTERLY GROUNDWATER MONITORING REPORT
PACIFIC DRY DOCK YARD I
OAKLAND, CALIFORNIA

Prepared for:

Crowley Environmental Services
2401 Fourth Avenue
P.O. Box 2287
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Prepared by:

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Versar Project No. 1457-027

October 26, 1993

Versar INC. SACRAMENTO

PROJECT SUMMARY

This quarterly sampling report was prepared by Versar, Inc. (Versar) of Sacramento for Crowley Environmental Services. Mr. Lawrence Kleinecke, Hydrologist/Chemist, prepared this report. Mr. John Bird, Geologist, reviewed this report. This work was performed under the supervision of Mr. Michael Holley, P.E., and Mr. Kleinecke.

Four quarterly sampling events will be conducted at Pacific Dry Dock Yard I, 1441 Embarcadero, Oakland, California. Included in this report are the findings of Versar's first quarterly groundwater investigation, including: 1) the monitoring well drilling, installation, and sampling methodology and 2) the results of field and laboratory analysis of soil and groundwater samples. Based on the results of the investigation, Versar has reached the following conclusions:

- The soil sampling results confirm the assessment described in the Preliminary Investigation and Evaluation Report with little additional information obtained.
- Petroleum hydrocarbon contamination was not identified in the groundwater samples collected from the monitoring wells. The identified soil contamination has apparently not impacted the groundwater beneath the site.

Prepared by:

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Approved for Release:

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Michael Holley, P.E.
Engineering Program Manager

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1.0 INTRODUCTION

Versar, Inc. (Versar) has been retained by Crowley Marine Services (Crowley) to conduct environmental investigations including a program of quarterly groundwater monitoring at Pacific Dry Dock Yard I (PDDI), located at 1441 Embarcadero, Oakland, California. This quarterly groundwater monitoring report includes details of the borehole drilling, monitoring well installation, soil and groundwater sampling, and laboratory analysis.

1.1 Site History

Since 1935, PDDI has been used as a dry dock facility. In the past, during the repair and refurbishing of seagoing vessels, Crowley utilized products containing regulated materials and generated various regulated and non-regulated wastes. These products and waste materials include waste sand-blasting materials, oil-based paints, solvents, acids, caustics, waste oils, and motor fuels. Figures 1 and 2 show the site location and layout, respectively.

During December 1989 and January 1990, Versar conducted a site assessment of PDDI (Versar 1990). The findings of the site assessment included the identification of an underground storage tank (UST) reported to contain unleaded gasoline. The UST was reportedly out of service.

In September 1991, Versar supervised the removal of the UST (Versar 1991). Soil and groundwater samples collected from the excavation following the removal were found to contain petroleum hydrocarbons as gasoline (TPH-G) and diesel (TPH-D); total oil and grease (TOG); benzene, toluene, ethylbenzene, xylenes (BTEX); and organic lead.

During October 1991 and January 1992, Versar collected a series of soil and groundwater samples from PDDI (Versar, May 1992). Figure 3 shows the groundwater monitoring well locations. The results of this investigation identified four areas of soil containing identifiable concentrations of TPH-G, TPH-D, TOG, or BTEX. These areas are: the southwest corner of the site where diesel fuel is stored in above-ground tanks; the northwest corner at the previous location of the UST; the location formerly occupied by the office building; and the former location of a waste- oil above-ground storage tank.

Groundwater grab samples collected during this investigation were found to contain the same contaminant compounds. Concentrations of chromium, lead, and nickel exceeding state and federal MCLs were identified in one groundwater grab sample collected from a boring immediately south of the former office building location. A lead concentration exceeding MCLs was identified near the former waste-oil tank location. Note that these groundwater grab samples were collected from temporary sample points and not collected from monitoring wells. These samples were not filtered and contained significant amounts of impacted soil from the surrounding formation and are therefore considered to be non-reproducible.

Between March 1992 and August 1992, Versar conducted an investigation of the eastern portion of PDDI (Versar, September 1992). The results of the investigation identified a UST containing water with identifiable concentrations of TPH-D, TPH-G, and BTEX. Soil sampling conducted during the investigation identified several areas of soil contamination. Concentrations of TPH-D exceeding 100 milligrams per kilogram (mg/kg) were identified at six sampling locations. Lead concentrations slightly exceeding the Soluble Threshold Limit Concentration (STLC) were identified in two locations and 0.39 mg/kg of bis (2-ethylhexyl) phthalate (listed as a toxic waste by the EPA) was identified in one location.

2.0 SITE DESCRIPTION

The site is located between the Embarcadero and the central portion of the north bank of Brooklyn Basin. Brooklyn Basin, an estuary of Oakland Inner Harbor, is bounded by Government Island to the south and the city of Oakland to the north. This section presents a description of the site layout, geology, and hydrology.

2.1 Site Layout

This investigation was conducted at PDDI, which occupies approximately 2 acres. A sheet-metal bulkhead abuts the southern edge of the site. A chain-link fence separates the site from the Embarcadero.

Currently, a machine shop with covered storage occupies the south-central section of the site. Four above-ground diesel storage tanks occupy the southwest corner of the site. Other structures, including an office building, a machine shop, an above-ground waste-oil tank, and assorted sheds and storage buildings, have been recently demolished and removed (see Figure 2).

2.2 Site Geology

The site is located in the Coast Ranges geomorphic province between the Hayward Fault (to the east) and the San Andreas Fault (to the west). The underlying bedrock consists of Mesozoic volcanic and metavolcanic rocks found throughout the coast range. Overlying the bedrock are Quaternary marine and nonmarine alluvial sediments consists of consisting of clays and silts.

The site is nearly level at an elevation of between five and ten feet above lower low water (National Geodetic Vertical Datum of 1929). Versar's investigation has characterized the shallow soils beneath the site as sand, silt, and clay fill material extending from the surface to the bay muds. The fill material also contains wood and brick fragments. Concrete obstructions have been encountered during drilling operations at several locations. These obstructions may include concrete cable anchors for the sheet metal bulkhead. Gravels extend from the surface to the bay muds near the bulkhead. Figures 4 through 7 are a cross-section line-of-reference, and subsurface cross-sections derived from field data.

The bay muds begin between 6.5 feet below ground surface (bgs) beneath the Embarcadero and 12 feet bgs near the south edge of the site, near Brooklyn Basin. The bay muds consist of silty clays, clays with shell fragments, and thin layers of sands or gravels. These layers are often saturated with groundwater.

2.3 Site Hydrology

During the drilling, saturated soils were identified between six and 11 feet bgs. The occurrence of groundwater in the soils often coincided with the depth of the bay muds but was occasionally found up to two feet above the bay muds. Following the installation of groundwater monitoring wells, the depth to groundwater was measured and found to vary between 4.8 feet bgs in the western wells and 9.3 feet bgs in the eastern wells. The water levels in the eastern wells fluctuated up to 1.46 feet in the six days between initial development and sampling. The impact of this fluctuation on gradient calculations has not been determined. A tidal study has been proposed for the site so that groundwater movement and migration can be more accurately defined. Preliminary calculations indicate a northeasterly gradient of 0.005 ft/ft and 0.01 ft/ft for the northern and southern portions of the site, respectively. Figure 8 shows the groundwater contours and flow directions calculated from the first quarterly sampling data.

3.0 GROUNDWATER MONITORING WELL INSTALLATION

A total of five groundwater monitoring wells were installed at the site between June 23 and June 24, 1993. One of the wells (MW5) was installed north of the Embarcadero to investigate and monitor potential offsite contamination. The remaining four wells were installed within the boundaries of PDDI. Monitoring well MW1 was installed within ten feet of the former UST location in the assumed upgradient position. Well MW2 was installed along the western property boundary to allow assessment of potential offsite contaminant migration. Well MW3 was installed at the former above-ground waste-oil tank location, where further investigation had been required by the Alameda County Health Care Agency (ACHCA). Monitoring well MW4 was installed in the former office building location to assess the potential groundwater impacts from previously identified soil contamination. For well locations, see Figure 3. Permits for the wells were obtained from ACHCA and the City of Oakland. Included as Appendix A are the procedures for decontamination, soil sampling, and groundwater sampling. Borehole logs are included as Appendix B.

3.1 Borehole Drilling and Soil Sampling

Each of the boreholes was drilled using a mobile drilling rig equipped with hollow-stem augers. During the drilling, soil samples were collected (using a decontaminated California split-spoon sampler lined with brass tubes) at five-foot intervals beginning at 1.5 feet bgs. Each borehole was drilled to a maximum depth of between 14 and 15 feet bgs.

Headspace analysis was terminated during the drilling of borehole MW2 due to equipment failure. However, each soil sample collected from above ten feet bgs was submitted to the laboratory for analysis. The soil samples collected from below ten feet bgs were not submitted for analysis due to the saturated nature of the soils at that depth.

Sample handling procedures along with tracking and management protocol are included in Appendix A.

A total of 22 soil samples were collected during the borehole drilling. Of these, ten were submitted to Trace Analysis Laboratory, Inc. (Trace), a California-certified laboratory, for analysis. The remainder were placed on hold at the laboratory for possible future analysis. Each sample was analyzed for TPH-D, TPH-G, TOG, and BTEX. Additionally, two samples (MW1-5.5 and MW3-5.5) were analyzed for semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), organochlorine pesticides and polychlorinated biphenyls (PCBs), CAM 17 metals, and organotins. The analytical results are described in section 4.0 Laboratory Analytical Results.

3.2 Groundwater Monitoring Well Installation and Sampling

Following completion of each borehole, a two-inch diameter groundwater monitoring well was installed as described in the Phase II Site Investigation Work Plan (Versar, March 1992). Figure 9 shows the typical well construction.

Each well was constructed of ten feet of PVC well screen with 0.010-inch slots and blank PVC casing to the surface. The total depth of each well was between 13 and 14 feet bgs. A number 2-12 sand pack was placed around the screen to a height of between one and two feet above the top of the screen. Approximately one foot of bentonite pellets was placed above the sand pack and hydrated. A neat cement grout was placed above the bentonite seal and a traffic-rated cover was installed flush with the ground surface.

On June 25, 1993 each well was developed by removing a minimum of five well volumes of groundwater (unless the well was bailed dry prior to achieving five well volumes). Slow recoveries were noted in monitoring wells MW1, MW2, and MW4.

On July 1, 1993 each of the wells was purged and sampled as described in the work plan, following the protocols described in Appendix A. Groundwater samples were collected from each monitoring well for analysis for TPH-D, TPH-G, TOG, and BTEX. Additionally, the sample collected from MW3 was submitted for analysis for SVOCs and VOCs. The analytical results are described in section 4.0, Laboratory Analytical Results. Groundwater sampling data sheets are included as Appendix C.

4.0 LABORATORY ANALYTICAL RESULTS

Each sample collected was submitted with Versar's chain-of-custody document to a Trace representative who picked up the samples at the PDDI site. The analytical methodologies used for both soil and water analyses were: Modified EPA Method 8020 for BTEX; the DHS Method for TPH-G and TPH-D; Standard Method 5520 for TOG; EPA Method 8240 for VOCs; EPA Method 820 for SVOCs; EPA Method 8080 for organochlorine pesticides and PCBs; gas chromatography for organotins; and the appropriate methodologies (described in the laboratory analytical results) using atomic absorption for CAM 17 metals. The laboratory analytical results are summarized in Tables 1 through 3. The laboratory analytical results and descriptions of the preparation and analysis methods are included as Appendix D.

4.1 Laboratory Results for Soils

Petroleum hydrocarbons (including BTEX) were identified in each of the soil samples, analyzed in concentrations totalling between 0.022 mg/kg and 7,822.435 mg/kg. The soil samples containing the highest concentrations of petroleum hydrocarbons were collected from boreholes MW1, MW2, and MW4. Samples collected from borehole MW5 contained only toluene in concentrations of 0.094 mg/kg and 0.022 mg/kg for samples MW5-2.0 and MW5-5.5, respectively.

Concentrations of TPH-G between 0.580 mg/kg and 17 mg/kg were identified in samples collected from boreholes MW1, MW2, and MW4. Concentrations of TPH-D were identified in all except three of the samples and were typically below 35 mg/kg. Although MW4 was reported to contain the highest readings of TPH-D (3,000 mg/kg at 5.5 feet bgs), the MW4 sample from 1.5 feet bgs showed TPH-D levels below the reporting limit of 1.0 mg/kg.

Oil and grease contamination was identified in four samples collected from boreholes MW1, MW2, and MW4. However, the concentration of TOG identified in the sample collected from MW4 (MW4-5.5) is approximately 15 percent of the TPH-D concentration identified in the same sample. Because the analysis for TOG is nonspecific, the concentration identified may include a portion of the previously identified TPH-D. The TOG concentrations identified in the samples collected from MW1 and MW2 were between 710 mg/kg (MW1-5.5) and 7,800 mg/kg (MW1-2.0).

Benzene was identified in only one sample (MW1-5.5) at a concentration of 0.110 mg/kg. Ethylbenzene and xylenes were identified in two samples (MW1-5.5 and MW4-5.5) in maximum concentrations of 0.13 mg/kg and 0.3 mg/kg, respectively. Toluene was identified in all except one of the samples (MW3-5.5) in concentrations between 0.022 mg/kg and 0.810 mg/kg.

Metals identified in the two soil samples analyzed (MW1-5.5 and MW3-5.5) include arsenic, barium, beryllium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc. However, none of the concentrations identified exceeded the Total Threshold Limit Concentration (TTLC) for the metal as described in Title 22 of the California Code of Regulations, nor did they exceed ten times the Soluble Threshold Limit Concentration (STLC, which accounts for the dilution factor inherent in the Waste Extraction Test used to determine soluble concentrations).

Tributyltin was identified in one sample (MW1-5.5) at a concentration of 0.003 mg/kg. No concentrations of VOCs, SVOCs, organochlorine pesticides, or PCBs at or above the respective methods' detection limits were identified.

4.2 Laboratory Results for Water

The results of laboratory analysis of the five groundwater samples collected did not identify concentrations of TPH-D, TPH-G, BTEX, VOCs, or SVOCs at or above the respective reporting limits.

5.0 EXTENT OF IMPACTED SOIL AND GROUNDWATER

The results of soil sampling conducted as part of the investigation confirm the extent of impacted soil described in the Preliminary Investigation and Evaluation Report (PIER) prepared for PDDI (Versar, May 1992). As described in the PIER, four areas of petroleum hydrocarbon contamination have been identified: the area extending south from the former location of the office building; the area surrounding the former location of the UST; the area near the above-ground diesel storage tanks; and to a lesser extent the area beneath the former location of the waste-oil tank. Figure 10 shows the extent of contamination and the monitoring wells.

Based on the results of the first round of sampling, there has been no impact on the groundwater beneath the site. Sampling will continue on a quarterly basis to confirm that the groundwater beneath the site has not been impacted by the contamination identified in the soils. The next quarterly sampling is scheduled for October 1, 1993.

6.0 REFERENCES

Versar, Inc. Fair Oaks, California. 1990, Site Assessment Report for the Pacific Dry Dock and Repair Yards 1 and 2, Oakland, California.

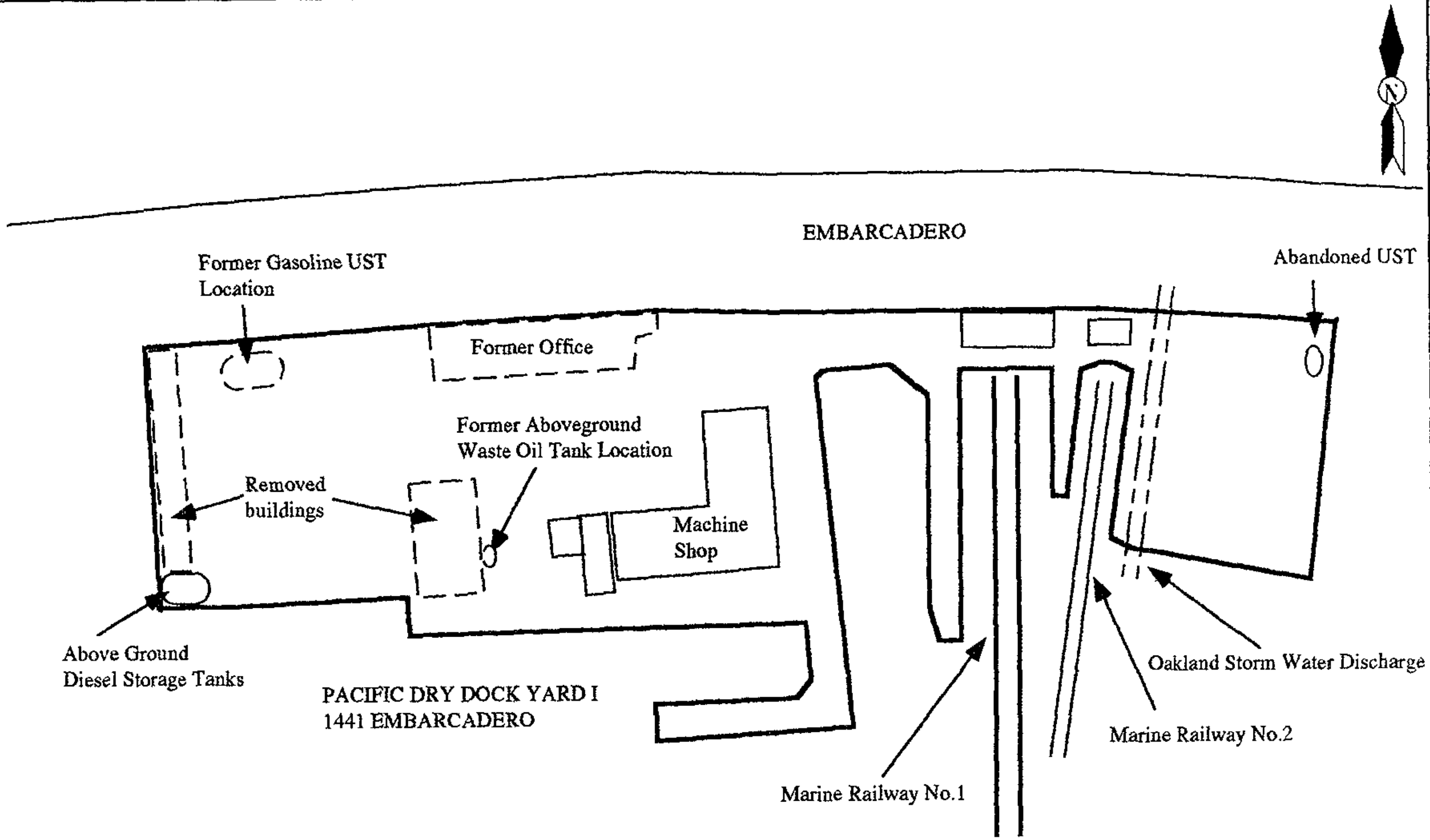
Versar, Inc. Fair Oaks, California. March 1992, Phase II Site Investigation Work Plan, Pacific Dry Dock and Repair Yard I, Western Section, Oakland, California.

