

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

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PROJECT SUMMARY

On October 14 and December 8, 1993, Versar, Inc. (Versar) collected groundwater samples as part of the second round of groundwater sampling at Pacific Dry Dock Yard I, at 1441 Embarcadero, Oakland, California.

Quarterly groundwater monitoring is being conducted from the five monitoring wells as part of the site investigation activities. Each sampling event includes:

1) measurement of groundwater levels; 2) collection of groundwater samples for analysis for total petroleum hydrocarbons as gasoline (TPH-G) and diesel (TPH-D), and for Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), Total Dissolved Solids (TDS), and Salinity; 3) calculation of the hydraulic gradient; and 4) generation of a report summarizing the results of the sampling event. Mr. Michael Kitko, Hydrogeologist, prepared this report under the guidance of Mr. Lawrence Kleinecke, Senior Geohydrologist.


The following conclusions summarize the findings of Versar's investigation:

- Laboratory analysis of groundwater samples collected on October 14, 1993, from monitoring wells MW1 through MW5 reported concentrations of TDS ranged between 2,000,000 micrograms per liter ( $\mu\text{g/L}$ ) and 31,000,000  $\mu\text{g/L}$ , and concentrations of salinity ranged between 2.0  $\mu\text{g/L}$  to 29  $\mu\text{g/L}$ . The analysis did not identify concentrations of TPH-G or BTEX at or above the relevant methods' detection limits. Analysis of groundwater samples collected from MW1 and MW3 identified concentrations of TPH-D.
- On October 14, 1993, the calculated groundwater gradient at this sampling event was 0.013 feet/foot (ft/ft) to the north.
- Laboratory analysis of groundwater samples collected on December 8, 1993, from monitoring wells MW1 and MW3 identified concentrations of TPH-D.
- On December 8, 1993, the calculated groundwater gradient at this sampling event was 0.016 ft/ft to the east.

- During this second round of quarterly sampling, concentrations of TPH-D were identified in the samples collected from monitoring wells MW1 and MW3. Because the initial sampling did not identify TPH-D, the identified concentrations may have been due to the increased turbidity of the second samples. Additional samples were subsequently collected, field filtered, and submitted for analysis to determine if the contamination was a result of adsorption to soil particles. The results indicated up to a 10 fold decrease in contaminant concentrations. These results indicate some but not all of the contaminations was likely due to adsorption of contaminants to the soil particles.

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## 1.0 INTRODUCTION

Versar, Inc. (Versar) has been retained by Crowley Marine Services, Inc. (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 describes the procedures and findings of the second round of quarterly groundwater sampling conducted on October 14 and on December 8, 1993. This investigation is being conducted in accordance with the policies of the San Francisco Bay Regional Water Quality Control Board and with the Alameda County Health Care Services Agency.

The site occupies approximately two acres, and is bounded by the Embarcadero to the north, the Oakland Inner Harbor to the south, an undeveloped lot to the east, and a boat repair yard to the west.

Currently, a machine shop with covered storage occupies the south-central section and a sheet-metal bulkhead abuts the southern edge of the site. Four above ground diesel storage tanks occupy the southwest corner of the site. Other structures, including an office building, a machine shed, an aboveground waste-oil tank, and assorted sheds and storage buildings have been recently demolished and removed. Figures 1 and 2 show the site location, and site layout, respectively.

### 1.1 Site Geology and Geohydrology

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 Ranges. Overlying the bedrock are Quaternary marine and non-marine alluvial sediments 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 contained wood and brick fragments. 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.

During the October 14, 1993 sampling event, groundwater was measured at high tide and found to vary between 3.98 to 6.92 feet below ground surface (bgs). Calculations indicate a gradient of 0.013 feet per foot (ft/ft) to the north. During the December 8, 1993 additional monitoring and sampling event, groundwater was measured at low tide and found to vary between 2.26 to 4.79 feet bgs. Calculations indicate a gradient of 0.016 ft/ft to the east. Figures 3 and 4 show the groundwater contours and flow directions calculated from the second quarterly sampling data.

## 1.2 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.

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). The results of this investigation identified four areas of soil containing identifiable concentrations of TPH-G, TPH-D, TOG, or BTEX.

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 an 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, lead, and bis (2-ethylhexyl) phthalate were identified during the investigation.

On June 23 and 24, 1993, a total of five, two-inch diameter groundwater monitoring wells were installed between 13 and 14 feet bgs at PDDI (Versar, November 7, 1993). During drilling activities, soil samples collected from boreholes MW1, MW2, and MW4 were submitted for laboratory analysis and identified concentrations of TPH-D, BTEX, and TOG. Analysis of soil samples collected from borehole MW3 identified concentrations of TPH-D and toluene. Samples collected and analyzed from borehole MW5 contained only toluene.

Metals were detected in the two soil samples analyzed (MW1-5.5 and MW3-5.5) for metals. Metals detected included arsenic, barium, beryllium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc. However, none of the metals detected exceeded their respective total threshold limit concentration (TTLC) as described in Title 22 of the California Code of Regulations, nor did they exceed ten times the soluble threshold limit concentration (STLC).

On June 25, 1993, each well was developed by removing a minimum of five well volumes of groundwater or until dry. On July 1, 1993, each of the wells were purged and sampled. The samples were analyzed for TPH-D, TPH-G, TOG, and BTEX. Additionally, the groundwater sample collected from MW3 was analyzed for semivolatile organic compounds (SVOCs) and volatile organic compounds (VOCs).

### 1.3 Site Investigation Objectives

The primary purpose of this investigation is to maintain regularly scheduled groundwater monitoring at the PDDI in Oakland, California. The general objectives of this quarterly sampling were to:

- Measure groundwater levels in monitoring wells MW1, MW2, MW3, MW4, and MW5 and determine the local hydraulic gradient.
- Collect groundwater samples from monitoring wells MW1, MW2, MW3, MW4, and MW5.
- Submit the groundwater samples to a certified laboratory for analysis for TPH-G, TPH-D, BTEX, TDS, and Salinity.
- Collect additional groundwater samples from MW1 and MW3, field filter and submit for laboratory analysis to determine if TPH-D contamination was a result of adsorption to soil particles.
- Verify depth to groundwater in wells MW1, MW2, MW3, MW4, and MW5.
- Prepare the second quarterly groundwater monitoring report.

## **2.0 SAMPLING ACTIVITIES**

The second round of quarterly groundwater monitoring and sampling at PDDI was conducted on October 14, 1993. The investigation included: 1) measurement of the groundwater levels in monitoring wells MW1, MW2, MW3, MW4, and MW5; and 2) purging and collection of groundwater samples from MW1, MW2, MW3, MW4, and MW5.

Additional groundwater sampling was conducted on December 8, 1993, to confirm the presence of TPH-D in MW1 and MW3. The work included: 1) measurement of the groundwater levels in monitoring wells MW1 through MW5; and 2) purging and collection of groundwater samples from MW1 and MW3.

### **2.1 Groundwater Monitoring and Sampling**

On October 14, 1993, prior to conducting any groundwater sampling, the depth to groundwater was measured in each monitoring well. Groundwater was present at depths of 6.54 feet bgs, 5.74 feet bgs, 3.98 feet bgs, 6.45 feet bgs, and 6.92 feet bgs in monitoring wells MW1, MW2, MW3, MW4, and MW5, respectively. These depths were converted to elevations using previous survey data and were used to calculate the hydraulic gradient, which was north at 0.013 ft/ft, as shown in Figure 3.

On December 8, 1993, additional sampling of groundwater was conducted to confirm the presence of TPH-D in monitoring wells MW1 and MW3. Groundwater was present at depth of 6.28 feet bgs, 4.55 feet bgs, 6.50 feet bgs, 6.02 feet bgs, and 6.71 feet bgs in monitoring wells MW1, MW2, MW3, MW4, and MW5, respectively. The depth to groundwater measurements in monitoring wells MW1 through MW5 were taken during a rain event. The groundwater measurement reading from MW4 was anomalous possibly because surface water may have infiltrated soil in the non-asphalted portion of the yard during a rain event, and caused groundwater mounding. The groundwater measurement reading from MW4 was not used to calculate the hydraulic gradient. The groundwater depths from MW1, MW2,

MW3, and MW5 were converted to elevations using previous survey data and were used to calculate the hydraulic gradient, which was east at 0.016 ft/ft, as shown in Figure 4.

