CROWLEY MARINE SERVICES, INC.

June 22, 1995

Mr. Barney Chan
Department of Environmental Health
State Water Resources Control Board
Division of Clean Water Program
UST Local Oversight Program
1131 Harbor Bay Parkway
Alameda, California 94502-6577

Reference: **Pacific Dry Dock Yard II, 321 Embarcadero, Oakland**

Dear Mr. Chan:

Enclosed for your review is a copy of the Versar Inc. ("Versar") report entitled "Groundwater Monitoring Well Installation and Monitoring Report - March 13, 1995." This report was prepared for Crowley Marine Services, Inc. ("Crowley") by Versar. Crowley is continuing to investigate the extent of the impacted soil and groundwater at the facility. These results will be submitted to your department in a Problem Assessment Report.

If you have any questions regarding this matter please contact me at (206) 443-8042.

Sincerely,

Stephen Wilson
Manager, Environmental Compliance

Encl.

cc: PDDII Corr w/o encl
Beth Hamilton w/ encl
Dan Schoenholtz w/ encl

Post Office Box 2287, Seattle, Washington 98111-2287 - (206) 443-8100 - Telex 6838207 - Fax (206) 443-8072
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4300 B Street, Suite 507, Anchorage, Alaska 99503-5997 - (907) 563-1114 - Telex 6732564 - Fax (907) 762-3330
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Versar INC.

GROUNDWATER MONITORING WELL INSTALLATION AND MONITORING REPORT-MARCH 13, 1995 FORMER PACIFIC DRY DOCK AND REPAIR COMPANY YARD II FACILITY OAKLAND, CALIFORNIA

Prepared for:

CROWLEY MARINE SERVICES, INC.
2401 Fourth Avenue
P.O. Box 2287
Seattle, Washington 98111

Prepared by:

VERSAR, INC.
7844 Madison Avenue, Suite 167
Fair Oaks, California 95628

Versar Project No. 2463

June 14, 1995

PROJECT SUMMARY

On July 8, 1994, Versar, Inc. (Versar) supervised the drilling and installation of three groundwater monitoring wells at the former Pacific Dry Dock and Repair Company Yard II Facility located at 321 Embarcadero in Oakland, California. The monitoring wells were developed on March 7, 1995. On March 13, 1995, all three monitoring wells were purged and sampled as part of the first round of a quarterly groundwater monitoring program.

Groundwater monitoring is being conducted from the three monitoring wells as part of the site investigation activities. Each sampling event includes (1) measurement of groundwater levels in all three monitoring wells; (2) collection and analysis of groundwater samples for total petroleum hydrocarbons as gasoline, total petroleum hydrocarbons as diesel, benzene, toluene, ethylbenzene, xylenes, and halogenated volatile organic compounds; (3) calculation of the hydraulic gradient; and (4) preparing a report summarizing the results of the sampling event. Mr. Philip Cox, Staff Geologist, prepared this report under the guidance of Mr. Lawrence Kleinecke, Senior Geohydrologist.

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

- On March 7, 1995, the calculated groundwater gradient was 0.015 foot/foot to the northwest. The data used to calculate this gradient were collected two hours after high tide.
- On March 13, 1995, the calculated groundwater gradient was 0.019 foot/foot to the northwest. The data used to calculate this gradient were collected during a high tide.
- Total petroleum hydrocarbons as diesel were detected in samples collected from groundwater monitoring wells MW1 and MW2.
- Chlorobenzene was detected in samples collected from groundwater monitoring wells MW1, MW2, and MW3.

- Total petroleum hydrocarbons as gasoline, benzene, and xylenes were detected in a sample collected from groundwater monitoring well MW2.

Prepared by:

for Philip Cox
Staff Geologist

Approved for Release:

Michael D. Holley, P.E.
Engineering Program Manager

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D. HOLLEY
No. C049190
Exp. 9-30-96
CIVIL
STATE OF CALIFORNIA

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1.0 INTRODUCTION

Crowley Marine Services, Inc. (Crowley) retained Versar, Inc. (Versar) to conduct an environmental investigation, including a program of groundwater monitoring, at the former Pacific Dry Dock and Repair Company Yard II Facility (the Site), located at 321 Embarcadero in Oakland, California (Figure 1). This report describes the installation and development of three groundwater monitoring wells and the procedures and findings of the first round of monitoring and groundwater sampling, which was conducted on March 13, 1995. This investigation is being conducted in accordance with the policies of the San Francisco Bay Regional Water Quality Control Board and the Alameda County Health Care Services Agency.

The Site occupies approximately 1.5 acres of shoreline property between the Embarcadero and Oakland Inner Harbor. The property is bounded by Oakland Inner Harbor on the south and west sides, the Embarcadero on the north side, and industrial property on the east side (Figure 2).

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 similar to those found throughout the Coast Ranges. Overlying the bedrock are Quaternary marine and nonmarine alluvial sediments consisting of clays and silts.

The Site is nearly level at an elevation of between 10 and 15 feet above lower low water (National Geodetic Vertical Datum of 1929). Versar has characterized the shallow soils as sand, silt, and clay fill material extending from the surface to the bay muds. The depth of the bay muds is between 15 feet and 20 feet below ground surface (bgs). The bay muds consist of silty clays and clays with shell fragments, and thin water-saturated layers of sands or gravels.

On March 7, 1995, Versar measured the depth to groundwater at between 3.15 and 4.12 feet bgs. On March 13, 1995, Versar measured the depth to groundwater between 2.62 and 3.96 bgs. Calculations for the March 7 and 13 events indicate a groundwater gradient of 0.015 and 0.019 feet per foot (ft/ft) to the northwest, respectively. The impact of tidal fluctuations on gradient calculations has not yet been determined. Figures 3 and 4 show the groundwater gradients calculated from the March 7 and March 13 data.

1.2 Site History

The first recorded owner of the Site property was James T. Stratton who secured a patent to the Tidelands of Brooklyn Basin in October, 1889. In May 1911, the City of Oakland voided Mr. Stratton's property rights, and assumed ownership of the property. Approximately one year later in June 1911, General Engineering and Dry Dock, Co. (GEDD) obtained a lease and sublet the Site to Hanlon Dry Dock and Shipbuilding Company (Hanlon). This lease continued until December 1939. In October 1942, following the termination of the lease agreement with GEDD, the United States of America assumed ownership of the property. In January 1948, the property was returned to the City of Oakland and the Port of Oakland was created.

Crowley has been at the Site since approximately 1948. In the past, while repairing and refurbishing seagoing vessels, Crowley used products containing regulated materials and generated various regulated and nonregulated wastes. These products and waste materials include sand-blasting materials, oil-based paints, solvents, acids, caustic agents, oils, and motor fuels. The following paragraphs summarize environmental activities conducted at the Site.

In December 1989, Versar performed a limit subsurface soils investigation at the Site. The purpose of the investigation was to investigate the impact of historical activities on the soils at the Site. The focus of the investigation was in the areas where aboveground and underground storage tanks (UST) were located and sand-blasting activities had occurred. The

investigation included hand augering 11 boreholes and collecting 20 soil samples and several spent sand-blasting material samples.

Laboratory analysis of the soil samples identified concentrations of total recoverable petroleum hydrocarbons (TRPH) ranging from 80 milligrams per kilogram (mg/kg) to 109,000 mg/kg. At one location, near the former battery shop, near surface soils were found to contain 0.21 mg/kg of tetrachloroethene and 0.30 mg/kg of bis (2-ethylhexyl) phthalate. None of the soil samples analyzed for CAM metals or copper and lead exceeded total threshold level concentrations. A California Waste Extraction Test and CAM 17 analysis performed on spent sand-blasting material identified a copper concentration of 26 milligrams per liter (mg/l). (STLC=25)

In May, 1994 Versar performed an additional subsurface investigation at the Site. The investigation included collecting 30 soil samples and one water sample from 18 boreholes. The purpose of the investigation was to further delineate the impacted soils identified in the December 1989 investigation and determine the presence or absence of groundwater contamination at the Site. The soil samples and one water sample were submitted to Trace Analytical Laboratories (Trace) for analysis. The results of the analyses will be included in a Problem Assessment Report (PAR) for the Site.

In September 1994, Versar supervised the removal of a 500-gallon UST from the location shown in Figure 2. Soil samples collected from the excavation following removal of the UST were analyzed for total petroleum hydrocarbons as gasoline (TPH-G); benzene, toluene, ethylbenzene, and xylenes (BTEX); and total lead. The laboratory analyses did not report any concentrations of TPH-G or BTEX in the samples collected from the excavated soil or the UST excavation. Site closure regarding the former UST was received from (BC) Alameda County Health Care Services Agency in a letter dated March 2, 1995.

In April 1995, Versar performed an additional subsurface soils investigation at the Site. During the investigation, 33 soil samples were submitted for laboratory analysis. The purpose of this investigation was to delineate the extent of petroleum hydrocarbon and metals

impacted vadose soils identified during the December, 1989 and April 1994 investigations. The results of these analyses will be included in the PAR.