Versar, Inc. Fair Oaks, California. May 1992, Preliminary Investigation and Evaluation Report (PIER), Pacific Dry Dock and Repair Yard I, Western Section, Oakland, California.

Versar, Inc. Fair Oaks, California. September 1992, Addendum to Phase II Site Investigation Work Plan, Pacific Dry Dock and Repair Yard I, Oakland, California.

SOURCE: USGS TOPO 1959

Scale (miles) 0 0.25 0.50	Site Location	Figure 1
Project No. 1457-027	Pacific Dry Dock Yard I Oakland, California	Versar Inc.



Scale (feet)

0 50 100

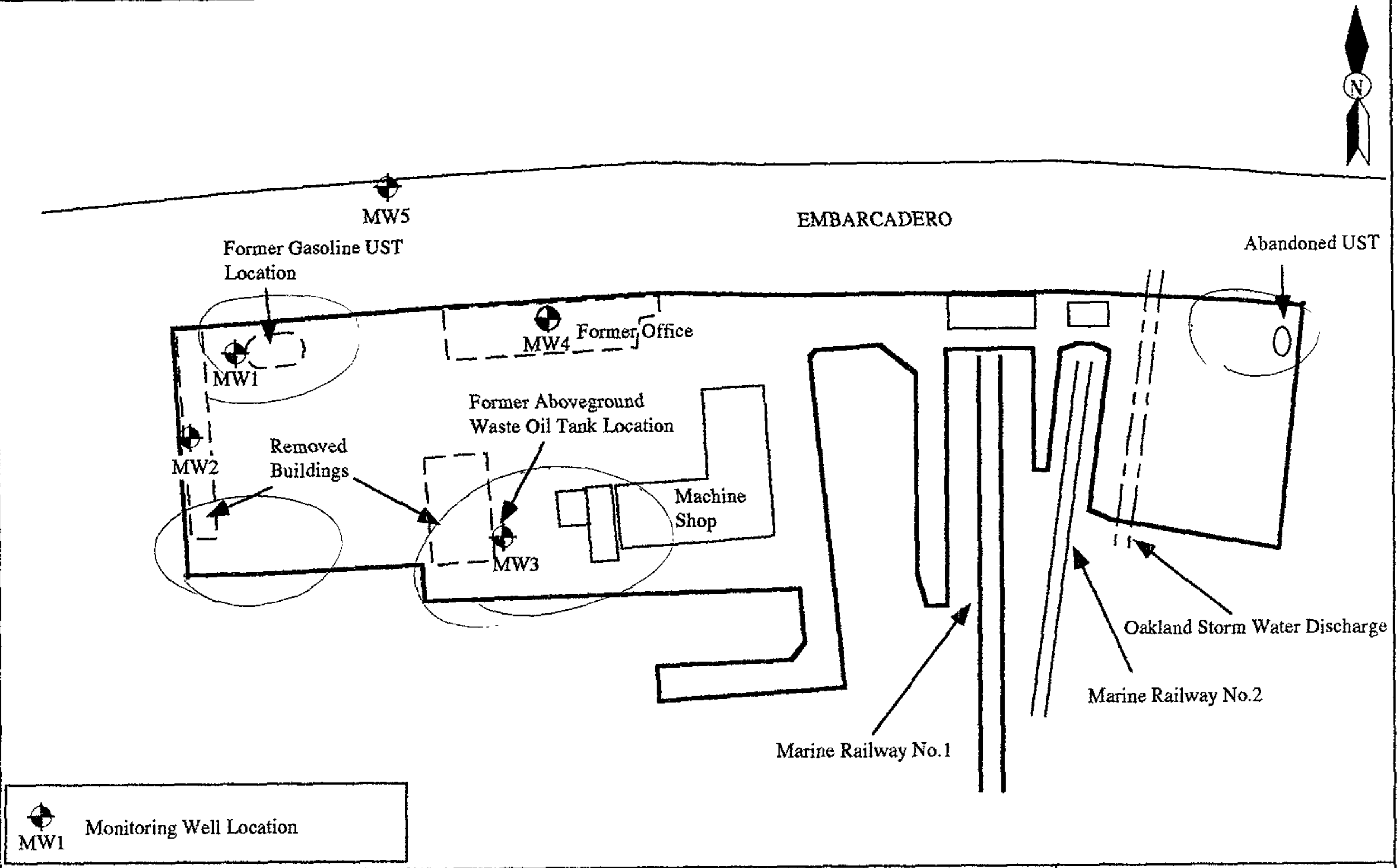
Project No. 1457-027

Site Layout

Pacific Dry Dock Yard I
Oakland, California

Figure 2

Versar Inc.



Scale (feet)
0 50 100

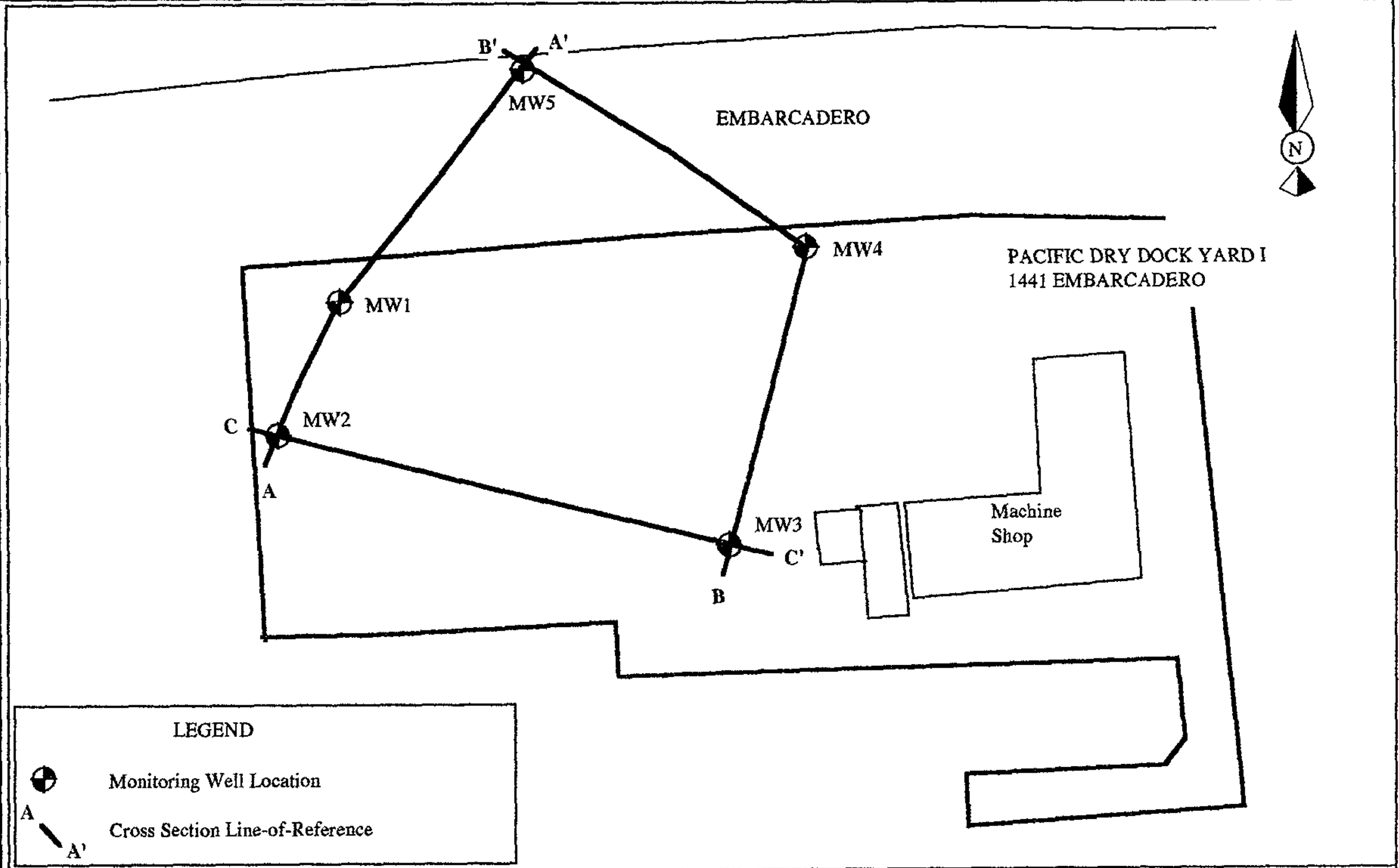
Project No. 1457-027

Groundwater Monitoring Well Locations

Pacific Dry Dock Yard I
1441 Embarcadero -- Oakland, California

Figure 3

Versar Inc.



Scale (feet)
0 50 100

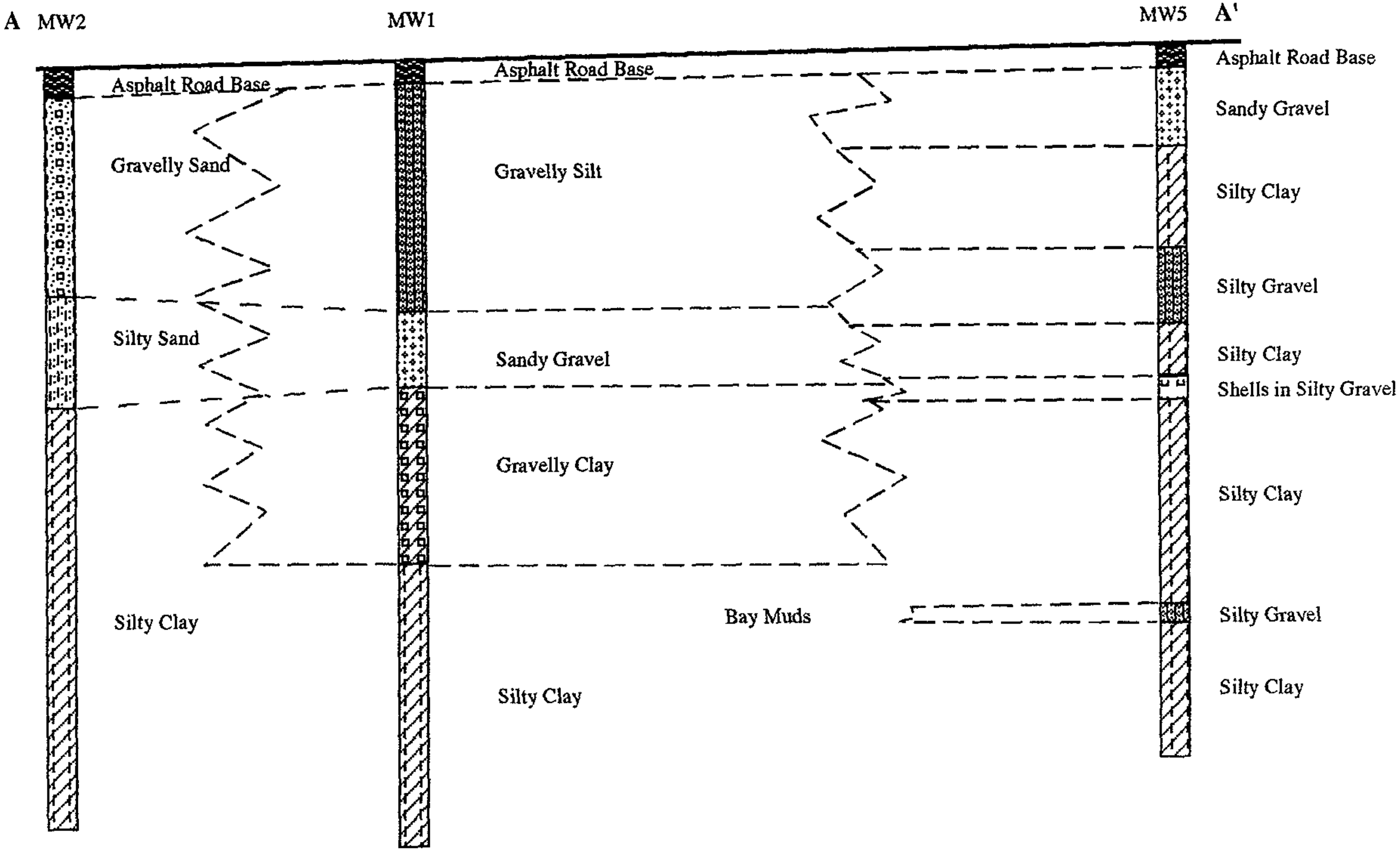
Project No. 1457-027

Cross Section Line-of-Reference Map

Pacific Dry Dock Yard I
Oakland, California

Figure 4

Versar Inc.



Horizontal Scale: 1 in = 20 ft
Vertical Scale: 1 in = 3 ft

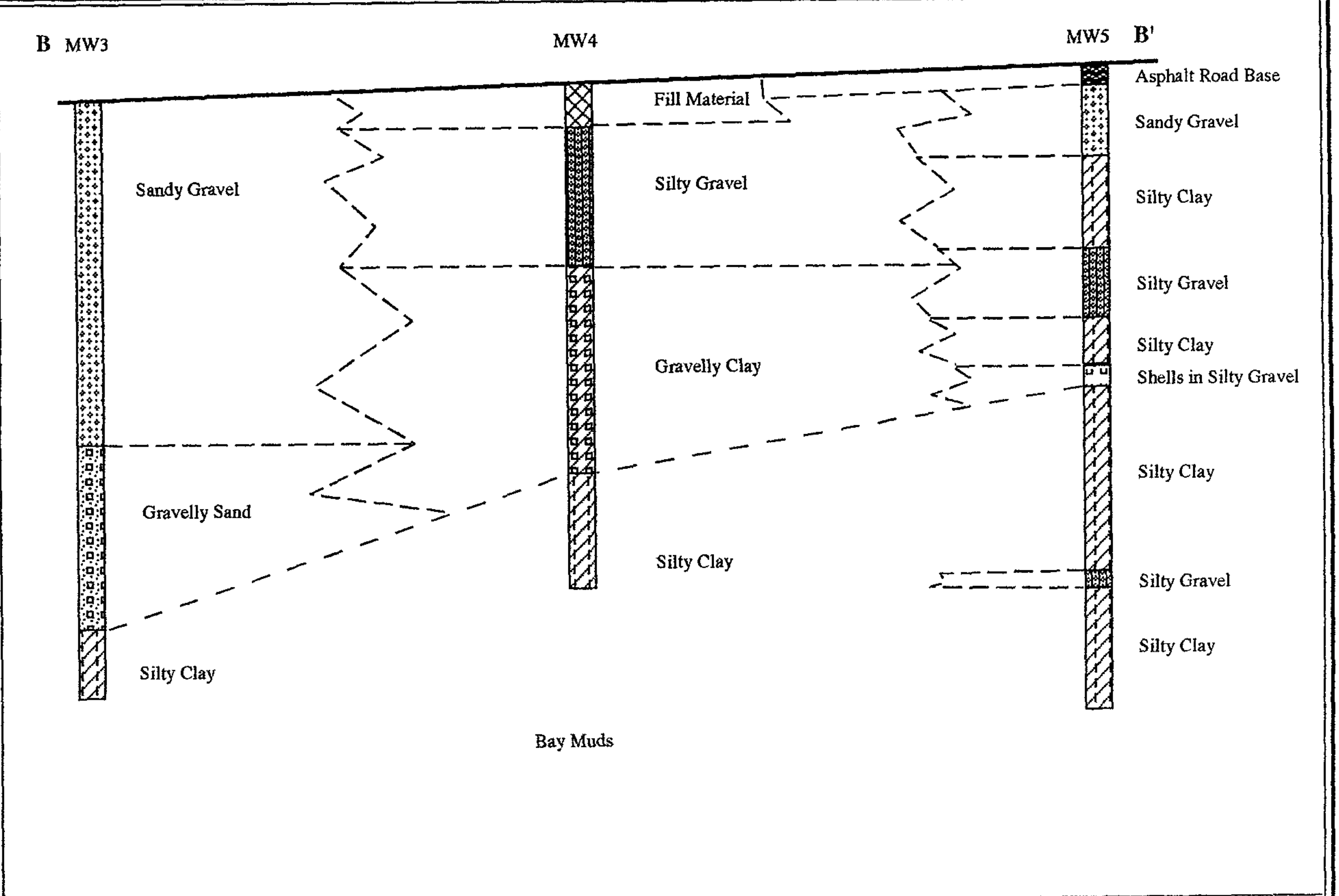
Project No. 1457-027

Cross Section A - A'

Pacific Dry Dock Yard I
Oakland, California

Figure 5

Versar, Inc.



Horizontal Scale: 1 in = 30 ft
Vertical Scale: 1 in = 3 ft

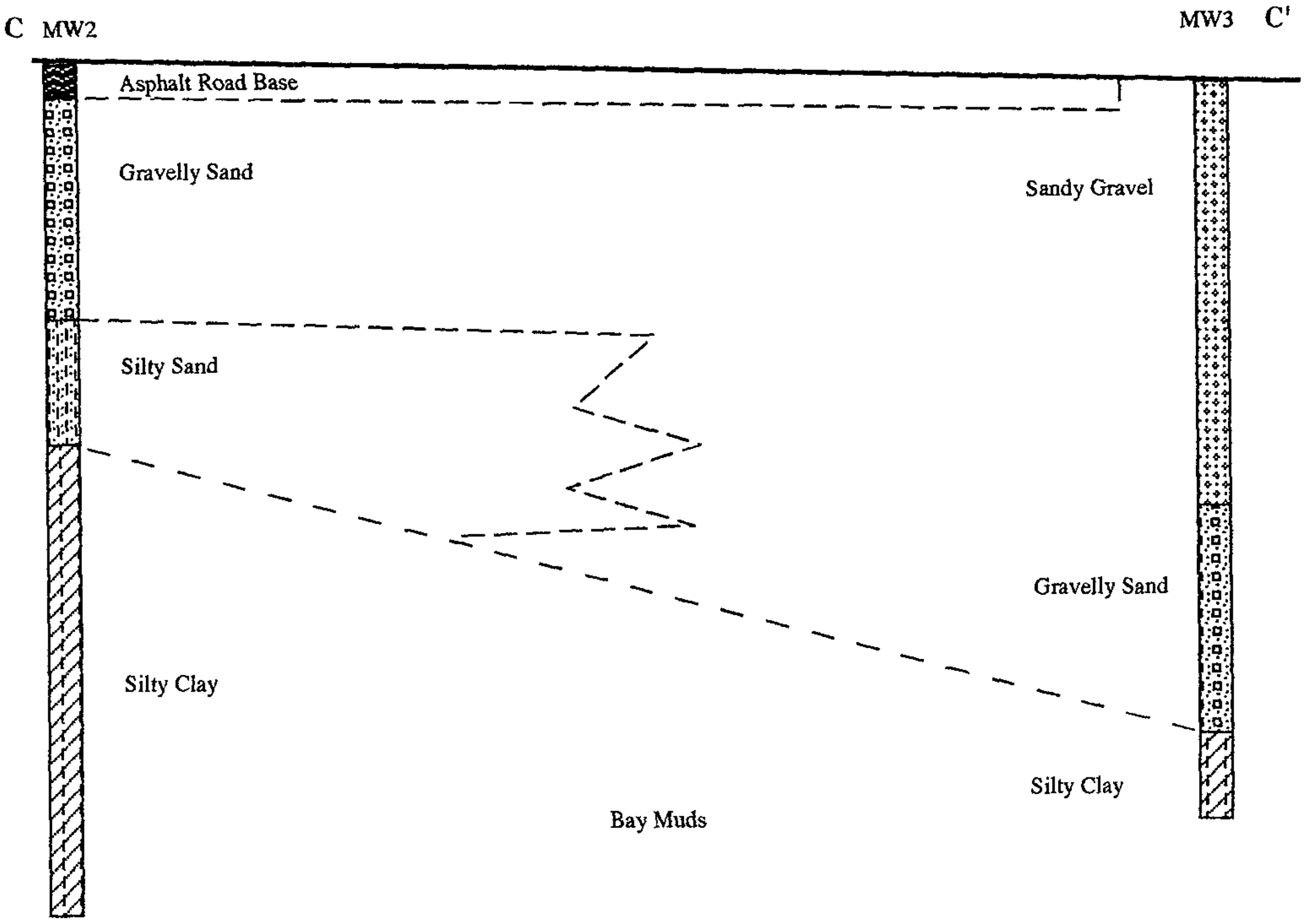
Project No. 1457-027

Cross Section B - B'

Pacific Dry Dock Yard I
Oakland, California

Figure 6

Versar, Inc.



