Versar INC. SACRAMENTO

91 APR -8 PM 3:09

SITE ASSESSMENT REPORT FOR THE PACIFIC DRY DOCK AND REPAIR YARDS 1 AND 2 OAKLAND, CALIFORNIA

Prepared for:

Crowley Maritime Corporation
Pacific Division
2401 Fourth Avenue
P.O. Box 2287
Seattle, Washington 98111

Prepared by:

Versar Inc. - Sacramento
5330 Primrose Drive, Suite 228
Fair Oaks, California 95628-3520

Versar Job No. 6695.09

October 2, 1990

Versar INC. SACRAMENTO

The information contained herein (or attached hereto) has been prepared at your request. The information is confidential and has been and will be disclosed only to those in Crowley Maritime Corporation, and Versar Inc. with a need to review this information.

PROJECT SUMMARY

Versar conducted a site assessment of the Pacific Dry Dock and Repair Yards 1 and 2, which are located in Oakland, California, on December 8, 1989 and January 10, 1990. The assessment included a physical site inspection, the augering of 22 boreholes, the collection of soil and sediment samples for analyses, and associated research. Mr. R. Stephen Wilson, Senior Geologist , and Mr. Michael Clancey, Environmental Scientist, conducted the site inspection and collection of samples. Mr. Wilson prepared this report and Mr. Clarence Johnson, R.P.G., reviewed this site assessment report.

The following brief conclusions summarize the findings of Versar's site assessment study:

- Petroleum hydrocarbons, volatile and semi-volatile organic compounds, metals and non-metals were identied in the soil and sediments of both Yard 1 and Yard 2.
- Versar recomends that further investigation of both sites is performed to identify the vertical and lateral extent of the impacted soils and sediments, and to determine if ground water has been impacted.

Approved for Release:

Clarence Johnson
Division Director
R.P.G. No. 4195

R. Stephen Wilson
Senior Geologist
Project Manager

DISCLAIMER

The purpose of this report is only to inform the client of the environmental conditions as they currently exist at the subject sites. Versar Inc. does not assume responsibility for the discovery and elimination of hazards that could possibly cause accidents, injuries, or damage. Compliance with submitted recommendations and/or suggestions in no way assures elimination of hazards or the fulfillment of a client's obligation under any local, state, or federal laws or any modifications or changes thereto. In many cases, federal, state, or local codes require the prompt reporting to relevant authorities if a release occurs. It is the responsibility of the client to comply with requirements to notify authorities of any conditions that are in violation of the current legal standards.

Factual information regarding operations, conditions, and test data was obtained, in part, from the client and has been assumed by Versar to be correct and complete. Since the facts stated in this report are subject to professional interpretation, they could result in differing conclusions. In addition, the findings and conclusions contained in this report are based on various quantitative and qualitative factors as they existed on or near the date of the investigation. Therefore, if the recommendations made in this report are not implemented within a reasonable period of time, there can be no assurances that intervening factors will not arise that will affect the conclusions reached herein.

This report reflects conditions, operations, and practices as observed during the investigation. Changes or modifications to procedures and/or facilities made after the site visit are not included.

Versar makes no warranty and assumes no liability with respect to the use of information contained in this report. No changes to its form or content may be made without Versar's express written approval.

Versar INC. SACRAMENTO

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

Versar was retained by Crowley Maritime Corporation, Pacific Division, to perform a site assessment of the Pacific Dry Dock and Repair Company (PDD) facilities located at 1441 Embarcadero Avenue (Yard 1) and 320 Embarcadero Avenue (Yard 2) in Oakland, California. The site assessment included: (1) a review of historical aerial photographs of the facilities; (2) a review of available and appropriate regulatory agencies files; (3) interviews with PDD personnel; and (4) soil and sediment sampling and analysis.

2.0 ENVIRONMENTAL SETTING

2.1 Site Location and Demographics

Oakland, a city with a population of approximately 400,000 people, is located in the northwest section of Alameda County, California. The location of Oakland is shown in Figure 2-1. The PDD facilities, Yard 1 and Yard 2, are located at 1441 and 320 Embarcadero Avenue, respectively, in the southwest section of the City of Oakland. The location of the facilities is shown in Figure 2-2. The sites layouts of Yard 1 and Yard 2 are shown in Figure 2-3 and Figure 2-4, respectively.

2.2 Land Use

Both Yards 1 and 2 have been used as boat repair and dry dock facilities from approximately 1935 to the present day, by Crowley Maritime Corporation or by other companies. Yard 1 was the first commercial facility to be sited west of the railway tracks. The land use in the area surrounding Yard 1 appears to have been light industrial and commercial offices from 1953 to the present day.

Yard 2 appears to have been part of a mature industrial area in 1934. The site to the northwest has changed from industrial and commercial (1934-1969) to a park and recreation area (1971-present). The site to the southeast is currently used for lime and gravel operations.

2.3 Surface Water

Yard 1 is situated on the Oakland Inner Harbor waterway and Yard 2 is situated on the Brooklyn Basin. San Francisco Bay is approximately 1.5 miles to the southwest.

2.4 Geology

Oakland is located in the Coast Ranges geomorphic province, at an average elevation of 70 feet. The area is tectonically active being situated between the Hayward Fault on the east and the San Andreas Fault on the west. The underlying bedrock consists of Mesozoic volcanic and