1.3 Groundwater Monitoring Well Installation

On July 8, 1994, Versar supervised the drilling of three boreholes and installation of three, four-inch groundwater monitoring wells at the Site. Monitoring well MW1 was located adjacent to the diesel fuel aboveground storage tanks (ASTs) to determine if any release had occurred and impacted groundwater. Monitoring well MW2 was located near the fence west of the guard shack, to determine if contamination observed at that location during May 1994 soil sampling activities had impacted the groundwater. MW3 was installed in an area that Versar believed would not have any groundwater contamination and therefore a measure of the background water quality at the Site could be gathered. The ability to determine a valid groundwater gradient for the Site was also taken into consideration in locating all of the monitoring wells. Prior to drilling and installing the monitoring wells, Versar submitted a Zone 7 Water Agency (Zone 7) well permit application on behalf of Crowley. The application was accepted and a permit issued by Mr. Wyman Hong of Zone 7 on June 6, 1994. A copy of the Zone 7 permit is included as Appendix A.

The monitoring well boreholes were drilled with a truck mounted drill rig using ten inch outside diameter hollow stem augers (HSA). Because numerous soil samples had been collected from the well locations during the December 1989, May 1994, and April 1995 investigations, Versar believed that soil sampling at five foot intervals was unnecessary. One soil sample, however, was collected using a California modified split spoon sampler lined with pre-cleaned brass liners, and submitted for laboratory analysis. Headspace analyses were performed on field samples. The headspace results are shown on Versar's borehole drilling logs included as Appendix B.

The boreholes were extended to the top of the bay muds, between 15 and 17 feet bgs. Versar did not encounter visible contamination while drilling boreholes MW1 and MW3. In

borehole MW2, an oily substance was observed at the contact between the upper soils and the bay muds. Groundwater was encountered during drilling at between six and ten feet bgs.

Versar supervised the construction of groundwater monitoring wells following the drilling of each borehole. Each monitoring well was constructed with ten feet of four inch 0.010 inch slotted polyvinyl chloride (PVC) casing, and four inch PVC blank casing to the surface. While removing the augers, a No. 2/12 sand pack was placed in the annulus up to one foot above the screened interval. Above the sand pack, a one foot thick bentonite chip seal was set and hydrated and then a cement grout seal installed to approximately one foot bgs. Each monitoring well was completed with a traffic rated box and a locking cap and labeled with the appropriate monitoring well number. In fulfilling Zone 7 requirements, Versar submitted well completion reports, borehole logs, and the drillers reports to Zone 7.

On February 7, 1995, Versar representatives Mr. Michael Holley, PE and Mr. Lawrence Kleinecke surveyed the monitoring wells to a temporary benchmark elevation of 100.00 feet.

On March 7, 1995, Versar representative Mr. Philip Cox developed the three monitoring wells. Prior to development, the depth to groundwater was measured in each well. Groundwater was present at depths of 3.15 feet bgs (MW1), 3.93 feet bgs (MW2), and 4.12 feet bgs (MW3). These depths were converted to elevations using data from the survey and were used to calculate the hydraulic gradient. The local hydraulic gradient for the Site on March 7, 1995 was 0.015 ft/ft in a northwest direction, as shown in Figure 3. The groundwater level data for March 7 are listed in Table 1.

MW1 and MW2 were developed by alternating bailing of groundwater and surge blocking. In order to avoid cross-contamination, Versar decided not to use the surge block and 3-inch PVC bailer to develop MW3 and therefore it was developed by bailing groundwater with disposable bailers. Development was halted when 10 well volumes of groundwater had been removed. At this point, the turbidity of the groundwater in each well had begun to decrease but was still moderate to heavy. Data collected during development included: (1) the initial and final depth to groundwater; (2) pH; (3) temperature;

(4) conductivity; and (5) observations of sheen, odor, free product, and turbidity. Details of the development were recorded and are included as Appendix C.

1.4 Groundwater Monitoring Program

The primary purpose of this program is to maintain regularly scheduled groundwater monitoring at the PDDII Site. The general objectives of the first sampling event were to:

- measure groundwater levels in monitoring wells MW1, MW2, and MW3 and determine the local hydraulic gradient;
- purge and collect groundwater samples from monitoring wells MW1, MW2, and MW3;
- submit the groundwater samples to a certified laboratory for analysis for TPH-G, BTEX, TPH-D, and HVOCs; and
- prepare this groundwater monitoring report.

1.5 Soil Laboratory Analytical Results

One soil sample was collected from borehole MW2 at 16.5 feet bgs and submitted to Trace, California-certified laboratory No. 1199. Trace analyzed for VOCs by EPA Method 8240; TPH as diesel (TPH-D) and TPH-G) by the Department of Health Services (DHS) Method; BTEX by EPA Method 8020. The results of the analysis reported concentrations of TPH-D at 2,700 mg/kg, TPH-G at 500 mg/kg, toluene at 1.0 mg/kg, ethylbenzene at 8.3 mg/kg, xylenes at 7.4 mg/kg, and benzene was not detected. The VOCs analysis reported chlorobenzene at 9.0 mg/kg, ethylbenzene at 1.6 mg/kg, xylenes at 3.9 mg/kg, 1,2-Dichlorobenzene at 4.2 mg/kg, and 1,4-Dichlorobenzene at 5.4 mg/kg. A complete copy of the analytical report is included in Appendix D.

2.0 SAMPLING ACTIVITIES

The first round of groundwater monitoring and sampling at the Site was conducted on March 13, 1995. The investigation included measurement of the groundwater levels and the collection of groundwater samples from the three monitoring wells.

On March 13, 1995, prior to conducting any groundwater sampling, the depth to groundwater was measured in each monitoring well. Groundwater was present at depths of 2.62 feet bgs (MW1), 3.23 feet bgs (MW2), and 3.96 feet bgs (MW3). These depths were converted to elevations using data from the survey and were used to calculate the hydraulic gradient. The gradient on March 13, 1995 was 0.019 ft/ft in a northwest direction, as shown in Figure 4. The groundwater level data for the first round are listed in Table 1. Historical groundwater level measurements are included as Figure 5.

After depth to groundwater in the monitoring well was measured, the monitoring wells were purged following Versar's standard procedures, outlined in Appendix E. Data collected during purging included (1) the initial and final 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 F.

Groundwater samples were collected from each monitoring well using a dedicated bailer. The samples for halogenated volatile organic compounds (HVOCs), TPH-G, and BTEX were placed in precleaned, 40-milliliter glass vials preserved with hydrochloric acid. Groundwater samples to be analyzed for TPH-D were placed in precleaned, 1-liter amber glass containers. Sampling containers were labeled with the date collected and a unique sample identification and stored at approximately 4° C in an insulated cooler. All groundwater samples and a Versar chain of custody document were picked up by a representative from Trace on March 13, 1995. The samples were prepared following U.S. 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".

3.0 GROUNDWATER LABORATORY ANALYTICAL RESULTS

During the March 13, 1995 sampling event, three groundwater samples were collected and submitted for laboratory analysis for HVOCs, TPH-G, TPH-D, and BTEX. Analysis for HVOCs was performed following EPA Method 601. Analysis for TPH-G and TPH-D was performed following the California Department of Health Services method. Analysis for BTEX was performed following the modified EPA Method 8020. Analytical results of groundwater samples are summarized in Table 2 and shown in Figure 6. A copy of the laboratory analytical report and chain-of-custody record from the sampling event is included as Appendix G.

Trace reported that the groundwater samples collected from monitoring wells MW1 and MW3 did not contain TPH-G or BTEX concentrations at or above the method reporting limits. The groundwater sample from MW2 contained 1,600 micrograms per liter (µg/L) of TPH-G, 77 µg/L of benzene, and 850 µg/L of total xylenes. The groundwater samples from MW1 and MW2 contained 220 and 2,500 µg/L of TPH-D, respectively and the samples from MW1, MW2, and MW3 contained chlorobenzene concentrations of 4.6 µg/L, 790 µg/L, and 0.51 µg/L, respectively. The laboratory analytical results indicate the matrix spike recovery and relative percent difference (RPD) are within acceptable ranges.