Groundwater elevations in each of the wells have fluctuated between sampling events. As a result, the flow direction has fluctuated 90 degrees between sampling events from the north on October 14, 1993 to the east on December 8, 1993. Groundwater level data for October 14 and December 8, 1993, are listed in Table 1.

After the measurement of groundwater levels, the wells were purged using disposable bailers following Versar's standard procedures outlined in Appendix A. Data collected during purging included: 1) the initial depth to groundwater; 2) pH; 3) temperature; 4) conductivity; and 5) observations of sheen, odor, free product, and turbidity. Details of the purging were recorded and are included as Appendix B.

Groundwater samples were collected from each well using a precleaned disposable bailer. The samples for TPH-G and BTEX were placed in precleaned, 40-milliliter (ml) glass vials preserved with hydrochloric acid. Groundwater samples to be analyzed for TPH-D were placed in precleaned, 1-liter glass amber containers, and samples analyzed for TDS and salinity were placed in 1-liter plastic containers. Sampling containers were labelled with the date collected, and a unique sample identification and stored at approximately 4° C in an insulated cooler. All monitoring well groundwater samples were submitted to Trace Analysis Laboratory, Inc. (TAL), California State-certified laboratory (certification no. 1199), for analysis. The samples were prepared following Environmental Protection Agency (EPA) protocols and were accompanied by Versar's chain-of-custody record. The results of the laboratory analysis are presented in Section 3.0, Laboratory Analytical Results.

## **2.2 Additional Groundwater Monitoring and Sampling**

The additional groundwater monitoring and sampling included the measurements of groundwater in monitoring wells MW1 through MW5, and the purging and collection of groundwater samples from MW1 and MW3. The additional groundwater monitoring and

sampling was conducted to further investigate the presence of TPH-D concentrations in MW1 and MW3, and to monitor the fluctuation of groundwater levels in wells MW1 through MW5.

On December 8, 1993, groundwater samples were collected to confirm the presence of dissolved TPH-D concentrations in MW1 and MW3. Due to the high turbidity of the groundwater from these monitoring wells, a peristaltic pump and an in-line high-capacity groundwater sampling filter with a 0.45 micron acrylic copolymer membrane were used to collect groundwater samples from MW1 and MW3. The peristaltic pump was used to maintain a consistent pump rate during the purging of MW1 and MW3, and the high-capacity groundwater sampling filter was used to filter the silt from groundwater during sampling. Because a filter was used during sampling, the groundwater samples had a lower turbidity than the previous samples collected from MW1 and MW3.

With exception to the use of the groundwater sampling filter, wells MW1 and MW3 were purged and sampled following Versar's standard procedures outlined in Appendix A.

### 3.0 LABORATORY ANALYTICAL RESULTS

On the October 14, 1993 sampling event, a total of five groundwater samples were collected for laboratory analysis for TPH-G, TPH-D, BTEX, TDS, and Salinity. TPH-G was analyzed following the California Department of Health Services (DHS), Leaking Underground Fuel Tank (LUFT) Manual method, BTEX was analyzed following the modified EPA Method 8020, TDS was analyzed following EPA Method 160.1, and salinity was analyzed following EPA Method 120.1. Groundwater samples and local results are summarized in Figure 5. A copy of the laboratory analytical results and chain-of-custody records from the sampling event are included as Appendix C.

TAL reported that the groundwater samples collected on October 14, 1993, from MW1, MW2, MW3, MW4, and MW5 did not contain TPH-G or BTEX at or above the relevant methods' reporting limits. However, the samples collected from MW1 and MW3 contained TPH-D concentrations of 63 micrograms per liter ( $\mu\text{g/L}$ ) and 840  $\mu\text{g/L}$ , respectively. Analysis of groundwater samples collected from MW1 through MW5 reported concentrations of TDS ranged between 2,000,000  $\mu\text{g/L}$  and 31,000,000  $\mu\text{g/L}$  and concentrations of salinity ranged between 2.0  $\mu\text{g/L}$  and 29  $\mu\text{g/L}$ .

Additional groundwater samples collected on December 8, 1993, from MW1 and MW3 contained TPH-D concentrations of 57  $\mu\text{g/L}$  and 89  $\mu\text{g/L}$ , respectively. The analytical results of filtered groundwater samples collected from MW1 and MW3 indicated up to a 10 fold decrease in the concentration of TPH-D. Groundwater sample analytical results are summarized in Table 2 and Figure 6. Historical chemical trend data is summarized in Table 3.

**4.0 FUTURE ACTIVITIES**

This is the second sampling event of the quarterly sampling activities for the five monitoring wells MW1, MW2, MW3, MW4, and MW5 at the PDDI site. Quarterly sampling will continue for a period of one year.

**5.0 REFERENCES**

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

Versar, Inc. Fair Oaks, California. October 1991, Tank Removal, Pacific Dry Dock and Repair Yard I, Western Section, 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.

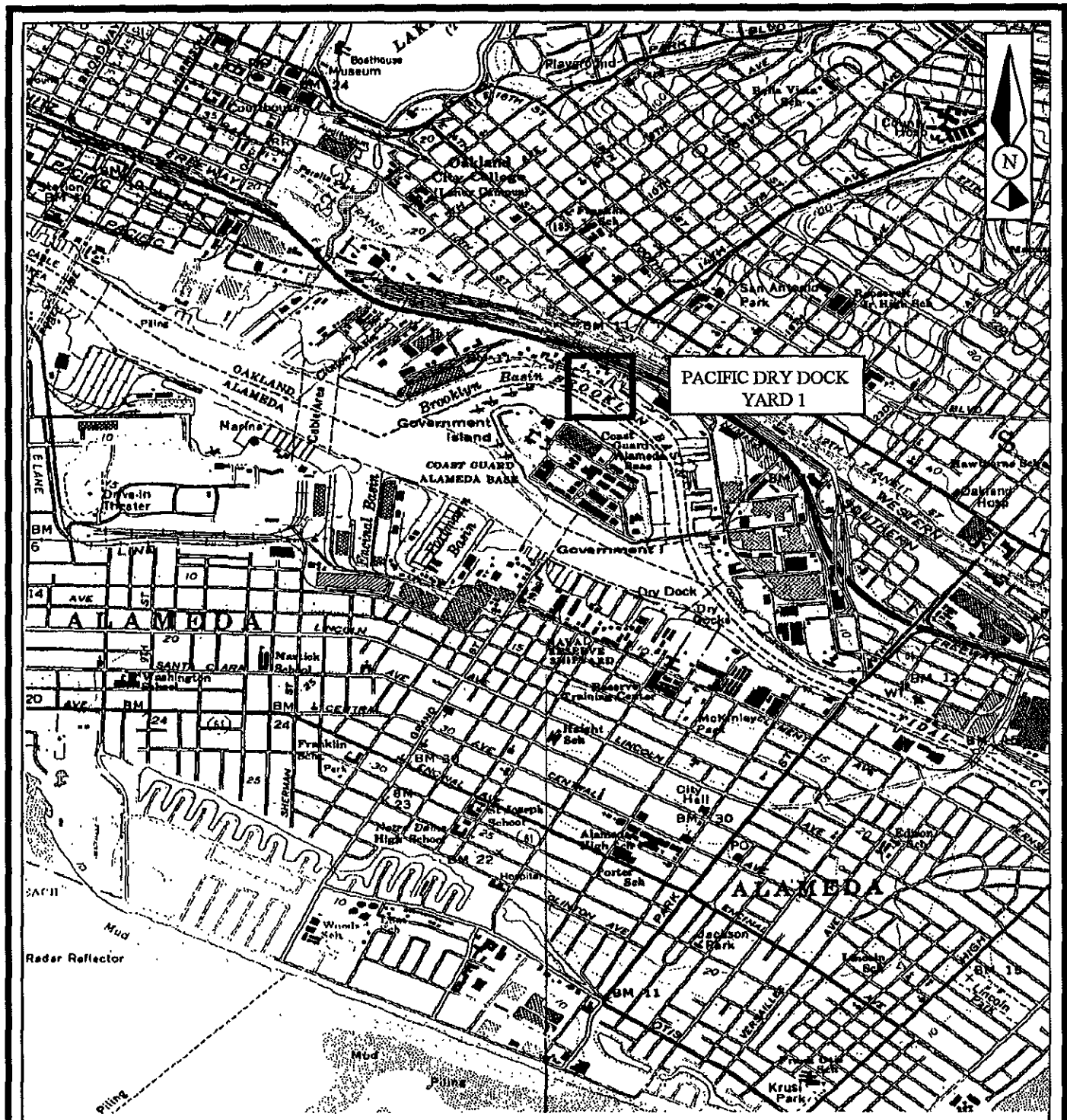
Versar, Inc. Fair Oaks, California. May 1992, Preliminary Investigation and Evaluation Report (PIER), Pacific Dry Dock and Repair Yard I, Western Section, Oakland, California.