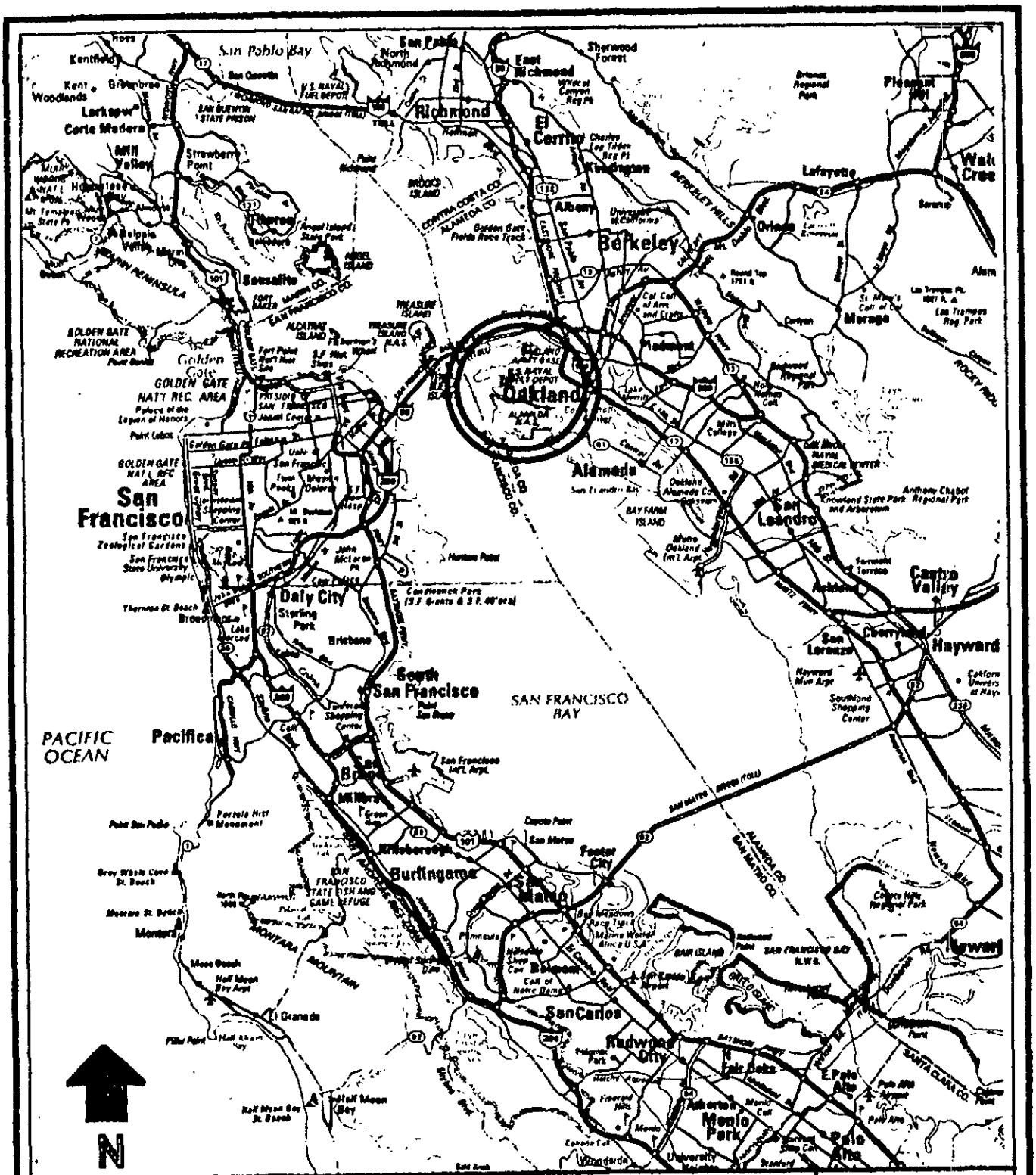
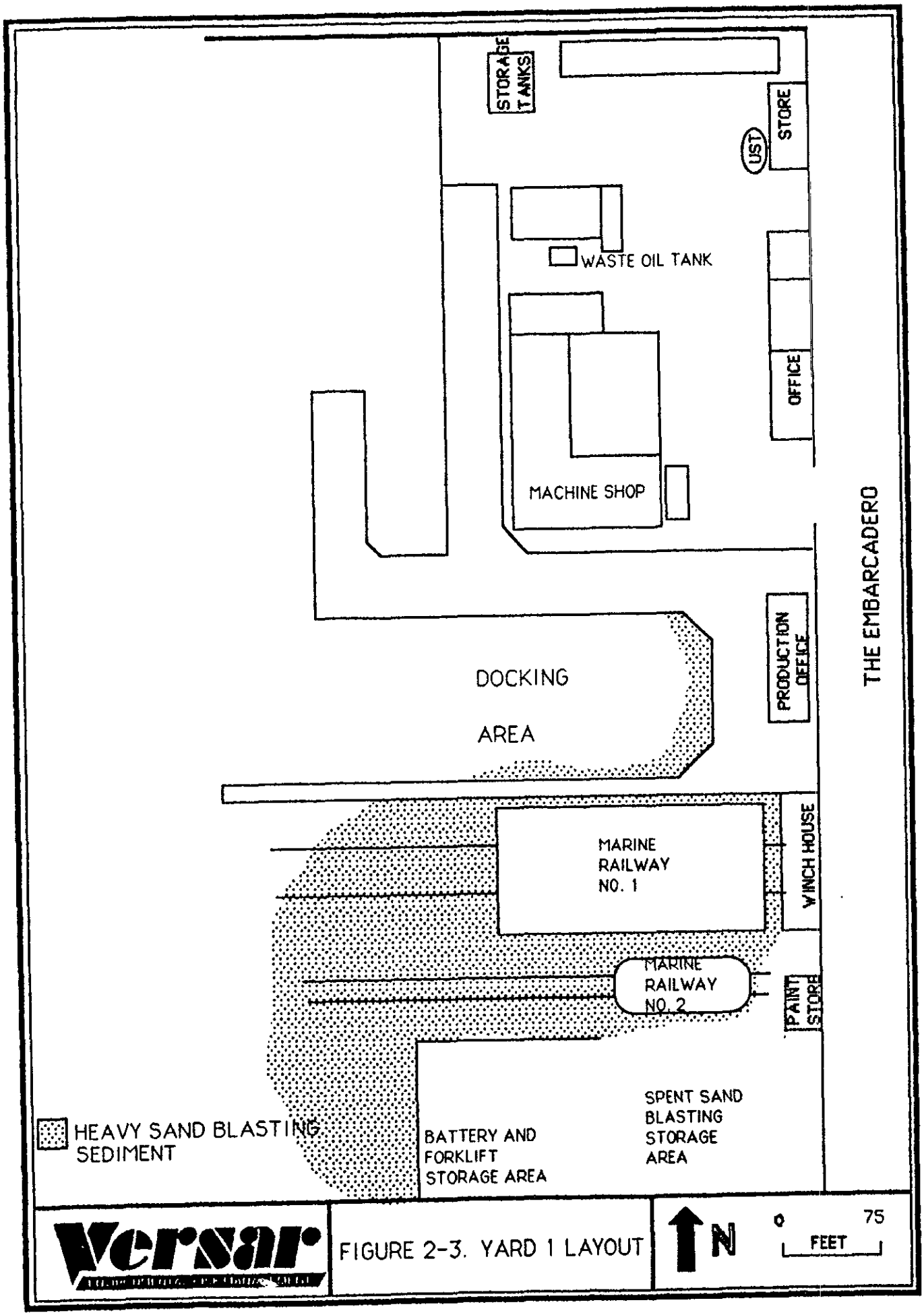


FIGURE 2-1. LOCATION OF THE CITY OF OAKLAND

0 miles 5

approximate scale


STORAGE TANKS
STORE
UST
WASTE OIL TANK
OFFICE
MACHINE SHOP
THE EMBARCADERO
PRODUCTION OFFICE
DOCKING
AREA
MARINE RAILWAY NO. 1
WINCH HOUSE
MARINE RAILWAY NO. 2
PAINT STORE
SPENT SAND BLASTING STORAGE AREA
BATTERY AND FORKLIFT STORAGE AREA
HEAVY SAND BLASTING SEDIMENT
Versar
FIGURE 2-3. YARD 1 LAYOUT
N
0
75
FEET

