

A Report Prepared for

Encinal Marina, Inc.
Foot of Grand Street
Alameda, California 94501

PETROLEUM HYDROCARBONS IN
SOILS AND GROUND WATER
FUEL STORAGE AREA
ENCINAL MARINA
ALAMEDA, CALIFORNIA

HTC/B Leased Property

HLA Job No. 18247,001.02

by

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July 17, 1987

concentration of 3800 ppm was measured in a composite soil sample collected from all well borings. Laboratory reports for samples collected by CES are presented in Appendix A.

Harding Lawson Associates was retained by Encinal Marina, Inc., to evaluate the distribution of petroleum hydrocarbons in soil and ground water around the fuel storage facility at the Encinal Marina site and to provide recommendations concerning suitable remedial measures. The investigation was performed in accordance with HLA's proposal of June 4, 1987.

FIELD INVESTIGATION

On June 11, 1987, seven soil borings were drilled outside the tank enclosure (Plate 2). Borings B-1 through B-6 were drilled to an approximate depth of 5-1/2 feet, approximately 2 feet below the water table. Boring B-7 was drilled to a depth of 12 feet and was completed as a ground-water monitoring well, as described below.

Borings were drilled by Bay Area Exploration Drilling, Suisun, California, using truck-mounted drilling equipment with 6-1/4-inch diameter hollow-stem augers. Borings were logged by an HLA geologist in accordance with the Unified Soil Classification System. Boring logs are presented on Plates 3 through 9.

Soil samples were collected at depths of 1 foot, 3 feet, and 5 feet below ground surface using a modified California Sampler equipped with 6-inch by 2-1/2-inch diameter stainless steel tubes. Immediately after collection, the tubes were labeled and capped with plastic caps lined with aluminum foil, which were taped in place. The samples were immediately placed in a cooler with ice, and were delivered to Brown and Caldwell Laboratories, Emeryville, California, by CES.

accompanied by chain of custody records. Soil samples were analyzed for TPH using EPA Method 3550/8015 modified.

The sampler and sample tubes were steam cleaned before collection of each sample. Augers were steam cleaned between borings. All borings were backfilled with neat cement and drilling cuttings were drummed and stored on site by CES.

Boring B-7 was completed as a 2-inch diameter ground-water monitoring well. Well construction details are shown on Plate 10.

On June 12, 1987, the five monitoring wells previously installed by CES and Well B-7 were sampled. The wells were checked for presence of floating product with a clear Lucite bailer. The wells were then purged by pumping with a centrifugal pump or bailing until all water was evacuated, then allowed to recharge before sampling with a stainless steel bailer. Samples were transferred to 40 ml volatile organic analysis (VOA) bottles with septum caps labeled, and placed in a cooler with ice. Water samples were delivered to Brown and Caldwell Laboratories, Emeryville, California, by CES, accompanied by chain of custody records. Water samples were analyzed for TPH, using EPA Method 3550/8015 modified salinity, and for benzene, toluene, xylenes, and ethylbenzene using EPA Method 602.

RESULTS

Soils

Our borings indicated the area is blanketed by 1 to 5 feet of fill which is underlain by native Bay Mud soils. The upper 1 to 2 feet of the Bay Mud is stiffer than the underlying Bay Mud.

Surface soil discoloration indicative of petroleum product spills was observed on the north side of the tank enclosure (Plate 2). Hydrocarbon odors were encountered in several borings, as shown on the boring logs.

Results of chemical analyses of soil samples are presented in Table 1. (Laboratory Reports are presented in Appendix B.) Only samples containing detectable hydrocarbons are listed. None of the other 17 samples contained hydrocarbons at concentrations greater than 10 ppm. It was not possible to recover a sample at Boring B-2 at the 1.5 foot depth because the sand could not be retained in the sampler.

Table 1. Petroleum Hydrocarbons in Soil

<u>Boring</u>	<u>Depth (feet)</u>	<u>TPH (ppm)</u>
1	1.0	2300
3	1.5	11
6	1.5	53

Ground Water

Ground water was typically encountered 2.5 to 3 feet below ground surface. None of the wells was capable of yielding a sustained volume of water during purging. A maximum of approximately 25 gallons of water was removed from each well before being pumped dry.

Results of chemical analyses of ground-water samples, including observations concerning presence of free product, are shown on Table 2. (Laboratory Reports are presented in Appendix B.)

Table 2. Chemical Analysis of Ground Water
(parts per million)

<u>Well</u>	<u>TPH</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl Benzene</u>	<u>Salinity</u>	<u>Free Product Thickness</u>
W-1	36	0.0066	ND ⁽²⁾	0.013	ND	14,000	0.25-0.5 in. ⁽¹⁾
W-2	1.3	0.350	ND	0.023	0.018	12,000	Sheen
W-3	ND	0.0041	ND	ND	ND	9,900	None
W-4	ND	ND	ND	ND	ND	3,700	None
W-5	ND	ND	ND	ND	ND	13,000	Sheen
B-7	ND	ND	ND	ND	ND	10,000	None

(1) Only sheen observed after purging well.

(2) ND = Not Detected
Refer to laboratory reports for limits of detection

Observations Concerning Operating Practices

During the field investigation, we noted the following conditions, which have resulted or could result in diesel fuel or other petroleum products being spilled or discharged to the ground around the tank area.

- It was reported that during filling of the storage tanks from tank trucks, residual fuel in a truck's discharge hose is routinely allowed to spill onto the ground in front of the pump houses, when the discharge hose is disconnected.
- A small slop oil tank was observed outside the tank containment wall. It was reported that this tank overflows onto the ground in rainy weather.
- Spilled fuel was observed in the concrete ditch just outside the containment wall on the north side. This may have resulted from pipe leaks or spills while pipes were being repaired.

A spill of what appeared to be lube oil was observed to remain on the concrete pad of the small pump house for a period of several days.

DISCUSSION OF RESULTS

Soils

Soils exhibiting TPH concentrations above 100 ppm have typically been considered "contaminated" by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). Therefore, 100 ppm TPH has been used as an action level when evaluating the distribution of hydrocarbons the fuel tank area.

Significant soil contamination (above 100 ppm TPH) appears to be limited to the sandy soil on the northern and eastern sides of the tank area, to depths of less than 3 feet below ground surface. In the area in front of the pump houses, significant contamination appears to be limited to a depth of less than 1.5 feet, as evidenced by the concentration of 11 ppm TPH at that depth in Boring B-3. Contamination may extend deeper at the location of Boring B-2, but the inability to recover a sample at the 1.5 foot depth did not allow us to confirm this. The absence of detectable TPH values in samples from Boring B-5 indicates that soil contamination does not extend that far to the west.

The highest TPH value obtained during the investigation, 2200 ppm, was measured at the eastern end of the tank compound in Boring B-1 in sandy soil at a depth of 1 foot. However, TPH was not detected in the dark gray clay at 2-1/2 feet.

The extent of contaminated soil to the north is indicated by Boring B-4, which contained no detectable TPH in any sample. Contaminated soil was also not

observed in Boring B-7, south of the tank enclosure. Although 53 ppm TPH was detected at 1.5 feet in Boring B-6, this is below the action level of 100 ppm.

Ground Water

Fuel constituents are present in ground water on the northern side of the tank area. Benzene was present in Wells W-1, W-2, and W-3, while xylenes were present in W-1 and W-2, and ethylbenzene in W-2. Only benzene was present at levels that exceed action levels for drinking water established by the U.S. Environmental Protection Agency or the California Department of Health Services.

Free product was encountered floating on ground water in Well W-1. The absence of measurable free product in Wells W-2 and W-5 indicates that the extent of the product plume is limited to the area in front of the pump houses. Because of the high salinity levels, shallow ground water in this area would not be suitable for use as a drinking water supply, and would have only limited, if any, industrial use.

CONCLUSIONS AND RECOMMENDATIONS

Soil and ground water on the northern and eastern sides of the tank farm are contaminated with petroleum hydrocarbons, including diesel fuel. This contamination has probably resulted from surface spills of product during truck unloading operations and other leaks from pipes and containers outside the tank containment structure. Soil contamination appears to extend less than 50 feet north of the tanks and at least 60 feet to the east. Ground-water contamination is limited to an area within 50 feet east of the tanks, but the lateral limit has not been defined in the northern direction.

We recommend that soils on the northern and eastern sides of the tank area be excavated if they exhibit discoloration or a hydrocarbon odor. Excavation should generally be limited to the sandy soils above bay mud. Soils should be stockpiled after excavation. Soils that are highly contaminated with heavy oily material should be stockpiled separately. Stockpiles should be covered to comply with Bay Area Air Quality Management District (BAAQMD) Regulation 8-40.