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

Versar, Inc. Fair Oaks, California. November 7, 1993, Well Installation, Pacific Dry Dock and Repair Yard I, Western Section, Oakland, California.

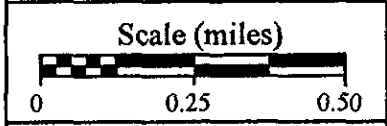


Figures



PACIFIC DRY DOCK  
YARD I

SOURCE: USGS TOPO 1959



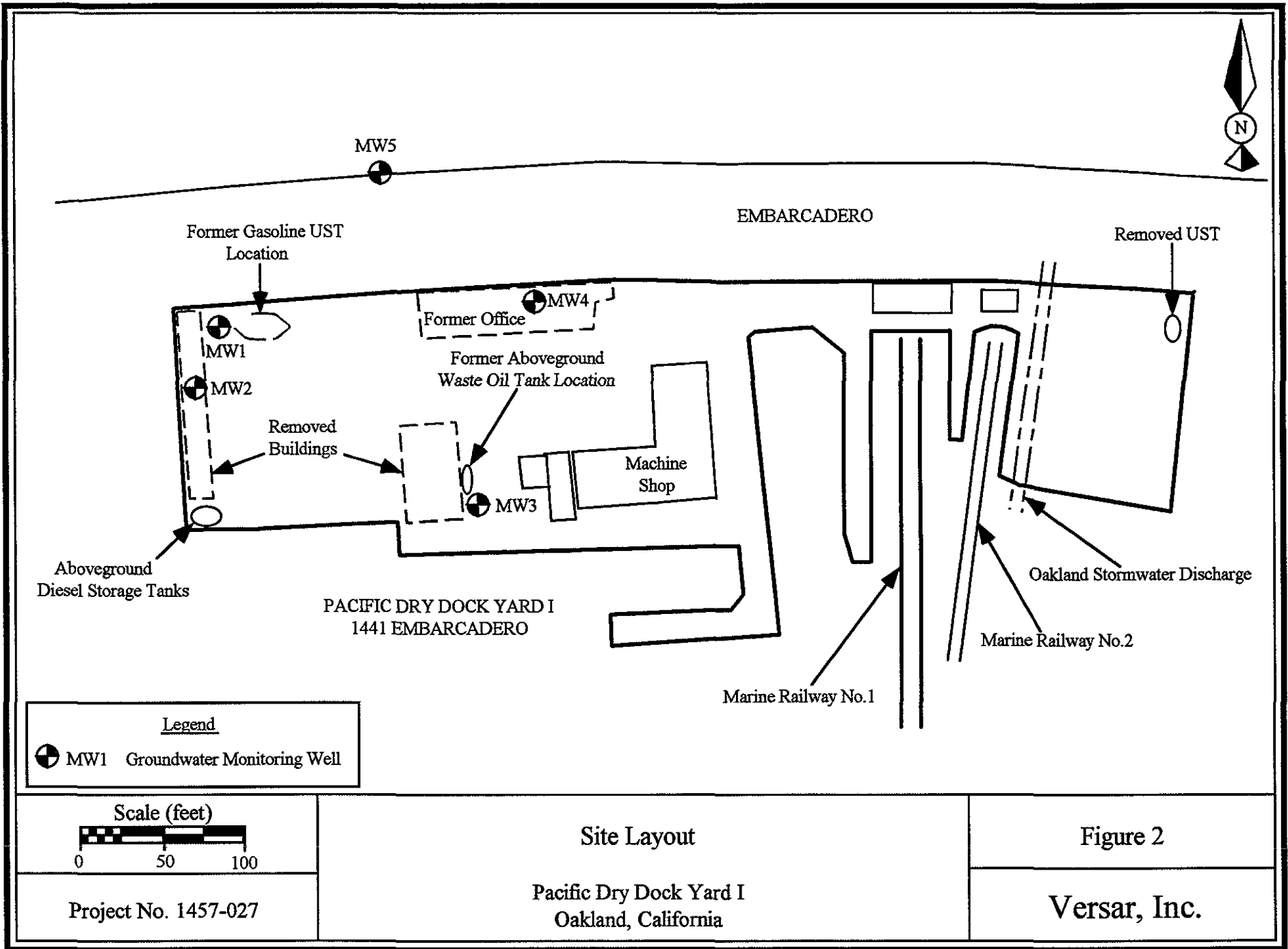
Site Location

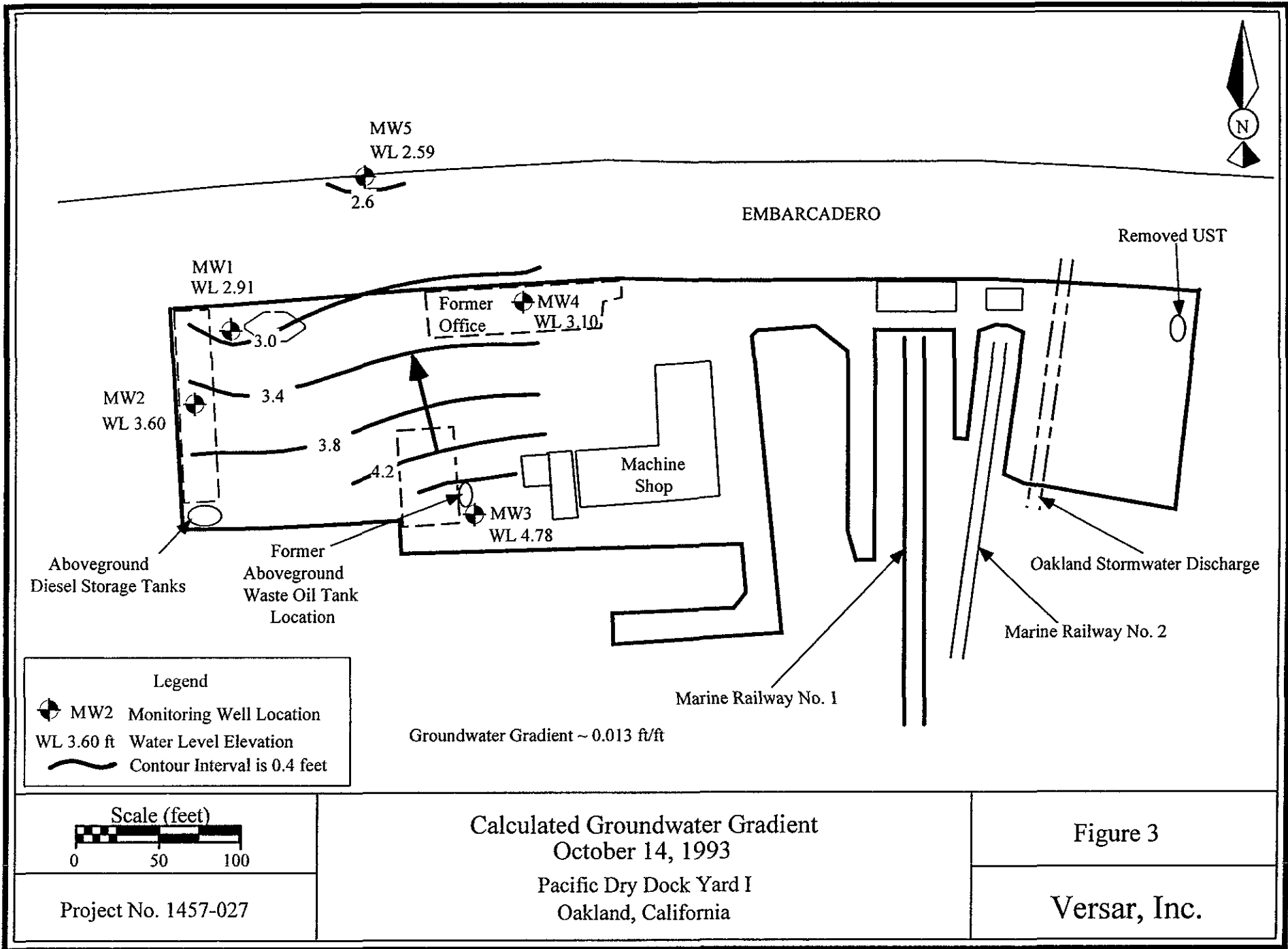
Figure 1

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Pacific Dry Dock Yard I  
Oakland, California



Versar, Inc.

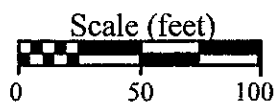




Groundwater Gradient ~ 0.013 ft/ft

**Legend**

-  MW2 Monitoring Well Location
- WL 3.60 ft Water Level Elevation
-  Contour Interval is 0.4 feet