4.0 FUTURE ACTIVITIES

The first round of groundwater sampling for the three monitoring wells at the Site was completed on March 13, 1995. Because hydrocarbon contamination has been identified in groundwater samples collected during the first sampling event, additional groundwater monitoring will be conducted. The next sampling event is scheduled for June 1995.

request - given

5.0 REFERENCES

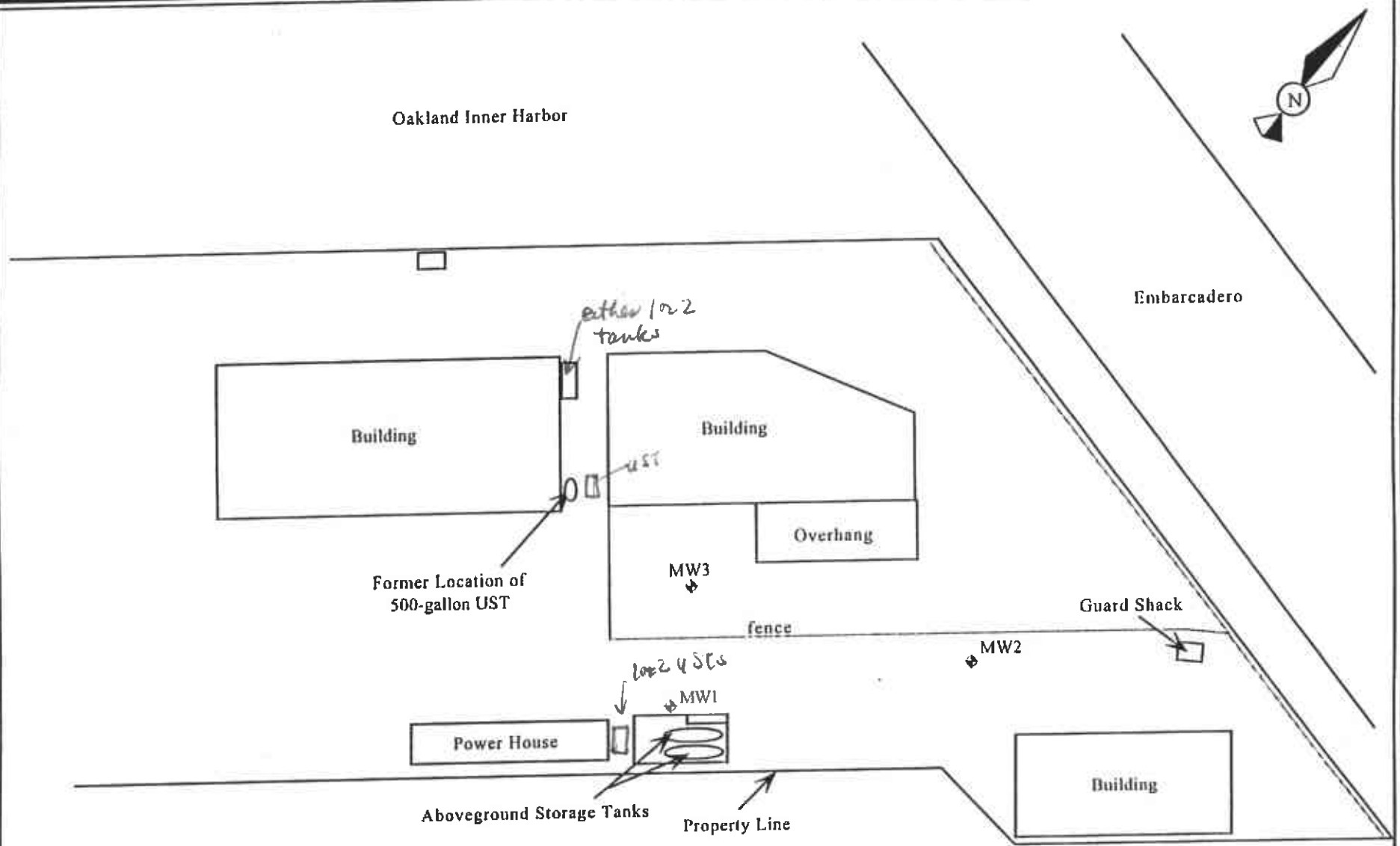
State of California, The Resources Agency, Department of Water Resources, Division of Local Assistance, Compilation of Federal and State Drinking Water Standards and Criteria, July 1993.

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. February 1995, Underground Storage Tank Removal, 321 Embarcadero, Oakland, California.

SOURCE: USGS TOPO 1959

Scale (miles) 0 0.25 0.50	Site Location	Figure 1
Project No. 2463-103	Former Pacific Dry Dock & Repair Company Yard II Facility Oakland, California	Versar, Inc.



Scale (feet)

0 40 80

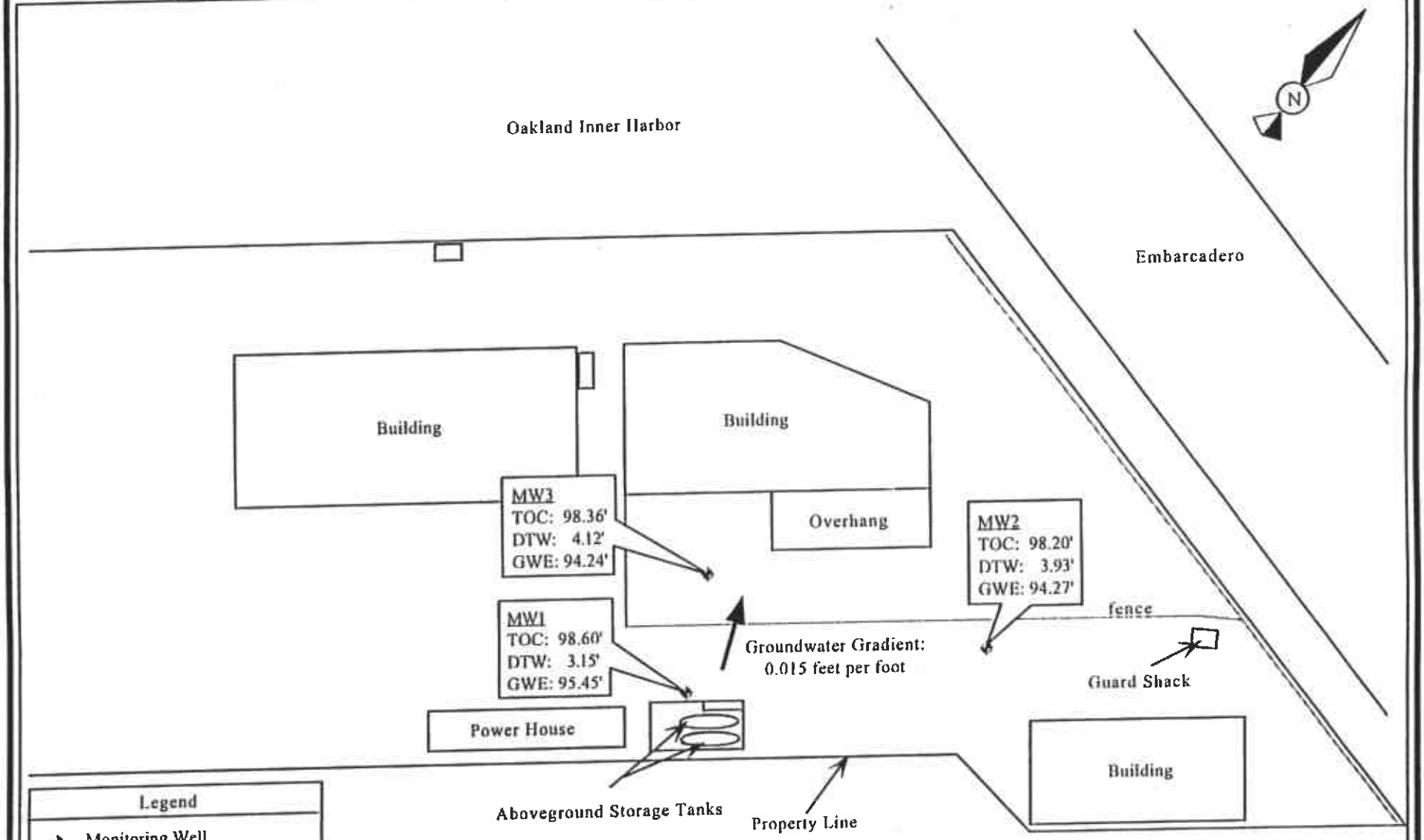
Project No. 2463-103

Site Layout

Former Pacific Dry Dock & Repair Company Yard II Facility
Oakland, California

Figure 2

Versar, Inc.