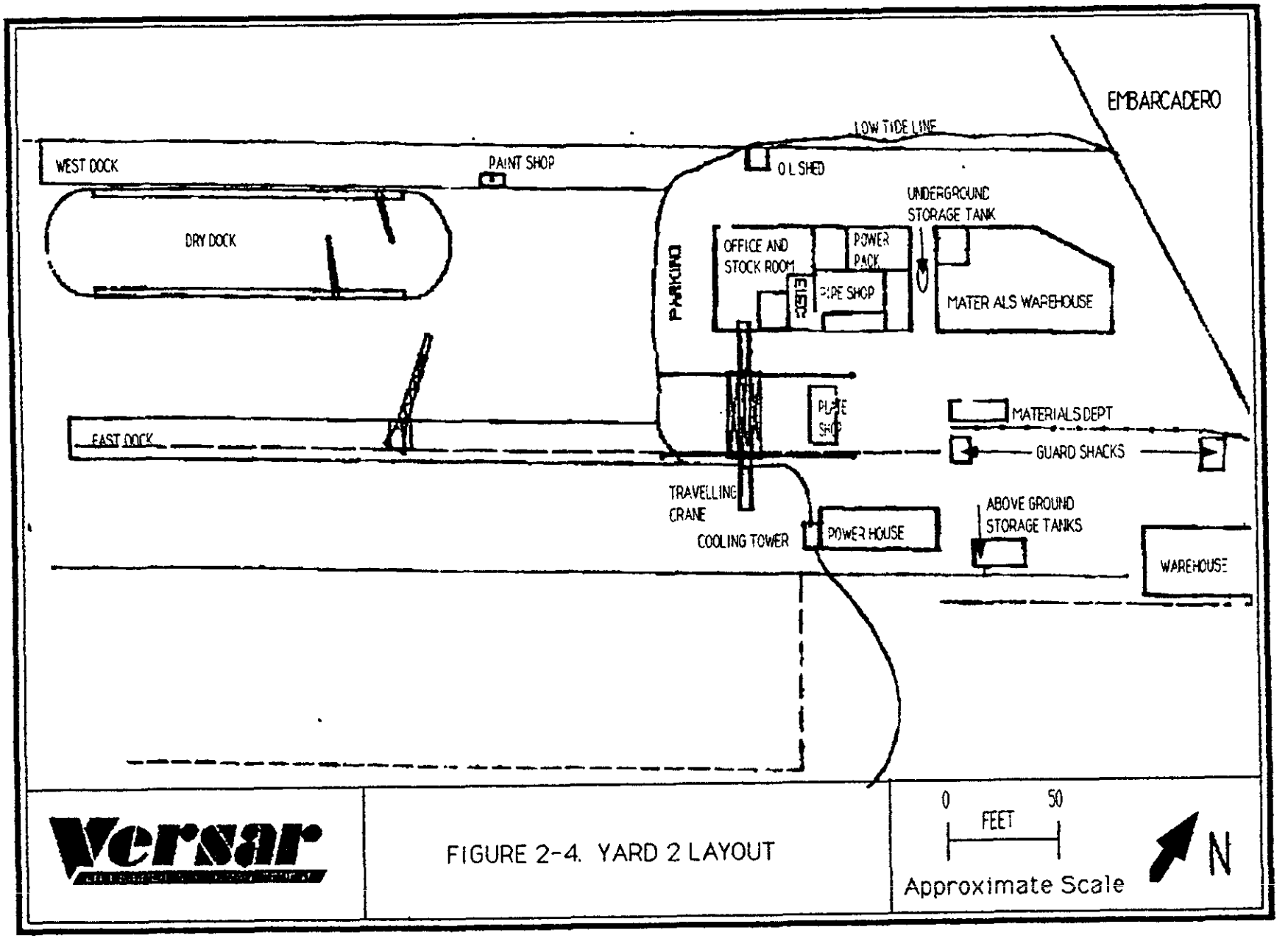


FIGURE 2-4. YARD 2 LAYOUT

metavolcanic rocks found throughout the Coast Ranges. The Oakland area is underlain by Quaternary marine and nonmarine alluvial sediments consisting of clays and silts. The local soil geology of the PDD facilities consists of fill material overlying silty clays.

2.5 Geohydrology

Ground water at the sites is encountered at depths varying between three and six feet below the ground surface dependent on tide and seasonal conditions. The direction of ground water flow at the sites has not been determined; however, it would be expected to move from on shore towards the inner harbor. Both ground water flow direction and depth would be subject to tidal fluctuations. The water is nonpotable, saline and no beneficial uses are known at this time.

Need to verify w/ TDS.

3.0 SITE INVESTIGATION

3.1 Literature Review

3.1.1 Historical Aerial Photographs

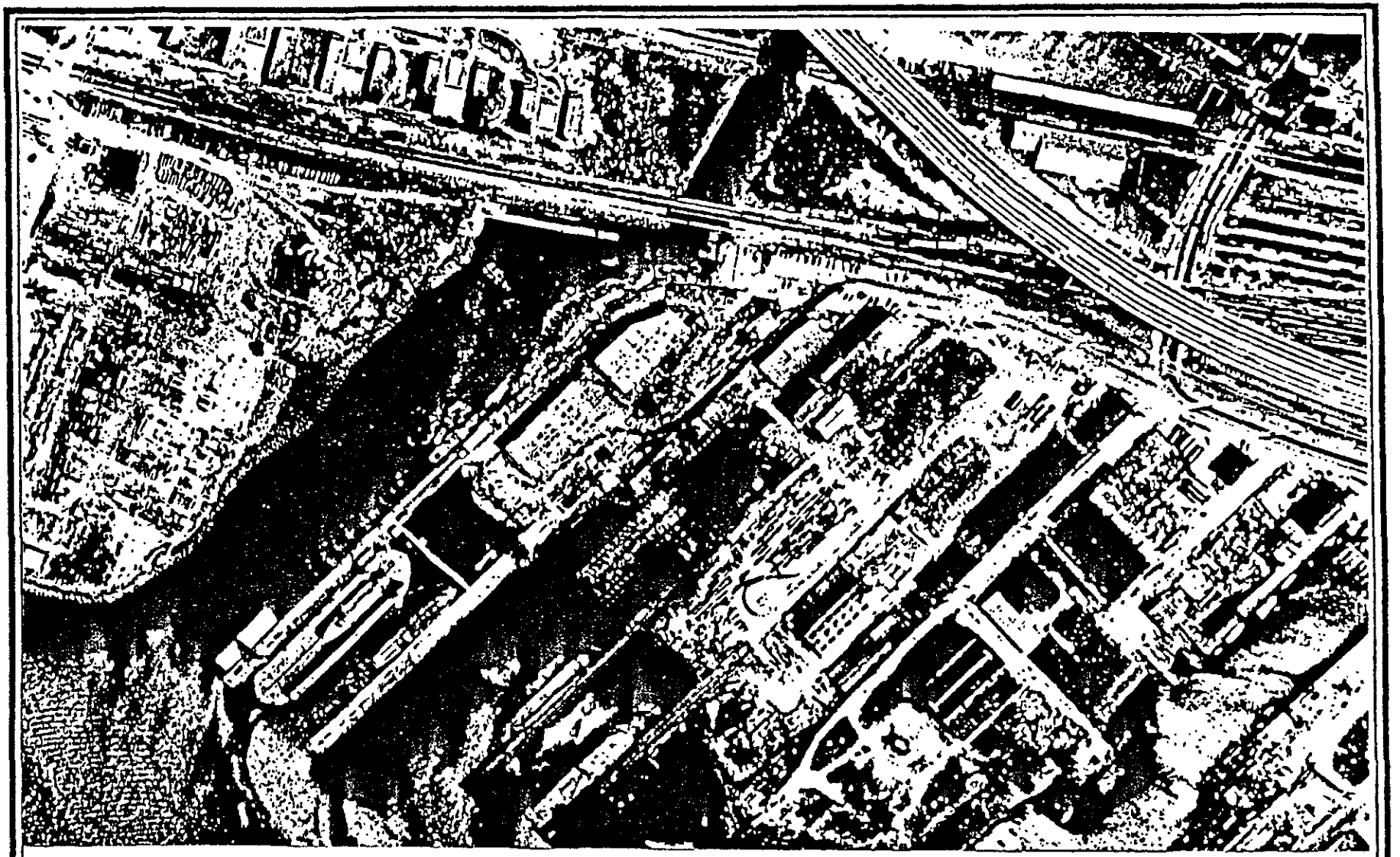
Aerial photographs of both sites were reviewed from 1987 photographs to 1934. Yard 1 is shown in the 1953 photograph as the only developed site in the area of the shoreline. Review of historical aerial photographs did not identify any specific environmental concern in the area around Yard 1.

Yard 2 is shown to be surrounded by industrial and commercial facilities in all photographs reviewed. The uses (as interpreted from aerial photographs) have varied from factories to lime and gravel operations. The 1957 aerial photograph, Figure 3-1, shows that a factory occupied the site to the southeast. The factory site shows evidence of above-ground storage tanks and features which may be interpreted to be stock piling of drums and other materials. Drum storage may also be seen on the Yard 2 site. The specific environmental impact of these activities is not known at this time.

3.1.2 Regulatory File Review

The Regional Water Quality Control Board-San Francisco Bay Region (RWQCB-SFBR) List of Sites which are known to have releases of toxic substances does not include Yard 1, Yard 2, nor any site located within a 0.5-mile radius of the yards.

Yard 2 is listed in the RWQCB-SFBR list of sites which have known fuel leaks. The file on Yard 2 consists of only two sheets of paper. The primary report indicates that a raw sewage release identified at Oakland park, and that the reported source was Yard 2. The report was filed by an anonymous informant using a telephone message. A subsequent



Versar

FIGURE 3-1. YARD 2 1957 AERIAL PHOTOGRAPH

N

SCALE 1 INCH = 275 FEET

report is a single page of computer print out, which indicates that there has been an unknown amount of heavy motor fuel released at an unknown time resulting in contamination. It is unknown if ground water has been impacted and action is not pending at this time. Background details for this report were not found.