An alternative option to disposal of contaminated soil at a hazardous waste site is aeration to reduce contaminant levels pursuant to the requirements of BAAQMD Regulation 8-40. However, in our experience at other sites, aeration has been only marginally effective in significantly reducing the concentrations of diesel fuel or heavier hydrocarbons. In the interest of reducing overall cost of the remedial action program, aeration could be attempted on a trial basis if the notification and quantity restrictions of Regulation 8-40 are adhered to. A test aeration program should be conducted involving approximately 5 cubic yards of soil. The soil for the test should not be selected from the heavily contaminated material described above. A composite sample should be collected and analyzed for TPH prior to the test, and the soil should be collected for odor and emission of volatile hydrocarbons. The test soil should be spread in a 1-foot-thick lift, and should be mixed on a weekly basis. Odors, emission of volatile hydrocarbons, and visual evidence of oily material should be checked weekly. If these three parameters can be brought below the limit of detection within 3 to 4 weeks, the soil should be resampled, and disposed of in the manner indicated below. If the test is successful in reducing the hydrocarbon concentration to the point where a less expensive disposal option can be utilized, additional soils should be aerated. If

significant concentration reduction cannot be achieved, further aeration should not be attempted.

Soil should be sampled at a frequency of one composite sample per 50 cubic yards and analyzed for TPH. Soils with TPH concentrations greater than 1000 ppm should be disposed at a permitted hazardous waste facility. Soils with TPH concentrations between 100 and 1000 ppm may also require disposal at a hazardous waste facility if a suitable Class II facility in the Bay Area cannot be located. Soils with TPH concentrations below 100 ppm can be disposed at a Class III sanitary landfill.

When soils are excavated around Well W-1, the excavations should be extended below the water table, and any accumulated fuel pumped into the slop tank inside the tank enclosure. This excavation should be observed over a several day period and a large diameter recovery well installed if fuel continues to accumulate on the ground-water surface. If a recovery well is installed, accumulated fuel should be pumped into the slop tank weekly.

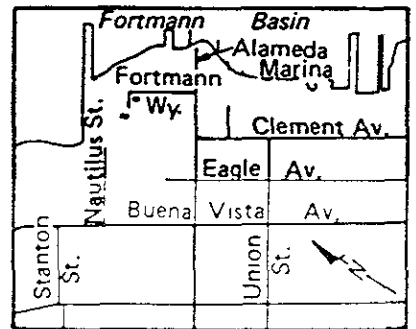
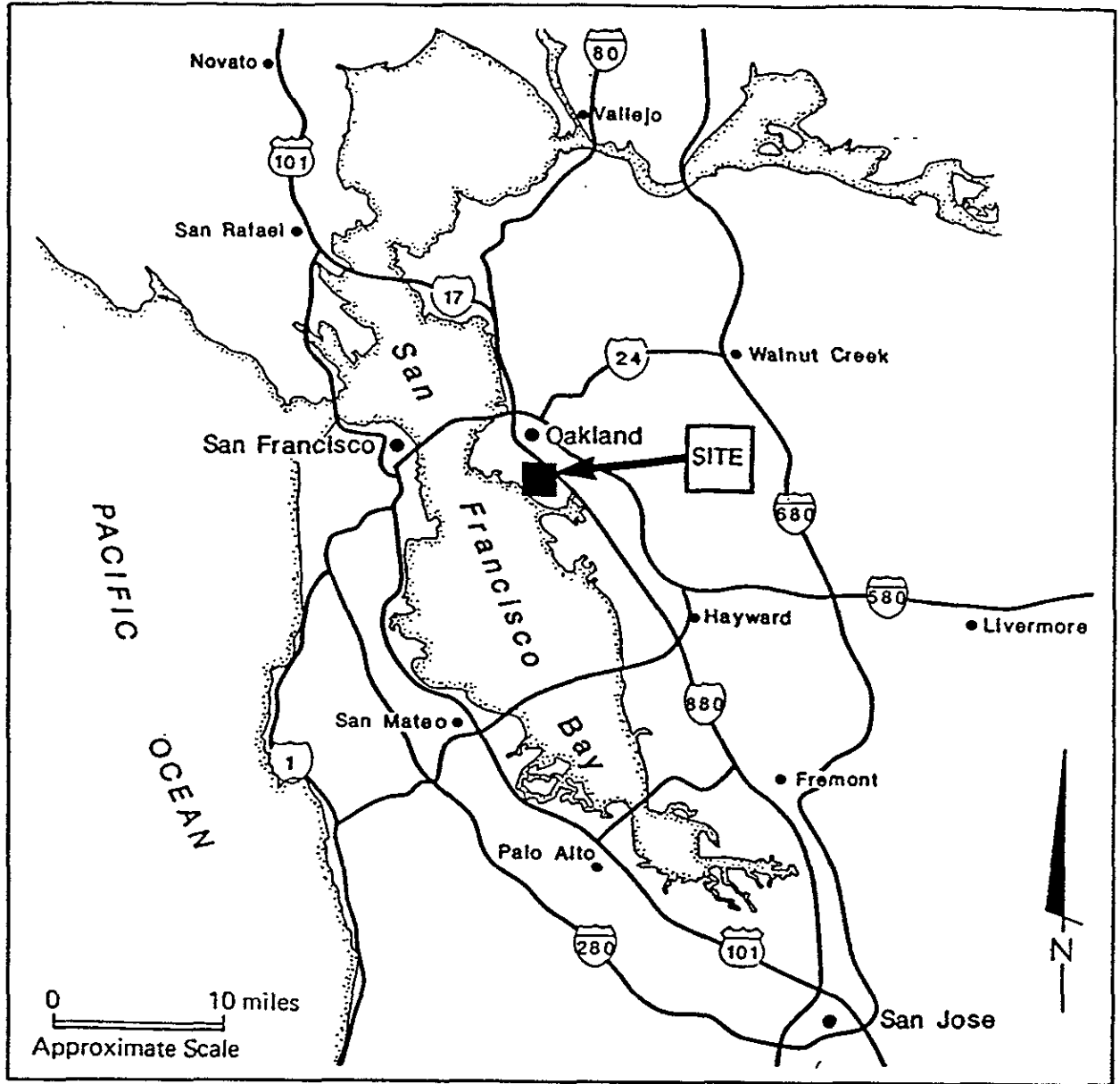
Removal of the source material, as described above, coupled with implementation of changes in operating procedures to prevent spills, as outlined below, should result in a reduction in the level of dissolved fuel constituents in ground water over time. We recommend that the existing wells be monitored for free product, TPH, benzene, toluene, and xylenes on quarterly basis, and that no further action be taken if levels decrease. If levels of dissolved constituents do not decrease, extraction and treatment of the ground water should be performed.

To prevent contamination from recurring, we recommend that the following steps be taken.

- Install a concrete pad that drains to a small sump or other contained area in the truck unloading area, to prevent spilled fuel from contaminating soil in this area. Unloading practices should be changed to prevent the routine spilling of fuel.
- Move the small slop oil tank to inside the containment structure.
- Institute a routine inspection and maintenance program for the tank area so that spills from pipe leaks or other sources are corrected and cleaned up in a timely manner.
- Pressure test the pipeline from the pump houses to the pier to verify that it is not leaking.

PLATES

Plate 1	Location Map
Plate 2	Site Plan
Plates 3 through 9	Logs of Borings B-1 through B-7
Plate 10	Well Construction Details



Harding Lawson Associates
Engineers and Geoscientists

Location Map
Environmental Assessment
Proposed Enclinal Marina
Alameda, California