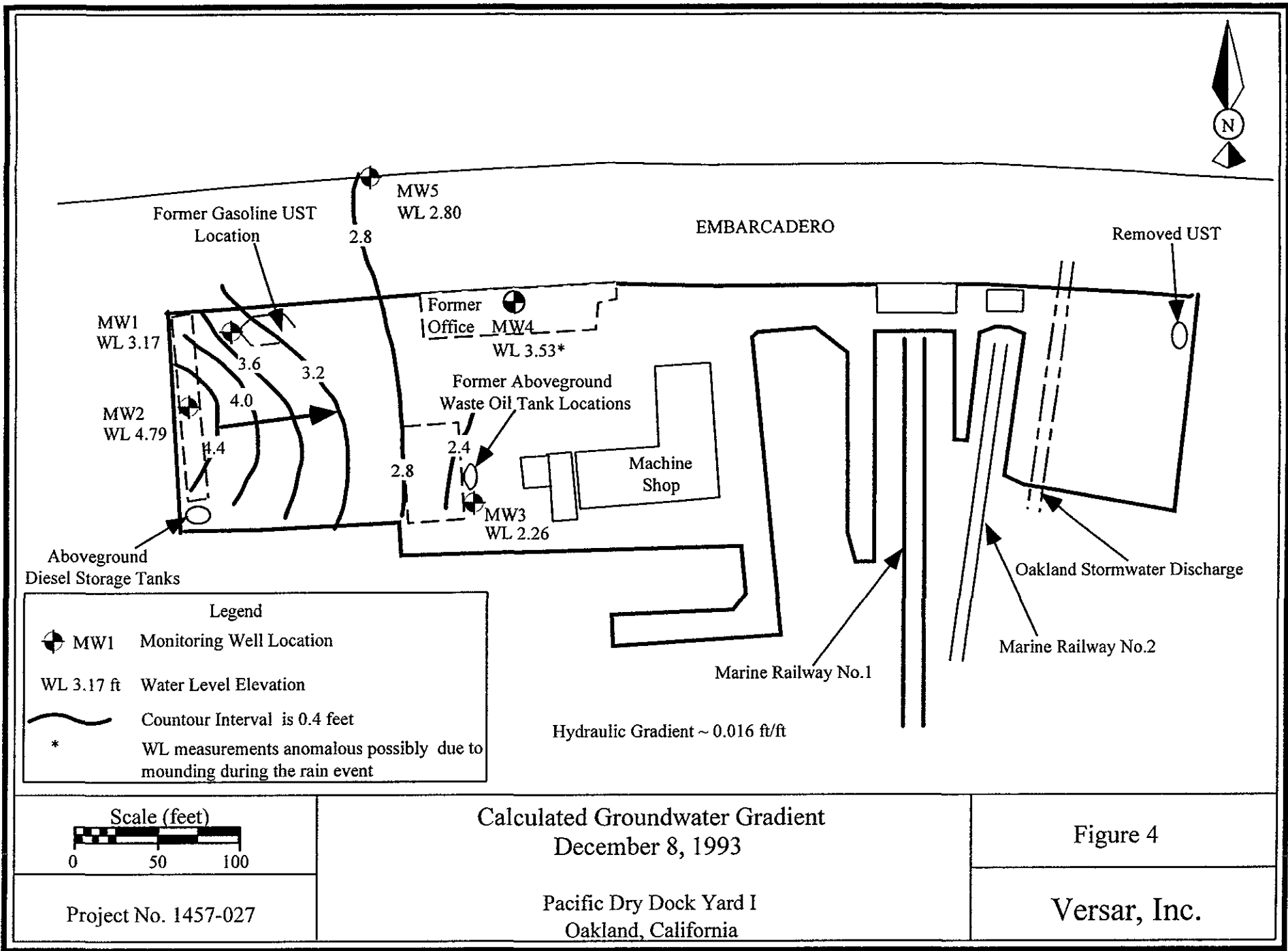


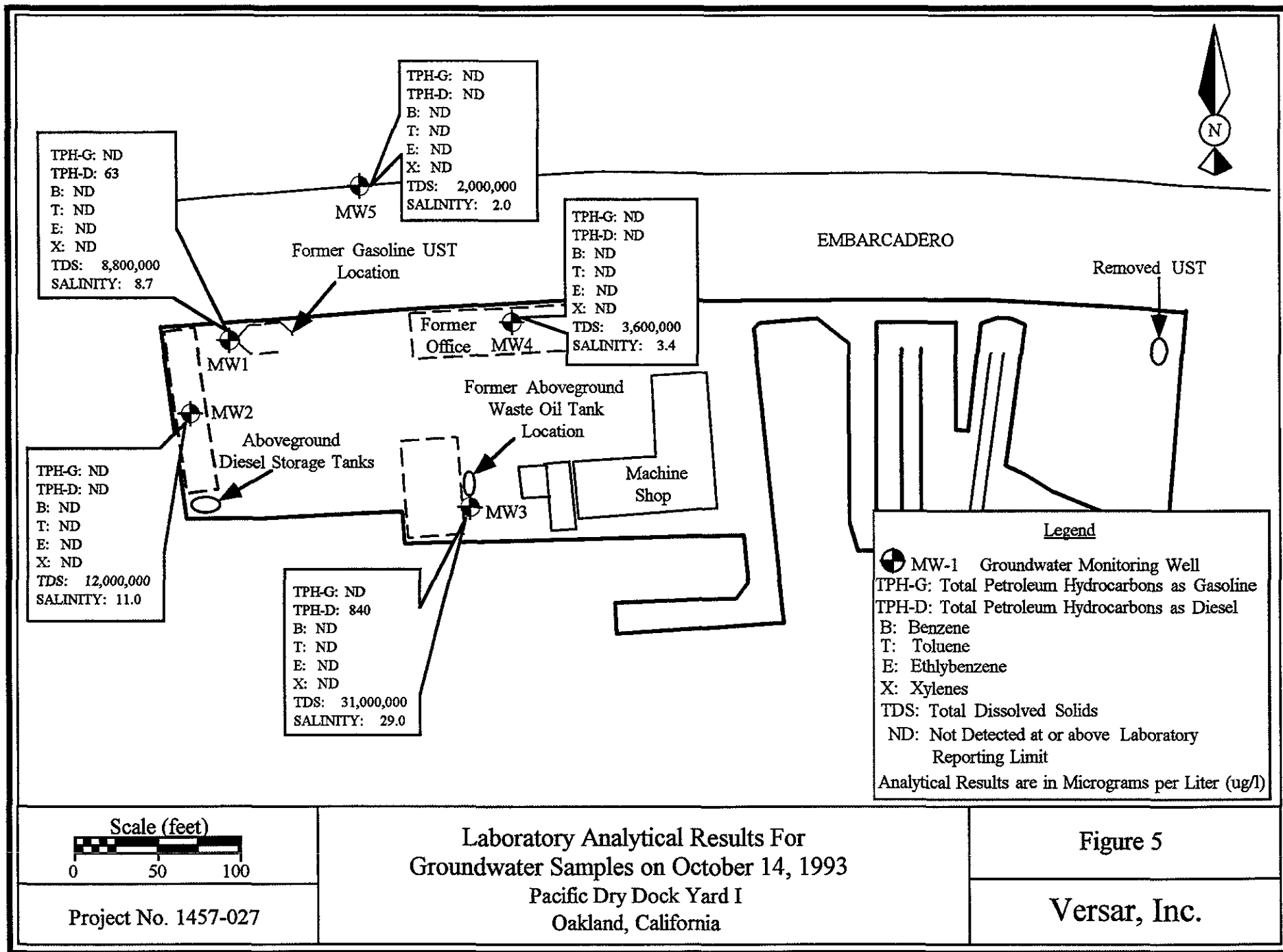
Project No. 1457-027

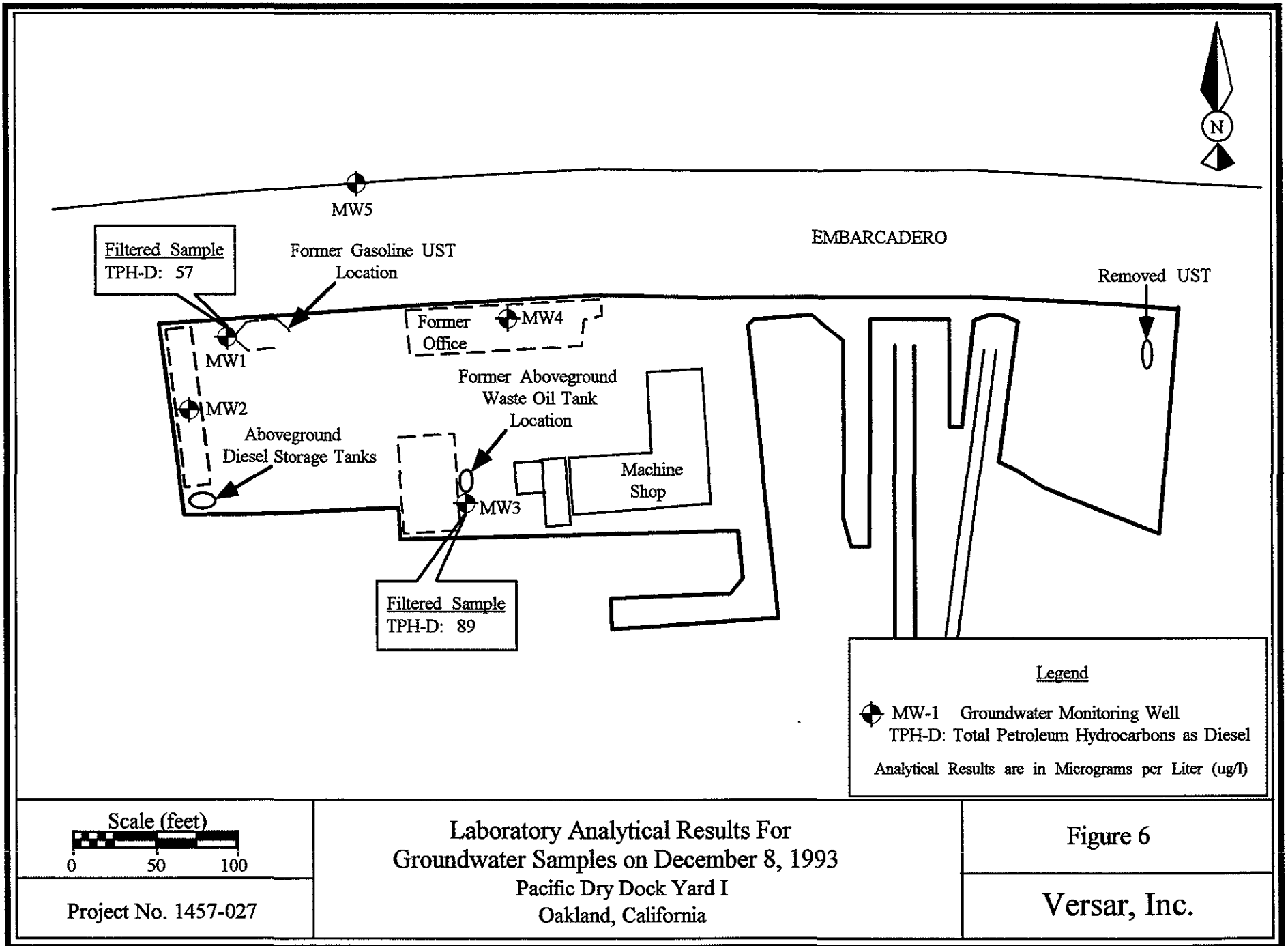
Calculated Groundwater Gradient  
 October 14, 1993  
 Pacific Dry Dock Yard I  
 Oakland, California

Figure 3

Versar, Inc.







Filtered Sample  
TPH-D: 57

Filtered Sample  
TPH-D: 89

Legend

⊕ MW-1 Groundwater Monitoring Well  
 TPH-D: Total Petroleum Hydrocarbons as Diesel  
 Analytical Results are in Micrograms per Liter (ug/l)

Scale (feet)  
 0 50 100

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Laboratory Analytical Results For  
 Groundwater Samples on December 8, 1993  
 Pacific Dry Dock Yard I  
 Oakland, California

Figure 6

Versar, Inc.

Tables



TABLE 1

QUARTERLY GROUNDWATER MONITORING REPORT  
MONITORING WELL GROUNDWATER LEVELS

October 14 and December 8, 1993

Pacific Dry Dock Yard I  
Oakland, California

	MW-1	MW-2	MW-3	MW-4	MW-5	Hydraulic Gradient (feet/foot)
Reference Casing Elevation <sup>2</sup> (feet)	9.45	9.34	8.76	9.55	9.51	
<u>October 14, 1993<sup>3</sup></u>						
Depth to Groundwater <sup>1</sup> (feet)	6.54	5.74	3.98	6.45	6.92	
Groundwater Elevation <sup>2</sup> (feet)	2.91	3.60	4.78	3.10	2.59	0.013 ft/ft to the north
<u>December 8, 1993<sup>4</sup></u>						