Neither Yard 1, Yard 2, nor any site located within a 0.5-mile radius of the yards, were identified in records of the Port of Oakland or Alameda County. Three sites within 0.5 miles of the yards, are included in the Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) files. Yard 1 is listed in the State of California Hazardous Substance Site List (HSSL), but it is believed that the entry is based on the RWQCB-SFBR report outlined above, as the Department of Water Resources (DWR), which is listed as the responsible agency, does not have any details on the site. Five other sites are listed in the HSSL, within a 0.5 mile radius of the two yards. All these sites have had leaking underground storage tanks.

3.1.3 Pacific Dry Dock Personnel

Versar interviewed Mr. John Dunn, Yard 2 Supervisor, regarding the past operations and waste disposal practices at Yards 1 and 2. The environmental audit interview form is included as Appendix A.

The practice of repairing and refurbishing sea-going vessels generates many different forms of both regulated and nonregulated wastes and also utilizes many products which are themselves regulated materials. These products and wastes include but are not limited to: waste sand blasting materials, oil based paints, solvents, acids, bases, waste oils, hydrocarbon contaminated water, and motor fuels.

PDD currently appears to be following a hazardous materials management plan regarding the regulated wastes which are generated at the site. Any waste oil or water contaminated with waste oil is collected by a licensed transport company and disposed of at a licensed facility, as shown in the Uniform Hazardous Waste manifest included as part of Appendix A.

Caustic soda, which is used in the power pack shop, is also disposed of at an off-site facility as shown on the Uniform Hazardous Waste manifest included as part of Appendix A. Spend sand blasting materials are currently being stored on-site at both facilities.

3.2 Soil and Sediment Sampling

Based on the reported historical operations Versar sampled the soil and sediment in and around Yards 1 and 2. Both yards are covered by

asphalt. The yards are generally composed of varying thickness of fill material, overlying bay area mud. The majority of Yard 2 has two layers of asphalt separated by a layer of fill material. Due to the uneven sorting and nature of the fill material, and the sampling technique, it was only possible to obtain surface samples at certain locations. The Yard 1 and Yard 2 soil sample locations are shown in Figures 3-2 and Figure 3-3, respectively, and are more fully described below.

3.2.1 Yard 1 Soil Samples

A total of 12 soil samples were collected from Yard 1. The samples included soil, spent sand blasting material and sediments. The samples were taken with a hand auger, which was decontaminated between each sample, and stored in laboratory prepared glass jars with teflon lined lids. The samples were delivered, under chain of custody, to a State of California, Department of Health Services (DHS) certified laboratory for analyses. The exact locations and the rationale for the locations are outlined below.

PDDI-1-0.5: The sample was taken at 0.5 feet in the center of Yard 1 (see Photo 1, Appendix B). Fill debris prevented deeper sampling.

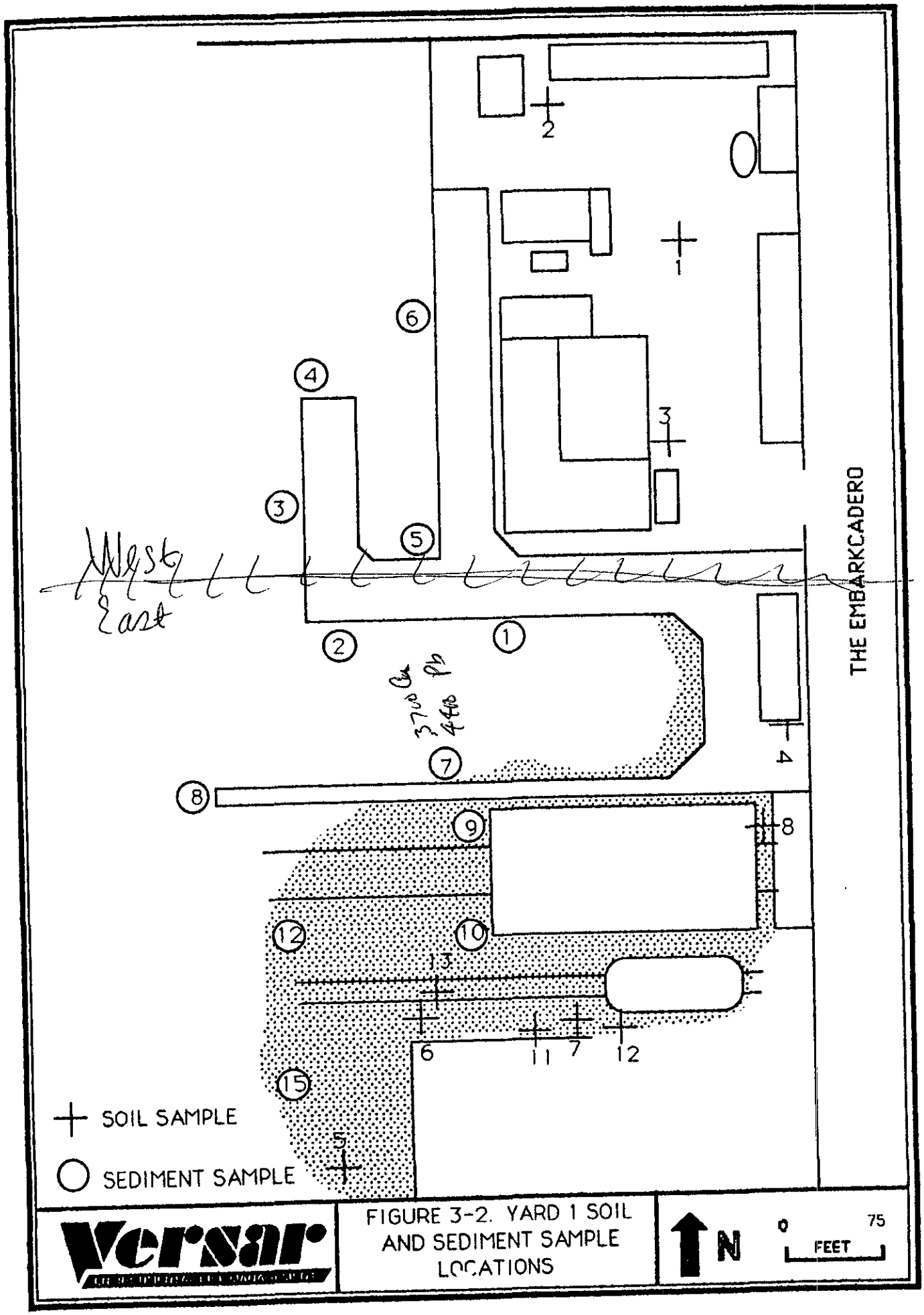
PDDI-2-0.5: The sample was taken at 0.5 feet in the northwest corner of the yard near the above-ground storage tanks, in an area of surface staining. Fill debris prevented deeper sampling.

PDDI-3-0.5/3.0: The samples were taken at 0.5 feet and 3.0 feet beside the compressor, at the entrance to the yard (see Photo 2, Appendix B). The entire area surrounding the compressor was heavily contaminated by free product although some effort had been made to clean up the area using an absorbent (see Photo 3, Appendix B).

PDDI-4-0.5/3.0: Samples were taken at 0.5 feet and 3.0 feet in an area below the production office (see Photo 4, Appendix B). The area is a trap for spent sand blasting material and dark staining of the material was indicative of possible hydrocarbon contamination.