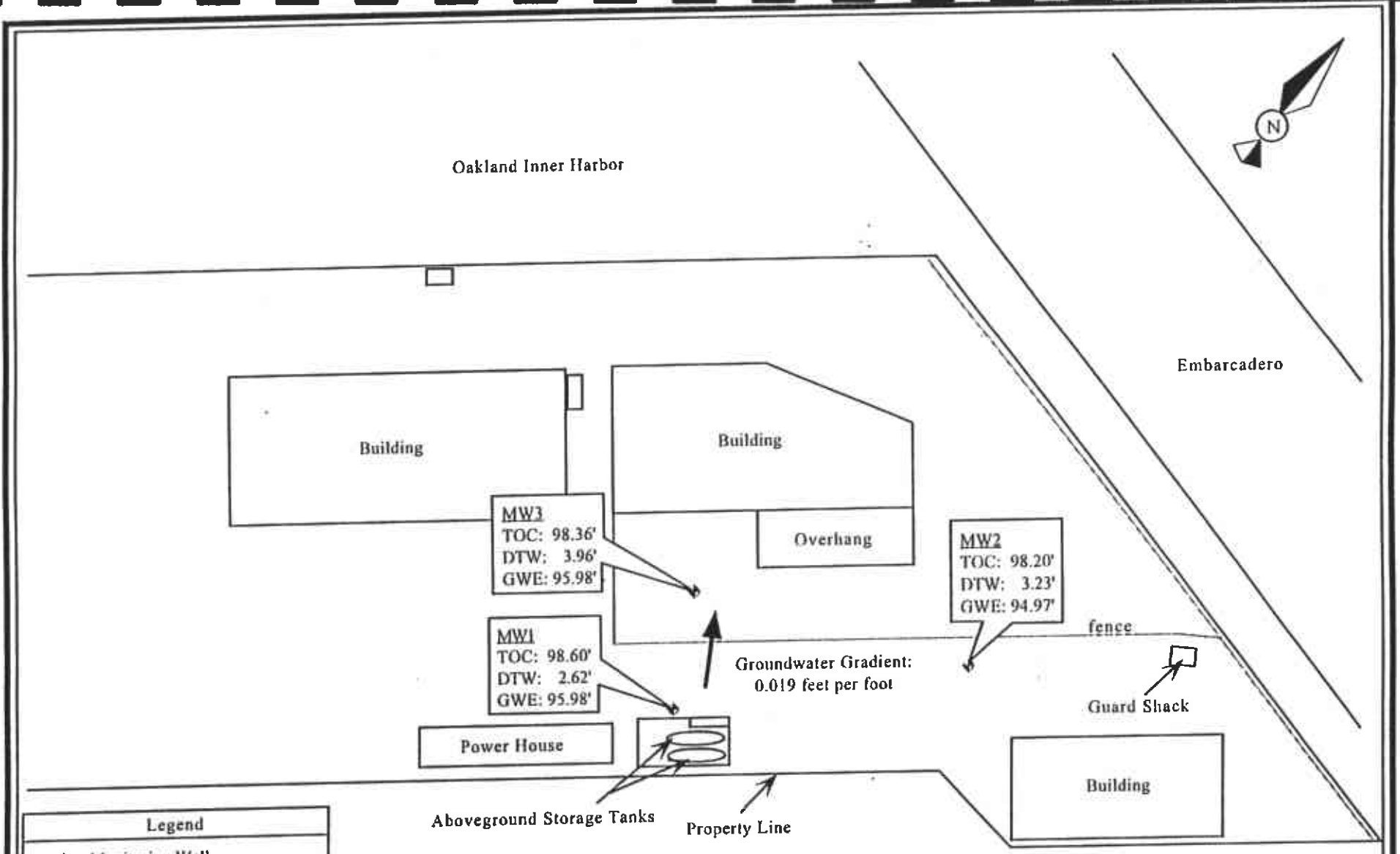


Calculated Groundwater Gradient, March 7, 1995

Former Pacific Dry Dock & Repair Company Yard II Facility
Oakland, California

Figure 3

Versar, Inc.



Legend
Monitoring Well
TOC Top of Casing
DTW Depth to Groundwater in feet
GWE Groundwater Elevation

Note: Top of Casing and Groundwater Elevations are in feet, relative to a temporary benchmark elevation of 100.00 feet.

Scale (feet)
0 40 80

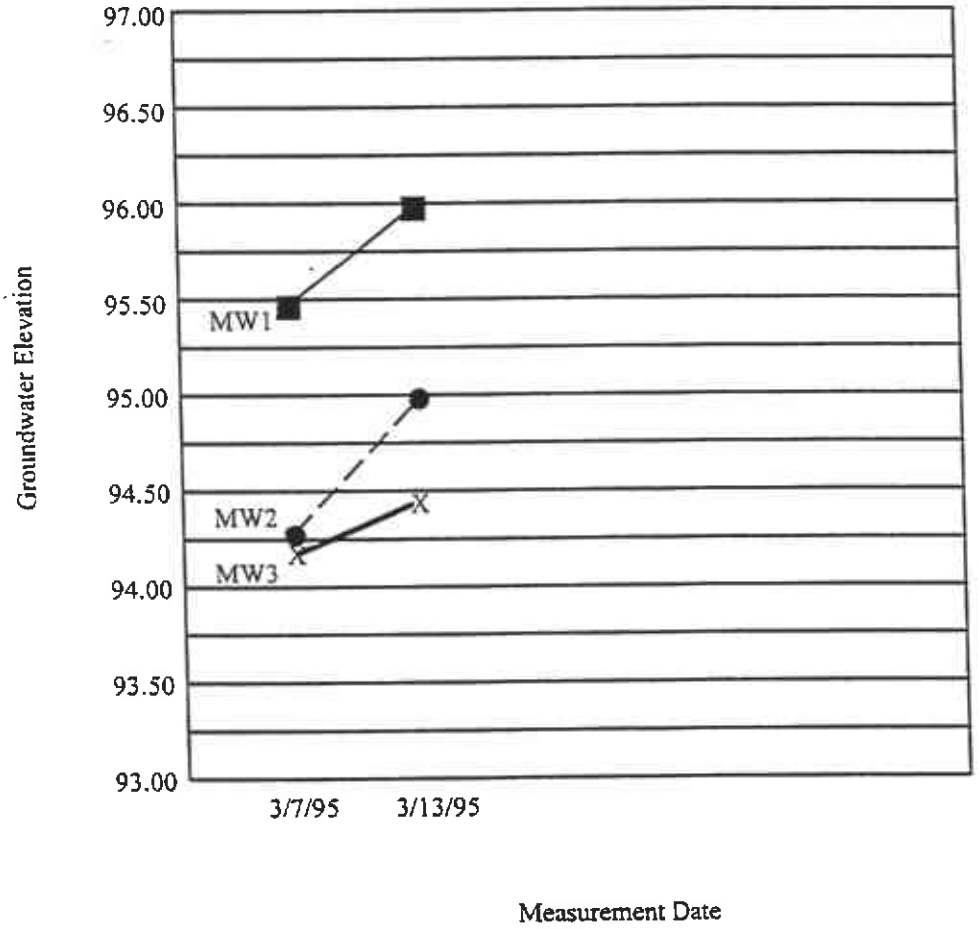
Project No. 2463-103

Calculated Groundwater Gradient, March 13, 1995

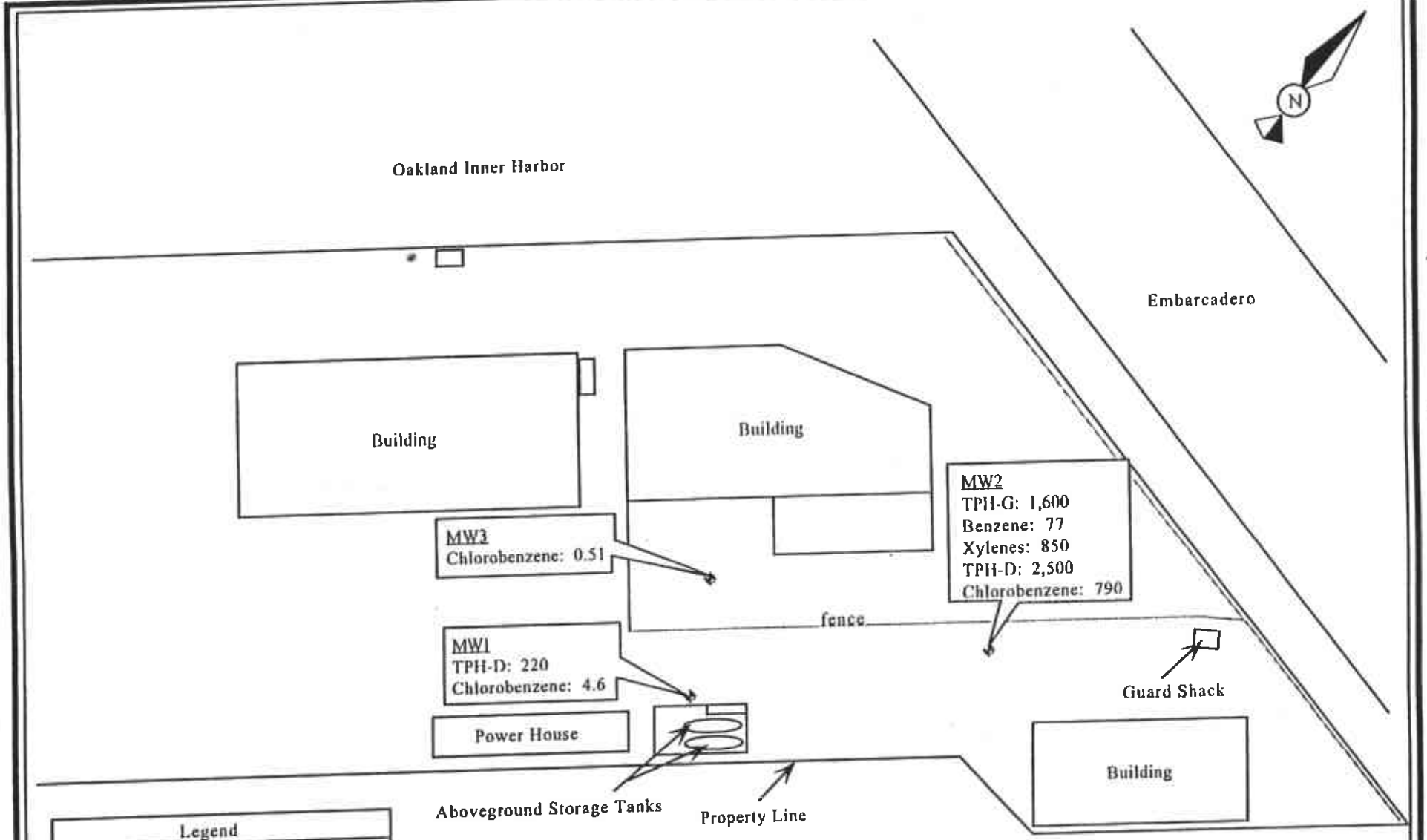
Former Pacific Dry Dock & Repair Company Yard II Facility
Oakland, California