Depth to Groundwater <sup>1</sup> (feet)	6.28	4.55	6.50	6.02	6.71	
Groundwater Elevation <sup>2</sup> (feet)	3.17	4.79	2.26	3.53	2.80	0.016 ft/ft to the east

<sup>1</sup> Groundwater depths are expressed in feet below ground surface (bgs).

<sup>2</sup> Groundwater elevations are expressed in feet above lower low tide.

<sup>3</sup> Groundwater measurements collected during high tide.

<sup>4</sup> Groundwater measurements collected during low tide.

TABLE 2

QUARTERLY GROUNDWATER MONITORING REPORT  
LABORATORY ANALYTICAL RESULTS FOR GROUNDWATER

October 14 and December 8, 1993

Pacific Dry Dock Yard I  
Oakland, California

Groundwater Monitoring Well	Sample Date	TPH-G <sup>2,5</sup> (ug/L) <sup>1</sup>	TPH-D <sup>2,6</sup> (ug/L)	Benzene <sup>3</sup> (ug/L)	Toluene <sup>3</sup> (ug/L)	Ethylbenzene <sup>3</sup> (ug/L)	Xylenes <sup>3</sup> (ug/L)	TDS <sup>3,7</sup> (ug/L)	Salinity <sup>3</sup> (ug/L)
MW-1	10/14/93	ND <sup>4</sup>	63	ND	ND	ND	ND	8,800,000	8.7
	12/8/93	NA <sup>8</sup>	57	NA	NA	NA	NA	NA	NA
MW-2	10/14/93	ND	ND	ND	ND	ND	ND	12,000,000	11.0
MW-3	10/14/93	ND	840	ND	ND	ND	ND	31,000,000	29.0
	12/8/93	NA	89	NA	NA	NA	NA	NA	NA
MW-4	10/14/93	ND	ND	ND	ND	ND	ND	3,600,000	3.4
MW-5	10/14/93	ND	ND	ND	ND	ND	ND	2,000,000	2.0

<sup>1</sup> Results are expressed in micrograms per liter (ug/L).