PLATE

1

DRAWN
DM

JOB NUMBER
18,247,001.02

APPROVED
J. Escobar

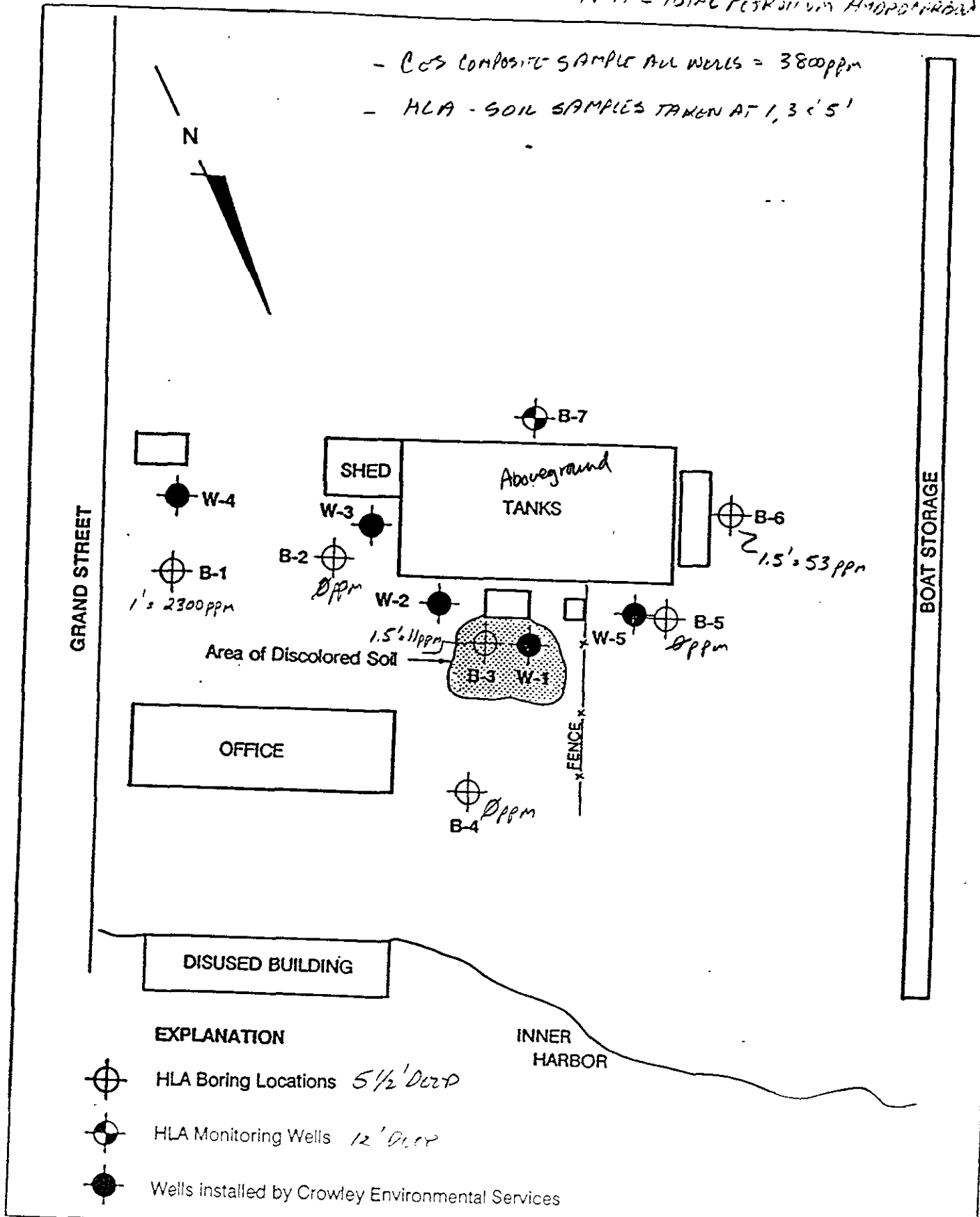
DATE
6/87

REVISED

DATE

TPH = TOTAL PETROLEUM HYDROCARBONS

- CCS COMPOSITE SAMPLE ALL WELLS = 3800ppm
- HLA - SOIL SAMPLES TAKEN AT 1, 3 & 5'



EXPLANATION

- HLA Boring Locations 5 1/2' Deep
- HLA Monitoring Wells 12' Deep
- Wells installed by Crowley Environmental Services



Harding Lawson Associates
Engineers and Geoscientists

Sampling Locations
Fuel Storage Area
Encinal Marina
Alameda, California

DRAWN
DM

JOB NUMBER
18,247,001.02

APPROVED
J. Blasco

DATE
6/87

REVISED

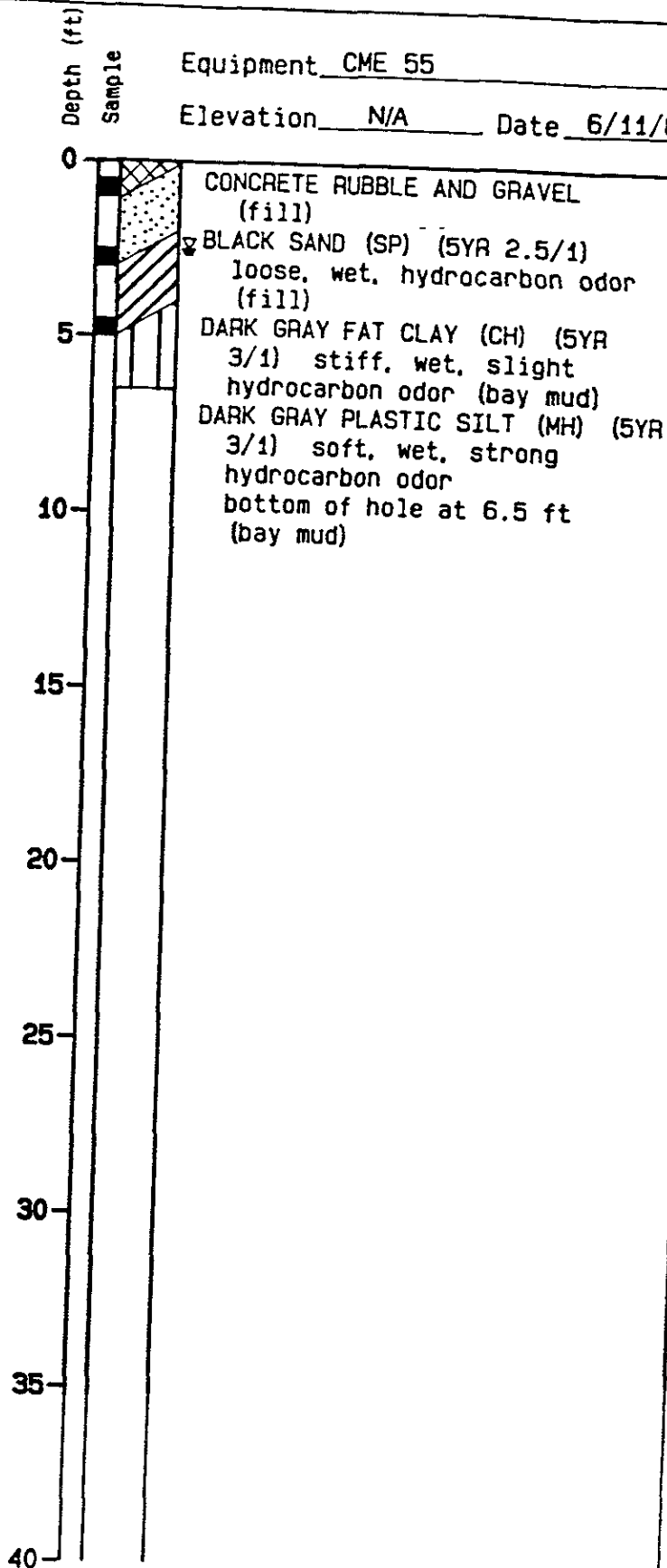
DATE

Laboratory Tests

Blows/8 In	Inches driven	Inches recovered
1	6	0
2	6	0
1	6	0
1	6	6
1	6	6
1	6	6
1	6	6
1	6	6

Equipment CME 55

Elevation N/A Date 6/11/87



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Log of Boring B-1
Encinal Marina
Alameda, California