Horizontal Scale: 1 in = 25 ft
Vertical Scale: 1 in = 3 ft

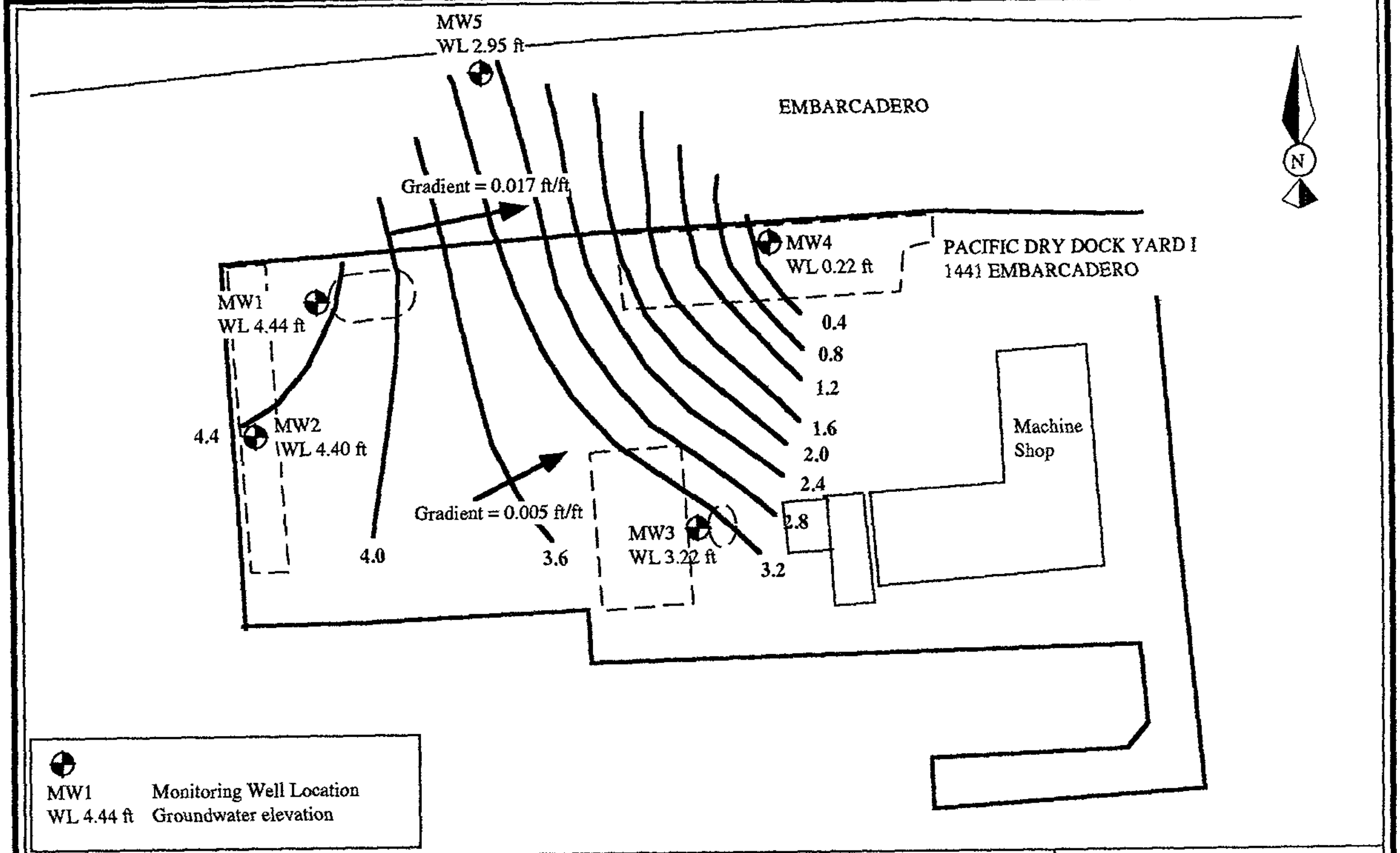
Project No. 1457-027

Cross Section C - C'

Pacific Dry Dock Yard I
Oakland, California

Figure 7

Versar, Inc.



Scale (feet)

0 50 100

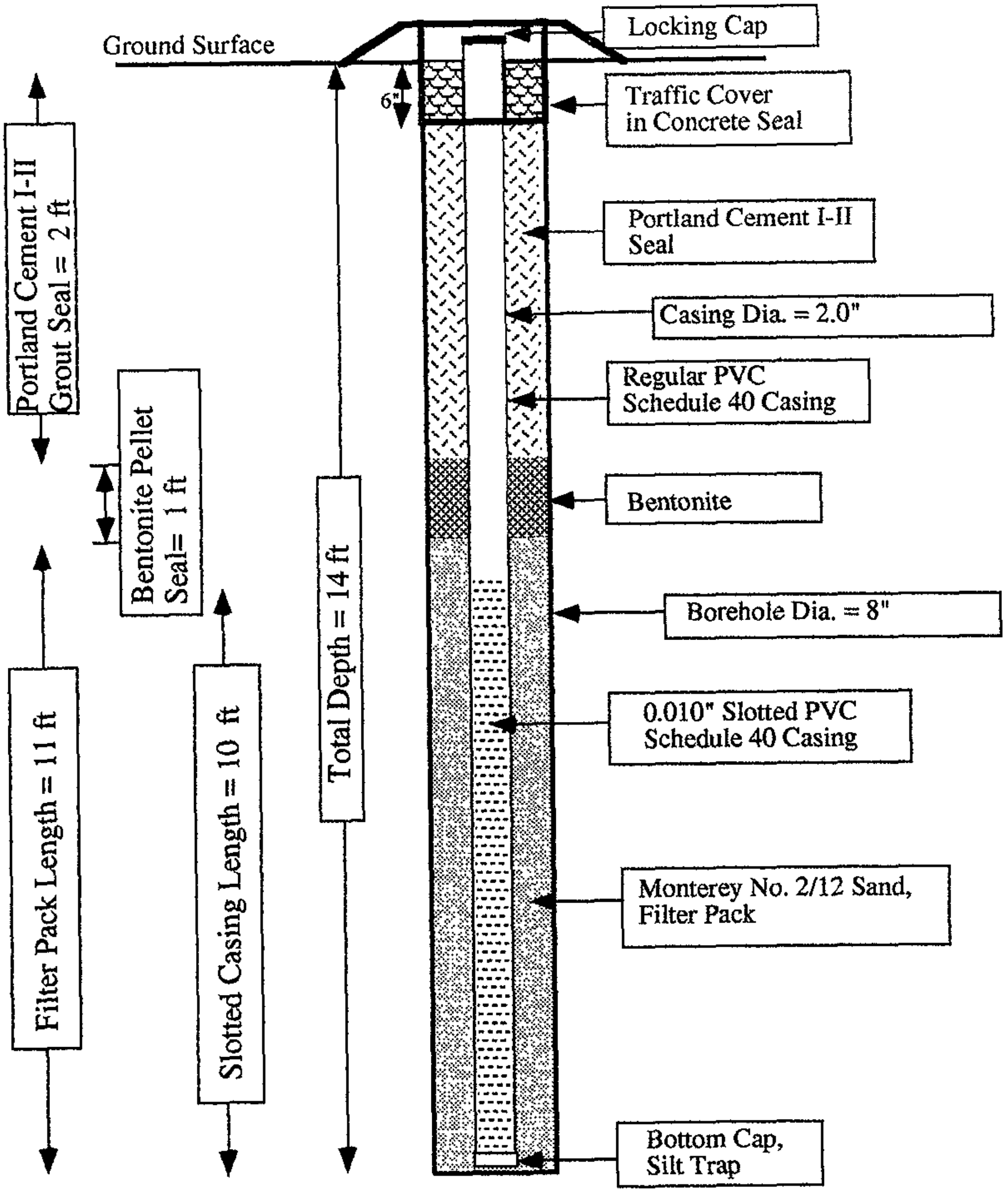
Project No. 1457-027

Calculated Groundwater Gradient

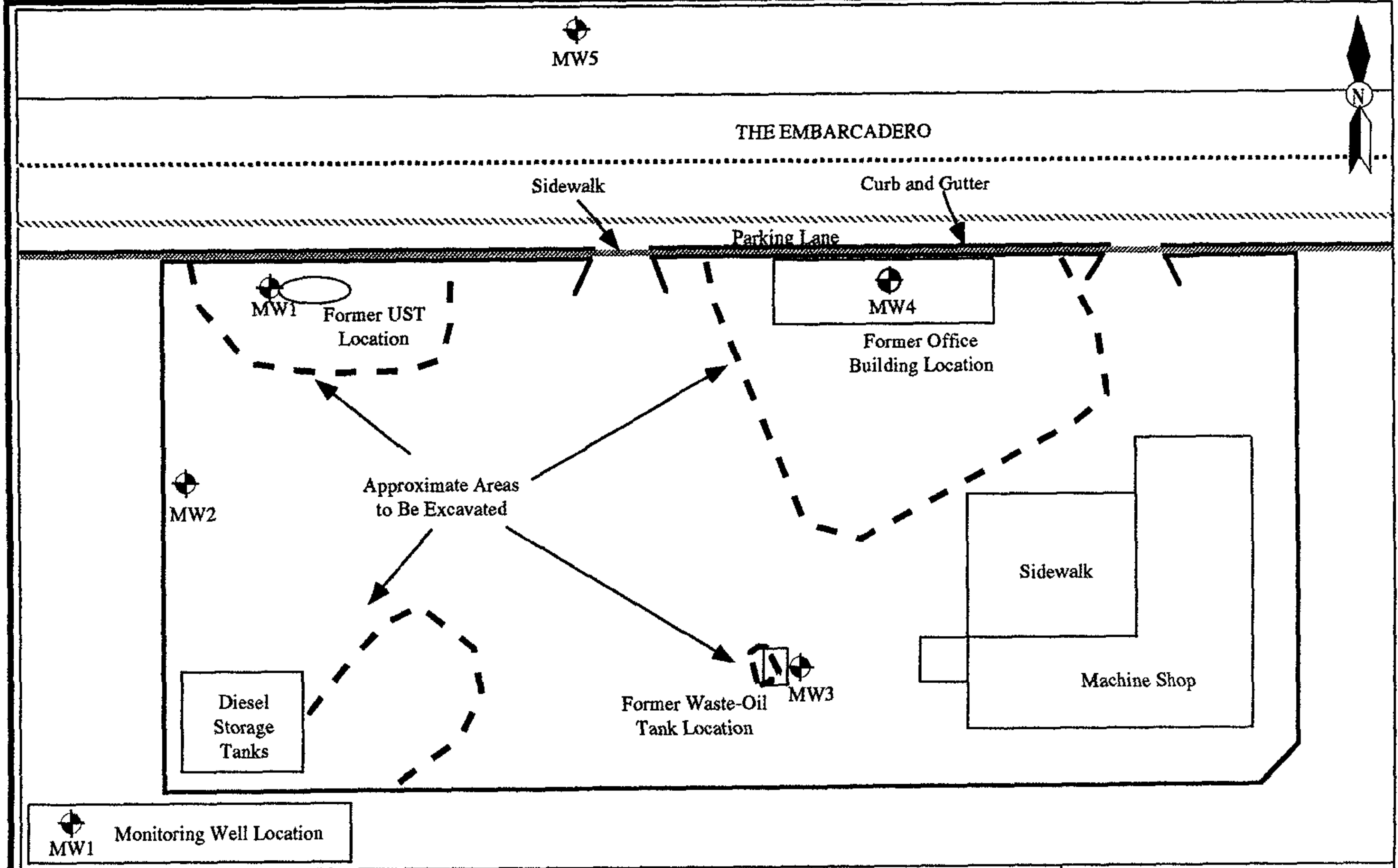
Pacific Dry Dock Yard I
Oakland, California

Figure 8

Versar Inc.



Not to Scale	Well Construction Diagram	Figure 9
Project No. 1457-027	Pacific Dry Dock Yard I Oakland, California	Versar Inc.



Project No. 1457-027

Extent of Impacted Soil

Pacific Dry Dock Yard I
1441 Embarcadero -- Oakland, California

Figure 10

Versar Inc.

Table 1

Laboratory Analytical Results for Soils
(Petroleum Hydrocarbons)

Pacific Dry Dock Yard I
Oakland, California

Sample Number	Sample Depth (feet)	Sample Collection Date	Total Petroleum Hydrocarbons DHS Method LUFT Field Manual		O&G Hydrocarbons EPA Method 5520CF	Volatile Organics Modified EPA Method 8020			
			Gasoline (mg/kg)	Diesel (mg/kg)	Oil and Grease (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)
MW1-2.0	2.0-2.5	6/23/93	11	2.6	710	<0.012	0.10	<0.018	<0.048
MW1-5.5	5.5-6.0	6/23/93	1.4	20	7,800	0.110	0.810	0.019	0.096
MW2-2.5	2.5-3.0	6/23/93	0.580	2.2	790	<0.005	0.170	<0.005	<0.015
MW2-5.5	5.5-6.0	6/23/93	<0.5	1.1	<50	<0.005	0.043	<0.005	<0.015
MW3-2.0	2.0-2.5	6/24/93	<0.5	2.2	<50	<0.005	0.0046	<0.006	<0.015
MW3-5.5	5.5-6.0	6/24/93	<0.5	32	<50	<0.005	<0.005	<0.005	<0.015
MW4-1.5	1.5-2.0	6/23/93	<0.5	<1.0	<50	<0.005	0.031	<0.005	<0.015
MW4-5.5	5.5-6.0	6/23/93	17	3,000	440	<0.036	0.078	0.130	0.30
MW5-2.0	2.0-2.5	6/24/93	<0.5	<1.0	<50	<0.005	0.094	<0.005	<0.015
MW5-5.5	5.5-6.0	6/24/93	<0.5	<1.0	<50	<0.005	0.022	<0.005	<0.015

Table 2

Laboratory Analytical Results for Soils[1] (Metals)

Pacific Dry Dock Yard I
Oakland, California

	MW1-5.5 (collected: 6/23/93)	MW3-5.5 (collected: 6/24/93)	TTLC[2]	STLC[3]
Antimony EPA Method 7040	N.D.	N.D.	500	15
Arsenic EPA Method 7060	9.2	1.8	500	5
Barium EPA Method 7080	200	<50	10,000	100
Beryllium	0.240	0.220	75	0.75
Cadmium	N.D.	N.D.	100	1.0
Chromium	18	14	2,500	560
Cobalt	17	<12	8,000	80
Copper	16	22	2,500	25
Lead	29	5	1,000	5
Mercury	<0.12	0.48	20	0.2
Molybdenum	N.D.	N.D.	3,500	350
Nickel	15	20	2,000	20
Selenium	N.D.	N.D.	100	1.0
Silver	N.D.	N.D.	500	5
Thallium	N.D.	N.D.	700	7
Vanadium	26	16	2,400	24
Zinc	78	71	5,000	250

[1] Concentrations expressed in milligrams per kilogram (mg/kg), with N.D. indicating "not detected at or above the reporting limit."
[2] Total threshold limit concentration values.
[3] Soluble threshold limit concentration values.

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Table 3

Laboratory Analytical Results for Soils
(Organotin)[1]

Pacific Dry Dock Yard I
Oakland, California

Sample Number	Sample Collection Date	Sample Depth (feet)	Monobutyltin (mg/kg)	Dibutyltin (mg/kg)	Tributyltin (mg/kg)	Tetrabutyltin (mg/kg)
MW1-5.5	6/23/93	5.5-6.0	<0.003	<0.003	0.003	<0.003
MW3-5.5	6/24/93	5.5-6.0	<0.003	<0.003	<0.003	<0.003

[1] Analysis by gas chromatography.

APPENDIX A

Sampling and Decontamination Procedures

1.0 SAMPLING AND DECONTAMINATION PROCEDURES

The decontamination procedures for non-dedicated field equipment and well development/purging equipment are given below. These procedures are followed during all field activities.

1. Non-dedicated well development, purging, and sampling equipment is carefully cleaned prior to each use, as follows:
   a. Carefully brush off any loose foreign debris with a soft bristle brush.
   b. Rinse the equipment thoroughly in clean water.
   c. Wash the equipment in a non-phosphate detergent bath.
   d. Rinse thoroughly in clean water.
   e. Rinse with pesticide-grade hexade (if deemed necessary).
   f. Rinse thoroughly with deionized water.
   g. Air dry in a dust-free environment.
   h. Store in sterile plastic bags or other suitable cover until use.
2. Clean disposable gloves are worn by all field personnel when handling decontaminated equipment.
3. A clean plastic apron is positioned adjacent to or around the well riser in order to prevent equipment from coming into contact with surface materials. All purging equipment and lines are kept on the apron or an adjacent plastic "clean area" following decontamination and when not in use.

2.0 COLLECTION OF SAMPLES

2.1 Soil Samples

Soil samples are subjected to field analysis with either a flame ionization detector (FID) or a photoionization detector (PID) with and 10.7 EV lamp immediately following sample collection. The field analysis is performed as follows:

1. A representative aliquot of the sample is placed in a glass jar or resealable freezer bag and broken up (to the extent possible) to allow the release of contaminant vapors.
2. The container is exposed to direct sunlight for a period of ten minutes to facilitate the volatilization of organic compounds within the sample.
3. The probe of the FID or PID is inserted into the container carefully and a sample of the vapor is drawn into the instrument. The maximum numerical reading observed is noted on the drilling log.