<sup>2</sup> DHS Method, Luft Manual.

<sup>3</sup> EPA Method 8020.

<sup>4</sup> ND = Not Detected at or Above Reporting Limits.

<sup>5</sup> Total Petroleum Hydrocarbons as Gasoline.

<sup>6</sup> Total Petroleum Hydrocarbons as Diesel.

<sup>7</sup> TDS = Total Dissolved Solids.

<sup>8</sup> NA = Not Analyzed.

TABLE 3

QUARTERLY GROUNDWATER MONITORING REPORT  
 HISTORICAL CHEMICAL TREND DATA FOR GROUNDWATER

Pacific Dry Dock Yard I  
 Oakland, California

Groundwater Monitoring Well	Sample Date	TPH-G <sup>2,6</sup> (ug/L) <sup>1</sup>	TPH-D <sup>2,7</sup> (ug/L)	Total Oil and Grease <sup>3</sup> (ug/L)	Benzene <sup>4</sup> (ug/L)	Toluene <sup>4</sup> (ug/L)	Ethylbenzene <sup>4</sup> (ug/L)	Xylenes <sup>4</sup> (ug/L)	TDS <sup>4,8</sup> (ug/L)	Salinity <sup>3</sup> (ug/L)
MW1	7/1/93	ND <sup>5</sup>	ND	ND	ND	ND	ND	ND	NA	NA
	10/14/93	ND	63	NA	ND	ND	ND	ND	8,800,000	8.7
	12/8/93	NA <sup>9</sup>	57	NA	NA	NA	NA	NA	NA	NA
MW2	7/1/93	ND	ND	ND	ND	ND	ND	ND	NA	NA
	10/14/93	ND	ND	NA	ND	ND	ND	ND	12,000,000	11
MW3	7/1/93	ND	ND	ND	ND	ND	ND	ND	NA	NA
	10/14/93	ND	840	NA	ND	ND	ND	ND	31,000,000	29
	12/8/93	NA	89	NA	NA	NA	NA	NA	NA	NA
MW4	7/1/93	ND	ND	ND	ND	ND	ND	ND	NA	NA
	10/14/93	ND	ND	NA	ND	ND	ND	ND	3,600,000	3.4
MW5	7/1/93	ND	ND	ND	ND	ND	ND	ND	NA	NA
	10/14/93	ND	ND	NA	ND	ND	ND	ND	2,000,000	2.0

<sup>1</sup> Results are expressed in micrograms per liter (ug/L).

<sup>2</sup> DHS Method, Luft Manual.

<sup>3</sup> EPA Method 5520F.

<sup>4</sup> EPA Method.

<sup>5</sup> ND = Not Detected at or Above Reporting Limits.

<sup>6</sup> Total Petroleum Hydrocarbons as Gasoline.

<sup>7</sup> Total Petroleum Hydrocarbons as Diesel.

<sup>8</sup> TDS = Total Dissolved Solids.

<sup>9</sup> NA = Not Analyzed.

APPENDIX A

Groundwater Monitoring and Sampling 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 pre-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 hexane (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.

## 2.0 COLLECTION OF SAMPLES

### 2.1 Groundwater Sampling

Groundwater samples were collected for laboratory analysis using the procedures given below.

1. Open the well and measure the organic vapor concentration with a flame ionization detector (FID) or photoionization detector (PID).
2. Measure the water 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 in the field notebook.
3. Inspect the disposable bailer to ensure that the bottom valve assembly is working correctly.
4. Begin purging the well by inserting a bailer into the PVC monitoring well casing 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 sampling containers.
6. Measure the temperature, conductivity, and pH. Record these and all subsequent measurements in the field 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 a new disposable bailer into the well and recover groundwater samples.
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 drums.

**3.0 ANALYSIS OF SAMPLES**

Samples are submitted to a California state-certified laboratory for analysis.

## **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, state, and federal procedures. All sample containers are precleaned in accordance with prescribed EPA 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, initialing the error, and 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 chain-of-custody records affixed.

Each sample shipment is accompanied by a chain-of-custody record identifying its contents. 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

Monitoring Well Purge Table Sheets

## Monitoring Well Purge Table

Well Number: MW1			Date(s) Purged: 10/14/93		
OVA - Ambient: 0.0			Purge Method: Hand Bail		
OVA - Vault: 0.0			Purge Rate: 0.1 gallon/minute		
OVA - Casing: 0.0			Date & Time Sampled: 10/14/93; 3:15 p.m.		
Water Level - Initial: 6.54 feet			Purged & Sampled By: Mike Kitko		
Water Level - Final: Dry			Sampling Method: Hand Bail		
Well Depth: 14.40 feet			Weather Conditions: Overcast		
Well Casing Volume: 2.4 gallons			Free Product: None		
Time	Cumulative Volume Removed (Gallons)	pH	Temperature (Degrees Fahrenheit)	Conductivity ( $\mu\text{m}/\text{cm}$ )	Turbidity
1:50 p.m.	0	---	---	---	---
2:00 p.m.	2	6.8	80.3	0.81	Moderate
2:15 p.m.	3.5	6.09	79.1	0.86	High
2:20 p.m.	Dry	---	---	---	---
3:15 p.m.	Sampled				
Field Notes: No hydrocarbon odor. Well purged dry after 3.5 gallons.					

## Monitoring Well Purge Table

Well Number: MW1			Date(s) Purged: 12/08/93		
OVA - Ambient: *			Purge Method: Peristaltic Pump		
OVA - Vault: *			Purge Rate: 0.15 gallon/minute		
OVA - Casing: *			Date & Time Sampled: 12/08/93; 5:30 p.m.		
Water Level - Initial: 6.28 feet			Purged & Sampled By: P. Cox		
Water Level - Final: 10.15 feet (5:00 p.m.)			Sampling Method: Peristaltic Pump w/0.45 $\mu$ m filter		
Well Depth: 14.40 feet			Weather Conditions: Rain		
Well Casing Volume: 1.3 gallons			Free Product: None		
Time	Cumulative Volume Removed (Gallons)	pH	Temperature (Degrees Fahrenheit)	Conductivity ( $\mu$ ms/cm)	Turbidity
12:00 p.m.	0.5	7.09	67.1	*	Low
12:05 p.m.	1.0	7.06	67.1	*	Low
12:10 p.m.	1.5	6.95	68.4	*	Low
12:13 p.m.	2.0	6.90	68.4	*	Low
12:17 p.m.	2.5	7.03	68.2	*	Low
12:20 p.m.	3.0	7.20	68.7	*	Low
5:30 p.m.	Sampled				
Field Notes: Well purged dry after 3.0 gallon					

\* = No readings taken due to adverse weather conditions.