PLATE

3

DRAWN
DM

JOB NUMBER
18,247,001.02

APPROVED
J. B. Lawson

DATE
6/87

REVISED

DATE

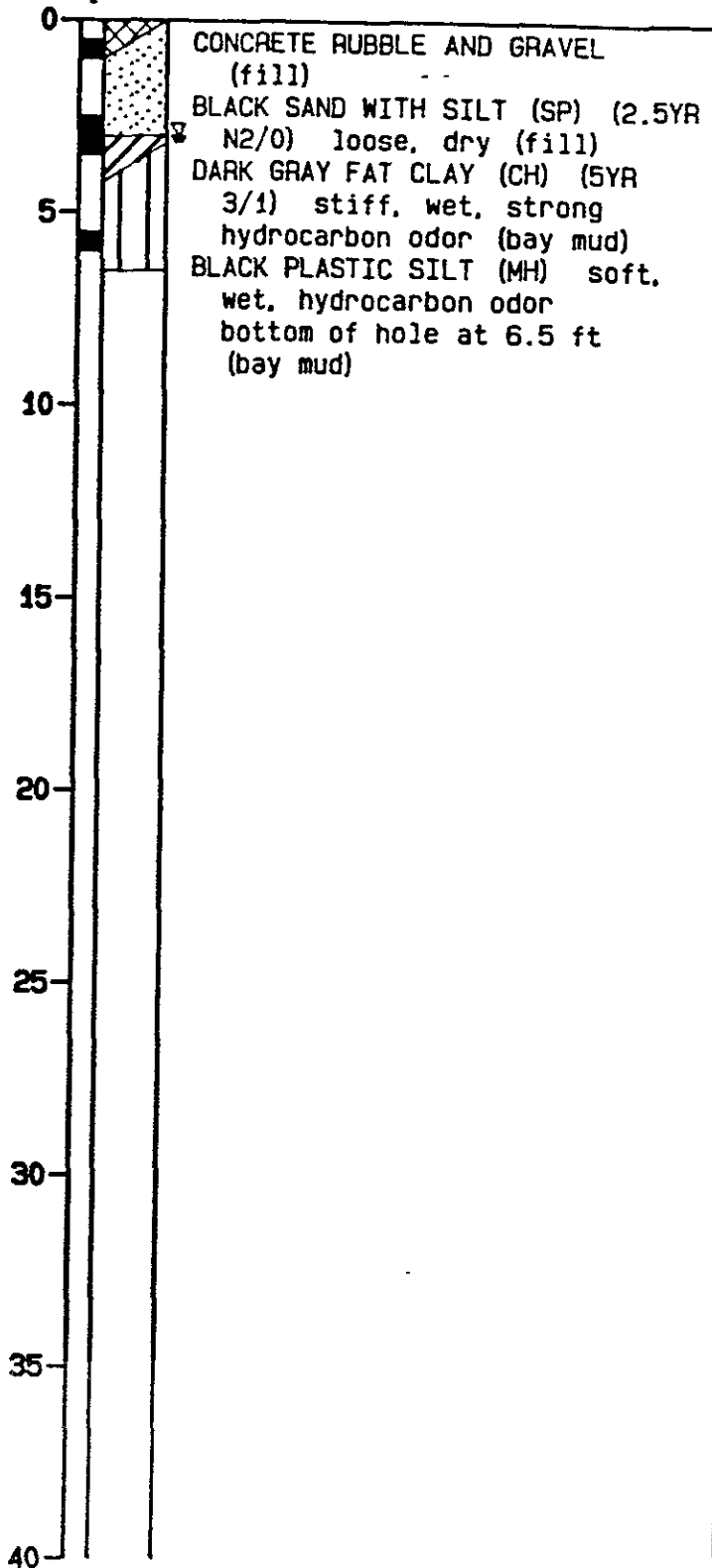
Laboratory Tests

Blows/6 in	Inches driven	Inches recovered
3	6	0
3	6	0
3	6	0
1	6	0
2	6	6
5	6	6
1	6	6
2	6	6
2	6	6

Depth (ft) Sample

Equipment CME 55

Elevation N/A Date 6/11/87



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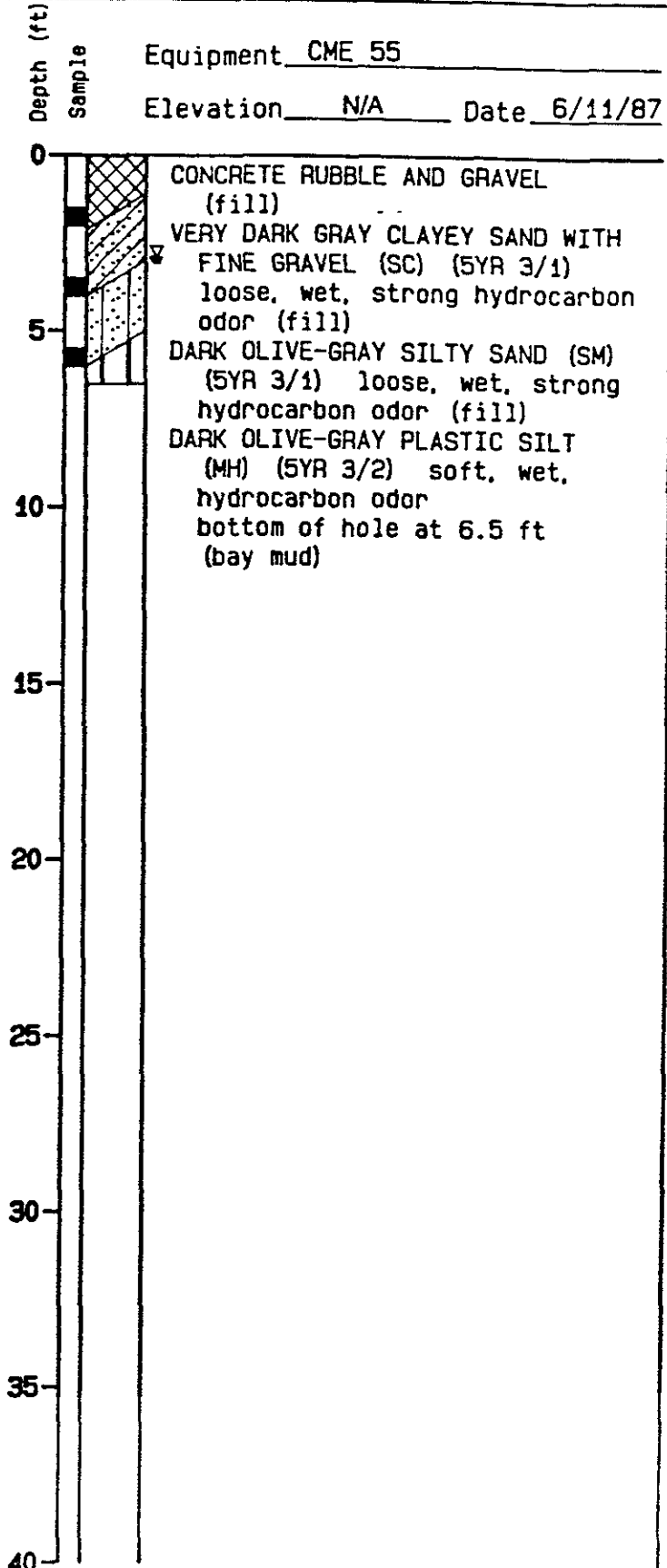
Log of Boring B-2
Encinal Marina
Alameda, California

PLATE
4

Laboratory Tests

Blows/6 in	Inches driven	Inches recovered
5	6	1
6	6	3
8	6	1
11	6	5
11	6	6
11	6	6
1	6	1
2	6	6
1	6	6

Equipment CME 55
 Elevation N/A Date 6/11/87



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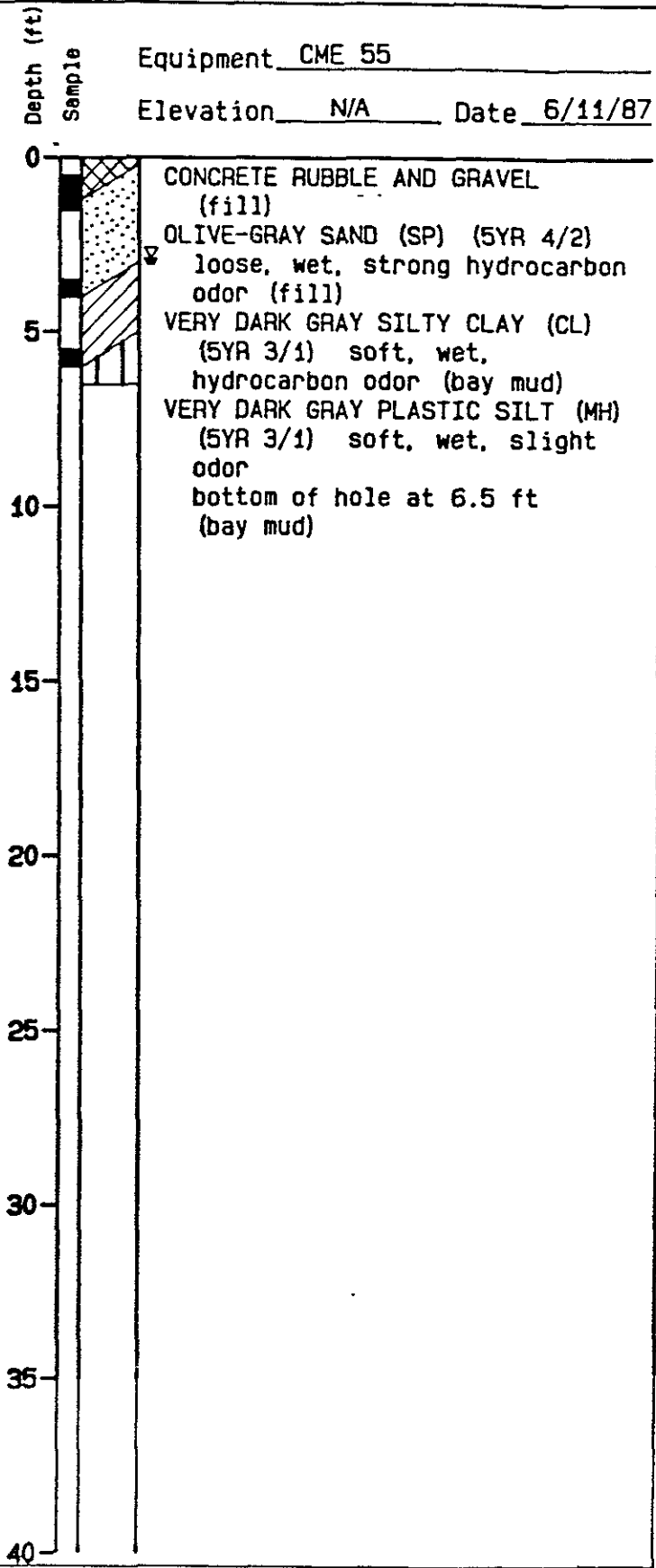
Log of Boring B-3
 Encinal Marina
 Alameda, California