All soil samples to be submitted for laboratory analysis are collected in brass tubes or precleaned glass jars. The ends of the brass tubes are covered with Teflon tape and fitted with airtight caps. Glass jars are laboratory cleaned and fitted with either teflon caps or foil covers and plastic caps. The selection of samples to be submitted for laboratory analysis will be based on the filed observations and headspace analysis.

2.2 Ground Water Sampling

Ground water samples will be collected for laboratory analysis using the procedures given below.

1. Open the well and measure the organic vapor concentration with a FID or PID.

2. Measure the water and DNAPL product levels (if any) in the well using a decontaminated measuring device. All measurements must be made to the nearest 0.01 foot, and measured relative to the top of the casing. Record the depth of the water and DNAPL in the field notebook.
3. Inspect the dedicated bailer to ensure that the bottom valve assembly is working correctly.
4. Begin purging the well by inserting a bailer into the PVC monitoring tube and carefully lower it into the well. Take care to avoid agitating and aerating the fluid column in the well.
5. Slowly withdraw the bailer and transfer the water samples to a holding container.
6. Measure the temperature, specific conductance, and pH. Record these and all subsequent measurements in the filed notebook.
7. Continue purging the well (a minimum of three well volumes) until the temperature, pH, and conductivity have stabilized, or the well is dry.
8. When the water has recovered to 80 percent of the original level, carefully lower the bailer into the well and recover a fresh water sample.
9. Fill the appropriate sample containers by releasing water from the bailer via the bottom emptying device with a minimum of agitation. The most volatile parameters are collected first, proceeding to the least volatile parameters.
10. Place the purge water in a DOT approved 55-gallon drum or a water treatment system.

Water treatment system samples are collected directly from sampling ports on the influent and effluent lines. Water is allowed to run from the ports for one minute for purging. The sample is then collected in VOA bottles. Purge water is returned to the water treatment system.

2.4 Air Treatment Samples

Samples are collected directly from sampling ports on influent and effluent lines. The sampler dons a respirator and opens the port. A FID or PID is used to measure the concentration of organic vapors in the airstream. The concentration is recorded in a field notebook. The sample is then introduced into an evacuated sampled canister through a line inserted directly into the airstream. The sample port is then closed.

3.0 ANALYSIS OF SAMPLES

Samples are submitted to a contract laboratory for analysis. Contract laboratories are certified by the State of California to perform the analyses requested.

4.0 SAMPLE HANDLING

4.1 Sample Containers, Preservation, and Holding Times

All samples are collected, placed in containers, preserved, and analyzed within the time constraints with applicable local, provincial, and federal procedures. All sample containers are precleaned in accordance with prescribed USEPA methods. A non-adhesive tape is placed around all sample container lids to prevent leaks and to prevent unauthorized tampering with individual samples following collection and prior to the time of analysis.

4.2 Sample Tracking and Management

All samples are tracked using a standard Chain of Custody form. The chain of custody record includes the following information:

1. Sample number
2. Signature of collector
3. Date and time of collection
4. Sample collection location
5. Sample type
6. Signature of persons involved in the chain of possession
7. Inclusive dates of possession
8. Analytical parameters
9. Pertinent field observations

The custody record is completed using waterproof ink. Corrections are made by drawing a line through and initialing the error, then entering the correct information.

Custody of the samples begins at the time of sample collection and are maintained by the sampling team supervisor until samples are relinquished for shipment to the laboratory, or until samples are hand-delivered to the designated laboratory sample custodian. Partial sample sets being accumulated for hand-delivery to the laboratory are stored in coolers with custody tape affixed.

Each sample shipment is accompanied by a Chain of Custody record identifying its contends. The original record accompanies the shipment and the copy is retained by the sampling team leader. The original (the top copy) is enclosed in a plastic zip-lock bag and secured to the inside of the cooler lid with tape.

APPENDIX B

Borehole Logs

P 1 of 2

Versar Inc.	DRILLING LOG	PROJECT NO.

Supervising Geologist: L. Kleinecke	Site Name: Crowley
Log By: P. Watsack	Boring No: MW-1
Date: 6/23/93	Boring Diameter: 8"
Drilling Contractor: Turner	Boring Depth: 14.0'
Contractor Lic. No.	Boring Location: NE site inside fence
Rig Type: Mobile B-34	
Driller: John / Al	

Depth (ft)	Advanced/ Recovered	Blow Counts	First Water/▽ Water Table ▽	Well Construction	USCS Group	Lithology	USCS SOIL DESCRIPTION SOIL CONDITION AND GEOLOGIC INTERPRETATION SOIL TYPE, ROUNDING, SORTING, PERCENT: GRAVEL, SANDS, FINES COLOR, MOISTURE, DENSITY, SECONDARY POROSITY, ODORS, STAINING GEOLOGY: FILL, ALLUVIUM, BEDROCK	Headspace (ppm)
1							0-6" gravel road base, asphalt	
2	X	20					2.0 - 5.0 gravelly silt. Silt: low plasticity	
3	A A	24 18					Gravel: angular, up to 0.5 inch, orange mottling, lt grey to lt green, Black Staining at 2.0 - 5.0, looks very oily w/ evidence of black liquid / sludge.	
4								
5							5.0 - 6.5 silty sandy gravel. Gravel: angular,	
6	X B	14 13					up to 1.5 inch; Silt: <20%. Sand well graded, subangular. low plasticity, black staining as above.	
7	X	5					6.5 - 7.0 interface. gravel with clay 7.0 - 10.0 gravelly clay. clay: high	
8							plasticity, sticky. Gravel: subangular up to 0.5 inch, <20%. Black grading to dark grey to lt grey w/ depth.	
9							Organic odor.	
10								
11	X C	2 1					10.0-15.5 clay, high plasticity, lt grey, moist	

P 2 of 2

Versar Inc.	DRILLING LOG	PROJECT NO.

Supervising Geologist: L. Kleinecke	Site Name: [illegible]
Log By: P. Walsch	Boring No: MW-1
Date: 6/23/93	Boring Diameter: 8"
Drilling Contractor: Turner	Boring Depth: 14.0'
Contractor Lic. No.	Boring Location: NE site inside fence
Rig Type: mobile B-34	
Driller: John / Al	

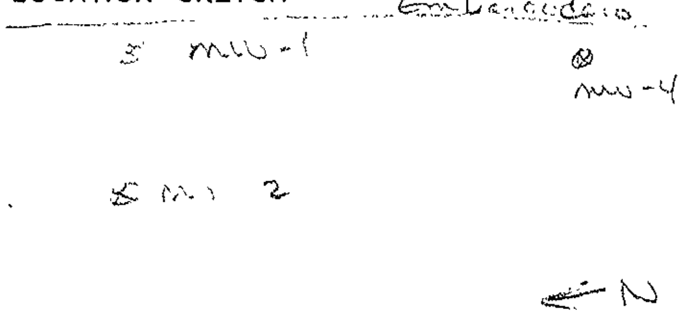
Depth (ft)	Advanced/	Recovered	Blow Counts	First Water/▽	Water Table ▽	Well Construction	USCS Group	Lithology	USCS SOIL DESCRIPTION SOIL CONDITION AND GEOLOGIC INTERPRETATION SOIL TYPE, ROUNDING, SORTING, PERCENT: GRAVEL, SANDS, FINES COLOR, MOISTURE, DENSITY, SECONDARY POROSITY, ODORS, STAINING GEOLOGY: FILL, ALLUVIUM, BEDROCK	Headspace (ppm)
12		X	1						Clay as above	
13										
14									14.0 End Boring	
15		X D	1 2						Clay as above	NA
16		X	1							

Versar INC.

WELL CONSTRUCTION RECORD

PROJECT: [illegible]
JOB NUMBER:
LOCATION: [illegible]
WELL NUMBER: MW-1
GROUND ELEVATION:
DATE INSTALLED: [illegible]
WELL CASING ELEVATION:
FIELD REPRESENTATIVE: P. [illegible]
PROTECTOR CASING ELEVATION:
DRILLING CONTRACTOR: Turner
DRILLER: John LICENSE NO.
DRILLING METHOD: HSA
RIG TYPE: Mobile B-24
CONDITION OF GROUND SURFACE: asphalt
FORMATION SCREENED: silt (4' - 7 bgs)
Clay (7' - 14' bgs)

LOCATION SKETCH



BIT TYPE	HOLE DIA. (IN.)	END DEPTH* (FT.)	FLUID TYPE

TIME LOG

ACTIVITY	DATE	START	END
DRILLING			
CASING			
FILTER PACK			
SEAL			
GROUT			
DEVELOPMENT			
SURVEY			
OTHER			

PROTECTOR, CASING & SCREEN RECORD

DESCRIPTION	DIA. (IN.)	TOTAL LENGTH	TOP*	BOTTOM*
Screen	2	10	4	14
blank	2	4	0	4

GROUND WATER LEVELS

DURING DRILLING:

COMPLETION MATERIALS RECORD

DESCRIPTION	TOP*	BOTTOM*
Sand 2/12	3	14
bentonite chip	2	3
grout	0	2

WELL DEVELOPMENT

* DEPTH FROM GROUND SURFACE

COMMENTS:

PAGE ____ OF ____

Versar Inc.	DRILLING LOG	PROJECT NO.

Supervising Geologist: L. Kleincane	Site Name: Chevron
Log By: P. Watson	Boring No: MW-2
Date: 6/23/93	Boring Diameter: 8"
Drilling Contractor: Turner	Boring Depth: 14.0'
Contractor Lic. No. 1	Boring Location: N side of property
Rig Type: Mobile B-34	west of MW-1
Driller: John / Al	(OVA ambient = 3 ppm)

Depth (ft)	Advanced/	Recovered	Blow Counts	First Water/▽	Water Table ▽	Well Construction	USCS Group	Lithology	USCS SOIL DESCRIPTION SOIL CONDITION AND GEOLOGIC INTERPRETATION SOIL TYPE, ROUNDING, SORTING, PERCENT: GRAVEL, SANDS, FINES COLOR, MOISTURE, DENSITY, SECONDARY POROSITY, ODORS, STAINING GEOLOGY: FILL, ALLUVIUM, BEDROCK	Headspace (ppm)
1									0-6" asphalt road base	
2		X							2.0-4.5 silty, gravelly, sand. Sand:	3-5
3		X A							fine, angular. Gravel: angular, up to 2.5 inch. Silt: 30%. Very well sorted soil, equal portions	
4									of each silt, gravel, and sand. No recovery. No sample. Too many gravels. Second Try = Sample @ 2.5'	
5									4.5-5.0 silty sand. Sand: fine, angular silt > 30%. Black staining	
6		X B	2 1						w/ odor. No sample collected Began sampling @ 5.0' bgs. 5.0-6.5 SAA, no staining	
7		X	2						6.5-7.0 interface of sand w/ clay 7.0-15.0 clay, lt green, high	
8									plasticity, moist. Traces of silt.	
9										
10										
11		X C	2 2							

P 2 of 2

Versar Inc.	**DRILLING LOG**	PROJECT NO.

Supervising Geologist: L. Kleinecke

Site Name: [illegible]

Log By: P. Wotsch

Boring No: MW - 2

Date: 6/23/93

Boring Diameter: 8"

Drilling Contractor: [illegible]

Boring Depth: 14.0'

Contractor Lic. No.

Boring Location:

Rig Type: Mobile B-34

Driller: John / Al

Depth (ft)	Advanced/ Recovered	Blow Counts	First Water/▽ Water Table ▼	Well Construction	USCS Group	Lithology	USCS SOIL DESCRIPTION SOIL CONDITION AND GEOLOGIC INTERPRETATION SOIL TYPE, ROUNDING, SORTING, PERCENT: GRAVEL, SANDS, FINES COLOR, MOISTURE, DENSITY, SECONDARY POROSITY, ODORS, STAINING GEOLOGY: FILL, ALLUVIUM, BEDROCK	Headspace (ppm)
12	X	3					clay as above	
12								
14							14.0 - 15.0 clay as above. End Boring	
15	X D	1 2						NA
16	X	3					15.0 - 15.5 gravelly clay. clay: high to med plasticity. Gravel: angular, up to 0.50 inch.	

Versar INC.

WELL CONSTRUCTION RECORD

PROJECT: [illegible]
JOB NUMBER:
LOCATION: [illegible] I
WELL NUMBER: [illegible]
GROUND ELEVATION:
DATE INSTALLED: [illegible]
WELL CASING ELEVATION:
FIELD REPRESENTATIVE: P. [illegible]
PROTECTOR CASING ELEVATION:
DRILLING CONTRACTOR: Turner
DRILLER: [illegible] LICENSE NO.
DRILLING METHOD: HSA
RIG TYPE: Mobile [illegible]-24
CONDITION OF GROUND SURFACE: asphalt
FORMATION SCREENED: silt (4'-7')
Clay (7'-14')

BIT TYPE	HOLE DIA. (IN.)	END DEPTH* (FT.)	FLUID TYPE

PROTECTOR, CASING & SCREEN RECORD

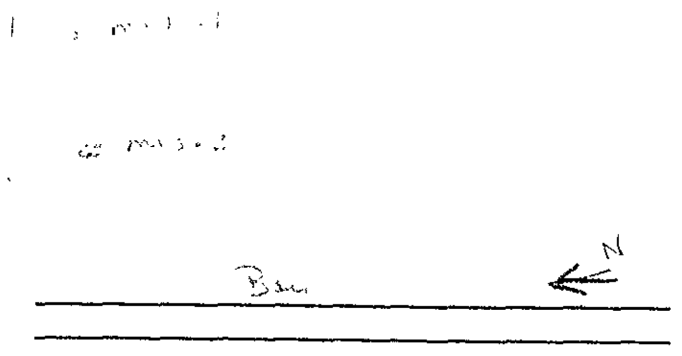
DESCRIPTION	DIA. (IN.)	TOTAL LENGTH	TOP*	BOTTOM*
Screen	2	10	4	14
Blank	2	4	0	4

COMPLETION MATERIALS RECORD

DESCRIPTION	TOP*	BOTTOM*
Sand 2/12	4	14
Bentonite	2	3
[illegible]	0	2

LOCATION SKETCH

Embarcadero



TIME LOG

ACTIVITY	DATE	START	END
DRILLING			
CASING			
FILTER PACK			
SEAL			
GROUT			
DEVELOPMENT			
SURVEY			
OTHER			

GROUND WATER LEVELS

DURING DRILLING:

WELL DEVELOPMENT

* DEPTH FROM GROUND SURFACE

COMMENTS:

PAGE ____ OF ____

P ___ of ___

Versar Inc.	**DRILLING LOG**	PROJECT NO. ______

Supervising Geologist:	Site Name: PDJI W
Log By: LKleinocke	Boring No: MW3A
Date: 6/24/93	Boring Diameter: 8"
Drilling Contractor: Turner Exploration	Boring Depth: 12'
Contractor Lic. No.	Boring Location: Adjacent To former
Rig Type: B-37	waste oil Tank location &
Driller: John Turner	2' E of former bldg wall

Depth (ft)	Advanced/ Recovered	Blow Counts	First Water ▽	Water Table ▽	Well Construction	USCS Group	Lithology	USCS SOIL DESCRIPTION SOIL CONDITION AND GEOLOGIC INTERPRETATION SOIL TYPE, ROUNDING, SORTING, PERCENT: GRAVEL, SANDS, FINES COLOR, MOISTURE, DENSITY, SECONDARY POROSITY, ODORS, STAINING GEOLOGY: FILL, ALLUVIUM, BEDROCK	Headspace (ppm)
1.5	▨	7					Δ	Reddish Brown sandy gravel - Traces silt 50% gravels to 2" diam 30% fin snd dry No odor	
5	▨	15 14					Δ	reddish brn sandy gravel - some silts	
	▨	18 10 8					Δ	50% gvls to 1.5" diam 30% med sand 20% silts + clays moist No odor	
10							Δ	DK yellow brn gravelly sand ang gvls to	
	▨	25 25 10					Δ	2.5" diam, med sand. moist No odor Bay muds beginning at 11.5' bgs	
							▨	olive brn silty clay obstruction at 12' bgs - concrete	
								Pulled out + moved 5' N	

P ___ of ___

Versar Inc.	DRILLING LOG	PROJECT NO.

Supervising Geologist:	Site Name: 2001 W
Log By: L. Klinnecke	Boring No: MW 3
Date: 6/24/93	Boring Diameter: 8"
Drilling Contractor: Turner Exploration	Boring Depth:
Contractor Lic. No.	Boring Location: Next to former
Rig Type: B 57	waste oil tank location
Driller: John Turner	

Depth (ft)	Advanced/	Recovered	Blow Counts	First Water/∇	Water Table ∇	Well Construction	USCS Group	Lithology	USCS SOIL DESCRIPTION SOIL CONDITION AND GEOLOGIC INTERPRETATION SOIL TYPE, ROUNDING, SORTING, PERCENT: GRAVEL, SANDS, FINES COLOR, MOISTURE, DENSITY, SECONDARY POROSITY, ODORS, STAINING GEOLOGY: FILL, ALLUVIUM, BEDROCK	Headspace (ppm)
1.5			8 14						Black stained sandy gravel some silts 50% gvl 50% F-m sand 20% silt dry st odor Fill	
3 5			11						As Above Black stained sandy gravel some silts	
			20 11 7						50% gvls to 1.5" diam 30% med sand 20% silts + clays moist mod odor	
10									Black stained gravelly sand Ang gvls to 3" diam	
			32 19 8	∇					Med sand moist slt odor Fill. Bay muds beginning at 11.5' bgs	
									Wood obstruction at 12' bgs - drilled past end of hole at 13' bgs in bay muds	
15										

P 1 of 2

Versar Inc.	**DRILLING LOG**	PROJECT NO.

Supervising Geologist: L. Kleinecke	Site Name: Crowley
Log By: P. Walsach	Boring No: MW - 4
Date: 6/23/93	Boring Diameter: 8"
Drilling Contractor: Turner	Boring Depth: 15.0'
Contractor Lic. No.	Boring Location: middle of eastern
Rig Type: Mobile B-24	portion of site by fence
Driller: John / Al	(OVA ambient 3 - 11 ppm)

Depth (ft)	Advanced/ Recovered	Blow Counts	First Water/▽ Water Table ▽	Well Construction	USCS Group	Lithology	USCS SOIL DESCRIPTION SOIL CONDITION AND GEOLOGIC INTERPRETATION SOIL TYPE, ROUNDING, SORTING, PERCENT: GRAVEL, SANDS, FINES COLOR, MOISTURE, DENSITY, SECONDARY POROSITY, ODORS, STAINING GEOLOGY: FILL, ALLUVIUM, BEDROCK	Headspace (ppm)
1							0 - 1.0' gravel, concrete, fill material	
2	A	16					1.0 - 4.0 silty gravel. Gravel, angular, up to 2.0 inch. Silt: low plasticity. orange mottling.	3
3	A X	8 9						3
4								
5							4.0 - 8.5 gravelly clay. Clay: med plasticity Gravel: angular, up to 1.5 inch. Also	
6	X B	3 4					White shells up to 0.5 inch, >50% shells. Lt green in color (clay) Odor at 6.0'. Install Trap	25
7	X	6					for sampling	
8								
9							8.5 - 11.0 clay high plasticity, occasional pebble and/or shell.	
10								
11	X C	3 3						

P 2 of 2

Versar Inc.	DRILLING LOG	PROJECT NO.