**Monitoring Well Purge Table**

<b>Well Number:</b> MW2			<b>Date(s) Purged:</b> 10/14/93		
<b>OVA - Ambient:</b> 0.0			<b>Purge Method:</b> Hand Bail		
<b>OVA - Vault:</b> 0.0			<b>Purge Rate:</b> 0.3 gallon/minute		
<b>OVA - Casing:</b> 0.0			<b>Date &amp; Time Sampled:</b> 10/14/93; 4:07 p.m.		
<b>Water Level - Initial:</b> 5.74 feet			<b>Purged &amp; Sampled By:</b> Mike Kitko		
<b>Water Level - Final:</b> 9.38 feet (4:07 p.m.)			<b>Sampling Method:</b> Hand Bail		
<b>Well Depth:</b> 14.20 feet			<b>Weather Conditions:</b> Overcast		
<b>Well Casing Volume:</b> 1.3 gallons			<b>Free Product:</b> None		
Time	Cumulative Volume Removed (Gallons)	pH	Temperature (Degrees Fahrenheit)	Conductivity ( $\mu\text{m}/\text{cm}$ )	Turbidity
3:30 p.m.	0.5	7.25	76.3	0.86	Clear
3:35 p.m.	2.0	6.93	75.0	0.87	Clear
3:43 p.m.	4.0	6.66	74.2	0.86	Clear
3:49 p.m.	6.0	6.43	74.4	0.86	Clear
4:07 p.m.	Sampled				
Field Notes: No hydrocarbon odor.					

Monitoring Well Purge Table

Well Number: MW3			Date(s) Purged: 10/14/93		
OVA - Ambient: 0.0			Purge Method: Hand Bail		
OVA - Vault: 0.0			Purge Rate: 0.24 gallon/minute		
OVA - Casing: 0.0			Date & Time Sampled: 10/14/93; 6:27 p.m.		
Water Level - Initial: 3.98 feet			Purged & Sampled By: Mike Kitko		
Water Level - Final: 9.67 feet (6:27 p.m.)			Sampling Method: Hand Bail		
Well Depth: 15.15 feet			Weather Conditions: Overcast		
Well Casing Volume: 1.76 gallons			Free Product: None		
Time	Cumulative Volume Removed (Gallons)	pH	Temperature (Degrees Fahrenheit)	Conductivity ( $\mu\text{m}/\text{cm}$ )	Turbidity
5:50 p.m.	2.0	6.39	67.9	3.11	High
6:05 p.m.	4.0	6.13	67.9	3.34	High
6:15 p.m.	6.0	6.05	67.8	3.54	High
6:27 p.m.	Sampled				
Field Notes: No hydrocarbon odor. Orange algae in purge water.					

## Monitoring Well Purge Table

Well Number: MW3			Date(s) Purged: 12/08/93		
OVA - Ambient: *			Purge Method: Peristaltic Pump		
OVA - Vault: *			Purge Rate: 0.3 gallon/minute		
OVA - Casing: *			Date & Time Sampled: 12/08/93; 5:00 p.m.		
Water Level - Initial: 6.50 feet			Purged & Sampled By: Phil Cox		
Water Level - Final: 9.67 feet (5:00 p.m.)			Sampling Method: Peristaltic Pump w/ 0.45 $\mu$ m filter		
Well Depth: 15.15 feet			Weather Conditions: Rain		
Well Casing Volume: 1.4 gallons			Free Product: None		
Time	Cumulative Volume Removed (Gallons)	pH	Temperature (Degrees Fahrenheit)	Conductivity ( $\mu$ m/cm)	Turbidity
12:38 p.m.	0.5	7.69	60.1	*	Low
12:42 p.m.	1.0	7.35	59.9	*	Low
12:46 p.m.	1.5	7.16	59.7	*	Low
12:50 p.m.	2.0	7.11	59.7	*	Low
12:53 p.m.	2.5	7.08	59.7	*	Low
12:55 p.m.	3.0	7.12	59.7	*	Low
12:57 p.m.	3.5	7.10	59.7	*	Low
1:00 p.m.	4.0	7.09	59.5	*	Low
1:03 p.m.	4.5	7.10	59.5	*	Low
5:00 p.m.	Sampled				
Field Notes: Orange algae in purge water; filtered out during sampling.					

\* = No readings taken due to adverse weather conditions.

Monitoring Well Purge Table

Well Number: MW4			Date(s) Purged: 10/14/93		
OVA - Ambient: 0.0			Purge Method: Hand Bail		
OVA - Vault: 0.0			Purge Rate: 0.1 gallon/minute		
OVA - Casing: 0.0			Date & Time Sampled: 10/14/93; 7:31 p.m.		
Water Level - Initial: 6.45 feet			Purged & Sampled By: Mike Kitko		
Water Level - Final: 10.32 feet (7:31 p.m.)			Sampling Method: Hand Bail		
Well Depth: 13.25 feet			Weather Conditions: Overcast		
Well Casing Volume: 1.2 gallons			Free Product: None		
Time	Cumulative Volume Removed (Gallons)	pH	Temperature (Degrees Fahrenheit)	Conductivity ( $\mu\text{m}/\text{cm}$ )	Turbidity
6:50 p.m.	0.5	6.70	66.1	6.64	Clear
7:04 p.m.	2.0 (dry)	6.43	65.9	5.50	Clear
7:14 p.m.	4.0	6.18	65.1	5.68	Clear
7:31 p.m.	Sampled				
Field Notes: No hydrocarbon odor.					



## Monitoring Well Purge Table

Well Number: MW5			Date(s) Purged: 10/14/93		
OVA - Ambient: 0.0			Purge Method: Hand Bail		
OVA - Vault: 0.0			Purge Rate: 0.33 gallon/minute		
OVA - Casing: 0.0			Date & Time Sampled: 10/14/93; 8:09 p.m.		
Water Level - Initial: 6.92 feet			Purged & Sampled By: Mike Kitko		
Water Level - Final: 7.1 feet (8:09 p.m.)			Sampling Method: Hand Bail		
Well Depth: 13.91 feet			Weather Conditions: Overcast		
Well Casing Volume: 1.2 gallons			Free Product: None		
Time	Cumulative Volume Removed (Gallons)	pH	Temperature (Degrees Fahrenheit)	Conductivity ( $\mu\text{m}/\text{cm}$ )	Turbidity
7:40 p.m.	1.5	6.37	65.0	4.70	Clear
7:45 p.m.	3.5	5.94	65.3	4.69	Clear
7:55 p.m.	5.0	5.69	65.2	4.75	Clear
8:09 p.m.	Sampled				
Field Notes: No hydrocarbon odor.					

APPENDIX C

Laboratory Analytical Results and Chain-of-Custody Records for  
Groundwater Samples Collected During October 14 and December 8, 1993  
Second Quarterly Groundwater Sampling



October 28, 1993

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

Dear Mr. Kleinecke:

Trace Analysis Laboratory received five water samples on October 14, 1993 for your Project No. 1457-027, Pacific Dry Dockyard 1 (our custody log number 3733).

These samples were analyzed for Total Dissolved Solids and Salinity. 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,

A handwritten signature in cursive script that reads "Scott T. Ferriman".

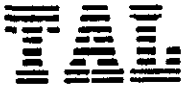
Scott T. Ferriman  
Project Specialist

Enclosures

**Trace Analysis Laboratory, Inc.**

3423 Investment Boulevard, #8 • Hayward, California 94545

Telephone (510) 783-69  
Facsimile (510) 783-15



LOG NUMBER: 3733  
DATE SAMPLED: 10/14/93  
DATE RECEIVED: 10/14/93  
DATE ANALYZED: 10/15/93  
DATE REPORTED: 10/28/93

CUSTOMER: Versar, Inc.  
REQUESTER: Lawrence Kleinecke  
PROJECT: No. 1457.027, Pacific Dry Dockyard 1

Sample Type: Water

Method and Constituent:	Units	MW-1		MW-2		MW-3	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 160.1							
TDS	ug/l	8,800,000	1,000	12,000,000	1,000	31,000,000	1,000

Method and Constituent:	Units	MW-4		MW-5		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
EPA Method 160.1							
TDS	ug/l	3,600,000	1,000	2,000,000	1,000	ND	1,000

QC Summary:

% RPD: 0.0

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

LOG NUMBER: 3733  
 DATE SAMPLED: 10/14/93  
 DATE RECEIVED: 10/14/93  
 DATE ANALYZED: 10/15/93  
 DATE REPORTED: 10/28/93  
 PAGE: Two

Sample Type: Water


Method and Constituent:	MW-1		MW-2		MW-3	
	Concen- tration	Reporting Limit	Concen- tration	Reporting Limit	Concen- tration	Reporting Limit
EPA Method 120.1 Salinity	8.7	0.010	11	0.010	29	0.010