PLATE
5

Laboratory Tests

Blows/6 In	Inches driven	Inches recovered
4	6	6
7	6	6
8	6	6
1	6	6
3	6	6
1	6	6
1	6	6
1	6	6

Equipment CME 55
 Elevation N/A Date 6/11/87



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Log of Boring B-4
 Encinal Marina
 Alameda, California

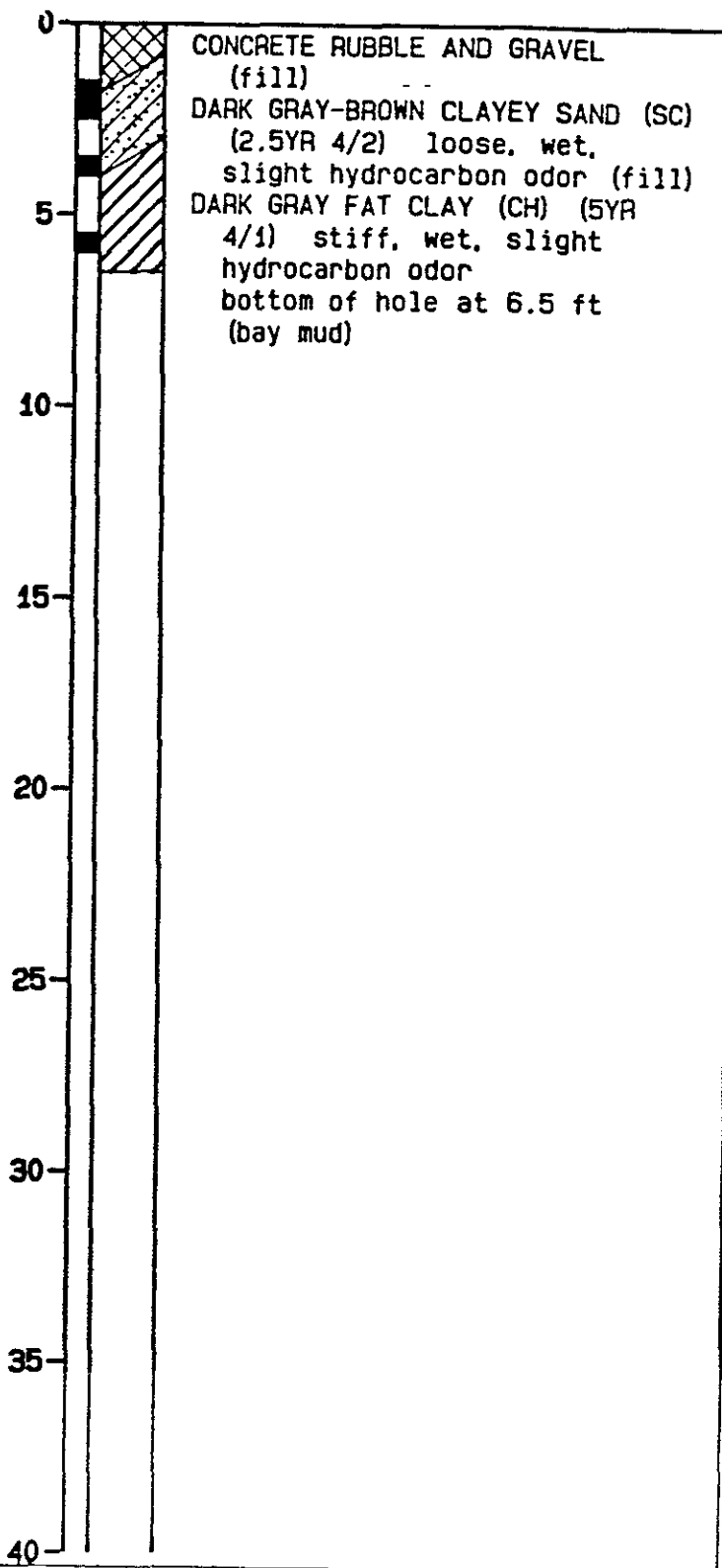
PLATE
6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
DM	18.247.001.02	J. Blasco	6/87		

Laboratory Tests

Blows/6 in	Inches driven	Inches recovered
4	6	5
9	6	6
7	6	6
1	6	6
2	6	6
1	6	6
2	6	6
2	6	6
3	6	6

Equipment CME 55
 Elevation N/A Date 6/11/87



Harding Lawson Associates
 Engineers and Geoscientists

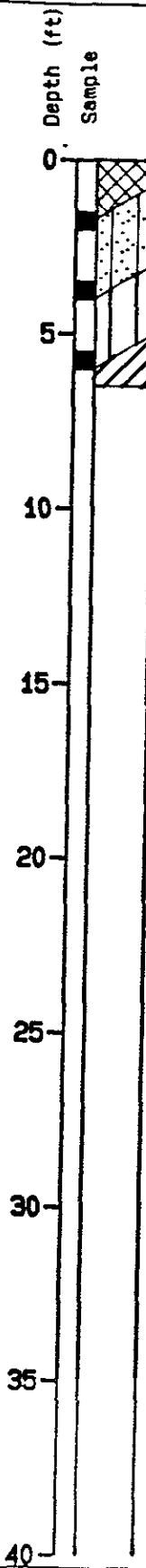
Log of Boring B-5
 Encinal Marina
 Alameda, California

PLATE
7

Laboratory Tests

Blows/6 In	Inches driven	Inches recovered
7	6	2
7	6	6
6	6	6
1	6	6
1	6	6
2	6	6
3	6	6
4	6	6

Equipment CME 55
 Elevation N/A Date 6/11/87



CONCRETE RUBBLE AND GRAVEL (fill)
 VERY DARK GRAY-BROWN SILTY SAND WITH GRAVEL (SM) (2.5YR 3/2) medium stiff, wet, no odor (fill)
 DARK OLIVE-GRAY SANDY SILT (MH) (5YR 3/2) soft, wet, faint hydrocarbon odor (bay mud)
 VERY DARK GRAY FAT CLAY (CH) (5YR 3/1) stiff, wet, no apparent odor (bay mud)
 bottom of hole at 6.5 ft



Harding Lawson Associates
 Engineers and Geoscientists

Log of Boring B-8
 Encinal Marina
 Alameda, California

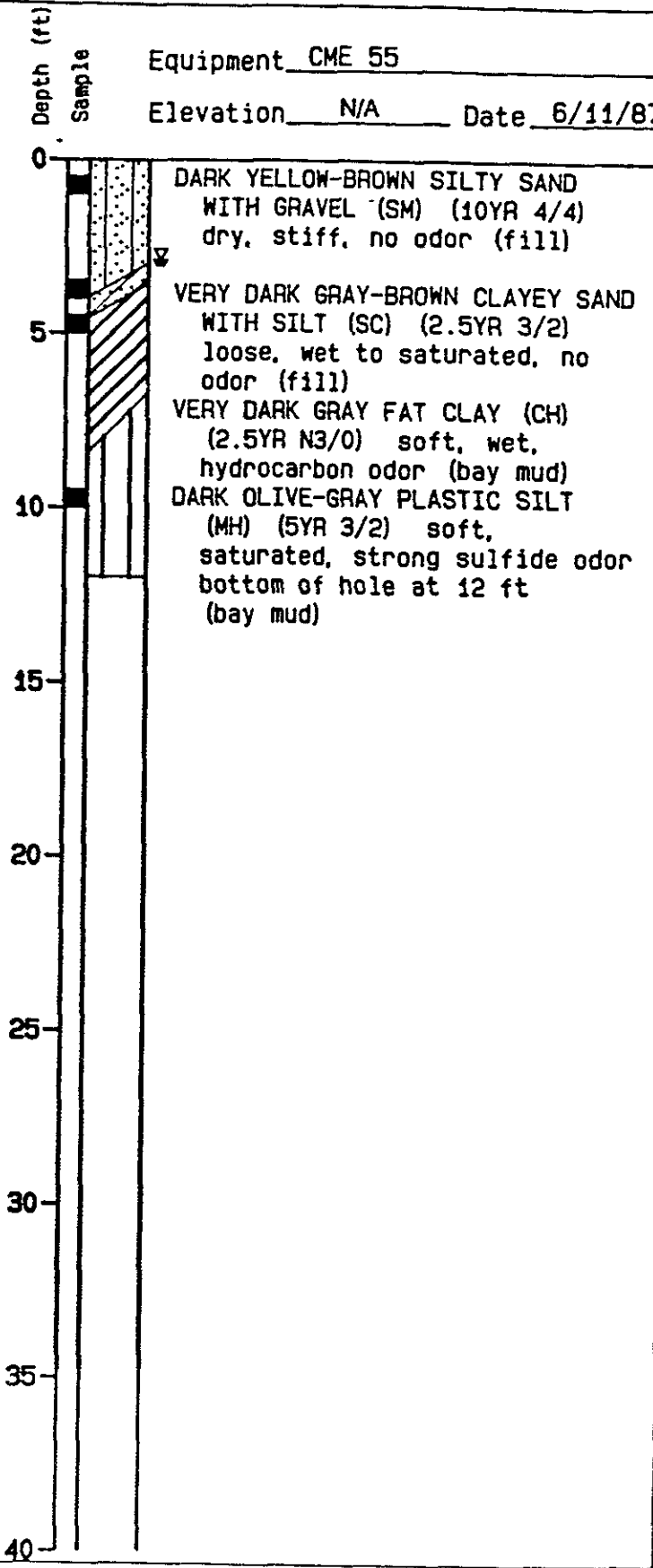
PLATE
8

Laboratory Tests

Blows/6 in	Inches driven	Inches recovered
7	6	3
7	6	3
9	6	6
1	6	6
2	6	6
3	6	6
1	6	6
2	6	6
2	6	6
1	6	6
1	6	6
1	6	6