Supervising Geologist: L. K[illegible]	Site Name: [illegible]
Log By: P. [illegible]	Boring No: MW-4
Date: 6/23/93	Boring Diameter: 8"
Drilling Contractor: T[illegible]	Boring Depth: 15.0'
Contractor Lic. No.	Boring Location:
Rig Type: [illegible]	
Driller: John / Al	

Depth (ft)	Advanced/	Recovered	Blow Counts	First Water/▽	Water Table ▼	Well Construction	USCS Group	Lithology	USCS SOIL DESCRIPTION SOIL CONDITION AND GEOLOGIC INTERPRETATION SOIL TYPE, ROUNDING, SORTING, PERCENT: GRAVEL, SANDS, FINES COLOR, MOISTURE, DENSITY, SECONDARY POROSITY, ODORS, STAINING GEOLOGY: FILL, ALLUVIUM, BEDROCK	Headspace (ppm)
12									11.0-15.0 clay, no pebbles, no shells high plasticity.	
13										
14										
15									15.0 End Boring	
	☒	1							15.5-16.5 silty clay. Clay: med plasticity. silty <20%. lt black in color.	3
16	D	1								
	☒	1								

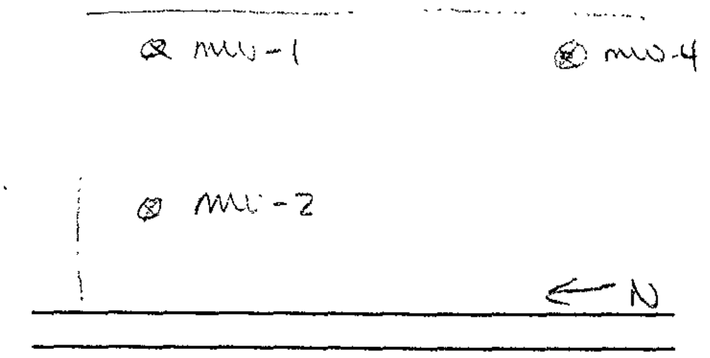
Versar INC.

WELL CONSTRUCTION RECORD

PROJECT: Crosby
JOB NUMBER:
LOCATION: FDOT
WELL NUMBER: MW-4
GROUND ELEVATION:
DATE INSTALLED: 6/28/93
WELL CASING ELEVATION:
FIELD REPRESENTATIVE: D. Watson
PROTECTOR CASING ELEVATION:
DRILLING CONTRACTOR: Turner
DRILLER: Jerry LICENSE NO.
DRILLING METHOD: HSA
RIG TYPE: Mobile B-34
CONDITION OF GROUND SURFACE: gravel
FORMATION SCREENED: clay (5-15 bgs)

BIT TYPE	HOLE DIA. (IN.)	END DEPTH* (FT.)	FLUID TYPE
	8	15.0'	

LOCATION SKETCH



PROTECTOR, CASING & SCREEN RECORD

DESCRIPTION	DIA. (IN.)	TOTAL LENGTH	TOP*	BOTTOM*
Screen 0.01'	2	10'	3	13
Blank	2	3	0	3

TIME LOG

ACTIVITY	DATE	START	END
DRILLING			
CASING			
FILTER PACK			
SEAL			
GROUT			
DEVELOPMENT			
SURVEY			
OTHER			

COMPLETION MATERIALS RECORD

DESCRIPTION	TOP*	BOTTOM*
sand 2/12	2.5	13
bentonite chips	1.5	2.5

GROUND WATER LEVELS

DURING DRILLING:

WELL DEVELOPMENT

* DEPTH FROM GROUND SURFACE

COMMENTS:

PAGE ____ OF ____

P ___ of ___

Versar Inc.	DRILLING LOG	PROJECT NO.

Supervising Geologist: M Sellens	Site Name: PDOI W
Log By: h Klemeck	Boring No: MW5
Date: 6/24/93	Boring Diameter: 8"
Drilling Contractor: Turner Exploration	Boring Depth:
Contractor Lic. No.	Boring Location: N side of Embarcadero
Rig Type:	at edge of roadway
Driller: John Turner	

Depth (ft)	Advanced/	Recovered	Blow Counts	▽▼ First Water/ Water Table	Well Construction	USCS Group	Lithology	USCS SOIL DESCRIPTION SOIL CONDITION AND GEOLOGIC INTERPRETATION SOIL TYPE, ROUNDING, SORTING, PERCENT: GRAVEL, SANDS, FINES COLOR, MOISTURE, DENSITY, SECONDARY POROSITY, ODORS, STAINING GEOLOGY: FILL, ALLUVIUM, BEDROCK	Headspace (ppm)
	▨	▨	4					Asphalt base 2" org brn sandy gvl To 2' bgs becoming blk silty clay dry hard No odor	
	▨		8 12					Green and rust inclusions To 1/4" diam becoming more moist + plastic with depth minor fracturing lith change at 4' bgs To silty Gvls To 1/2" diam	
5	▨	▨	2 3 4	▽				lith change at 5.5' bgs To silty clay olive brown with shells sat at 6.5' bgs in silty gravels silty clays begin at 7' bgs again	
								bay muds as above olive brown silty clay	
10	▨	▨	3 3 3					silty gravel lens at 11' To 11.4'	
								high water content due To gravel lenses end of hole at 14' in bay muds silty clay olive brn with gravel lenses To 6" Thick rounded gvls	
15								To 1" diam.	

APPENDIX C

Groundwater Developing and Sampling Data Sheets

16 x bottles of water ≈ 8 gal   Developing   - label drums ~~trip sheets~~   - clean bailer/buckets between wells   - call in 5

WELL No.	DATE (M/D)	DEPTH of WELL	DEPTH TO WATER (ft)			TIME			PURGE VOLUME (gals)	NOTES
			Before Purge BP	After AP	~~DS~~	Start Purge SP	End Purge EP	~~SS~~		
5	6/25	14.1	6.50	7.27		6:00	6:27		17	lots of mud in all buckets
4		13	7.90	dry		7:00	7:08		3	less than ½ of bailer was being filled
3		15	7.0	7.30		7:31	7:43		8	muddy
2		14	4.88	Dry		8:01	8:11		6	
1		14.1	4.93	Dry		8:35	8:40		6	

Versar Monitoring Well Purging Table

PROJECT No :

LOCATION : PDD I

Field Representative Signature

PDD I 7/1/93

WELL No.	DATE (D/M)	DEPTH of WELL	DEPTH TO WATER (m)			TIME			PURGE VOLUME	NOTES
			BP	AP	BS	SP	EP	SS		
1	7/1	14.62	5.01	dry	11.50	1405	1427	1506	≈6.5	
2	7/1	14.22	4.94	dry	11.34	1441	1503	1540	≈8	
3	7/1	15.34	5.54	6.15	5.78	1130	1200	1300	9 gal!	
4	7/1	13.37	9.33	dry	12.18	1050	1105	1205	3 gal!	~~[illegible] to sample.~~
5	7/1	13.77	6.56	6.98	6.79	9:15	9:40	10:00	8 gal.	

Monitoring Well Purging Table

Versar Inc.

WELL No.	DEPTH (ft)	TEMP (C)	pH	Cond (mho/cm)	O.V.A. (ppm)	SHEEN	ODOR	FREE Product	TURBID (NTU)	Cumm. Volume Purged (gals)	NOTES
1	14.62	84.6	7.44	2630		none	none	none	low	0	
		75.6	7.18	2400		"	"	"	low	2	
		72.0	6.86	8930		"	"	"	low-mod	4	
		73.2	6.87	14910		"	"	"	mod-high	6	
		76.5	7.59	11420		"	"	"	off scale		Sample

DATE: 7/1/93 LOCATION: PPDI

Versar
ENVIRONMENTAL RISK MANAGEMENT

Figure GW-2
Ground Water Monitoring Data Sheet

Field Representative Signature

WELL No.	DEPTH (ft)	TEMP (F)	pH	Cond (mho/cm)	O.V.A. (ppm)	SHEEN	ODOR	FREE Product	TURBID (NTU)	Cumm. Volume Purged (gals)	NOTES
2	14.22	78.1	8.27	1610		none	none	none	Very low	0	
		74.1	7.89	1370		"	"	"	low	2	
		70.1	7.54	4360		"	"	"	low	4	
		68.9	7.36	7150		"	"	"	med-high	6	
		69.4	6.67	15000		"	"	"	high	8	dry well
		74.3	7.91	11530		"	"	"	off scale		Sample

Versar Ground Water Monitoring Data Sheet

DATE: 7/1/93

LOCATION: PDDI

Field Representative Signature Vernon P. Elartt

WELL No.	DEPTH (ft)	TEMP (F)	pH	Cond (mho/cm)	O.V.A. (ppm)	SHEEN	ODOR	FREE Product	TURBID (NTU)	Cumm. Volume Purged (gals)	NOTES
3	15.34	79.8	7.34	to high to measure		none	none	none	low	0	
		76.7	7.04	"		"	"	"	low	2	
		73.3	6.89	"		"	"	"	low	4	
		78.4	6.81	"		"	"	"	low	7	
		74.8	6.80	"		"	"	"	low	9	
		85.0	8.39	"		"	"	"	63.7		sample

Versar Ground Water Monitoring Data Sheet

DATE : 7/1/93

LOCATION : PPD.I

Field Representative Signature Vernon

WELL No.	DEPTH (ft)	TEMP (F)	pH	Cond (mho/cm)	O.V.A. (ppm)	SHEEN	ODOR	FREE Product	TURBID (NTU)	Cumm. Volume Purged (gals)	NOTES
4	13.37	72.2	8.30	5400		none	none	none	low	0	
		70.8	7.25	5960		none	none	none	low-med	1.5	
		69.5	7.36	7950		none	none	none	mod-high	3.0	dry wel
		79.5	7.62	12650		none	none	none	low-med		Sample

Versar Ground Water Monitoring Data Sheet

DATE : 7/1/93

LOCATION : PDD I

Field Representative Signature Vernon P.

WELL No.	DEPTH (ft)	TEMP (F)	pH	Cond (mho/cm)	O.V.A. (ppm)	SHEEN	ODOR	FREE Product	TURBID (NTU)	Cumm. Volume Purged (gals)	NOTES
5	13.77	76.1	6.75	3530		none	none	none	moderate -high	0	
		72.3	6.66	3800		none	none	none	moderate -high	2	
		70.9	6.66	3720		none	none	none	moderate -high	3.5	
		71.2	6.48	3520		none	none	none	mod- high	6	
		71.1	6.37	4040		none	none	none	mod- high	8	
		74.2	6.43	4130		none	none	none	high		Sample
											~~Sample~~

Versar Ground Water Monitoring Data Sheet

DATE: 7/1/93

LOCATION: PDDI

Field Representative Signature

APPENDIX D

Laboratory Analytical Results

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545

Telephone (510) 783-6960
Facsimile (510) 783-1512

TAL

July 19, 1993

Mr. Larry Kleinecke
Versar, Inc.
5330 Primrose Drive, Suite 228
Fair Oaks, California 95628

Dear Mr. Kleinecke:

Trace Analysis Laboratory received twenty soil samples on June 24, 1993 for your Project PDDI, (our custody log number 3361).

These samples were analyzed according to your chain of custody, except that EPA 420.1 can not be adapted to soil samples. Organotin results will be submitted in a separate report. Our analytical report, the completed chain of custody form, and our analytical methodologies are enclosed for your review.

Trace Analysis Laboratory is certified under the California Environmental Laboratory Accreditation Program. Our certification number is 1199.

If you should have any questions or require additional information, please call me.

Sincerely yours,

Scott T. Ferriman
Project Specialist

Enclosures

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (510) 783-6960
Facsimile (510) 783-1512

TAL

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 06/30/93
DATE ANALYZED: 07/14/93
DATE REPORTED: 07/19/93

CUSTOMER: Versar, Inc.

REQUESTER: Lawrence Kleinecke

PROJECT: PDDI

Sample Type: Soil

Method and Constituent:	Units	MW-1-2.0		MW-1-5.5		MW-2-2.5	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/kg	2,600	1,000	20,000	1,000	22,000	1,000

Method and Constituent:	Units	MW-2-5.5		MW-4-1.5		MW-4-5.5	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/kg	1,100	1,000	ND	1,000	3,000,000	1,000

Method and Constituent:	Units	MW-3-2.0		MW-3-5.5		MW-5-2.0	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/kg	2,200	1,000	32,000	1,000	ND	1,000

Concentrations reported as ND were not detected at or above the reporting limit.

Samples MW1-5.5 and MW2-2.5 contains compounds eluting later than the diesel standard. Sample MW3-5.5 results primarily consists of a single compound.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 06/30/93
DATE ANALYZED: 07/14/93
DATE REPORTED: 07/19/93
PAGE: Two

Sample Type: Soil

		MW-5-5.5		Method Blank	
Method and Constituent:	Units	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method:					
Total Petroleum Hydrocarbons as Diesel	ug/kg	ND	1,000	ND	1,000

QC Summary:

% Recovery: 74
% RPD: 25

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/01/93
DATE ANALYZED: 07/02/93, 07/04/93 and 07/07/9
DATE REPORTED: 07/19/93
PAGE: Three

Sample Type: Soil

Method and Constituent:	Units	MW-1-2.0 Concentration	MW-1-2.0 Reporting Limit	MW-1-5.5 Concentration	MW-1-5.5 Reporting Limit	MW-2-2.5 Concentration	MW-2-2.5 Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/kg	11,000	500	1,400	500	580	500
Modified EPA Method 8020 for:							
Benzene	ug/kg	ND	12	110	7.2	ND	5.0
Toluene	ug/kg	100	12	810	7.3	170	5.0
Ethylbenzene	ug/kg	ND	18	19	7.5	ND	5.0
Xylenes	ug/kg	ND	48	96	20	ND	15

Method and Constituent:	Units	MW-2-5.5 Concentration	MW-2-5.5 Reporting Limit	MW-4-1.5 Concentration	MW-4-1.5 Reporting Limit	MW-4-5.5 Concentration	MW-4-5.5 Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/kg	ND	500	ND	500	17,000	780
Modified EPA Method 8020 for:							
Benzene	ug/kg	ND	5.0	ND	5.0	ND	36
Toluene	ug/kg	43	5.0	31	5.0	78	37
Ethylbenzene	ug/kg	ND	5.0	ND	5.0	130	55
Xylenes	ug/kg	ND	15	ND	15	300	140

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/01/93
DATE ANALYZED: 07/02/93, 07/04/93 and 07/07/9
DATE REPORTED: 07/19/93
PAGE: Four

Sample Type: Soil

Method and Constituent:	Units	MW-3-2.0		MW-3-5.5		MW-5-2.0	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/kg	ND	500	ND	500	ND	500
Modified EPA Method 8020 for:							
Benzene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Toluene	ug/kg	46	5.0	ND	5.0	94	5.0
Ethylbenzene	ug/kg	ND	5.0	ND	5.0	ND	5.0
Xylenes	ug/kg	ND	15	ND	15	ND	15

Method and Constituent:	Units	MW-5-5.5		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method:					
Total Petroleum Hydrocarbons as Gasoline	ug/kg	ND	500	ND	500
Modified EPA Method 8020 for:					
Benzene	ug/kg	ND	5.0	ND	5.0
Toluene	ug/kg	22	5.0	ND	5.0
Ethylbenzene	ug/kg	ND	5.0	ND	5.0
Xylenes	ug/kg	ND	15	ND	15

QC Summary:

% Recovery: 116, 122, 109
% RPD: 8.1, 13, 5.7

Concentrations reported as ND were not detected at or above the reporting limit.