Method and Constituent:	MW-4		MW-5	
	Concen- tration	Reporting Limit	Concen- tration	Reporting Limit
EPA Method 120.1 Salinity	3.4	0.010	2.0	0.010

QC Summary:

% RPD: 2.9

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

  
 Louis W. DuPuis  
 Quality Assurance/ Quality Control Manager

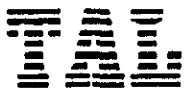
3733

**Versar**

CHAIN OF CUSTODY RECORD

PROJECT NO.		PROJECT NAME					PARAMETERS										INDUSTRIAL HYGIENE SAMPLE		Y			
1457-027		Pacific Dry Dock Yard I																	N			
SAMPLERS: (Signature)					(Printed)					NO. OF CONTAINERS Total Disposed Soiled Salinity										REMARKS		
<i>Michael Kiteo</i>					Michael Kiteo																	
FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION																	
MW-1	10/14/93			X	MW-1					2	X	X										
MW-2	10/14/93			X						2	X	X										
MW-3	10/14/93			X						2	X	X										
MW-4	10/14/93			X						2	X	X										
MW-5	10/14/93			X						2	X	X										
Relinquished by: (Signature)			Date / Time		Received by: (Signature)					Relinquished by: (Signature)					Date / Time		Received by: (Signature)					
<i>Michael Kiteo</i>			10/14 5:00		<i>[Signature]</i>																	
(Printed)					(Printed)					(Printed)							(Printed)					
<i>Michael Kiteo</i>																						
Relinquished by: (Signature)			Date / Time		Received for Laboratory by: (Signature)					Date / Time		Remarks										
					<i>[Signature]</i>					10/14/93 5:00 PM												
(Printed)					(Printed)																	
					Scott T. Ferriman																	

FILE



November 4, 1993

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

Dear Mr. Kleinecke:

Trace Analysis Laboratory received five water samples on October 15, 1993 for your Project No. 1457-027, Pacific Dry Dock 1 (our custody log number 3736).

These samples were analyzed for Total Petroleum Hydrocarbons as Diesel and Gasoline, Benzene, Toluene, Ethylbenzene and Xylenes. 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,

A handwritten signature in cursive script that reads "Scott T. Ferriman".

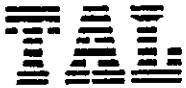
Scott T. Ferriman  
Project Specialist

Enclosures

Trace Analysis Laboratory, Inc.

3423 Investment Boulevard, #8 • Hayward, California 94545

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



LOG NUMBER: 3736  
DATE SAMPLED: 10/14/93  
DATE RECEIVED: 10/15/93  
DATE EXTRACTED: 10/18/93  
DATE ANALYZED: 10/30/93  
DATE REPORTED: 11/04/93

CUSTOMER: Versar, Inc.  
REQUESTER: Lawrence Kleinecke  
PROJECT: No. 1457-027, Pacific Dry Dock 1

Sample Type: Water

Method and Constituent:	Units	MW-1		MW-2		MW-3	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method: Total Petroleum Hydrocarbons as Diesel	ug/l	63	50	ND	50	840	50

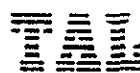
Method and Constituent:	Units	MW-4		MW-5		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method: Total Petroleum Hydrocarbons as Diesel	ug/l	ND	50	ND	50	ND	50

QC Summary:

% Recovery: 68  
% RPD: 2.7

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





LOG NUMBER: 3736  
DATE SAMPLED: 10/14/93  
DATE RECEIVED: 10/15/93  
DATE ANALYZED: 10/23/93 and 10/27/93  
DATE REPORTED: 11/04/93  
PAGE: Two

Sample Type: Water


Method and Constituent:	Units	MW-1		MW-2		MW-3	
		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-4		MW-5		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: 84 and 107  
% RPD: 17 and 3.7

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

  
Louis W. DuPuis  
Quality Assurance/Quality Control Manager

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 <sup>o</sup> C
DETECTOR TEMPERATURE:	270 <sup>o</sup> C
INITIAL TEMPERATURE:	50 <sup>o</sup> C
Hold for 2 minutes	
PROGRAM RATE:	6 <sup>o</sup> C/min.
FINAL TEMPERATURE:	90 <sup>o</sup> 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.

1/2/90



## 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, flow rate, and temperature program 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 0.53mm x 10m J&W DB-2887 gas chromatography column and then detected by a flame ionization detector (FID).

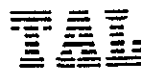
Gas Chromatograph Conditions:

CARRIER GAS:	Nitrogen
FLOW RATE:	8 ml/min.
INJECTOR TEMPERATURE:	220 <sup>o</sup> C
DETECTOR TEMPERATURE:	280 <sup>o</sup> C
INITIAL TEMPERATURE:	60 <sup>o</sup> C
Hold for 10 minutes	
PROGRAM RATE:	15 <sup>o</sup> C/min.
FINAL TEMPERATURE:	260 <sup>o</sup> C
Hold for 12 minutes	

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.

11/01/93



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:	50° C
Hold for 2 minutes	
PROGRAM RATE:	6° C/min.
FINAL TEMPERATURE:	90° C
Hold for 17 minutes	

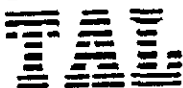
Calculation:

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

CHAIN OF CUSTODY RECORD

PROJECT NO.		PROJECT NAME					PARAMETERS							INDUSTRIAL HYGIENE SAMPLE	Y N		
1457-027		Pacific Dry Dock I					NO. OF CONTAINERS	TPH-gasoline	BTEX	TPH-diesel							REMARKS
SAMPLERS: (Signature) <i>Michael Kitko</i>					(Printed) Michael Kitko												
FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION												
MW-1	10/14/93			X		3	X	X	X								
MW-2	10/14/93			X		3	X	X	X								
MW-3	10/14/93			X		3	X	X	X								
MW-4	10/14/93			X		3	X	X	X								
MW-5	10/14/93			X		3	X	X	X								
Relinquished by: (Signature) <i>Michael Kitko</i>		Date / Time 10/15/93 1:13		Received by: (Signature) <i>[Signature]</i>			Relinquished by: (Signature)		Date / Time		Received by: (Signature)						
(Printed) Michael Kitko				(Printed)			(Printed)				(Printed)						
Relinquished by: (Signature)		Date / Time		Received for Laboratory by: (Signature) <i>Scott T. Ferriman</i>			Date / Time 10/15/93 1:13 PM		Remarks								
(Printed)				(Printed) Scott T. Ferriman													



December 30, 1993

Mr. Michael Kitko  
Versar, Inc.  
5330 Primrose Drive, Suite 228  
Fair Oaks, California 95628

Dear Mr. Kitko:

Trace Analysis Laboratory received two water samples on December 10, 1993 for your Project No. 1457-027, Crowley (our custody log number 3916).

These samples were analyzed for Total Petroleum Hydrocarbons as Diesel. Our analytical report and the completed chain of custody form 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,

A handwritten signature in cursive script that reads "Scott T. Ferriman". The signature is written in black ink and is positioned above the typed name.

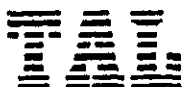
Scott T. Ferriman  
Project Specialist

Enclosures

Trace Analysis Laboratory, Inc.

3423 Investment Boulevard, #8 • Hayward, California 94545

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



LOG NUMBER: 3916  
DATE SAMPLED: 12/08/93  
DATE RECEIVED: 12/10/93  
DATE EXTRACTED: 12/17/93  
DATE ANALYZED: 12/23/93  
DATE REPORTED: 12/30/93

CUSTOMER: Versar, Inc.  
REQUESTER: Michael Kitko  
PROJECT: No. 1457-027, Crowley


Sample Type: Water

Method and Constituent:	Units	MW-1		MW-3		Method Blank	
		Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
DHS Method: Total Petroleum Hydrocarbons as Diesel	ug/l	57	50	89	50	ND	50

QC Summary:

% Recovery: 95  
% RPD: 15

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

  
\_\_\_\_\_  
Louis W. DuPuis  
Quality Assurance/Quality Control Manager