Equipment CME 55

Elevation N/A Date 6/11/87

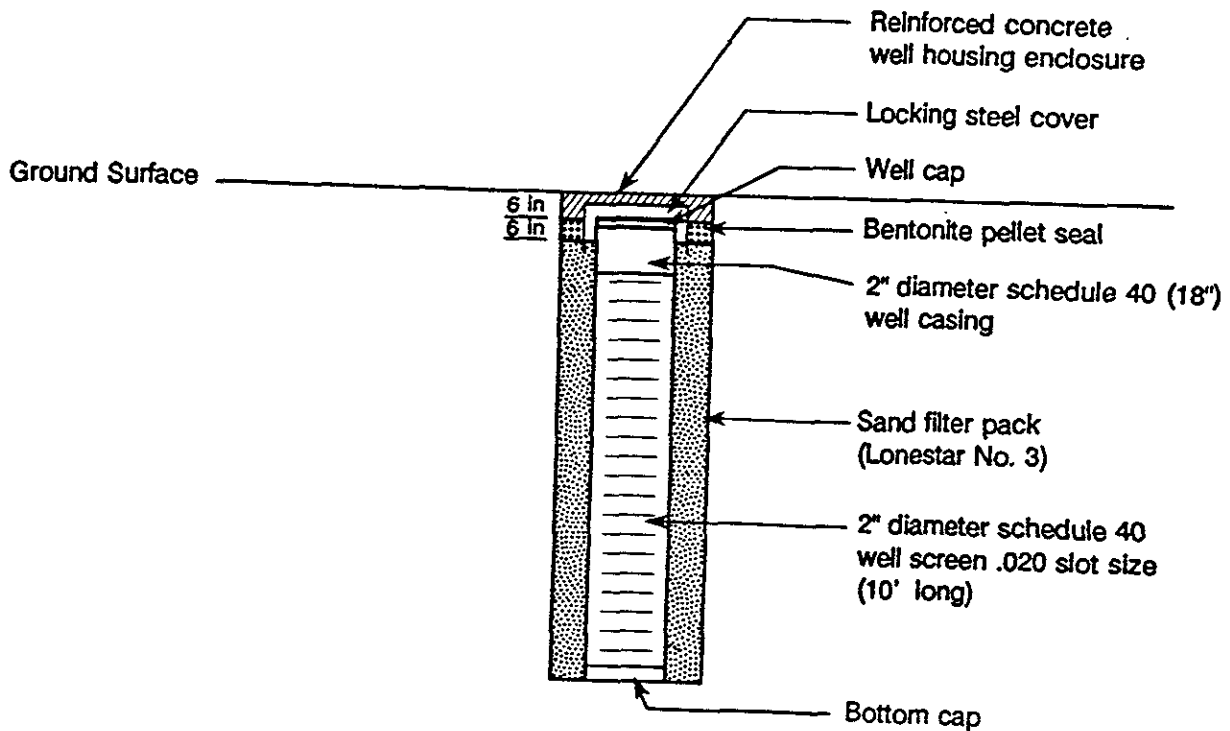


Harding Lawson Associates
Engineers and Geoscientists

Log of Boring B-7
Encinal Marina
Alameda, California

PLATE
9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
DM	18,247,001.02	J. Blakes	6/87		



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Engineers and Geoscientists

Well Construction Details for Boring B-7
Enclnal Marina
Alameda, California

PLATE

10

DRAWN
DM

JOB NUMBER
18,247,001.02

APPROVED
J. Blasco

DATE
6/87

REVISED

DATE



BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

RECEIVED

APR 17 1987

RUSS JOHNSON

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 420-2300

LOG NO: E87-04-051

Received: 03 APR 87

Reported: 16 APR 87

Mr. Luther Blevins
Crowley Environmental Services
321 Embarcadero
Oakland, CA 94606

REPORT OF ANALYTICAL RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED				
04-051-1	Well #1	02 APR 87				
04-051-2	Well #2	02 APR 87				
04-051-3	Well #3	02 APR 87				
04-051-4	Well #4	02 APR 87				
04-051-5	Well #5	02 APR 87				
PARAMETER		04-051-1	04-051-2	04-051-3	04-051-4	04-051-5
Total Fuel Hydrocarbons, mg/L		12	13	<1	<1	<1



BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

LOG NO: E87-04-051

Received: 03 APR 87

Reported: 16 APR 87

Mr. Luther Blevins
Crowley Environmental Services
321 Embarcadero
Oakland, CA 94606

REPORT OF ANALYTICAL RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
04-051-6	Soil Composite from Wells #1 thru #5	02 APR 87
PARAMETER		04-051-6
Total Fuel Hydrocarbons, mg/kg		3800

Dinda Black Fox
D. A. McLean, Laboratory Director

UNDERGROUND STORAGE TANK UNAUTHORIZED RELEASE (LEAK)/CONTAMINATION SITE REPORT

EMERGENCY <input type="checkbox"/> YES <input type="checkbox"/> NO		HAS STATE OFFICE OF EMERGENCY SERVICES REPORT BEEN FILED? <input type="checkbox"/> YES <input type="checkbox"/> NO		STATE TANK ID # _____	
REPORT DATE M M D D Y Y		LOCAL CASE # _____		REGIONAL BOARD CASE # _____	
NAME OF INDIVIDUAL FILING REPORT _____		PHONE () _____		SIGNATURE _____	
REPRESENTING <input type="checkbox"/> LOCAL AGENCY <input type="checkbox"/> OTHER <input type="checkbox"/> OWNER/OPERATOR <input type="checkbox"/> REGIONAL BOARD		COMPANY OR AGENCY NAME _____			
ADDRESS STREET _____ CITY _____ STATE _____ ZIP _____					
NAME _____ <input type="checkbox"/> UNKNOWN		CONTACT PERSON _____		PHONE () _____	
ADDRESS STREET _____ CITY _____ STATE _____ ZIP _____					
FACILITY NAME (IF APPLICABLE) _____		OPERATOR _____		PHONE () _____	
ADDRESS STREET _____ CITY _____ COUNTY _____ ZIP _____					
CROSS STREET _____		TYPE OF AREA <input type="checkbox"/> COMMERCIAL <input type="checkbox"/> INDUSTRIAL <input type="checkbox"/> RESIDENTIAL <input type="checkbox"/> RURAL <input type="checkbox"/> OTHER _____		TYPE OF BUSINESS <input type="checkbox"/> RETAIL FUEL STATION <input type="checkbox"/> UNKNOWN <input type="checkbox"/> OTHER _____	
LOCAL AGENCY AGENCY NAME _____		CONTACT PERSON _____		PHONE () _____	
REGIONAL BOARD _____		_____		() _____	
TSCD _____		_____		() _____	
CAS # (ATTACH EXTRA SHEET IF NEEDED) _____				NAME _____	
(1) _____				QUANTITY LOST (GALLONS) _____ <input type="checkbox"/> UNKNOWN	
(2) _____				_____ <input type="checkbox"/> UNKNOWN	
DATE DISCOVERED M M D D Y Y		HOW DISCOVERED <input type="checkbox"/> INVENTORY CONTROL <input type="checkbox"/> SUBSURFACE MONITORING <input type="checkbox"/> ROUTINE MONITORING <input type="checkbox"/> TANK REMOVAL <input type="checkbox"/> NUISANCE CONDITIONS <input type="checkbox"/> OTHER: _____			
DATE DISCHARGE BEGAN M M D D Y Y		METHOD USED TO STOP DISCHARGE (CHECK ALL THAT APPLY) <input type="checkbox"/> REMOVE CONTENTS <input type="checkbox"/> REPLACE TANK <input type="checkbox"/> CLOSE TANK <input type="checkbox"/> REPAIR TANK <input type="checkbox"/> REPAIR PIPING <input type="checkbox"/> CHANGE PROCEDURES <input type="checkbox"/> OTHER _____			
HAS DISCHARGE BEEN STOPPED? <input type="checkbox"/> YES <input type="checkbox"/> NO IF YES, DATE M M D D Y Y		SOURCE(S) OF DISCHARGE <input type="checkbox"/> TANK LEAK <input type="checkbox"/> UNKNOWN <input type="checkbox"/> PIPING LEAK <input type="checkbox"/> OTHER (SPECIFY) _____			
TANKS ONLY/CAPACITY _____ GAL AGE _____ YRS. <input type="checkbox"/> UNKNOWN MATERIAL <input type="checkbox"/> STEEL <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> OTHER _____		CAUSE(S) <input type="checkbox"/> OVERFILL <input type="checkbox"/> CORROSION <input type="checkbox"/> RUPTURE/FAILURE <input type="checkbox"/> SPILL <input type="checkbox"/> UNKNOWN <input type="checkbox"/> OTHER _____			
RESOURCES AFFECTED AIR (VAPOR) <input type="checkbox"/> YES <input type="checkbox"/> NO SOIL (VAPOSE ZONE) <input type="checkbox"/> YES <input type="checkbox"/> NO GROUNDWATER <input type="checkbox"/> YES <input type="checkbox"/> NO SURFACE WATER OR STORM DRAIN <input type="checkbox"/> YES <input type="checkbox"/> NO BUILDING OR UTILITY VAULT <input type="checkbox"/> YES <input type="checkbox"/> NO OTHER (SPECIFY) _____		THREATENED UNKNOWN <input type="checkbox"/> THREATENED <input type="checkbox"/> UNKNOWN		WATER SUPPLIES AFFECTED PUBLIC DRINKING WATER <input type="checkbox"/> YES <input type="checkbox"/> NO PRIVATE DRINKING WATER <input type="checkbox"/> YES <input type="checkbox"/> NO INDUSTRIAL <input type="checkbox"/> YES <input type="checkbox"/> NO AGRICULTURAL <input type="checkbox"/> YES <input type="checkbox"/> NO OTHER (SPECIFY) _____	
GROUNDWATER BASIN NAME _____ <input type="checkbox"/> UNKNOWN		# OF UNKNOWN WELLS _____			
COMMENTS: _____					