Except for samples MW1-2 and MW4-5.5, Toluene was the major constituent found by the analysis for Total Petroleum Hydrocarbons as Gasoline and Benzene, Toluene, Ethylbenzene, and Xylenes. Sample MW3-2 was analyzed by EPA Method 8240 with a library search to confirm Toluene and indentify other compounds.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/12/93
DATE ANALYZED: 07/14/93
DATE REPORTED: 07/19/93
PAGE: Five

Sample Type: Soil

Method and Constituent:	Units	MW-1-2.0		MW-1-5.5		MW-2-2.5	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
Standard Method 5520 CF Hydrocarbons:							
Oil and Grease	ug/kg	710,000	50,000	7,800,000	50,000	790,000	50,000

Method and Constituent:	Units	MW-2-5.5		MW-4-1.5		MW-4-5.5	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
Standard Method 5520 CF Hydrocarbons:							
Oil and Grease	ug/kg	ND	50,000	ND	50,000	440,000	50,000

Method and Constituent:	Units	MW-3-2.0		MW-3-5.5		MW-5-2.0	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
Standard Method 5520 CF Hydrocarbons:							
Oil and Grease	ug/kg	ND	50,000	ND	50,000	ND	50,000

Method and Constituent:	Units	MW-5-5.5		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit
Standard Method 5520 CF Hydrocarbons:					
Oil and Grease	ug/kg	ND	50,000	ND	50,000

QC Summary:

% Recovery: 88
% RPD: 14

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/06/93
DATE ANALYZED: 07/09/93
DATE REPORTED: 07/19/93
PAGE: Six

Sample Type: Soil

Method and Constituent:	Units	MW-1-5.5 Concentration	MW-1-5.5 Reporting Limit	MW-3-5.5 Concentration	MW-3-5.5 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8270:							
N-Nitrosodimethylamine	ug/kg	ND	3,300	ND	660	ND	660
Phenol	ug/kg	ND	3,300	ND	660	ND	660
Bis (-2-Chloroethyl) ether	ug/kg	ND	3,300	ND	660	ND	660
2-Chlorophenol	ug/kg	ND	3,300	ND	660	ND	660
1,3-Dichlorobenzene	ug/kg	ND	3,300	ND	660	ND	660
1,4-Dichlorobenzene	ug/kg	ND	3,300	ND	660	ND	660
1,2-Dichlorobenzene	ug/kg	ND	3,300	ND	660	ND	660
N-Nitroso-Di-N-Propylamine	ug/kg	ND	3,300	ND	660	ND	660
Hexachloroethane	ug/kg	ND	3,300	ND	660	ND	660
Nitrobenzene	ug/kg	ND	3,300	ND	660	ND	660
Isophorone	ug/kg	ND	3,300	ND	660	ND	660
2-Nitrophenol	ug/kg	ND	3,300	ND	660	ND	660
2,4-Dimethylphenol	ug/kg	ND	3,300	ND	660	ND	660
Bis(-2-Chloroethoxy) Methane	ug/kg	ND	3,300	ND	660	ND	660
2,4-Dichlorophenol	ug/kg	ND	3,300	ND	660	ND	660
1,2,4-Trichlorobenzene	ug/kg	ND	3,300	ND	660	ND	660
Naphthalene	ug/kg	ND	3,300	ND	660	ND	660

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/06/93
DATE ANALYZED: 07/09/93
DATE REPORTED: 07/19/93
PAGE: Seven

Sample Type: Soil

Method and Constituent	Units	MW-1-5.5		MW-3-5.5		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 8270 (Continued):							
Hexachlorobutadiene	ug/kg	ND	3,300	ND	660	ND	660
4-Chloro-3-Methylphenol	ug/kg	ND	6,500	ND	1,300	ND	1,300
Hexachlorocyclopentadiene	ug/kg	ND	3,300	ND	660	ND	660
2,4,6-Trichlorophenol	ug/kg	ND	3,300	ND	660	ND	660
2-Chloronaphthalene	ug/kg	ND	3,300	ND	660	ND	660
Dimethyl Phthalate	ug/kg	ND	3,300	ND	660	ND	660
Acenaphthylene	ug/kg	ND	3,300	ND	660	ND	660
Acenaphthene	ug/kg	ND	3,300	ND	660	ND	660
2,4-Dinitrophenol	ug/kg	ND	16,000	ND	3,300	ND	3,300
4-Nitrophenol	ug/kg	ND	16,000	ND	3,300	ND	3,300
2,4-Dinitrotoluene	ug/kg	ND	3,300	ND	660	ND	660
2,6-Dinitrotoluene	ug/kg	ND	3,300	ND	660	ND	660
Diethylphthalate	ug/kg	ND	3,300	ND	660	ND	660
4-Chlorophenylphenyl Ether	ug/kg	ND	3,300	ND	660	ND	660
Fluorene	ug/kg	ND	3,300	ND	660	ND	660
N-Nitrosodiphenylamine	ug/kg	ND	3,300	ND	660	ND	660
4-Bromophenylphenyl Ether	ug/kg	ND	3,300	ND	660	ND	660
Hexachlorobenzene	ug/kg	ND	3,300	ND	660	ND	660
Pentachlorophenol	ug/kg	ND	16,000	ND	3,300	ND	3,300
Phenanthrene	ug/kg	ND	3,300	ND	660	ND	660
Anthracene	ug/kg	ND	3,300	ND	660	ND	660

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/06/93
DATE ANALYZED: 07/09/93
DATE REPORTED: 07/19/93
PAGE: Eight

Sample Type: Soil

Method and Constituent:	Units	MW-1-5.5		MW-3-5.5		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 8270 (Continued):							
Di-N-Butylphthalate	ug/kg	ND	3,300	ND	660	ND	660
Fluoranthene	ug/kg	ND	3,300	ND	660	ND	660
Benzidine	ug/kg	ND	3,300	ND	660	ND	660
Pyrene	ug/kg	ND	3,300	ND	660	ND	660
Butylbenzylphthalate	ug/kg	ND	3,300	ND	660	ND	660
3,3′-Dichlorobenzidine	ug/kg	ND	6,500	ND	1,300	ND	1,300
Benzo(a)Anthracene	ug/kg	ND	3,300	ND	660	ND	660
Bis(2-Ethylhexyl) Phthalate	ug/kg	ND	3,300	ND	660	ND	660
Chrysene	ug/kg	ND	3,300	ND	660	ND	660
Di-N-Octyl Phthalate	ug/kg	ND	3,300	ND	660	ND	660
Benzo(b)Fluoranthene	ug/kg	ND	3,300	ND	660	ND	660
Benzo(k)Fluoranthene	ug/kg	ND	3,300	ND	660	ND	660
Benzo(a)Pyrene	ug/kg	ND	3,300	ND	660	ND	660
Indeno(1,2,3-cd)Pyrene	ug/kg	ND	3,300	ND	660	ND	660
Dibenzo(a,h)Anthracene	ug/kg	ND	3,300	ND	660	ND	660
Benzo(g,h,i)Perylene	ug/kg	ND	3,300	ND	660	ND	660
Surrogate % Recovery:							
2-Fluorophenol		140		130		145	
Phenol d6		123		113		124	
Nitrobenzene d5		59		49		61	
2-Fluorobiphenyl		69		58		70	
2-4-6 Tribromophenol		95		83		109	
p-Terphenyl-d14		91		79		94	

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/06/93
DATE ANALYZED: 07/15/93
DATE REPORTED: 07/19/93
PAGE: Nine

Sample Type: Soil

Method and Constituent:	Units	Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 8080:							
Aldrin	ug/kg	ND	3.3	ND	3.3	ND	3.3
Alpha-BHC	ug/kg	ND	3.3	ND	3.3	ND	3.3
Beta-BHC	ug/kg	ND	3.3	ND	3.3	ND	3.3
Delta-BHC	ug/kg	ND	3.3	ND	3.3	ND	3.3
Gamma-BHC (Lindane)	ug/kg	ND	3.3	ND	3.3	ND	3.3
Chlordane	ug/kg	ND	33	ND	33	ND	33
4,4′-DDD	ug/kg	ND	3.3	ND	3.3	ND	3.3
4,4′-DDE	ug/kg	ND	3.3	ND	3.3	ND	3.3
4,4′-DDT	ug/kg	ND	3.3	ND	3.3	ND	3.3
Dieldrin	ug/kg	ND	3.3	ND	3.3	ND	3.3
Endosulfan I	ug/kg	ND	3.3	ND	3.3	ND	3.3
Endosulfan II	ug/kg	ND	3.3	ND	3.3	ND	3.3
Endosulfan Sulfate	ug/kg	ND	3.3	ND	3.3	ND	3.3
Endrin	ug/kg	ND	3.3	ND	3.3	ND	3.3
Endrin Aldehyde	ug/kg	ND	3.3	ND	3.3	ND	3.3
Heptachlor	ug/kg	ND	3.3	ND	3.3	ND	3.3
Heptachlor Epoxide	ug/kg	ND	3.3	ND	3.3	ND	3.3
Methoxychlor	ug/kg	ND	3.3	ND	3.3	ND	3.3
Toxaphene	ug/kg	ND	33	ND	33	ND	33

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/06/93
DATE ANALYZED: 07/15/93
DATE REPORTED: 07/19/93
PAGE: Ten

Sample Type: Soil

		MW-1-5.5		MW-3-5.5		Method Blank	
Method and Constituent:	Units	Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reportin Limit
EPA Method 8080, continued							
Aroclor 1016	ug/kg	ND	33	ND	33	ND	33
Aroclor 1221	ug/kg	ND	33	ND	33	ND	33
Aroclor 1232	ug/kg	ND	33	ND	33	ND	33
Aroclor 1242	ug/kg	ND	33	ND	33	ND	33
Aroclor 1248	ug/kg	ND	33	ND	33	ND	33
Aroclor 1254	ug/kg	ND	33	ND	33	ND	33
Aroclor 1260	ug/kg	ND	33	ND	33	ND	33

QC Summary:

% Recovery: 138
% RPD: 6.8

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/02/93 and 07/06/93
DATE ANALYZED: 07/06/93, 07/07/93, 07/09/93 and 07/12/93
DATE REPORTED: 07/19/93
PAGE: Eleven

Sample Type: Soil

Method and Constituent:	Units	MW-1-5.5		MW-3-5.5		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 7040: Antimony	ug/kg	ND	79,000	ND	79,000	ND	79,000
EPA Method 7060: Arsenic	ug/kg	9,200	160	1,800	160	ND	160
EPA Method 7080: Barium	ug/kg	200,000	50,000	ND	50,000	ND	50,000
EPA Method 7090: Beryllium	ug/kg	240	120	220	120	ND	120
EPA Method 7130: Cadmium	ug/kg	ND	250	ND	250	ND	250
EPA Method 7190: Chromium	ug/kg	18,000	1,200	14,000	1,200	ND	1,200
EPA Method 219.1: Cobalt	ug/kg	17,000	12,000	ND	12,000	ND	12,000
EPA Method 7210: Copper	ug/kg	16,000	500	22,000	500	ND	500
EPA Method 7420: Lead	ug/kg	29,000	3,600	5,000	3,600	ND	3,600

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/02/93 and 07/06/93
DATE ANALYZED: 07/06/93, 07/07/93, 07/09/93 and 07/12/93
DATE REPORTED: 07/19/93
PAGE: Twelve

Sample Type: Soil

		MW-1-5.5		MW-3-5.5		Method Blank	
Method and Constituent:	Units	Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 7471:							
Mercury	ug/kg	ND	120	480	120	ND	120
EPA Method 246.1							
Molybdenum	ug/kg	ND	25,000	ND	25,000	ND	25,000
EPA Method 7520:							
Nickel	ug/kg	15,000	7,400	20,000	7,400	ND	7,400
EPA Method 7741:							
Selenium	ug/kg	ND	250	ND	250	ND	250
EPA Method 7760:							
Silver	ug/kg	ND	280	ND	280	ND	280
EPA Method 7840:							
Thallium	ug/kg	ND	2,500	ND	2,500	ND	2,500
EPA Method 7910:							
Vanadium	ug/kg	26,000	5,000	16,000	5,000	ND	5,000
EPA Method 7950:							
Zinc	ug/kg	78,000	1,200	71,000	1,200	ND	1,200

Concentrations reported as ND were not detected at or above the reporting limit.

Sample Type: Soil

Method and Constituent:	Units	QC Summary % Recovery	 % RPD
EPA Method 7040:			
Antimony	ug/kg	98*	11
EPA Method 7060:			
Arsenic	ug/kg	74	9.8
EPA Method 7080:			
Barium	ug/kg	106	6.5
EPA Method 7090:			
Beryllium	ug/kg	62	5.0
EPA Method 7130:			
Cadmium	ug/kg	83	5.7
EPA Method 7190:			
Chromium	ug/kg	68	5.7
EPA Method 219.1:			
Cobalt	ug/kg	81	6.1
EPA Method 7210:			
Copper	ug/kg	64	6.4
EPA Method 7420:			
Lead	ug/kg	76	4.2

Concentrations reported as ND were not detected at or above the reporting limit.
*The Recovery is for the Laboratory Control Sample, due to interference in the spiked sampl

Sample Type: Soil

Method and Constituent:	Units	QC Summary % Recovery	% RPD
EPA Method 7471:			
Mercury	ug/kg	104*	22
EPA Method 246.1			
Molybdenum	ug/kg	84	3.0
EPA Method 7520:			
Nickel	ug/kg	72	0.44
EPA Method 7741:			
Selenium	ug/kg	99*	**
EPA Method 7760:			
Silver	ug/kg	136*	46
EPA Method 7840:			
Thallium	ug/kg	104	5.8
EPA Method 7910:			
Vanadium	ug/kg	90	11
EPA Method 7950:			
Zinc	ug/kg	77	0.30

Concentrations reported as ND were not detected at or above the reporting limit.
*The Recovery is for the Laboratory Control Sample, due to interference in the spiked sample.
**The RPD is not reportable since the sample prepared in duplicate was not detectable.

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/06/93
DATE ANALYZED: 07/07/93
DATE REPORTED: 07/19/93
PAGE: Fifteen

Sample Type: Soil

Method and Constituent:	Units	MW-3-5.5 Concentration	MW-3-5.5 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8240:					
Chloromethane	ug/kg	ND	60	ND	60
Bromomethane	ug/kg	ND	60	ND	60
Dichlorodifluoromethane	ug/kg	ND	60	ND	60
Vinyl Chloride	ug/kg	ND	120	ND	120
Chloroethane	ug/kg	ND	120	ND	120
Iodomethane	ug/kg	ND	1,200	ND	1,200
Methylene Chloride	ug/kg	ND	1,200	ND	1,200
Acetone	ug/kg	ND	1,200	ND	1,200
Carbon Disulfide	ug/kg	ND	1,200	ND	1,200
Trichlorofluoromethane	ug/kg	ND	120	ND	120
1,1-Dichloroethene	ug/kg	ND	60	ND	60
Allyl Chloride	ug/kg	ND	60	ND	60
1,1-Dichloroethane	ug/kg	ND	60	ND	60
Trans-1,2-Dichloroethene	ug/kg	ND	60	ND	60
Chloroform	ug/kg	ND	60	ND	60
2-Butanone (MEK)	ug/kg	ND	1,200	ND	1,200
1,2-Dichloroethane	ug/kg	ND	60	ND	60
Dibromomethane	ug/kg	ND	60	ND	60
1,1,1-Trichloroethane	ug/kg	ND	60	ND	60
Carbon Tetrachloride	ug/kg	ND	60	ND	60

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/06/93
DATE ANALYZED: 07/07/93
DATE REPORTED: 07/19/93
PAGE: Sixteen

Sample Type: Soil

		MW-3-5.5		Method Blank	
Method and Constituent	Units	Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 8240 (Continued):					
Vinyl Acetate	ug/kg	ND	600	ND	600
Bromodichloromethane	ug/kg	ND	60	ND	60
1,2-Dichloropropane	ug/kg	ND	60	ND	60
Cis-1 3-Dichloropropene	ug/kg	ND	60	ND	60
Bromoacetone	ug/kg	ND	1,200	ND	1,200
Trichloroethene	ug/kg	ND	60	ND	60
Benzene	ug/kg	ND	60	ND	60
Chlorodibromomethane	ug/kg	ND	60	ND	60
1,1,2-Trichloroethane	ug/kg	ND	60	ND	60
Trans-1 3-Dichloropropane	ug/kg	ND	60	ND	60
1 2-Dibromoethane (EDB)	ug/kg	ND	60	ND	60
2-Chloroethylvinyl Ether	ug/kg	ND	120	ND	120
Acrolein	ug/kg	ND	1,200	ND	1,200
Bromoform	ug/kg	ND	60	ND	60
1,1,1,2-Tetrachloroethane	ug/kg	ND	60	ND	60
4-Methyl-2-Pentanone (MIBK)	ug/kg	ND	600	ND	600
2-Hexanone	ug/kg	ND	600	ND	600
1,2,3-Trichloropropane	ug/kg	ND	60	ND	60
1,1,2,2-Tetracholorethane	ug/kg	ND	60	ND	60
Tetrachloroethene	ug/kg	ND	60	ND	60
Toluene	ug/kg	ND	60	ND	60
Chlorobenzene	ug/kg	ND	60	ND	60
Ethyl Benzene	ug/kg	ND	60	ND	60

LOG NUMBER: 3361
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/06/93
DATE ANALYZED: 07/07/93
DATE REPORTED: 07/19/93
PAGE: Seventeen

Sample Type: Soil

		MW-3-5.5		Method Blank	
Method and Constituent	Units	Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 8240 (Continued):					
1,2-Dibromo 3-Chloropropane	ug/kg	ND	1,200	ND	1,200
Benzyl Chloride	ug/kg	ND	1,200	ND	1,200
Styrene	ug/kg	ND	60	ND	60
Xylenes	ug/kg	ND	180	ND	180
1,3-Dichlorobenzene	ug/kg	ND	60	ND	60
1,2-Dichlorobenzene	ug/kg	ND	60	ND	60
1,4-Dichlorobenzene	ug/kg	ND	60	ND	60
Surrogate % Recovery					
1,2-Dichloroethane-d4		126		99	
Toluene-d8		99		79	
4-Bromofluorobenzne		104		84	

Concentrations reported as ND were not detected at or above the reporting limit.

Louis W. DuPuis
Quality Assurance/Quality Control Manager

3361

Versar

CHAIN OF CUSTODY RECORD

Page 1 of 2

PROJECT NO.	PROJECT NAME ODDI	INDUSTRIAL HYGIENE SAMPLE	Y ☐ N ☐
SAMPLERS: *(Signature)* V. Elarth	(Printed) V. Elarth		

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPHD	TPH(G)(BTEX per KP)	TOG5520C+F (w/SG per KP)	8270	8080 (per KP)	CAM17	420.1	organotin	REMARKS
MW-1-2.0	6/23	1600		X		2	/	X	X						
MW-1-5.5		1615				1	X	X	X	X	X	X	X	X	~~[illegible]~~ V.E.
MW-1-10.5		1624				1									HOLD
MW-1-14.5		1642				1									HOLD
MW-2-2.5		1400				1	X	X	X						
MW-2-5.5		1414				1	X	X	X						
MW-2-10.5		1426				1									HOLD
MW-2-14.5		1440				1									HOLD
MW-4-1.5		1115				2	X	X	X						
MW-4-5.5		1140				1	X	/	X						
MW-4-10.5		1150				1									HOLD
MW-4-15.5	↓	12:15				1									HOLD

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
(Printed)		(Printed)	(Printed)		(Printed)
Relinquished by: *(Signature)* V. Elarth	Date / Time 6/24 3:10	Received for Laboratory by: *(Signature)* Scott Ferriman TAL	Date / Time 6/24/93 3:10 PM	Remarks Normal Turn Around	
(Printed) V Elarth		(Printed) ~~TA~~ Scott Ferriman		PU, Ice, Y-84	

3361

Versar

Page 2 of 2

CHAIN OF CUSTODY RECORD

PROJECT NO.	**PROJECT NAME** PODI	**INDUSTRIAL HYGIENE SAMPLE**	Y N
SAMPLERS: *(Signature)* V. Elarth	*(Printed)* V. Elarth		

PARAMETERS (BTEX/fuel D) (CA) part

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPHD	TFHG(BTEX)	TCG55 30C(H)	8270	8080 (pest/P)	CAM17	430-1	C[illegible]	3240	REMARKS
mw-3-2.0	6/24	1000		X		2	X	X	X							
mw-3-5.5		1014				1	X	X	X	X	X	X	X	X	X	
mw-3-10.5		1030				1										HOLD
mw-3-15.5		1140				1										HOLD
mw-5-2.0		1300				1	X	X	X							
mw-5-5.5		1308				1	X	X	X							
mw-5-10.5		1323				1										HOLD
mw-5-15.5	✓	1340				1										HOLD

Relinquished by: *(Signature)*	**Date / Time**	**Received by:** *(Signature)*	**Relinquished by:** *(Signature)*	**Date / Time**	**Received by:** *(Signature)*
(Printed)		(Printed)	(Printed)		(Printed)

Relinquished by: *(Signature)* V. Elarth	**Date / Time** 6/24 / 5:10	**Received for Laboratory by:** *(Signature)* Scott T Ferrman TAL	**Date / Time** 6/24/95 / 340 PM	**Remarks** Normal Turn Around
(Printed) V. Elarth		(Printed) Scott T. Ferrman		

TOTAL PETROLEUM HYDROCARBONS AS DIESEL, KEROSENE, JET FUEL OR MOTOR OIL FOR SOIL

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California. This method uses an alternative column and flow rate as specified below.