Figure 4

Versar, Inc.



Vertical Scale (feet) 0 0.50 1.00	Groundwater Measurements March 7, 1995, through March 13, 1995	Figure 5
Project No. 2463-103	Former Pacific Dry Dock & Repair Company Yard II Facility Oakland, California	Versar, Inc.



Project No. 2463-103

Laboratory Analytical Results for Groundwater
Samples Collected on March 13, 1995
Former Pacific Dry Dock & Repair Company Yard II Facility
Oakland, California

Figure 6

Versar, Inc.

TABLE 1

GROUNDWATER MONITORING REPORT
MONITORING WELL GROUNDWATER LEVELS

March 13, 1995

Pacific Dry Dock and Repair Company Yard II Facility
Oakland, California

	MW1	MW2	MW3	Hydraulic Gradient (feet/foot)
Reference Casing Elevation (feet)	98.60	98.20	98.36	---
March 7, 1995				
Depth to Groundwater[1]	3.15	3.93	4.12	0.015 ft/ft
Groundwater Elevation[2]	95.45	94.27	94.24	to the northwest
March 13, 1995				
Depth to Groundwater[1]	2.62	3.23	3.96	0.019 ft/ft
Groundwater Elevation	95.98	94.97	94.40	to the northwest

[1] Depth-to-groundwater measurements are expressed in feet below top of casing.
[2] Groundwater elevations are in feet relative to a temporary benchmark elevation of 100.00 feet.

TABLE 2

GROUNDWATER MONITORING REPORT
LABORATORY ANALYTICAL RESULTS FOR GROUNDWATER

March 13, 1995

Pacific Dry Dock and Repair Company Yard II Facility
Oakland, California

Groundwater Monitoring Well	Sample Date	TPH-D (µg/L)[1]	TPH-G (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Chlorobenzene (µg/L)
MW1	3/13/95	220	ND	ND	ND	ND	ND	4.6
MW2	3/13/95	2,500	1,600	77	ND	ND	850	790
MW3	3/13/95	ND	ND	ND	ND	ND	ND	0.51

[1] µg/L = micrograms per liter
[2] ND = Not Detected at or above method reporting limits.

APPENDIX A

Zone 7 Water Agency Well Permit

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588 VOICE (510) 462-3600
FAX (510) 462-3914

RECEIVED
JUN 1 1994
ZONE 7, ACFC&WC

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

ON OF PROJECT PACIFIC DRY DOCK YARD II
320 EMBARCADERO
OAKLAND CALIFORNIA 94606

E
e CROWLEY MARINE SERVICES
ress 2401 FOURTH AVENUE Voice (206) 443-8042
SEATTLE, WASHINGTON Zip 98111

LICANT
ne VERSAR, INC.
MR. LAWRENCE KLEINECKE Fax (916) 962-2678
ress 5330 PRIMROSE DR. #2 Voice (916) 962-1612
FAIR OAKS, CA Zip 95628

E OF PROJECT
Construction
Cathodic Protection ____
Water Supply ____
Monitoring X
Geotechnical Investigation
General ____
Contamination ____
Well Destruction ____

OSED WATER SUPPLY WELL USE
nestic ____ Industrial ____ Other ____
icipal ____ Irrigation ____

LING METHOD:
Rotary ____ Air Rotary ____ Auger X
le ____ Other ____

LER'S LICENSE NO. C57-602720

L PROJECTS
ill Hole Diameter 8 in. Maximum
Casing Diameter 4 in. Depth 15 ft.
urface Seal Depth 5 ft. Number 6

OTECHNICAL PROJECTS
Number of Borings ____ Maximum
ole Diameter ____ in. Depth ____ ft.

TIMATED STARTING DATE JUNE 13, 1994
TIMATED COMPLETION DATE JULY 1, 1994

reby agree to comply with all requirements of this permit and Alameda unty Ordinance No. 73-68.

PLICANT'S
GNATURE [signature] Date 5/31/94

FOR OFFICE USE

PERMIT NUMBER 94343
LOCATION NUMBER ____

PERMIT CONDITIONS

Circled Permit Requirements Apply

(A.) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well Projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

(B.) WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 6 Jun 94
Wyman Hong

91992

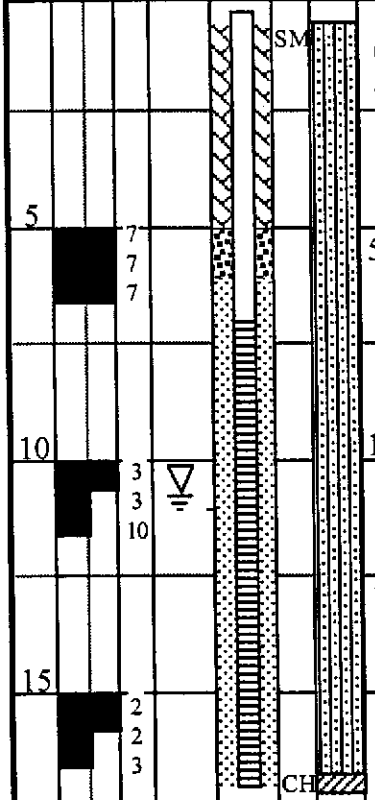
Versar Inc.	DRILLING LOG	PROJECT NO. 2463

Supervising Geologist: Michael Sellens	Site Name: Former Pacific Dry Dock & Repair Yard II
Log By: Lawrence Kleinecke	Boring No: MW1
Date: 7/8/94	Boring Diameter: 10 inches
Drilling Contractor: Turner Explorations, Inc.	Boring Depth: 15 feet
Contractor Lic. No. C57-602720	Boring Location: North of ASTs, 11 feet west of retaining wall
Rig Type: B53	
Driller: Kevin/Lou	

Depth (ft)	Advanced/ Recovered	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)
				CL		0.0'-0.5' Asphalt with gravel base. 0.5'-3.5' Silty Clay: medium brown, gravels up to 1/2 inch diameter, damp, no hydrocarbon odor, no staining.	
5				SM			2
						3.5'-13.0' Silty sand: olive gray, moist, 60% medium sand, 40% fine sand and silt, strong fuel odor.	
10		▽					2
				CH		13.0'-15.0' Bay muds. End hole at 15.0'.	
15							2
						Well construction: 10' of 4 inch 0.010 inch slotted screen, 5' blank, 11' sand 1 foot bentonite chips, and cement grout to 6" bgs.	

Versar Inc.	**DRILLING LOG**	PROJECT NO. 2463

Supervising Geologist: Michael Sellens	Site Name: Former Pacific Dry Dock & Repair Yard II
Log By: Lawrence Kleinecke	Boring No: MW2
Date: 7/8/94	Boring Diameter: 10 inches
Drilling Contractor: Turner Explorations, Inc.	Boring Depth: 17 feet
Contractor Lic. No. C57-602720	Boring Location: Area 5, between BH15 and BH19
Rig Type: B53	
Driller: Kevin/Lou	



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)
0.0'-0.5' Asphalt with gravel base. 0.5'-5.0' Sandy silt: 60% silt, 30% coarse to medium sand, damp, 10% gravels up to 1/2", slight odor.	324
5.0'-10.0' Sandy silt: dark olive gray, 60% silt, 30% coarse to medium sand, damp, medium to strong odor, solvents-sheen on sampler, wood fragments. Red brown cuttings beginning at 6.5', below wood fragments.	
10.0'-15.0' SAA: strong odor, saturated.	--
15.0'-16.5' SAA: NAPL droplets on sampler and in organic material at bay mud contact, organic matter fragments very abundant over bay muds.	151
16.5'-17.0' Bay muds. End hole at 17.0'.	
Well construction: 10' of 4 inch 0.010 inch slotted screen, 5' blank, 11' sand 1 foot bentonite chips, and cement grout to 6" bgs.	