AGENCIES INVOLVED
 ABATEMENT
 SOURCE/CAUSE
 RESOURCES AT RISK

APPENDIX C



1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

LOG NO: E87-06-291

Received: 12 JUN 87

Reported: 16 JUN 87

Mr. John Blasco
Crowley Environmental Services
321 Embarcadero
Oakland, CA 94606

Project: 18247,001.02

REPORT OF ANALYTICAL RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED		
06-291-21	8706615	11 JUN 87		
06-291-22	8706710	11 JUN 87		
06-291-23	87067100	11 JUN 87		
PARAMETER		06-291-21	06-291-22	06-291-23
Total Fuel Hydrocarbons, mg/kg		53	<10	<10

Daniel Mew for
J. A. McLean, Laboratory Director



LOG NO: E87-06-291

Received: 12 JUN 87

Reported: 16 JUN 87

Mr. John Blasco
Crowley Environmental Services
321 Embarcadero
Oakland, CA 94606

Project: 18247,001.02

REPORT OF ANALYTICAL RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES					DATE SAMPLED
06-291-16	8706855					11 JUN 87
06-291-17	8706110					11 JUN 87
06-291-18	8706315					11 JUN 87
06-291-19	8706410					11 JUN 87
06-291-20	8706520					11 JUN 87
PARAMETER	06-291-16	06-291-17	06-291-18	06-291-19	06-291-20	
Total Fuel Hydrocarbons, mg/kg	<10	2300	11	<10	<10	



BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

LOG NO: E87-06-291

Received: 12 JUN 87

Reported: 16 JUN 87

Mr. John Blasco
Crowley Environmental Services
321 Embarcadero
Oakland, CA 94606

Project: 18247,001.02

REPORT OF ANALYTICAL RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED				
06-291-11	8706635	11 JUN 87				
06-291-12	8706655	11 JUN 87				
06-291-13	8706735	11 JUN 87				
06-291-14	8706750	11 JUN 87				
06-291-15	8706830	11 JUN 87				
PARAMETER	06-291-11	06-291-12	06-291-13	06-291-14	06-291-15	
Total Fuel Hydrocarbons, mg/kg	<10	<10	<10	<10	<10	



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Project: 18247,001.02

REPORT OF ANALYTICAL RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED				
06-291-6	8706355					
06-291-7	8706435					11 JUN 87
06-291-8	8706455					11 JUN 87
06-291-9	8706535					11 JUN 87
06-291-10	8706555					11 JUN 87
PARAMETER		06-291-6	06-291-7	06-291-8	06-291-9	06-291-10
Total Fuel Hydrocarbons, mg/kg		<10	<10	<10	<10	<10



BROWN AND CALDWELL LABORATORIES

ANALYTICAL REPORT

1255 POWELL STREET EMERYVILLE, CA 94608 * (415) 428-2300

LOG NO: E87-06-291

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Crowley Environmental Services
321 Embarcadero
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Project: 18247,001.02

REPORT OF ANALYTICAL RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED				
06-291-1	8706130	11 JUN 87				
06-291-2	8706150	11 JUN 87				
06-291-3	8706235	11 JUN 87				
06-291-4	8706255	11 JUN 87				
06-291-5	8706335	11 JUN 87				
PARAMETER		06-291-1	06-291-2	06-291-3	06-291-4	06-291-5
Total Fuel Hydrocarbons, mg/kg		<10	<10	<10	<10	<10



LOG NO: E87-06-302

Received: 12 JUN 87

Reported: 16 JUN 87

Mr. John Blasco
Crowley Environmental Services
321 Embarcadero
Oakland, CA 94606

Project: 18247,001.02

REPORT OF ANALYTICAL RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION, WATER SAMPLES	DATE SAMPLED	
06-302-6	B-7	12 JUN 87	
06-302-7	B-1	12 JUN 87	
PARAMETER		06-302-6	06-302-7
Clarity, ppt		10	<3.6
Total Fuel Hydrocarbons, mg/L EPA Method 602		<1.0	<1.0
Date Extracted		06.15.87	06.15.87
1,2-Dichlorobenzene, ug/L		<0.5	<0.5
1,3-Dichlorobenzene, ug/L		<0.5	<0.5
1,4-Dichlorobenzene, ug/L		<0.5	<0.5
Benzene, ug/L		<0.5	<0.5
Chlorobenzene, ug/L		<0.5	<0.5
Ethylbenzene, ug/L		<0.5	<0.5
Toluene, ug/L		<0.5	<0.5
Additional Compounds:			
Total Xylene, ug/L		<0.5	<0.5

Daniel McLean
D. A. McLean, Laboratory Director

DISTRIBUTION
PETROLEUM HYDROCARBONS IN
SOILS AND GROUND WATER
FUEL STORAGE AREA
ENCINAL MARINA
ALAMEDA, CALIFORNIA
July 17, 1987

Copy No. _____

Copy No.

3 copies: Encinal Marina, Inc.
Foot of Grand Street
Alameda, California 94501

1-3

Attention: Mr. Dean Anderson

1 copy: QA/QC File

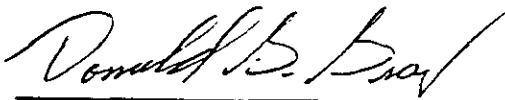
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JCB/CAH/clm/F0775-R

QUALITY CONTROL REVIEWER



Donald G. Gray
Civil Engineer



LABORATORY CERTIFICATE



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

290 Division Street, San Francisco, CA 94103, Phone (415) 861-1863

Laboratory No. 12905
Preliminary No.

Reported 06/19/87
Sampled
Received 06/15/87

For HARDING LAWSON ASSOCIATES

Report on 2 Water Samples

Mark Job ID: Encinal Marina
Job Number: 18247.001.02

SEE ATTACHED RESULTS


Laboratory Director

LAB NUMBER: 12905-1A
 CLIENT: HARDING LAWSON ASSOCIATES
 CLIENT ID: R7CT
 CLIENT JOB #: 18,247,001.02

DATE RECEIVED: 06/15/87
 DATE ANALYZED: 06/15-18/87
 DATE REPORTED: 06/19/87

13 PRIORITY POLLUTANT METALS BY ATOMIC ABSORPTION IN WATER
 EPA METHOD 7000 SERIES
 DIGESTION METHOD EPA 3010

COMPOUND	Results mg/L	LOD mg/L
Antimony	ND	0.02
Arsenic	ND	0.02
Beryllium	ND	0.01
Cadmium	ND	0.01
Chromium	ND	0.05
Copper	ND	0.05
Lead	0.14	0.05
Nickel	ND	0.05
Selenium	ND	0.02
Silver	ND	0.05
Thallium	ND	0.1
Zinc	ND	0.05

EPA METHOD 7470

Mercury	ND	0.001
---------	----	-------

=====

QA - QC SUMMARY

	%RPD	%SPIKE		%RPD	%SPIKE
Antimony	1	121	Lead	17	100
Arsenic	1	107	Nickel	1	99
Beryllium	1	98	Selenium	1	83
Cadmium	1	98	Silver	1	91
Chromium	1	80	Thallium	1	105
Copper	1	104	Zinc	1	103
Mercury	1	82			

ND = NONE DETECTED. mg/Kg = parts per million.