Sample Preparation:

Approximately 50 grams of soil are extracted with 80 ml of solvent on a mechanical shaker for 4 hours. The extract is filtered and dried with anhydrous sodium sulfate. It is then concentrated using a Kuderna-Danish apparatus and brought to 10ml.

Sample Introduction:

The extracts are analyzed by direct injection into a gas chromatograph (GC).

Gas Chromatography Analysis:

The extractable hydrocarbons are separated on a 6-ft by 2 mm I.D. gas chromatography column packed with 10% SP-2100 on Supelcoport and then detected by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	250^{o} C
DETECTOR TEMPERATURE:	300^{o} C
INITIAL TEMPERATURE: Hold for 4 minutes	40^{o} C
PROGRAM RATE:	10^{o} C/min.
FINAL TEMPERATURE: Hold for 10 minutes	265^{o} C

Calculation:

Total Petroleum Hydrocarbons as Diesel is quantified by comparing the sum of the area of peaks from the sample, that elute in the same time range as the standard, to the sum of the area of peaks in the standard. The standard may be diesel, kerosene, jet fuel, or other compounds depending on the source of the sample.

2/20/91

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPH-G) FOR SOIL, BY PURGE AND TRAP

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column, flow rate, and temperature program as specified below.

Sample Preparation:

Approximately 15 grams of the soil sample are added to 10 ml of methanol. The sample is extracted by agitation.

Sample Introduction:

Methanol extracts are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A flame ionization detector (FID) is used to detect total petroleum hydrocarbons as gasoline (TPH-G). The FID is preceded by a photoionization detector (PID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

Calculation:

Total Petroleum Hydrocarbons as Gasoline is quantified by comparing the sum of the area of peaks from the sample to the sum of the area of peaks in the gasoline standard.

3/13/91

BENZENE, TOLUENE, XYLENES, AND ETHYLBENZENE (BTXE) FOR SOIL, BY PURGE AND TRAP

Method:

This method is EPA Method 8020 as referenced in the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative carrier gas as specified below.

Sample Preparation:

Approximately 15 grams of the soil sample are added to 10 ml of methanol. The sample is extracted by agitation.

Sample Introduction:

Methanol extracts are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A photoionization detector (PID) is used to detect BTXE. The PID is followed by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240^{o} C
DETECTOR TEMPERATURE:	270^{o} C
INITIAL TEMPERATURE: Hold for 2 minutes	50^{o} C
PROGRAM RATE:	6^{o} C/min.
FINAL TEMPERATURE: Hold for 17 minutes	90^{o} C

Calculation:

BTXE are identified by comparing the retention times of the sample peaks to those of the standards. BTXE are quantified by comparing the area of the sample peaks to those of the standards. If BTX or E is present and Total petroleum Hydrocarbons as Gasoline (TPH-G) is not, the analysis is confirmed by using a second column or a gas chromatograph mass spectrometer (GC/MS).

3/13/91

PETROLEUM HYDROCARBONS, TOTAL RECOVERABLE FOR SOIL

Method:

This is EPA method 418.1 from Methods for Chemical Analysis of Water and Wastes, March 1983. This test eliminates oil and grease from animal and vegetable sources.

Sample Preparation and Analysis

Oil and grease are extracted from the sample with freon by agitation, sonication or soxhlet extraction.

The freon extract is dried with sodium sulfate and then treated with silica gel. Non-petroleum oil and grease is removed by absorption onto the silica gel. The absorbance of the remaining extract is measured with an infrared spectrophotometer.

Calculation

The oil and grease content is calculated by comparison to standards.

EPA METHOD 8270, SEMIVOLATILE ORGANICS FOR SOIL

Method:

This is EPA Method 8270 from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd edition, by the U.S. Environmental Protecton Agency.

Sample Preparation:

Sample preparation is by EPA Method 3550, solvent extraction with sonication. Methylene chloride is the solvent used. The extraction is followed by a concentration process using a Kuderna-Danish apparatus.

Sample Introduction:

Samples are introduced by direct injection.

Gas Chromatography Analysis:

The semivolatile organics are separated on a capillary gas chromatography column. A mass spectrometer is used to detect the compounds.

Calculation:

Compounds are identified by comparing ion spectra with the ion spectra of the 8270 compounds in our standards. The compounds are quantified by using the internal standard method of calibration.

8/90

EPA METHOD 8240, VOLATILE ORGANICS FOR WATER

Method:

This is EPA Method 8240 from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

There is no sample preparation other than dilution.

Sample Introduction:

Water samples are introduced to the gas chromatograph (GC) by EPA Method 5030, purge and trap. Up to 5 ml of sample is purged by this method.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 1% SP-1000 on Carbopack-B. A mass spectrometer is used to detect the compounds.

Gas Chromatograph Conditions:

CARRIER GAS:	Helium
FLOW RATE:	40 ml/min.
INJECTOR TEMPERATURE:	225^{0} C
DETECTOR TEMPERATURE:	275^{0} C
INITIAL TEMPERATURE: Hold for 3 minutes	45^{0} C
PROGRAM RATE:	8^{0} C/min.
FINAL TEMPERATURE: Hold for 15 minutes	220^{0} C

Calculation:

The compounds are quantified by using the internal standard method of calibration. Compounds are identified by comparing ion spectra with the ion spectra of the 8240 compounds in our standard.

EPA METHOD 8080, ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (PCBS) FOR SOIL

Method:

This is EPA Method 8080 from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd edition, by the U.S. Environmental Protecton Agency.

Sample Preparation:

EPA Method 3550 (sonication extraction) is used to prepare soil samples. The sample is extracted with methylene chloride three times. The extracts are combined and concentrated in a Kuderna - Danish apparatus.

Sample Introduction:

Samples are introduced by direct injection.

Gas Chromatography Analysis:

The compounds are separated on a 6-ft. x 2mm I.D. gas chromatography column packed with 1.5% SP-2250 + 1.95% SP-2401 on Supelcoport. An electron capture detector is used to detect the compounds.

Gas Chromatograph Conditions:

CARRIER GAS:	Argon/Methane
FLOW RATE:	50 ml/min
TEMPERATURE PROGRAM:	200^{0} C for 26 min.

Calculation:

The compounds are quantified by comparison to external standards.

EPA METHOD 7040 - ANTIMONY (Sb) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Antimony
Wavelength:	217.6 nm
Heat Source:	Flame

Atomic Absorption Analysis:

A portion of the sample is aspirated into the flame. The element then absorbs energy from the lamp. The magnitude of absorbance is displayed.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7060 - ARSENIC (As) BY FURNACE

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency. This method uses an alternative heat source as specified below.

Sample Preparation:

Water samples are prepared by EPA Method 3020, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Arsenic
Wavelength:	193.7 nm
Heat Source:	Graphite Furnace

Atomic Absorption Analysis:

A portion of the sample is placed into the graphite furnace. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7080 - BARIUM (Ba) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Barium
Wavelength:	553.6 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7090 - BERYLLIUM (Be) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Beryllium
Wavelength:	234.9 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7130 - CADMIUM (Cd) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp: Cadmium
Wavelength: 228.8 nm
Heat Source: Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7190 - CHROMIUM (Cr) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Chromium
Wavelength:	357.9 nm
Heat Source:	Nitrous Oxyde-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 219.1 - COBALT (Co) BY FLAME

Method:

This method is from "Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020," by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Cobalt
Wavelength:	240.7 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7210 - COPPER (Cu) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Copper
Wavelength:	324.8 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7420 - LEAD (Pb) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Lead
Wavelength:	283.3 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit then displays the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHODS 7470 and 7471 - MERCURY (Hg) BY COLD VAPOR

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 7470. The sample is digested with acid, potassium permanganate, and heat.

Soil samples are prepared by EPA Method 7471. The sample is dried, sifted, and digested with aqua regia, potassium permanganate, and heat.

Atomic Absorption Conditions:

Lamp:	Mercury
Wavelength:	253.7
Heat Source:	None

Atomic Absorption Analysis:

The sample is placed into a reaction vessel. A metal hydride gas is formed. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 246.1 - MOLYBDENUM (Mo) BY FLAME

Method:

This method is from "Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020," by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Molybdenum
Wavelength:	313.3 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7520 - NICKEL (Ni) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Nickel
Wavelength:	231.6 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7740 - SELENIUM (Se) BY FURNACE

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency. This method uses an alternative heat source as specified below.

Sample Preparation:

Water samples are prepared by EPA Method 3020, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Selenium
Wavelength:	196.0 nm
Heat Source:	Graphite Furnace

Atomic Absorption Analysis:

A portion of the sample is placed into the graphite furnace. The element absorbs energy from the lamp. The magnitude of the absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7760 - SILVER (Ag) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 7760, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Silver
Wavelength:	328.1 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7840 - THALLIUM (Tl) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 3rd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Thallium
Wavelength:	276.8 nm
Heat Source:	Flame

Atomic Absorption Analysis:

The sample is aspirated into the flame. The element then absorbs energy from the lamp. The magnitude of absorbance is displayed and also recorded on a strip chart recorder.

Calculation:

The concentration is quantified by comparing the magnitude of absorbance of the sample to the absorbance of standards. The calculation considers the amount of sample used and the subsequent dilution of the sample.

5/23/91

EPA METHOD 7910 - VANADIUM (V) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Vanadium
Wavelength:	318.4 nm
Heat Source:	Nitrous Oxide-Acetylene flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

EPA METHOD 7950 - ZINC (Zn) BY FLAME

Method:

This method is from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd Edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

Water samples are prepared by EPA Method 3010, which is a digestion using acid and heat.

Soil samples are prepared by EPA Method 3050. The sample is dried, sifted, and digested with acid, hydrogen peroxide, and heat.

Atomic Absorption Conditions:

Lamp:	Zinc
Wavelength:	213.9 nm
Heat Source:	Acetylene-Air flame

Atomic Absorption Analysis:

The sample is directly aspirated into the flame. The element entering the flame absorbs energy from the lamp. The atomic absorption unit will then display the concentration of the sample aspirated into the flame.

Calculation:

The concentration displayed is adjusted to account for the amount of sample used and the subsequent dilution of the sample.

1/2/90

COPY

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (510) 783-6960
Facsimile (510) 783-1512
TAL

August 3, 1993

Mr. Larry Kleinecke
Versar, Inc.
5330 Primrose Drive, Suite 228
Fair Oaks, California 95628

Dear Mr. Kleinecke:

Trace Analysis Laboratory received twenty soil samples on June 24, 1993 for your Project PDDI, (our custody log number 3361A).

Two of these samples were analyzed for Organotin. Our analytical report, the completed chain of custody form, and our analytical methodologies are enclosed for your review.

Trace Analysis Laboratory is certified under the California Environmental Laboratory Accreditation Program. Our certification number is 1199.

If you should have any questions or require additional information, please call me.

Sincerely yours,

Scott T. Ferriman

Scott T. Ferriman
Project Specialist

Enclosures

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (510) 783-6960
Facsimile (510) 783-1512

LOG NUMBER: 3361A
DATE SAMPLED: 06/23/93 and 06/24/93
DATE RECEIVED: 06/24/93
DATE EXTRACTED: 07/21/93
DATE ANALYZED: 07/23/93
DATE REPORTED: 08/03/93

CUSTOMER: Versar, Inc.

REQUESTER: Lawrence Kleinecke

PROJECT: PDDI

Sample Type: Soil

		MW-1-5.5		MW-3-5.5		Method Blank		Spike Recovery
Method and Constituent:	Units	Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit	%
Organo Tin Analysis by Gas Chromatography:								
Monobutylin	ug/kg	ND	3.0	ND	3.0	ND	3.0	5
Dibutyltin	ug/kg	ND	3.0	ND	3.0	ND	3.0	131
Tributyltin	ug/kg	3.0	3.0	ND	3.0	ND	3.0	69
Tetrabutyltin	ug/kg	ND	3.0	ND	3.0	ND	3.0	60
Surrogate % Recovery:								
Tripropyltin		116		62		79		89

Concentrations reported as ND were not detected at or above the reporting limit.

Concentrations are on a dry weight basis.

Louis W. DuPuis
Quality Assurance/Quality Control Manager

ToxScan Inc.

42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

Trace Analysis Laboratory, Inc.
3423 Investment Blvd. # 8
Hayward, CA. 94545

July 27, 1993

Attn: Scott Ferriman

MATERIAL:	Soil samples received July 2, 1993
DATE SAMPLED:	June 23-24, 1993
ANALYSIS COMPLETED:	July 23, 1993
EXTRACTION DATE:	July 21, 1993
IDENTIFICATION:	Project 3361
TOXSCAN NUMBER:	T-9958
REPORT:	Quantitative chemical analysis for butyltin species by pentyl derivatization using a Gas Chromatograph with a Flame Photometric Detector is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Sample ID	Monobutyltin	Dibutyltin	Tributyltin	Tetrabutyltin	% TPT SUR
MW-1-5.5	ND	ND	3	ND	116
MW-3-5.5	ND	ND	ND	ND	62
Spike of T-9799-52 recovery as (%)	5	131	69	60	89
Blank	ND	ND	ND	ND	79

TPT SUR = Tripropyltin surrogate recovery

ND = None detected

Detection limit = 3 ppb

Philip D. Carpenter
Laboratory Director

RECEIVED JUL 3 1 1993

ToxScan Inc.

42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

Trace Analysis Laboratory, Inc.
3423 Investment Blvd. # 8
Hayward, CA. 94545

July 27, 1993

Attn: Scott Ferriman

MATERIAL: Soil samples received July 2, 1993
DATE SAMPLED: June 23-24, 1993
ANALYSIS COMPLETED: July 13, 1993
IDENTIFICATION: Project 3361
TOXSCAN NUMBER: T-9958
REPORT: Quantitative analysis for percent solids is as follows:

Sample ID	Percent Solids
MW -1-5.5	91
MW-3-5.5	90

Philip D. Carpenter
Laboratory Director

3361

Versar

Page 1 of 2

CHAIN OF CUSTODY RECORD

PROJECT NO.	**PROJECT NAME** PODI	**INDUSTRIAL HYGIENE SAMPLE** Y / N
SAMPLERS: *(Signature)* V. Elarth	*(Printed)* V. Elarth	

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	T8HD	TFH(G/BTEX per L-D)	TOG5520C+F (w/s 1 per...)	8270	8080 (per LD)	CAM17	420.1	organotin	REMARKS
mw-1-2.0	6/23	1600		X		2	Y	X	X						
mw-1-5.5		1615				1	X	X	X	X	X	X	X	X	VE
mw-1-10.5		1624				1									HOLD
mw-1-14.5		1642				1									HOLD
mw-2-2.5		1400				1	X	X	X						
mw-2-5.5		1414				1	X	X	X						
mw-2-10.5		1426				1									HOLD
mw-2-14.5		1440				1									HOLD
mw-4-1.5		1115				2	X	X	X						
mw-4-5.5		1140				1	X	/	X						
mw-4-10.5		1150				1									HOLD
mw-4-15.5	↓	12:15				1									HOLD

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
(Printed)		(Printed)	(Printed)		(Printed)

Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks
V. Elarth	6/24 3:10	TAL Scott Ferriman	6/24/93 3:10 pm	Normal Turn Around
(Printed) V Elarth		(Printed) ~~[illegible]~~ Scott Ferriman		pH, Ice, Y-84

336L

Page 2 of 2

Versar

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME PODI	INDUSTRIAL HYGIENE SAMPLE Y / N
SAMPLERS: (Signature) V. Elarth	(Printed) V. Elarth	

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH D	TFH (extended D)	TVG 5530 CTF	8270	8080 (pest-P)	CAM 17	420-1	Organotin	8240	REMARKS
mw-3-2.0	6/24	1000		X		2	X	X	X							
mw-3-5.5		1014				1	X	X	X	X	X	X	X	X	X	
mw-3-10.5		1030				1										HOLD
mw-3-15.5		1140				1										HOLD
mw-5-2.0		1300				1	X	X	X							
mw-5-5.5		1308				1	X	X	X							
mw-5-10.5		1323				1										HOLD
mw-5-15.5		1340				1										HOLD

Relinquished by: (Signature)
(Printed)
Date / Time
Received by: (Signature)
(Printed)

Relinquished by: (Signature)
(Printed)
Date / Time
Received by: (Signature)
(Printed)

Relinquished by: (Signature) V. Elarth
(Printed) V. Elarth
Date / Time 6/24 | 3:10

Received for Laboratory by: (Signature) Scott T. Ferriman TAL
(Printed) Scott T. Ferriman
Date / Time 6/24/93 | 3:10 PM

Remarks Normal Turn Around

Distribution: Original Plus One Accompanies Shipment (white and yellow); Copy to Coordinator Field Files (pink).

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545
Telephone (510) 783-6960
Facsimile (510) 783-1512
TAL

July 22, 1993

Mr. Larry Kleinecke
Versar, Inc.
5330 Primrose Drive, Suite 228
Fair Oaks, California 95628

Dear Mr. Kleinecke:

Trace Analysis Laboratory received five water samples on July 1, 1993 for your Project, Crowley, PDDI (our custody log number 3383).

These samples were analyzed according to your chain of custody. Our analytical report, the completed chain of custody form, and our analytical methodologies are enclosed for your review.

Trace Analysis Laboratory is certified under the California Environmental Laboratory Accreditation Program. Our certification number is 1199.

If you should have any questions or require additional information, please call me.

Sincerely yours,

For Scott T. Ferriman
Project Specialist

Enclosures

Founding Member of the Association of California Testing Laboratories

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545

Telephone (510) 783-6960
Facsimile (510) 783-1512

TAL

LOG NUMBER: 3383
DATE SAMPLED: 07/01/93
DATE RECEIVED: 07/01/93
DATE ANALYZED: 07/04/93 and 07/09/93
DATE REPORTED: 07/22/93

CUSTOMER: Versar, Inc.