Versar Inc.	**DRILLING LOG**	PROJECT NO. 2463

Supervising Geologist: Michael Sellens	Site Name: Former Pacific Dry Dock & Repair Yard II
Log By: Lawrence Kleinecke	Boring No: MW3
Date: 7/8/94	Boring Diameter: 10 inches
Drilling Contractor: Turner Explorations, Inc.	Boring Depth: 15 feet
Contractor Lic. No. C57-602720	Boring Location: Inside gated area, 30' east of gate
Rig Type: B53	
Driller: Kevin/Lou	

Depth (ft)	Advanced/ Recovered	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)
				SM		0.0'-0.5' Asphalt with gravel base. 0.5'-5.0' Sandy silt: olive brown, 60% silt, 30% coarse to medium sand, damp, 10% gravels, no odor.	
5							3
		▽				5.0'-8.0' SAA: medium brown, moist.	
10						8.0'-14.0' SAA: olive green.	3
15				CH		14.0'-15.0' Bay muds. End hole at 15.0'.	
						Well construction: 10' of 4 inch 0.010 inch slotted screen, 5' blank, 11' sand 1 foot bentonite chips, and cement grout to 6" bgs.	

APPENDIX C

Monitoring Well Development Table Sheets

MONITORING WELL DEVELOPMENT TABLE

Project Number: 2463	**Site Name:** Former Pacific Dry Dock and Repair Company Yard II Facility
Well Number: MW1	**Date(s) Developed:** 3/7/95
OVA - Ambient: 0 ppm	**Development Method:** Precleaned 3-inch PVC Bailer
OVA - Vault: 3 ppm	**Development Rate:** 2.2 gallons/min
OVA - Casing: 0 ppm	**Developed By:** P. Cox
Water Level - Initial: 3.15 feet	**Free Product:** No
Water Level - Final: 3.18 feet	**Sheen:** Yes
Well Depth: 14.60 feet	**Odor:** Moderate - Strong Petroleum Hydrocarbon
Well Diameter: 4 inches	
Well Casing Volume: 7.3 gallons	

Time	Water Removed (gallons)	Temperature (degrees Fahrenheit)	pH	Electrical Conductivity (umhos/cm)	Turbidity
1208-1218	Surge Block				
1219	1	65.4	8.49	2,990	Very High
1223	8	62.5	8.72	490	Very High
1226	16	61.3	8.82	229	Very High
1230	24	60.7	8.51	200	High
1231-1235	Surge Block				
1239	32	60.4	8.53	223	High
1240-1244	Surge Block				
1247	40	60.3	8.86	169	High
1252	48	60.8	8.69	239	High
1253-1300	Surge Block				
1304	56	60.0	9.11	176.5	High
1310	64	60.4	8.64	454	Moderate-High
1311-1320	Surge Block				
1325	73	59.9	9.24	212	Moderate-High

Field Notes:

MONITORING WELL DEVELOPMENT TABLE

Project Number: 2463	**Site Name:** Former Pacific Dry Dock and Repair Company Yard II Facility
Well Number: MW2	**Date(s) Developed:** 3/7/95
OVA - Ambient: 0 ppm	**Development Method:** Precleaned 3-inch Bailer
OVA - Vault: 1 ppm	**Development Rate:** 2.0 gallons/min
OVA - Casing: 0 ppm	**Developed By:** P. Cox
Water Level - Initial: 3.93 feet	**Free Product:** Yes
Water Level - Final: 3.95 feet	**Sheen:** Yes
Well Depth: 16.56 feet	**Odor:** Strong Petroleum Hydrocarbon
Well Diameter: 4 inches	
Well Casing Volume: 8.1 gallons	

Time	Water Removed (gallons)	Temperature (degrees Fahrenheit)	pH	Electrical Conductivity (umhos/cm)	Turbidity
1414-1424	Surge Block				
1429	1	66.3	8.98	2,280	Very High
1433	8	65.6	8.32	1,475	Very High
1437	16	65.0	8.23	1,019	Very High
1438-1445	Surge Block				
1449	24	64.8	7.93	1,127	Very High
1453	32	64.8	7.92	899	Very High
1454-1500	Surge Block				
1505	40	65.1	7.64	1,117	High
1510	48	64.9	7.82	862	High
1511-1517	Surge Block				
1522	56	65.1	7.62	1,036	High
1526	64	64.3	7.72	871	High
1527-1533	Surge Block				
1537	72	64.0	7.66	879	High
1541	80	64.1	7.66	823	Moderate-High

Field Notes:

MONITORING WELL DEVELOPMENT TABLE

Project Number: 2463	**Site Name:** Former Pacific Dry Dock and Repair Company Yard II Facility
Well Number: MW3	**Date(s) Developed:** 3/7/95
OVA - Ambient: 0 ppm	**Development Method:** 2 Disposable Bailers
OVA - Vault: 0 ppm	**Development Rate:** 0.8 gallons/min
OVA - Casing: 0 ppm	**Developed By:** P. Cox
Water Level - Initial: 4.12 feet	**Free Product:** None
Water Level - Final: 4.20 feet	**Sheen:** None
Well Depth: 14.33 feet	**Odor:** Possible Light Petroleum Hydrocarbon
Well Diameter: 4 inches	
Well Casing Volume: 6.5 gallons	

Time	Water Removed (gallons)	Temperature (degrees Fahrenheit)	pH	Electrical Conductivity (umhos/cm)	Turbidity
1643	1	62.2	7.68	3,160	Low
1652	7	61.3	7.43	4,320	Low
1659	14	6.4	7.76	3,910	Low
1709	21	61.2	7.88	3,190	Low
1716	28	60.9	7.79	3,060	Low
1724	35	60.4	7.55	2,950	Low
1733	42	59.2	7.51	2,820	Low
1740	49	59.6	7.49	2,820	Low
1748	56	60.3	7.37	3,480	Moderate
1753	62	60.5	7.42	3,390	Moderate
1757	65	60.8	7.45	2,990	Moderate

Field Notes:

APPENDIX D

Laboratory Analytical Report and Chain-of-Custody Records
for Soil Sample Collected July 8, 1994

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

TAL

LOG NUMBER: 4577
DATE SAMPLED: 07/08/94
DATE RECEIVED: 07/08/94
DATE EXTRACTED: 07/11/94
DATE ANALYZED: 07/13/94
DATE REPORTED: 07/22/94

CUSTOMER: Versar, Inc.

REQUESTER: Lawrence Kleinecke

PROJECT: No. 2463-002, Crowley: Yard II

Sample Type: Soil

Method and Constituent:	Units	MW-2, 16.5 Concentration	MW-2, 16.5 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
DHS Method:					
Total Petroleum Hydrocarbons as Diesel	ug/kg	2,700,000	1,000	ND	1,000

QC Summary:

% Recovery: 86
% RPD: 3.5

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

Trace Analysis Laboratory, Inc.

LOG NUMBER: 4577
DATE SAMPLED: 07/08/94
DATE RECEIVED: 07/08/94
DATE EXTRACTED: 07/12/94
DATE ANALYZED: 07/13/94
DATE REPORTED: 07/22/94
PAGE: Two

Sample Type: Soil

Method and Constituent:	Units	MW-2, 16.5 Concentration	MW-2, 16.5 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
DHS Method:					
Total Petroleum Hydrocarbons as Gasoline	ug/kg	500,000	12,000	ND	500
Modified EPA Method 8020 for:					
Benzene	ug/kg	ND	140	ND	5.0
Toluene	ug/kg	1,000	150	ND	5.0
Ethylbenzene	ug/kg	8,300	160	ND	5.0
Xylenes	ug/kg	7,400	430	ND	15

QC Summary:

% Recovery: 120
% RPD: 20

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

Trace Analysis Laboratory, Inc.