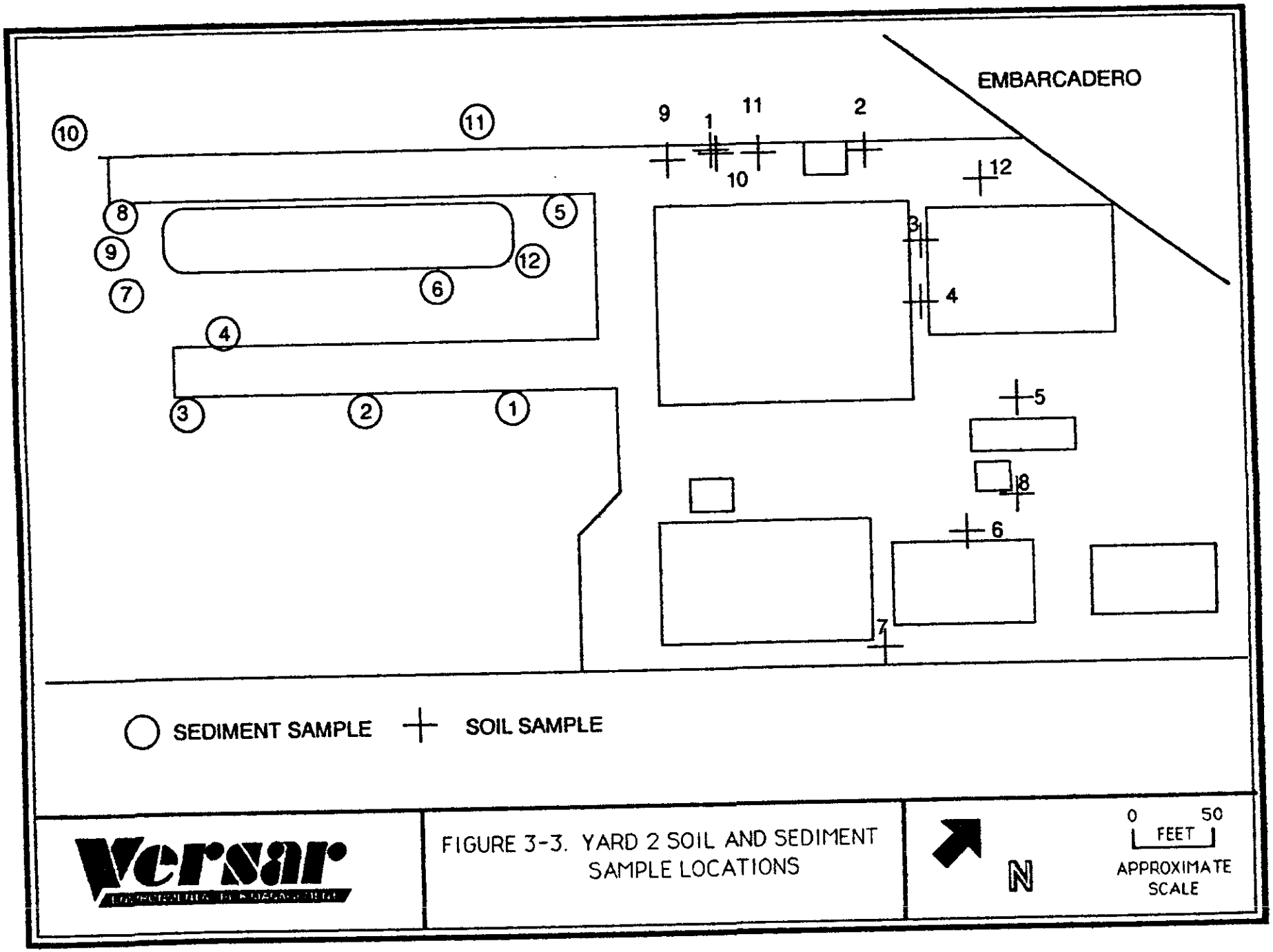
PDDI-5-0.5/2.5: Used batteries and forklift trucks are stored on on the southern edge of the site (see Photo 5, Appendix B). Samples were taken at 0.5 feet and 2.5 feet in the intratidal zone after a sheen was noticed on the surface (see Photos 6 and 7, Appendix B).

PDDI-6-0.5/2.5: Samples were taken at 0.5 feet and 2.5 feet in the intratidal area to the west of dry dock No. 2. The sediment section at this point is composed almost completely of spent sand blasting material (see Photo 8, Appendix B).



Versar

FIGURE 3-2. YARD 1 SOIL AND SEDIMENT SAMPLE LOCATIONS


EMBARCADERO
SEDIMENT SAMPLE
SOIL SAMPLE
Versar
FIGURE 3-3. YARD 2 SOIL AND SEDIMENT SAMPLE LOCATIONS
N
0
50
FEET
APPROXIMATE SCALE

PDDI-7-1.5: A sample was taken at a depth of 1.5 feet below surface to the south of the tracks for dry dock No. 2. (see Photo 9, Appendix B). The yard historically used spend sand blasting material as a fill material. The sample was taken at the contact between native fill and spent sand blasting material.

PDDI-8-0.5: A sample was taken at 0.5 feet in the area between the paint store and dry dock area No. 1 (see Photo 10, Appendix B). The area has a build up of spend sand blasting material and apparent waste oil build up.

After laboratory analytical results had been obtained, six additional samples were collected and analyzed. PDDI-11-1.5 and PDDI-12-0.5 were taken adjacent of PDDI-7-1.5 to determine the lateral extent of high metal concentrations. PDDI-13-1.0 was taken adjacent to PDDI-6-0.5/2.5 to determine if petroleum hydrocarbons were being flushed from the sediment (see Photo 11, Appendix B). PDDI-16 was taken to be analyzed by Waste Extraction Test (WET), if required. A composite sample was taken from the spent sand blasting material at Yard 1 for analysis for metals.

3.2.2 Yard 1 Sediment Samples

A total of 11 sediment samples were collected from the intertidal and offshore areas of Yard 1. The samples were collected, with an Eckmann dredge, at the locations shown in Figure 3-2. The dredge was cleaned and decontaminated between each sample. The samples were stored in laboratory prepared glass jars with teflon lined lids. A portion of each sample was taken to form two composite samples, which were then submitted to a DHS-certified laboratory for analysis.

3.2.3 Yard 2 Soil Samples

Sixteen samples were collected from Yard 2. The samples included soil, spent sand blasting material and sediments, were collected with a hand auger and stored in laboratory prepared glass jars with teflon lids. The exact locations and the rationale for the locations are outlined below.

PDDI1-1-0.5/2.5: The samples were collected at depths of 0.5 feet and 2.5 feet, on the northwestern edge of the property on the edge of the estuary, to provide a background for the yard (see Photo 12, Appendix B).

PDDII-2-0.5/2.5: The samples were collected at depths of 0.5 feet and 2.5 feet, adjacent to an oil storage shed and in a run-off channel from a machine shop (see Photos 13 and 14, Appendix B).

PDDII-3-0.5/2.5/5.0: The samples were collected at depths of 0.5 feet, 2.5 feet, and 5.0 feet, at the northern door to the power pack shop, beside the wash tank (see Photo 15, Appendix B). The October, 1989, earthquake raised the concrete slab on which the wash tank is situated (see Photo 16, Appendix B) and the wash tank does not have any spill containment (see Photo 17, Appendix B).

PDDII-4-0.5: The sample was collected at 5.0 feet at the northwest end of a known underground storage tank (UST). Fill debris prevented deeper sampling (see Photo 18, Appendix B).

PDDII-5-0.5: The sample was collected at 0.5 feet at the northeast side of the sales office (see Photo 19, Appendix B). A second layer of asphalt was encountered at 0.75 feet. This sample was taken in an attempt to establish a background level for Yard 2.

PDDII-6-0.5/2.5/5.0: The samples were collected at depths of 0.5 feet, 2.5 feet, and 5.0 feet adjacent to the northern containment walls of above-ground storage tanks. Dark staining at the bottom of the containment walls indicate that the walls are no longer impermeable (see Photo 20, Appendix B). The sample had a silver sheen and oily texture (see Photo 21, Appendix B).

PDDII-7-0.5/2.5: The samples were collected at depths of 0.5 feet and 2.5 feet at the southern edge of an above-ground storage tank. Heavy surface staining is evident in the area (see Photo 22, Appendix B).

PDDII-8-0.5/5.0: The samples were collected at depths of 0.5 feet and 5.0 feet adjacent to the septic tank northeast of the guard house. These samples were taken in order to establish a background for the yard (see Photo 23, Appendix B).