REQUESTER: Larry Kleinecke

PROJECT: Crowley, PDDI

Sample Type: Water

Method and Constituent:	Units	MW-1		MW-2		MW-4	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/l	ND	50	ND	50	ND	50
Modified EPA Method 8020 for:							
Benzene	ug/l	ND	0.50	ND	0.50	ND	0.50
Toluene	ug/l	ND	0.50	ND	0.50	ND	0.50
Ethylbenzene	ug/l	ND	0.50	ND	0.50	ND	0.50
Xylenes	ug/l	ND	1.5	ND	1.5	ND	1.5

Method and Constituent:	Units	MW-5		MW-3		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/l	ND	50	ND	50	ND	50
Modified EPA Method 8020 for:							
Benzene	ug/l	ND	0.50	ND	0.50	ND	0.50
Toluene	ug/l	ND	0.50	ND	0.50	ND	0.50
Ethylbenzene	ug/l	ND	0.50	ND	0.50	ND	0.50
Xylenes	ug/l	ND	1.5	ND	1.5	ND	1.5

QC Summary:

% Recovery: 86, 100
% RPD: 13, 10

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3383
DATE SAMPLED: 07/01/93
DATE RECEIVED: 07/01/93
DATE EXTRACTED: 07/12/93
DATE ANALYZED: 07/20/93 and 07/21/93
DATE REPORTED: 07/22/93
PAGE: Two

Sample Type: Water

		MW-1		MW-2		MW-5	
Method and Constituent:	Units	Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/l	ND	50	ND	50	ND	50

		MW-3		Method Blank	
Method and Constituent:	Units	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method:					
Total Petroleum Hydrocarbons as Diesel	ug/l	ND	50	ND	50

QC Summary:

% Recovery: 79
% RPD: 13

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3383
DATE SAMPLED: 07/01/93
DATE RECEIVED: 07/01/93
DATE EXTRACTED: 07/20/93
DATE ANALYZED: 07/21/93 and 07/22/93
DATE REPORTED: 07/22/93
PAGE: Three

Sample Type: Water

		MW-1		MW-2		MW-5	
Method and Constituent:	Units	Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
Standard Method 5520 Hydrocarbons:							
Oil and Grease	ug/l	ND	1,000	ND	1,000	ND	1,000

		MW-3		Method Blank	
Method and Constituent:	Units	Concentration	Reporting Limit	Concentration	Reporting Limit
Standard Method 5520 Hydrocarbons:					
Oil and Grease	ug/l	ND	1,000	ND	1,000

QC Summary:

% Recovery: 73
% RPD: 2.0

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3383
DATE SAMPLED: 07/01/93
DATE RECEIVED: 07/01/93
DATE EXTRACTED: 07/02/93
DATE ANALYZED: 07/17/93
DATE REPORTED: 07/22/93
PAGE: Four

Sample Type: Water

		MW-3		Method Blank	
Method and Constituent:	Units	Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 8270:					
N-Nitrosodimethylamine	ug/l	ND	10	ND	10
Phenol	ug/l	ND	10	ND	10
Bis (-2-Chloroethyl) ether	ug/l	ND	10	ND	10
2-Chlorophenol	ug/l	ND	10	ND	10
1,3-Dichlorobenzene	ug/l	ND	10	ND	10
1,4-Dichlorobenzene	ug/l	ND	10	ND	10
1,2-Dichlorobenzene	ug/l	ND	10	ND	10
N-Nitroso-Di-N-Propylamine	ug/l	ND	10	ND	10
Hexachloroethane	ug/l	ND	10	ND	10
Nitrobenzene	ug/l	ND	10	ND	10
Isophorone	ug/l	ND	10	ND	10
2-Nitrophenol	ug/l	ND	10	ND	10
2,4-Dimethylphenol	ug/l	ND	10	ND	10
Bis(-2-Chloroethoxy) Methane	ug/l	ND	10	ND	10
2,4-Dichlorophenol	ug/l	ND	10	ND	10
1,2,4-Trichlorobenzene	ug/l	ND	10	ND	10
Naphthalene	ug/l	ND	10	ND	10

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3383
DATE SAMPLED: 07/01/93
DATE RECEIVED: 07/01/93
DATE EXTRACTED: 07/02/93
DATE ANALYZED: 07/17/93
DATE REPORTED: 07/22/93
PAGE: Five

Sample Type: Water

Method and Constituent	Units	MW-3		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 8270 (Continued):					
Hexachlorobutadiene	ug/l	ND	10	ND	10
4-Chloro-3-Methylphenol	ug/l	ND	20	ND	20
Hexachlorocyclopentadiene	ug/l	ND	10	ND	10
2,4,6-Trichlorophenol	ug/l	ND	10	ND	10
2-Chloronaphthalene	ug/l	ND	10	ND	10
Dimethyl Phthalate	ug/l	ND	10	ND	10
Acenaphthylene	ug/l	ND	10	ND	10
Acenaphthene	ug/l	ND	10	ND	10
2,4-Dinitrophenol	ug/l	ND	50	ND	50
4-Nitrophenol	ug/l	ND	50	ND	50
2,4-Dinitrotoluene	ug/l	ND	10	ND	10
2,6-Dinitrotoluene	ug/l	ND	10	ND	10
Diethylphthalate	ug/l	ND	10	ND	10
4-Chlorophenylphenyl Ether	ug/l	ND	10	ND	10
Fluorene	ug/l	ND	10	ND	10
N-Nitrosodiphenylamine	ug/l	ND	10	ND	10
4-Bromophenylphenyl Ether	ug/l	ND	10	ND	10
Hexachlorobenzene	ug/l	ND	10	ND	10
Pentachlorophenol	ug/l	ND	50	ND	50
Phenanthrene	ug/l	ND	10	ND	10
Anthracene	ug/l	ND	10	ND	10

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3383
DATE SAMPLED: 07/01/93
DATE RECEIVED: 07/01/93
DATE EXTRACTED: 07/02/93
DATE ANALYZED: 07/17/93
DATE REPORTED: 07/22/93
PAGE: Six

Sample Type: Water

Method and Constituent:	Units	MW-3 Concentration	MW-3 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8270 (Continued):					
Di-N-Butylphthalate	ug/l	ND	10	ND	10
Fluoranthene	ug/l	ND	10	ND	10
Benzidine	ug/l	ND	10	ND	10
Pyrene	ug/l	ND	10	ND	10
Butylbenzylphthalate	ug/l	ND	10	ND	10
3,3′-Dichlorobenzidine	ug/l	ND	20	ND	20
Benzo(a)Anthracene	ug/l	ND	10	ND	10
Bis(2-Ethylhexyl) Phthalate	ug/l	ND	10	ND	10
Chrysene	ug/l	ND	10	ND	10
Di-N-Octyl Phthalate	ug/l	ND	10	ND	10
Benzo(b)Fluoranthene	ug/l	ND	10	ND	10
Benzo(k)Fluoranthene	ug/l	ND	10	ND	10
Benzo(a)Pyrene	ug/l	ND	10	ND	10
Indeno(1,2,3-cd)Pyrene	ug/l	ND	10	ND	10
Dibenzo(a,h)Anthracene	ug/l	ND	10	ND	10
Benzo(g,h,i)Perylene	ug/l	ND	10	ND	10

Surrogate % Recovery:	MW-3	Method Blank
2-Fluorophenol	71	71
Phenol d6	55	56
Nitrobenzene d5	47	52
2-Fluorobiphenyl	63	67
2-4-6 Tribromophenol	46	49
p-Terpheny-dl4	82	99

Concentrations reported as ND were not detected at or above the reporting limit.

LOG NUMBER: 3383
DATE SAMPLED: 07/01/93
DATE RECEIVED: 07/01/93
DATE ANALYZED: 07/08/93
DATE REPORTED: 07/22/93
PAGE: Seven

Sample Type: Water

Method and Constituent:	Units	MW-3 Concentration	MW-3 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8240:					
Chloromethane	ug/l	ND	5.0	ND	5.0
Bromomethane	ug/l	ND	5.0	ND	5.0
Dichlorodifluoromethane	ug/l	ND	5.0	ND	5.0
Vinyl Chloride	ug/l	ND	10	ND	10
Chloroethane	ug/l	ND	10	ND	10
Iodomethane	ug/l	ND	100	ND	100
Methylene Chloride	ug/l	ND	100	ND	100
Acetone	ug/l	ND	100	ND	100
Carbon Disulfide	ug/l	ND	100	ND	100
Trichlorofluoromethane	ug/l	ND	10	ND	10
1,1-Dichloroethene	ug/l	ND	5.0	ND	5.0
Allyl Chloride	ug/l	ND	5.0	ND	5.0
1,1-Dichloroethane	ug/l	ND	5.0	ND	5.0
Trans-1,2-Dichloroethene	ug/l	ND	5.0	ND	5.0
Chloroform	ug/l	ND	5.0	ND	5.0
2-Butanone (MEK)	ug/l	ND	100	ND	100
1,2-Dichloroethane	ug/l	ND	5.0	ND	5.0
Dibromomethane	ug/l	ND	5.0	ND	5.0
1,1,1-Trichloroethane	ug/l	ND	5.0	ND	5.0
Carbon Tetrachloride	ug/l	ND	5.0	ND	5.0

LOG NUMBER: 3383
DATE SAMPLED: 07/01/93
DATE RECEIVED: 07/01/93
DATE ANALYZED: 07/08/93
DATE REPORTED: 07/22/93
PAGE: Eight

Sample Type: Water

Method and Constituent	Units	MW-3		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 8240 (Continued):					
Vinyl Acetate	ug/l	ND	50	ND	50
Bromodichloromethane	ug/l	ND	5.0	ND	5.0
1,2-Dichloropropane	ug/l	ND	5.0	ND	5.0
Cis-1 3-Dichloropropene	ug/l	ND	5.0	ND	5.0
Bromoacetone	ug/l	ND	100	ND	100
Trichloroethene	ug/l	ND	5.0	ND	5.0
Benzene	ug/l	ND	5.0	ND	5.0
Chlorodibromomethane	ug/l	ND	5.0	ND	5.0
1,1,2-Trichloroethane	ug/l	ND	5.0	ND	5.0
Trans-1 3-Dichloropropene	ug/l	ND	5.0	ND	5.0
1 2-Dibromoethane (EDB)	ug/l	ND	5.0	ND	5.0
2-Chloroethylvinyl Ether	ug/l	ND	10	ND	10
Acrolein	ug/l	ND	100	ND	100
Bromoform	ug/l	ND	5.0	ND	5.0
1,1,1,2-Tetrachloroethane	ug/l	ND	5.0	ND	5.0
4-Methyl-2-Pentanone (MIBK)	ug/l	ND	50	ND	50
2-Hexanone	ug/l	ND	50	ND	50
1,2,3-Trichloropropane	ug/l	ND	5.0	ND	5.0
1,1,2,2-Tetracholorethane	ug/l	ND	5.0	ND	5.0
Tetrachloroethene	ug/l	ND	5.0	ND	5.0
Toluene	ug/l	ND	5.0	ND	5.0
Chlorobenzene	ug/l	ND	5.0	ND	5.0
Ethyl Benzene	ug/l	ND	5.0	ND	5.0

LOG NUMBER: 3383
DATE SAMPLED: 07/01/93
DATE RECEIVED: 07/01/93
DATE ANALYZED: 07/08/93
DATE REPORTED: 07/22/93
PAGE: Nine

Sample Type: Water

Method and Constituent	Units	MW-3 Concentration	MW-3 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8240 (Continued):					
1,2-Dibromo 3-Chloropropane	ug/l	ND	100	ND	100
Benzyl Chloride	ug/l	ND	100	ND	100
Styrene	ug/l	ND	5.0	ND	5.0
Xylenes	ug/l	ND	15	ND	15
1,3-Dichlorobenzene	ug/l	ND	5.0	ND	5.0
1,2-Dichlorobenzene	ug/l	ND	5.0	ND	5.0
1,4-Dichlorobenzene	ug/l	ND	5.0	ND	5.0
Surrogate % Recovery					
1,2-Dichloroethane-d4		124		92	
Toluene-d8		94		61	
4-Bromofluorobenzne		98		71	

Concentrations reported as ND were not detected at or above the reporting limit.

Louis W. DuPuis
Quality Assurance/Quality Control Manager

3383

Versar

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME Crowley - PDDI	INDUSTRIAL HYGIENE SAMPLE Y / N
SAMPLERS: (Signature) Vernon P. Elarth	(Printed) Vernon P. Elarth	

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH-G	TPH-D	TPH-O&G	BTEX	8270	8240			REMARKS
mw-1	7/1	1506		X	Amber Liter	2		X	X						
	7/1	1506			VOA	2	X			X					
mw-2	7/1	1540			Amber	2		X	X						
	7/1	1540			VOA	2	X			X					
mw-34.	~~7/1~~	~~1205~~			V.E. ~~Amber~~	~~2~~		~~X~~	~~X~~						
	7/1	1205			VOA	2	X			X					
mw-5	7/1	1000			Amber	2		X	X						
	7/1	1000			VOA	2	X			X					
mw-3	7/1	1300			VOA	2	X			X					
	7/1	1300			Amber	2		X	X						
	7/1	1300			VOA	3						X			
	7/1	1300			Amber	1					X				

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
(Printed)		(Printed)	(Printed)		(Printed)
Relinquished by: (Signature) Vernon P. Elarth	Date / Time 7/1/93 5:06pm	Received for Laboratory by: (Signature) for TAL	Date / Time	Remarks reg TAT, walked in, water, 1 liter w/ HCl - O&G, 1-liter unpres TPHD, 8270 2-40ml HCl - TPHG/BTEX, 8240, Green	
(Printed) Vernon P. Elarth		(Printed) Louis Du Puis			

TOTAL PETROLEUM HYDROCARBONS AS DIESEL, KEROSENE, OR JET FUEL FOR WATER

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column and flow rate as specified below.

Sample Preparation:

EPA Method 3510 (separatory funnel liquid-liquid extraction) is used to prepare water samples. The sample is extracted with methylene chloride three times. The extracts are combined, then filtered and dried with anhydrous sodium sulfate. It is then concentrated using a Kuderna-Danish apparatus and brought to 10ml.

Sample Introduction:

The extracts are analyzed by direct injection into a gas chromatograph (GC).

Gas Chromatography Analysis:

The extractable hydrocarbons are separated on a 6-ft by 2 mm I.D. gas chromatography column packed with 10% SP-2100 on Supelcoport and then detected by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	250^{o} C
DETECTOR TEMPERATURE:	300^{o} C
INITIAL TEMPERATURE: Hold for 4 minutes	40^{o} C
PROGRAM RATE:	10^{o} C/min.
FINAL TEMPERATURE: Hold for 10 minutes	265^{o} C

Calculation:

Total Petroleum Hydrocarbons as Diesel is quantified by comparing the sum of the area of peaks from the sample, that elute in the same time range as the standard, to the sum of the area of peaks in the standard. The standard may be diesel, kerosene, jet fuel, or other compounds depending on the source of the sample.

1/2/90

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (TPH-G) FOR WATER, BY PURGE AND TRAP

Method:

This method is based on the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative column, flow rate, and temperature program as specified below.

Sample Preparation:

There is no sample preparation other than dilution.

Sample Introduction:

Water samples are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap. Up to 5 ml of sample is purged by this method.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A flame ionization detector (FID) is used to detect total petroleum hydrocarbons as gasoline (TPH-G). The FID is preceded by a photoionization detector (PID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240^{0} C
DETECTOR TEMPERATURE:	270^{0} C
INITIAL TEMPERATURE: Hold for 2 minutes	50^{0} C
PROGRAM RATE:	6^{0} C/min.
FINAL TEMPERATURE: Hold for 17 minutes	90^{0} C

Calculation:

Total Petroleum Hydrocarbons as Gasoline is quantified by comparing the sum of the area of peaks from the sample, to the sum of the area of peaks in the gasoline standard.

1/2/90

TAL Trace Analysis Laboratory, Inc.

BENZENE, TOLUENE, XYLENES, AND ETHYLBENZENE (BTXE) FOR WATER, BY PURGE AND TRAP

Method:

This method is EPA Method 8020 as referenced in the "Leaking Underground Fuel Tank (Luft) Field Manual," May 1988, prepared by the State of California, and on the "Regional Board Staff Recommendations," May 1989, by the North Coast, San Francisco, and Central Valley Regional Water Quality Control Boards. This method uses an alternative carrier gas as specified below.

Sample Preparation:

There is no sample preparation other than dilution.

Sample Introduction:

Water samples are introduced to the gas chromatograph (GC) by EPA Method 5030, Purge and Trap.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 5% SP-1200/1.75% Bentone-34 on Supelcoport. A photoionization detector (PID) is used to detect BTXE. The PID is followed by a flame ionization detector (FID).

Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	30 ml/min.
INJECTOR TEMPERATURE:	240° C
DETECTOR TEMPERATURE:	270° C
INITIAL TEMPERATURE: Hold for 2 minutes	50° C
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE: Hold for 17 minutes	90° C

Calculation:

BTXE are identified by comparing the retention times of the sample peaks to those of the standards. BTXE are quantified by comparing the area of the sample peaks to those of the standards. If BTX or E is present and Total petroleum Hydrocarbons as Gasoline (TPH-G) is not, the analysis is confirmed by using a second column or a gas chromatograph mass spectrometer (GC/MS).

1/2/90

EPA METHOD 8240, VOLATILE ORGANICS FOR WATER

Method:

This is EPA Method 8240 from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd edition, by the U.S. Environmental Protection Agency.

Sample Preparation:

There is no sample preparation other than dilution.

Sample Introduction:

Water samples are introduced to the gas chromatograph (GC) by EPA Method 5030, purge and trap. Up to 5 ml of sample is purged by this method.

Gas Chromatography Analysis:

The volatile organics are separated on a 6-ft x 2 mm I.D. gas chromatography column packed with 1% SP-1000 on Carbopack-B. A mass spectrometer is used to detect the compounds.

Gas Chromatograph Conditions:

CARRIER GAS:	Helium
FLOW RATE:	40 ml/min.
INJECTOR TEMPERATURE:	225° C
DETECTOR TEMPERATURE:	275° C
INITIAL TEMPERATURE:	45° C
Hold for 3 minutes	
PROGRAM RATE:	8° C/min.
FINAL TEMPERATURE:	220° C
Hold for 15 minutes	

Calculation:

The compounds are quantified by using the internal standard method of calibration. Compounds are identified by comparing ion spectra with the ion spectra of the 8240 compounds in our standard.

PETROLEUM HYDROCARBONS, TOTAL RECOVERABLE FOR WATER

Method:

This is EPA method 418.1 from Methods for Chemical Analysis of Water and Wastes, March 1983. This test eliminates oil and grease from animal and vegetable sources.

Sample Preparation and Analysis

A separatory funnel liquid-liquid extraction is used to prepare water samples. Oil and grease are extracted from the sample with freon in a separatory funnel by shaking. The freon extract is collected and the sample is extracted two more times.

The freon extract is dried with sodium sulfate and then treated with silica gel. Non-petroleum oil and grease is removed by absorption onto the silica gel. The absorbance of the remaining extract is measured with an infrared spectrophotometer.

Calculation

The oil and grease content is calculated by comparison to standards.

EPA METHOD 8270, SEMIVOLATILE ORGANICS FOR WATER

Method:

This is EPA Method 8270 from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846," 2nd edition, by the U.S. Environmental Protecton Agency.

Sample Preparation:

Sample preparation is by EPA Method 3510, liquid-liquid extraction with a separatory funnel. Methylene chloride is the solvent used. The extraction is followed by a concentration process using a Kuderna-Danish apparatus.

Sample Introduction:

Samples are introduced by direct injection.

Gas Chromatography Analysis:

The semivolatile organics are separated on a capillary gas chromatography column. A mass spectrometer is used to detect the compounds.

Calculation:

Compounds are identified by comparing ion spectra with the ion spectra of the 8270 compounds in our standards. The compounds are quantified by using the internal standard method of calibration.

8/90