LOG NUMBER: 4577
DATE SAMPLED: 07/08/94
DATE RECEIVED: 07/08/94
DATE EXTRACTED: 07/16/94
DATE ANALYZED: 07/21/94
DATE REPORTED: 07/22/94
PAGE: Three

Sample Type: Soil

Method and Constituent:	Units	MW-2, 16.5 Concentration	MW-2, 16.5 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8240:					
Chloromethane	ug/kg	ND	900	ND	60
Bromomethane	ug/kg	ND	900	ND	60
Dichlorodifluoromethane	ug/kg	ND	900	ND	60
Vinyl Chloride	ug/kg	ND	1,800	ND	120
Chloroethane	ug/kg	ND	1,800	ND	120
Iodomethane	ug/kg	ND	18,000	ND	1,200
Methylene Chloride	ug/kg	ND	18,000	ND	1,200
Acetone	ug/kg	ND	18,000	ND	1,200
Carbon Disulfide	ug/kg	ND	18,000	ND	1,200
Trichlorofluoromethane	ug/kg	ND	1,800	ND	120
1,1-Dichloroethene	ug/kg	ND	900	ND	60
Allyl Chloride	ug/kg	ND	900	ND	60
1,1-Dichloroethane	ug/kg	ND	900	ND	60
Trans-1,2-Dichloroethene	ug/kg	ND	900	ND	60
Chloroform	ug/kg	ND	900	ND	60
2-Butanone (MEK)	ug/kg	ND	18,000	ND	1,200
1,2-Dichloroethane	ug/kg	ND	900	ND	60
Dibromomethane	ug/kg	ND	900	ND	60
1,1,1-Trichloroethane	ug/kg	ND	900	ND	60
Carbon Tetrachloride	ug/kg	ND	900	ND	60

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

LOG NUMBER: 4577
DATE SAMPLED: 07/08/94
DATE RECEIVED: 07/08/94
DATE EXTRACTED: 07/16/94
DATE ANALYZED: 07/21/94
DATE REPORTED: 07/22/94
PAGE: Four

Sample Type: Soil

Method and Constituent	Units	MW-2, 16.5 Concentration	MW-2, 16.5 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8240 (Continued):					
Vinyl Acetate	ug/kg	ND	9,000	ND	600
Bromodichloromethane	ug/kg	ND	900	ND	60
1,2-Dichloropropane	ug/kg	ND	900	ND	60
Cis-1 3-Dichloropropene	ug/kg	ND	900	ND	60
Bromoacetone	ug/kg	ND	18,000	ND	1,200
Trichloroethene	ug/kg	ND	900	ND	60
Benzene	ug/kg	ND	900	ND	60
Chlorodibromomethane	ug/kg	ND	900	ND	60
1,1,2-Trichloroethane	ug/kg	ND	900	ND	60
Trans-1 3-Dichloropropane	ug/kg	ND	900	ND	60
1 2-Dibromoethane (EDB)	ug/kg	ND	900	ND	60
2-Chloroethylvinyl Ether	ug/kg	ND	1,800	ND	120
Acrolein	ug/kg	ND	18,000	ND	1,200
Bromoform	ug/kg	ND	900	ND	60
1,1,1,2-Tetrachloroethane	ug/kg	ND	900	ND	60
4-Methyl-2-Pentanone (MIBK)	ug/kg	ND	9,000	ND	600
2-Hexanone	ug/kg	ND	9,000	ND	600
1,2,3-Trichloropropane	ug/kg	ND	900	ND	60
1,1,2,2-Tetracholorethane	ug/kg	ND	900	ND	60
Tetrachloroethene	ug/kg	ND	900	ND	60
Toluene	ug/kg	ND	900	ND	60
Chlorobenzene	ug/kg	9,000	900	ND	60
Ethyl Benzene	ug/kg	1,600	900	ND	60

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

LOG NUMBER: 4577
DATE SAMPLED: 07/08/94
DATE RECEIVED: 07/08/94
DATE EXTRACTED: 07/16/94
DATE ANALYZED: 07/21/94
DATE REPORTED: 07/22/94
PAGE: Five

Sample Type: Soil

Method and Constituent	Units	MW-2, 16.5 Concentration	MW-2, 16.5 Reporting Limit	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 8240 (Continued):					
1,2-Dibromo 3-Chloropropane	ug/kg	ND	18,000	ND	1,200
Benzyl Chloride	ug/kg	ND	18,000	ND	1,200
Styrene	ug/kg	ND	900	ND	60
Xylenes	ug/kg	3,900	2,700	ND	180
1,3-Dichlorobenzene	ug/kg	ND	900	ND	60
1,2-Dichlorobenzene	ug/kg	4,200	900	ND	60
1,4-Dichlorobenzene	ug/kg	5,400	900	ND	60
Surrogate % Recovery					
1,2-Dichloroethane-d4		94		105	
Toluene-d8		103		97	
4-Bromofluorobenzne		102		96	

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

Louis W. DuPuis
Quality Assurance/Quality Control Manager

APPENDIX E

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 dectector (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 disposal 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 a sampling containers.

6. Measure the temperature, pH, conductivity, and turbidity. 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, conductivity, and turbidity 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, provincial, 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 F

Monitoring Well Purge Table Sheets

MONITORING WELL PURGE TABLE

Project Number: 2463	**Site Name:** Former Pacific Dry Dock and Repair Company Yard II Facility
Well Number: MW1	**Date(s) Purged:** 3/13/95
OVA - Ambient: 0 ppm	**Purge Method:** Dedicated bailer
OVA - Vault: 0 ppm	**Purge Rate:** 0.9 gallon/min
OVA - Casing: 0 ppm	**Date & Time Sampled:** 3/13/95 (1215)
Water Level - Initial: 2.62 feet	**Purged & Sampled By:** P. Cox
Water Level - Final: 2.64 feet	**Sampling Method:** Dedicated bailer
Well Depth: 14.93 feet	**Free Product:** None
Well Diameter: 4 inches	**Sheen:** None
Well Casing Volume: 12.3 gallons	**Odor:** Moderate petroleum hydrocarbon

Time	Purge Water Removed (gallons)	Temperature (degrees Fahrenheit)	pH	Electrical Conductivity (umhos/cm)	Turbidity
1123	0.5	60.9	9.19	378	Low
1134	8	60.1	8.55	348	Low
1137	12	59.8	8.46	344	Moderate
1141	16	69.8	87.2	345	Moderate
1145	20	59.8	8.75	346	Moderate
1149	24	59.4	8.74	340	Moderate
1153	28	59.6	8.77	346	Moderate
1157	32	59.4	8.62	348	Moderate
1201	36	59.5	8.78	356	Moderate
1204	38	59.3	8.79	354	Moderate
1215	Sample	59.7	8.78	357	Low

MONITORING WELL PURGE TABLE

Project Number: 2463	**Site Name:** Former Pacific Dry Dock and Repair Company Yard II Facility
Well Number: MW2	**Date(s) Purged:** 3/13/95
OVA - Ambient: 0 ppm	**Purge Method:** Dedicated bailer
OVA - Vault: 0 ppm	**Purge Rate:** 0.9 gallon/min
OVA - Casing: 0 ppm	**Date & Time Sampled:** 3/13/95 (1330)
Water Level - Initial: 3.23 feet	**Purged & Sampled By:** P. Cox
Water Level - Final: 3.25 feet	**Sampling Method:** Dedicated bailer
Well Depth: 16.56 feet	**Free Product:** None
Well Diameter: 4 inches	**Sheen:** None
Well Casing Volume: 8.5 gallons	**Odor:** Strong Petroleum Hydrocarbon Odor

Time	Purge Water Removed (gallons)	Temperature (degrees Fahrenheit)	pH	Electrical Conductivity (umhos/cm)	Turbidity
1245	0.5	62.1	8.47	1,039	Low
1251	6	62.4	8.55	1,062	Moderate
1254	9	62.6	8.50	1,074	Moderate
1257	12	62.7	8.46	1,111	Moderate
1300	15	62.6	8.37	1,146	Moderate
1303	18	62.6	8.35	1,180	Moderate
1306	21	62.8	8.24	1,209	Moderate
1312	24	62.5	8.04	1,216	Moderate
1315	27	62.5	7.98	1,236	Moderate
1318	30	62.5	8.25	1.255	Moderate
1330	Sample	62.3	8.30	1,250	Low

MONITORING WELL PURGE TABLE

Project Number: 2463	**Site Name:** Former Pacific Dry Dock and Repair Company Yard II Facility
Well Number: MW3	**Date(s) Purged:** 3/13/95
OVA - Ambient: 0 ppm	**Purge Method:** Dedicated bailer
OVA - Vault: 0 ppm	**Purge Rate:** 0.9 gallon/min
OVA - Casing: 0 ppm	**Date & Time Sampled:** 3/13/95 (1100)
Water Level - Initial: 3.96 feet	**Purged & Sampled By:** P. Cox
Water Level - Final: 5.12 feet	**Sampling Method:** Dedicated bailer
Well Depth: 14.50 feet	**Free Product:** None
Well Diameter: 4 inches	**Sheen:** None
Well Casing Volume: 6.7 gallons	**Odor:** Light Petroleum Hydrocarbon Odor

Time	Purge Water Removed (gallons)	Temperature (degrees Fahrenheit)	pH	Electrical Conductivity (umhos/cm)	Turbidity
1020	0.5	62.4	8.95	3,640	Low
1023	5.0	62.2	7.88	5,280	Low
1026	7.5	62.0	8.04	2,920	Moderate
1029	10.0	62.0	7.61	3,510	Moderate
1031	12	62.1	7.76	3,130	Moderate
1033	14	66.2	7.69	3,070	Moderate
1036	16	62.1	7.89	2,720	Moderate
1039	18	62.1	7.44	2,730	Moderate
1041	20	62.1	7.69	2,670	Moderate
1043	22	62.0	7.65	2,570	Moderate
1045	24	61.8	7.71	2,560	Moderate
1100	Sample	62.0	7.75	2,480	Low

APPENDIX G

Laboratory Analytical Results and Chain-of-Custody Records for
Groundwater Samples Collected During March 13, 1995
First Groundwater Sampling Event

LOG NUMBER: 5307
DATE SAMPLED: 03/13/95
DATE RECEIVED: 03/13/95
DATE ANALYZED: 03/24/95
DATE REPORTED: 04/06/95
PAGE: Two

Sample Type: Water

Method and Constituent:	Units	MW-1 Concentration	MW-1 Reporting Limit	MW-2 Concentration	MW-2 Reporting Limit	MW-3 Concentration	MW-3 Reporting Limit
DHS Method:							
Total Petroleum Hydrocarbons as Gasoline	ug/l	ND	50	1,600	1,200	ND	50
Modified EPA Method 8020 for:							
Benzene	ug/l	ND	0.50	77	25	ND	0.50
Toluene	ug/l	ND	0.50	ND	25	ND	0.50
Ethylbenzene	ug/l	ND	0.50	ND	25	ND	0.50
Xylenes	ug/l	ND	1.5	850	75	ND	1.5

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

QC Summary:

% Recovery: 102
% RPD: 3.8

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

Trace Analysis Laboratory, Inc.