After laboratory analytical results had been received for the above samples, five additional samples were collected. PDDII-9-2.5, PDDII-10-2.5, and PDDII-11-1.5 were taken in the area of sample PDDII-1 in order to attempt to delineate the elevated concentrations of petroleum hydrocarbons detected in PDDII-1-0.5/2.5. A composite sample of the spent sand blasting material was collected at Yard 2, and a further sample, PDDII-12, was taken and held for a waste extraction test.

3.2.4 Yard 2 Sediment Samples

A total of 12 sediment samples were collected from the intertidal and offshore areas of Yard 2. The samples were collected at the locations shown in Figure 3-3. An Eckmann dredge was used to take the samples. The dredge was cleaned and decontaminated between each sample. The samples were stored in laboratory prepared glass jars with teflon lined lids. A portion of each sample was taken to form composite samples, which were then submitted to a laboratory for analysis.

3.3 Laboratory Analyses and Results

3.3.1 Yard 1 Soil Samples

Versar collected a total of 17 soil and spent sand blasting material samples for analyses from Yard 1. The samples were placed in laboratory prepared glass jars and stored on ice for delivery, under chain of custody, to a DHS-certified laboratory for analysis.

Twelve samples were analyzed for TPH by EPA Method 418.1. The samples contained a wide range of petroleum hydrocarbon concentrations. The minimum concentration was 330 milligrams per kilogram (mg/kg) in sample PDDI-3-3.0. The maximum concentration was 53,000 mg/kg in sample PDDI-8-0.5. The results are shown in Table 3-1.

Three samples were analyzed for volatile organics by EPA Method 8240. None of the samples contained any of the method's volatile organics at or above the method's reporting limit. The results are shown in Table 3-2.

One sample was analyzed for semi-volatile organic compounds by EPA Method 8270. Sample PDDI-3-3.0 contained 0.24 mg/kg of Pyrene. The results are shown in Table 3-2.

Two samples were analyzed for TPH (purgeable and extractable) by EPA Method 8020, the State of California, State Water Resources Control Board, Leaking Underground Fuel Tank (LUFT) Field Manual method, and the DHS Method. Sample PDDI-13-1.0 contained 320 mg/kg of petroleum hydrocarbons as diesel and sample PDDI-3-20 contained 28 mg/kg of other petroleum hydrocarbons. The results are shown in Table 3-3.

Six samples were analyzed for the California Administrative Manual (CAM) metals. Sample PDDI-7-1.5 contained copper (3,700 mg/kg), lead (4,400 mg/kg), and mercury (21 mg/kg) concentrations in excess of the Toxic Threshold Limit Concentration (TTLC). Sample PDDI-12-0.5 contained copper (3,300 mg/kg) concentrations in excess of the TTLC. The results are presented in Table 3-4.

Table 3-1. Results of the Analysis for Total Petroleum Hydrocarbons by EPA Method 418.1[1]

Sample Number	Sample Depth (feet)	Total Petroleum Hydrocarbons (mg/kg)[2]
		Yard 1
PDDI-1-0.5	0.5	340
PDDI-2-0.5	0.5	1,900
PDDI-3-1.0	1.0	4,600
PDDI-3-3.0	3.0	330
PDDI-4-0.5	0.5	820
PDDI-4-3.0	3.0	740
PDDI-5-0.5	0.5	2,600
PDDI-5-2.5	2.5	1,400
PDDI-6-0.5	0.5	1,300
PDDI-6-2.5	2.5	36,000
PDDI-7-1.5	1.5	13,000
PDDI-8-0.5	0.5	53,000
		Yard 2
PDDII-1-0.5	0.5	3,800
PDDII-1-2.5	2.5	4,300
PDDII-2-0.5	0.5	3,200
PDDII-2-2.5	2.5	3,400
PDDII-3-0.5	0.5	109,000
PDDII-3-2.5	2.5	22,000
PDDII-3-5.0	5.0	7,900
PDDII-4-0.5	0.5	5,600
PDDII-5-0.5	0.5	4,500
PDDII-6-0.5	0.5	6,700
PDDII-6-2.5	2.5	80
PDDII-6-5.0	5.0	6,100
PDDII-7-0.5	0.5	35,000
PDDII-7-2.5	2.5	11,000
PDDII-8-1.0	1.0	5,900
PDDII-8-5.0	5.0	114

[1]EPA Method 418.1 detection limits = 25 mg/kg
[2]Milligrams per kilogram

Table 3-2. Results of the Analyses for Volatile[1] and Semi-Volatile[2] Organic Compounds

Sample Number	Sample Depth (feet)	Compound[3]	Amount Detected (mg/kg)	Reporting Limit (mg/kg)
PDDI-3-1.0	1.0	N.D.[4]	---	---
PDDI-3-3.0	3.0	Pyrene	0.240	0.200
PDDI-4-0.5	0.5	N.D.	---	---
PDDI-8-0.5	0.5	N.D.	---	---
PDDII-3-0.5	0.5	Tetrachloroethene	0.210	0.007
PDDII-3-5.0	5.0	bis (2-Ethylhexyl) phthalate	0.300	0.200

[1]EPA Method 8240

[2]EPA Method 8270

[3]Only detected compounds reported

[4]None detected

Table 3-3. Results of the Analyses for Petroleum Hydrocarbons

Sample Number	Sample Depth (feet)	EPA Method 8020[1]				DHS Method[2]	LUFT Field Manual Method		
		Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylene mg/kg	TPH mg/kg	Gasoline mg/kg	Diesel mg/kg	Other mg/kg
PDDI-3-20	2.0	BRL[3]	BRL	BRL	BRL	BRL	BRL[4]	BRL[4]	28[4]
PDDI-13-1.0	1.0	BRL	BRL	BRL	BRL	BRL	BRL[5]	320[5]	BRL[5]

[1]EPA Method 8020 detection limits: benzene - 0.05 mg/kg; toluene - 0.05 mg/kg; ethylbenzene - 0.05 mg/kg; xylene - 0.05 mg/kg

[2]DHS Method detection limits: total petroleum hydrocarbons - 1 mg/kg

[3]Below reporting limits

[4]LUFT Field Manual Method detection limits: 200 mg/kg

[5]LUFT Field Manual Method detection limits: 10 mg/kg

Table 3-4. Results of the Analyses for CAM Metals - TTLC[1]

Compound	Soil Sample Number													
	PDDI-5 -2.5 mg/kg	PDDI-6 -2.5 mg/kg	PDDI-7 -1.5 mg/kg	PDDI-11 -0.5 mg/kg	PDDI-12 -0.5 mg/kg	PDDII-1 -2.5 mg/kg	PDDII-3 -2.5 mg/kg	PDDII-6 -5.0 mg/kg	PDDII-9 -2.5 mg/kg	PDDII-10 -2.5 mg/kg	PDDII-11 -1.5 mg/kg	YARD I mg/kg	YARD II mg/kg	TTLC
Arsenic	4.6[3]	24	47	NA[2]	NA	25	5.5	3.3	NA	NA	NA	16	5.0	500
Antimony	BRL[3]	BRL	4.5	NA	NA	5.2	BRL	BRL	NA	NA	NA	BRL	BRL	500
Barium	130	180	330	NA	NA	51	88	32	NA	NA	NA	190	53	10,000
Beryllium	BRL	BRL	BRL	NA	NA	BRL	BRL	BRL	NA	NA	NA	1.2	BRL	75
Cadmium	BRL	BRL	1.3	NA	NA	BRL	1.6	BRL	NA	NA	NA	BRL	BRL	100
Chromium Total	39	280	77	NA	NA	61	27	37	NA	NA	NA	47	25	2,500
Chromium VI	BRL	BRL	BRL	NA	NA	BRL	BRL	BRL	NA	NA	NA	BRL	BRL	500
Cobalt	13	17	99	NA	NA	5.8	9.5	11	NA	NA	NA	29	7.6	8,000
Copper	50	33	3,700[4]	550	3,300[4]	1,900	140	90	1,600	1,800	770	1,300	190	2,500
Lead	55	290	4,400[5]	75	290	7,500[5]	220	78	660	650	290	110	28	1,000
Mercury	0.65	1.6	21[6]	NA	NA	26[6]	0.38	0.50	NA	NA	NA	0.4	0.3	20
Molybdenum	BRL	BRL	BRL	NA	NA	BRL	BRL	BRL	NA	NA	NA	BRL	BRL	3,500
Nickel	69	210	55	NA	NA	12	29	31	NA	NA	NA	26	38	2,000
Selenium	BRL	BRL	BRL	NA	NA	BRL	BRL	BRL	NA	NA	NA	BRL	BRL	100
Silver	BRL	2.0	1.8	NA	NA	BRL	BRL	BRL	NA	NA	NA	BRL	BRL	500
Thallium	BRL	BRL	BRL	NA	NA	BRL	BRL	BRL	NA	NA	NA	BRL	BRL	700
Vanadium	28	38	38	NA	NA	20	30	52	NA	NA	NA	54	26	2,400
Zinc	160	840	1,400	NA	NA	550	600	360	NA	NA	NA	370	100	5,000

[1] Method detection limit dependent on compound

[2] Not analyzed

[3] Below reporting limits

[4] Above total threshold limit concentration of 2,500 mg/kg

[5] Above total threshold limit concentration of 1,000 mg/kg

[6] Above total threshold limit concentration of 20 mg/kg

A representative sample of the spent sand-blasting material stock piled at Yard I was analyzed using the Waste Extraction Test (WET) for determination of the Soluble Threshold Limit Concentration (STLC). It was determined that only the lead concentration of 14 milligrams per liter (mg/l) exceeded the STLC regulatory value (5 mg/l). The results are presented in Table 3-5.

3.3.2 Yard 1 Sediment Samples

Versar collected 12 sediment samples from the offshore area surrounding Yard 1. Versar composited two samples from the 12 spot samples. The representative samples were stored on ice and delivered by courier, under chain of custody, to a DHS-certified laboratory for physical and chemical analysis.

Tox Scan performed physical characterization and sediment chemistry testing on the Yard 1 composite sample. Tox Scan performed a grain size analysis and total solids/water content, and analyzed the sediments for the following: (1) metals-antimony, arsenic, chromium, copper, lead, mercury, nickel, silver, selenium, thallium, zinc; (2) nonmetals-cyanide and total and water soluble sulfides; (3) pesticides; (4) oil and grease; (5) organotin compounds; (6) phenols; (7) poly-chlorinated biphenyls; (8) polynuclear aromatic hydrocarbons; (9) phthalates and (10) total organic carbon.

A physical size analysis of the sample indicated that the Yard 1 sample contained 69.77 percent coarse material and 30.23 percent fine material. The results are presented in Table 3-6.

The sediment sample contained varying concentrations of different metals. The detection limit (dl) for the analytical method was 0.01 mg/kg unless otherwise stated and the following metals were detected: cadmium 0.42 mg/kg; chromium 167 mg/kg; copper 2,870 mg/kg; lead 236 mg/kg; mercury 0.02 mg/kg (dl 0.02); nickel 51.0 mg/kg; selenium 0.85 mg/kg; silver 5.6 mg/kg ; thallium 17.0 mg/kg (dl 1.0); and zinc 886 mg/kg.

The sediment also contained the following concentrations of non-metals: arsenic 36.88 mg/kg; cyanide 0.075 mg/kg (dl 0.02 mg/kg); total sulfides 130 mg/kg; water soluble sulfides 5.4 mg/kg. The results are presented in Table 3-7.

Analysis of the sediment by EPA Method 8080 for pesticides, PCBs, and organochlorines, determined that the sample contained: gamma chlordane 0.007 mg/kg (dl 0.005); 4,4'-DDD 0.019 mg/kg (dl 0.0005); and Aroclor 1254 0.26 mg/kg (dl 0.02). The results are presented in Table 3-8.

Table 3-5. Results of the CAM Metals - STLC[1]

Compound	Yard I (mg/l)	Yard II (mg/l)	Soluable Threshold Limit Concentration (mg/l)
Arsenic	ND	ND	5
Antimony	ND	ND	15
Barium	12	5.9	100
Beryllium	ND	ND	0.75
Cadmium	ND	ND	1
Chromium	7.8	0.77	560
Chromium VI	NA[3]	NA	5
Cobalt	0.33	0.32	80
Copper	ND	26[4]	25
Lead	14[4]	0.67	5
Mercury	ND	ND	0.2
Molybdenum	ND	ND	350
Nickel	0.3	0.35	20
Selenium	ND	ND	1
Silver	ND	ND	5
Thallium	ND	ND	7
Vanadium	0.28	0.27	24
Zinc	34	70	250

[1]Detection limits for soluble threshold limit concentration (STLC) vary dependent on compound

[2]Not detected at or above the method's detection limits

[3]Not analyzed due to laboratory error

[4]Above STLC Value

Table 3-6. Physical Size Analysis

	Yard I	Yard II
% Fine	39.25	71.75
% Coarse	60.75	28.25

Table 3-7. Results of the Chemical Analyses of Sediments[1]

Compound	Yard I (ppm)[2]	Yard II (ppm)
Antimony	ND[3]	6.43
Arsenic	36.88	24.98
Cadmium	0.42	0.74
Chromium	167	246
Copper	2,870	480
Cyanide	0.075	0.370
Dibutyltin	0.006	ND
Lead	236	113
Mercury	0.02	0.02
Monobutyltin	0.015	0.013
Nickel	51	138
Selenium	0.85	0.72
Silver	5.6	3.7
Thallium	17	33
Tributyltin	0.032	0.007
Zinc	886	507
TPH[4]	75	1,800
TOC[5]	1.32	2.21
Water Soluble Sulfides	5.4	16
Total Sulfides	130	250
% Moisture	43	62

[1]Detection limits vary dependent on compound

[2]Results reported in equivalent to parts per million

[3]Not detected at or above the method detection limits

[4]TPH = Total petroleum hydrocarbons

[5]TOC = Total organic carbon results reported as a percentage of dry weight

Table 3-8. Results of the Analysis of Sediments EPA Method 8080[1]

Compound	Yard I (mg/kg)[2]	Yard II (mg/kg)
Aldrin	ND[3]	0.086
gamma-Chlordane	0.007	ND
4,4'-DDD	0.019	ND
4,4'-DDE	ND	0.021
PCBs (Aroclor-254)	0.26	ND

[1]Method 8080 detection limits dependent on compound
[2]Milligrams per kilogram
[3]Not detected at or above methods detection limits

The sediment sample was analysed for oil and grease following EPA Method 418.1 and contained 75 mg/kg of hydrocarbon compounds. The detection limit for the analytical method was 50 mg/kg. The result is shown in Table 3-7.

The sediment sample contained the following concentrations of organotin compounds: monobutyltin 0.015 mg/kg, dibutyltin 0.006 mg/kg, and tributyltin 0.032 mg/kg. The results are expressed on a dry weight basis and presented in Table 3-7.

Analysis of the Yard 1 sample by EPA Method 8270 for polynuclear aromatic hydrocarbons, phenols, and pthalates, detected the following compounds: phenol 0.1 mg/kg; benzoic acid 0.29 mg/kg; pentachlorophenol 0.11 mg/kg; phenanthrene 0.15 mg/kg; anthracene 0.073 mg/kg; fluoranthene 0.48 mg/kg; pyrene 0.5 mg/kg; benzo (a) anthracene 0.25 mg/kg; bis-phthalate 0.43 mg/kg; chrysene 0.56 mg/kg; indeno (1,2,3-cd) pyrene 0.25 mg/kg; dibenz (a,h) anthracene 0.17 mg/kg; and benzo (g,h,i) perylene 0.34 mg/kg. The detection limit was variable depending on compound detected. The results are presented in Table 3-9.

The sediment sample for Yard 1 contained 1.32 percent (dry weight) of organic carbon, and 43 percent moisture. The results are shown in Table 3-7. Versar's chain of custody form for the soil and sediments samples, and the detailed analytical results are included as Appendix D.