LOG NUMBER: 5307
DATE SAMPLED: 03/13/95
DATE RECEIVED: 03/13/95
DATE ANALYZED: 03/24/95
DATE REPORTED: 04/06/95
PAGE: Three

Sample Type: Water

Method and Constituent	Units	MW-1 Concentration	MW-1 Reporting Limit	MW-2 Concentration	MW-2 Reporting Limit	MW-3 Concentration	MW-3 Reporting Limit
EPA Method 601:							
Benzyl Chloride	ug/l	ND	600	ND	3,000	ND	120
Bromobenzene	ug/l	ND	600	ND	3,000	ND	120
Bromodichloromethane	ug/l	ND	2.5	ND	12	ND	0.50
Bromoform	ug/l	ND	2.5	ND	12	ND	0.50
Bromomethane	ug/l	ND	30	ND	150	ND	6.0
Carbon Tetrachloride	ug/l	ND	30	ND	150	ND	6.0
Chlorobenzene	ug/l	4.6	2.5	790	12	0.51	0.50
Chloroethane	ug/l	ND	30	ND	150	ND	6.0
2-Chloroethyl Vinyl Ether	ug/l	ND	30	ND	150	ND	6.0
Chloroform	ug/l	ND	2.5	ND	12	ND	0.50
Chloromethane	ug/l	ND	30	ND	150	ND	6.0
Dibromochloromethane	ug/l	ND	2.5	ND	12	ND	0.50
Dibromomethane	ug/l	ND	600	ND	3,000	ND	120
1,2-Dichlorobenzene	ug/l	ND	30	ND	150	ND	6.0
1,3-Dichlorobenzene	ug/l	ND	30	ND	150	ND	6.0
1,4-Dichlorobenzene	ug/l	ND	30	ND	150	ND	6.0
Dichlorodifluoromethane	ug/l	ND	30	ND	150	ND	6.0
1,1-Dichloroethane	ug/l	ND	2.5	ND	12	ND	0.50
1,2-Dichloroethane	ug/l	ND	2.5	ND	12	ND	0.50
1,1-Dichloroethene	ug/l	ND	2.5	ND	12	ND	0.50

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

Trace Analysis Laboratory, Inc.

LOG NUMBER: 5307
DATE SAMPLED: 03/13/95
DATE RECEIVED: 03/13/95
DATE ANALYZED: 03/24/95
DATE REPORTED: 04/06/95
PAGE: Four

Sample Type: Water

Method and Constituent	Units	MW-1 Concentration	MW-1 Reporting Limit	MW-2 Concentration	MW-2 Reporting Limit	MW-3 Concentration	MW-3 Reporting Limit
EPA Method 601 (Continued):							
cis and trans-1,2-Dichloroethene	ug/l	ND	2.5	ND	12	ND	0.50
Dichloromethane	ug/l	ND	600	ND	3,000	ND	120
1,2-Dichloropropane	ug/l	ND	2.5	ND	12	ND	0.50
cis-1,3-Dichloropropene	ug/l	ND	2.5	ND	12	ND	0.50
trans-1,3-Dichloropropene	ug/l	ND	2.5	ND	12	ND	0.50
1,1,2,2-Tetrachloroethane	ug/l	ND	2.5	ND	12	ND	0.50
1,1,1,2-Tetrachloroethane	ug/l	ND	600	ND	3,000	ND	120
Tetrachloroethene	ug/l	ND	2.5	ND	12	ND	0.50
1,1,1-Trichloroethane	ug/l	ND	2.5	ND	12	ND	0.50
1,1,2-Trichloroethane	ug/l	ND	2.5	ND	12	ND	0.50
Trichloroethene	ug/l	ND	2.5	ND	12	ND	0.50
Trichlorofluoromethane	ug/l	ND	2.5	ND	12	ND	0.50
1,2,3-Trichloropropane	ug/l	ND	600	ND	3,000	ND	120
Vinyl Chloride	ug/l	ND	30	ND	150	ND	6.0

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

LOG NUMBER: 5307
DATE SAMPLED: 03/13/95
DATE RECEIVED: 03/13/95
DATE ANALYZED: 03/24/95
DATE REPORTED: 04/06/95
PAGE: Five

Sample Type: Water

Method and Constituent	Units	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 601:			
Benzyl Chloride	ug/l	ND	120
Bromobenzene	ug/l	ND	120
Bromodichloromethane	ug/l	ND	0.50
Bromoform	ug/l	ND	0.50
Bromomethane	ug/l	ND	6.0
Carbon Tetrachloride	ug/l	ND	6.0
Chlorobenzene	ug/l	ND	0.50
Chloroethane	ug/l	ND	6.0
2-Chloroethyl Vinyl Ether	ug/l	ND	6.0
Chloroform	ug/l	ND	0.50
Chloromethane	ug/l	ND	6.0
Dibromochloromethane	ug/l	ND	0.50
Dibromomethane	ug/l	ND	120
1,2-Dichlorobenzene	ug/l	ND	6.0
1,3-Dichlorobenzene	ug/l	ND	6.0
1,4-Dichlorobenzene	ug/l	ND	6.0
Dichlorodifluoromethane	ug/l	ND	6.0
1,1-Dichloroethane	ug/l	ND	0.50
1,2-Dichloroethane	ug/l	ND	0.50
1,1-Dichloroethene	ug/l	ND	0.50

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

LOG NUMBER: 5307
DATE SAMPLED: 03/13/95
DATE RECEIVED: 03/13/95
DATE ANALYZED: 03/24/95
DATE REPORTED: 04/06/95
PAGE: Six

Sample Type: Water

Method and Constituent	Units	Method Blank Concentration	Method Blank Reporting Limit
EPA Method 601 (Continued):			
cis and trans-1,2-Dichloroethene	ug/l	ND	0.50
Dichloromethane	ug/l	ND	120
1,2-Dichloropropane	ug/l	ND	0.50
cis-1,3-Dichloropropene	ug/l	ND	0.50
trans-1,3-Dichloropropene	ug/l	ND	0.50
1,1,2,2-Tetrachloroethane	ug/l	ND	0.50
1,1,1,2-Tetrachloroethane	ug/l	ND	120
Tetrachloroethene	ug/l	ND	0.50
1,1,1-Trichloroethane	ug/l	ND	0.50
1,1,2-Trichloroethane	ug/l	ND	0.50
Trichloroethene	ug/l	ND	0.50
Trichlorofluoromethane	ug/l	ND	0.50
1,2,3-Trichloropropane	ug/l	ND	120
Vinyl Chloride	ug/l	ND	6.0

QC Summary:

% Recovery: 106
% RPD: 6.5

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

Louis W. DuPuis
Quality Assurance/Quality Control Manager

Versar 5307

CHAIN OF CUSTODY RECORD

PROJECT NO.	PROJECT NAME	INDUSTRIAL HYGIENE SAMPLE	Y / N
2463	Crowley Yd. II 1st Quarter QM&S		N

SAMPLERS: *(Signature)* Philip M. Cox — (Printed) Philip M. Cox

PARAMETERS

FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH-D	Gas/BTEX	HVOCs/601						REMARKS
MW-1	3/13/95	1215		X		5	X	X	X						14 Day TAT
MW-2	↓	1330		↓		5	X	X	X						↓
MW-3	↓	1100		↓		5	X	X	X						↓

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Philip M. Cox	3/13/95 2:00				
(Printed) Philip M. Cox	Versar	(Printed)	(Printed)		(Printed)

Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks
		Scott T. [illegible]	3/13/95 2:00	Please send any preliminary results + final report to Phil Cox in Fair Oaks office (916) [illegible] Fax [illegible]
(Printed)		(Printed) Scott T. [illegible]		