3.3.3 Yard 2 Soil Samples

Versar collected a total of 20 soil and spent sand blasting material samples for analyses from Yard 2. The samples were placed in laboratory prepared glass jars and stored on ice in a cooler for delivery, under chain of custody, to a DHS-certified laboratory for analysis.

Sixteen samples were analyzed for TPH following EPA Method 418.1. The samples contained a wide range of petroleum hydrocarbon concentrations. The minimum concentration was 80 mg/kg in sample PDDII-6-2.5. The maximum concentration was 109,000 mg/kg in sample PDDII-3-0.5. The results are shown in Table 3-1.

One sample was analyzed for volatile organic compounds by EPA Method 8240. The sample (PDDII-3-0.5) contained 0.21 mg/kg of tetrachloroethene. The results are shown in Table 3-2.

One sample was analyzed for semi-volatile organic compounds by EPA Method 8270. The sample PDDII-3-3.0 contained 0.30 mg/kg of bis(2-ethylhexyl) phthalate. The results are shown in Table 3-2.

Table 3-9. Results of the Analysis of Sediments by EPA Method 8270[1]

Compound[2]	Yard I[3] (mg/kg)	Yard II (mg/kg)
Anthracene	0.073	0.043
Benzo(a)Anthracene	0.250	0.096
Benzo(a)Pyrene	ND	0.230
Benzo(g,h,i)Perylene	0.340	ND
Benzo(k)Fluoranthene	ND	0.520
Benzoic Acid	0.290	ND
bis(2-Ethylhexyl) Phthalate	0.430	0.120
Chrysene	0.560	0.190
Dibenzo(a,h) Anthracene	0.170	ND
Fluoranthene	0.480	0.190
Indeno(1,2,3-cd) Pyrene	0.250	ND
Pentachlorophenol	0.110	ND
Phenanthrene	0.150	0.069
Phenol	0.100	ND
Pyrene	0.500	0.180

[1]Detection limits for EPA Method 625/8270 dependent on compound

[2]Only detected compounds reported

[3]Milligrams per kilogram

[4]Not detected at or above the method detection limits

Five samples were analyzed for CAM metals. None of the samples contained metal concentrations in excess of the TTLC. Three samples were analyzed only for copper and lead. None of the samples contained lead or copper concentrations in excess of the TTLC. The results are shown in Table 3-4.

A representative sample of the spent sand-blasting material stockpiled at Yard 2 was analyzed following CAM Metals STLC extraction. The analysis determined that only copper, with a concentration of 26 mg/l, exceeded the STLC regulatory value (25 mg/l). The results are presented in Table 3-5. The detailed analytical results and Versar's chain of custody for the samples are included as Appendix D.

3.3.2 Yard 2 Sediment Samples

Versar collected 12 sediment samples from the offshore area surrounding Yard 2. Versar composited two samples from the 12 and stored the representative samples on ice and delivered the samples, under chain of custody, to a DHS-certified laboratory for physical and chemical analysis.

Tox Scan performed physical characterization and sediment chemistry testing on the Yard 2 composite samples. Tox Scan performed a grain size analysis and total solids/water content, and analyzed the sediments for the following: (1) metals-antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, selenium, thallium, zinc; (2) nonmetals-cyanide and total and water soluble sulfides; (3) pesticides; (4) oil and grease; (5) organotin compounds; (6) phenols; (7) polychlorinated biphehyls; (8) polynuclear aromatic hydrocarbons; (9) pythalates and (10) total organic carbon.

A physical size analysis of the sample indicated that the Yard 2 sample contained 84.40 percent of fine sediment and 17.6 percent of coarse sediment. The results are presented in Table 3-6.

The sediment sample for Yard 2 contained varying concentrations of different metals. The detection limit (dl) for the analytical method was 0.1 mg/kg unless otherwise stated, and the following metals were detected: antimony 6.43 mg/kg (dl 1.0); cadmium 0.74 mg/kg; chromium 246 mg/kg; copper 480 mg/kg; lead 113 mg/kg; mercury 0.02 mg/kg (dl 0.02); nickel 138 mg/kg; selenium 0.72 mg/kg; silver 3.7 mg/kg; thallium 33 mg/kg (dl 1.0); and zinc 507 mg/kg (dl 2.0). The results are presented in Table 3-7.

The sediment sample contained the following non-metal compound concentrations: arsenic 24.98 mg/kg; cyanide 0.37 mg/kg (dl 0.02); total sulfides 250 mg/kg; and water soluble sulfides 16 mg/kg. The results are presented in Table 3-7.

Analysis of the sediment sample by EPA Method 8080 for pesticides, PCBs, and organochlorine compounds detected aldrin 0.086 mg/kg; and 4,4'-DDE 0.021 mg/kg. The detection limit for the analytical method was 0.0005 mg/kg. The results are presented in Table 3-8.

The sediment sample was analysed for oil and grease following EPA Method 418.1. The sample contained 1,800 mg/kg hydrocarbon compounds. The result is shown in Table 3-7.

The sediment sample contained two organotin compounds above the analytical method's detection limit of 0.001 mg/kg: monobutyltin 0.013 mg/kg, and tributyltin 0.007 mg/kg. The results are presented in Table 3-7.

Analysis of the sediment sample by EPA Method 8270 for polynuclear aromatic hydrocarbons, phenols, and pthalates, detected the following compounds concentrations: phenanthrene 0.069 mg/kg; anthracene 0.043 mg/kg; fluoranthene 0.19 mg/kg; pyrene 0.18 mg/kg; benzo (a) anthracene 0.096 mg/kg; bis-phthalate 0.12 mg/kg; chrysene 0.19 mg/kg; benzo (k) fluoranthene 0.52 mg/kg; and benzo (a) pyrene 0.23 mg/kg. The detection limit was variable depending on the compound detected. The results are presented in Table 3-9.

The sediment sample contained 2.21 percent organic carbon, and 62 percent moisture. The results are presented in Table 3-7. Versar's chain of custody form and the detailed analytical results for the sediment and the soil samples are included as Appendix D.

4.0 CONCLUSION

Given the nature and levels of contamination at the two sites, Versar recommends that a more detailed site assessment is performed at Pacific Dry Dock and Repair Yards 1 and 2. The site assessment should be performed to determine: (1) the vertical and lateral extent of the impacted soils and sediments; and (2) if ground or coastal waters have been impacted.

5.0 REFERENCES

The preliminary waste assessment of the Pacific Dry Dock sites utilized the reference materials and reports documented below.

U.S. Geological Survey Topographical Map, 7.5 Minute Series, Oakland East Quadrangle, 1959 (Photorevised, 1980).

U.S. Geological Survey Topographical Map, 7.5 Minute Series, Oakland West Quadrangle, 1959 (Photorevised, 1980).

Norris, R.M. and Web, R.W., Geology of California, John Wiley and Sons, New York, 1976.

Jennings, C.W., Geological Map of California, Division of Mines and Geology, 1969-1973.

Pacific Aerial Surveys Aerial Photograph Library, Photograph Yard 1: 1988, 1981, 1975, 1971, 1969, 1959, 1953, 1947, 1940, 1937, and 1934. Yard 2: 1985, 1975, 1971, 1969, 1959, 1957, 1953, 1950, 1947, 444 Pendleton Way, Oakland 94621.

California Regional Water Quality Control Board-San Francisco Bay, List of Sites-Toxic Substances.

California Regional Water Quality Control Board-San Francisco Bay, List of Sites-Fuel Leaks.

State of California Hazardous Substance Site List, June, 1989.

U.S.E.P.A. Superfund Program Comprehensive Environmental Response Compensation and Liability Information System, November, 1989.

6.0 APPENDIX

The following appendices constitute the technical appendix to this report:

Appendix A: Environmental Audit Interview Form
Appendix B: Site Photographs
Appendix C: Laboratory Analytical Results and Versar's Chain of Custody form