LABORATORY NUMBER: 12905-1B
 CLIENT: HARDING LAWSON ASSOCIATES
 CLIENT ID: B7CT

 DATE RECEIVED: 06/15/87
 DATE ANALYZED: 06/15-16/87
 DATE REPORTED: 06/19/87

 EPA 601
 Purgeable Halocarbons in Water

Compound	Result ug/L	LOD ug/L
chloromethane	ND	1
bromomethane	ND	1
vinyl chloride	ND	1
chloroethane	ND	1
methylene chloride	ND	1
trichlorofluoromethane	ND	5
1,1-dichloroethene	ND	1
1,1-dichloroethane	ND	1
trans-1,2-dichloroethene	ND	1
chloroform	ND	1
freon 113	ND	1
1,2-dichloroethane	ND	1
1,1,1-trichloroethane	ND	1
carbon tetrachloride	ND	1
bromodichloromethane	ND	1
1,2-dichloropropane	ND	1
cis-1,3-dichloropropene	ND	1
trichloroethylene	ND	1
1,1,2-trichloroethane	ND	1
trans-1,3-dichloropropene	ND	1
dibromochloromethane	ND	1
2-chloroethylvinyl ether	ND	1
bromoform	ND	1
tetrachloroethene	ND	1
1,1,2,2-tetrachloroethane	ND	1
chlorobenzene	ND	1
1,3-dichlorobenzene	ND	1
1,2-dichlorobenzene	ND	1
1,4-dichlorobenzene	ND	1

ND = None Detected. Limit of detection (LOD) in last column.

LABORATORY CERTIFICATE



Curtis & Tompkins, Ltd., Analytical Laboratories. Since 1878

290 Division Street, San Francisco, CA 94103. Phone (415) 861-1863

Laboratory No. 12916
Preliminary No.

Reported 06/19/87
Sampled
Received 06/15/87

For HARDING LAWSON ASSOCIATES

Report on 1 Water Sample

Mark Job ID: Encinal Marina
Job Number: 18247.001.02

SEE ATTACHED RESULTS


Laboratory Director

LAB NUMBER: 12916-1B
 CLIENT: HARDING LAWSON ASSOCIATES
 CLIENT ID: 87063CT
 CLIENT JOB #: 12,247,001.02

DATE RECEIVED: 06/15/87
 DATE ANALYZED: 06/15-18/87
 DATE REPORTED: 06/19/87

13 PRIORITY POLLUTANT METALS BY ATOMIC ABSORPTION IN WATER
 EPA METHOD 7000 SERIES
 DIGESTION METHOD EPA 3010

COMPOUND	Results mg/L	LOD mg/L
Antimony	ND	0.02
Arsenic	ND	0.02
Beryllium	ND	0.01
Cadmium	ND	0.01
Chromium	ND	0.05
Copper	ND	0.05
Lead	ND	0.05
Nickel	ND	0.05
Selenium	ND	0.02
Silver	ND	0.05
Thallium	ND	0.1
Zinc	2.7	0.05

EPA METHOD 7470

Mercury	ND	0.001
---------	----	-------

=====
 QA - QC SUMMARY

	%RPD	%SPIKE		%RPD	%SPIKE
Antimony	1	119	Lead	1	101
Arsenic	1	87	Nickel	1	86
Beryllium	1	96	Selenium	1	105
Cadmium	1	108	Silver	1	101
Chromium	1	93	Thallium	1	101
Copper	1	102	Zinc	1	104
Mercury	1	96			

ND = NONE DETECTED. mg/Kg = parts per million.



LABORATORY NUMBER: 12916-1A
CLIENT: HARDING LAWSON ASSOCIATES
CLIENT ID: 87063CT

DATE RECEIVED: 06/15/87
DATE ANALYZED: 06/15-18/87
DATE REPORTED: 06/19/87

EPA METHOD 624: VOLATILE ORGANICS IN WATER

COMPOUND	Result ug/L	LOD ug/L
Benzene	ND	(5)
Carbon tetrachloride	ND	(5)
Chlorobenzene	ND	(5)
1,2-dichloroethane	ND	(5)
1,1,1-trichloroethane	ND	(5)
1,1-dichloroethane	ND	(5)
1,1,2-trichloroethane	ND	(5)
1,1,2,2-tetrachloroethane	ND	(5)
Chloroethane	ND	(10)
2-chloroethylvinyl ether	ND	(10)
Chloroform	ND	(5)
1,1-dichloroethene	ND	(5)
1,2-trans-dichloroethene	ND	(5)
1,2-dichloropropane	ND	(5)
1,3-dichloropropene	ND	(5)
Ethylbenzene	ND	(5)
Methylene chloride	ND	(5)
Chloromethane	ND	(10)
Bromomethane	ND	(10)
Bromoform	ND	(10)
Bromodichloromethane	ND	(5)
Fluorotrichloromethane	ND	(10)
Chlorodibromomethane	ND	(5)
Tetrachloroethene	ND	(5)
Toluene	ND	(5)
Trichloroethene	ND	(5)
Vinyl chloride	ND	(10)

QA/QC SUMMARY

=====	
1,2 Dichloroethane-d4	118%
Toluene-d8:	95%
Bromofluorobenzene	69%



BROWN AND CALDWELL LABORATORIES
HARDING LAWSON ASSOC

1255 POWELL STREET EMERYVILLE CA 94608 • (415) 486-2300

ANALYTICAL REPORT

JUL - 2 1987

LOG NO: E87-06-333

Received: 16 JUN 87

Reported: 26 JUN 87

Mr. John Blasco
Harding Lawson and Associates
7655 Redwood Blvd.
Novato, CA 94947

Project: 18247.001.02

REPORT OF ANALYTICAL RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
06-333-1	8706001	15 JUN 87
06-333-2	8706002	15 JUN 87
06-333-3	8706003	15 JUN 87
06-333-4	8706004	15 JUN 87
06-333-5	8706005	15 JUN 87

PARAMETER	06-333-1	06-333-2	06-333-3	06-333-4	06-333-5
Beryllium, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium, mg/kg	<0.2	<0.2	<0.2	<0.2	0.5
Chromium, mg/kg	26	22	21	32	21
Copper, mg/kg	11	4.6	62	73	100
Lead, mg/kg	21	8.9	840	140	190
Nickel, mg/kg	23	16	26	53	51
Silver, mg/kg	1.3	<1.0	<1.0	<1.0	<1.0
Thallium, mg/kg	<2	<2	<2	5.4	<2
Zinc, mg/kg	27	12	310	270	330
Antimony, mg/kg	21	20	<10	<10	<10
Arsenic, mg/kg	2.6	1.6	4.7	38	0.4
Selenium, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Mercury, mg/kg	0.07	0.03	0.13	0.26	0.17
Nitric Acid Digestion, Date	06.18.87	06.18.87	06.18.87	06.18.87	06.18.87
Total Fuel Hydrocarbons, mg/kg	<10	<10	<10	31000	<10



LOG NO: E87-06-333

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Mr. John Blasco
 Harding Lawson and Associates
 7655 Redwood Blvd.
 Novato, CA 94947

Project: 18247.001.02

REPORT OF ANALYTICAL RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES					DATE SAMPLED
06-333-1	8706001					15 JUN 87
06-333-2	8706002					15 JUN 87
06-333-3	8706003					15 JUN 87
06-333-4	8706004					15 JUN 87
06-333-5	8706005					15 JUN 87
PARAMETER	06-333-1	06-333-2	06-333-3	06-333-4	06-333-5	
Purgeable Priority Pollutants						
Extraction	06.17.87	06.17.87	06.17.87	06.17.87	06.25.87	
1,1,1-Trichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2,2-Tetrachloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2-Trichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichloropropane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
2-Chloroethylvinylether, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Acrolein, mg/kg	<2	<2	<2	<2	<2	<2
Acrylonitrile, mg/kg	<2	<2	<2	<2	<2	<2
Bromodichloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bromomethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzene, mg/kg	<0.2	<0.2	<0.2	350	<0.2	<0.2
Chlorobenzene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon Tetrachloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bromoform, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroform, mg/kg	<0.2	0.4	0.3	<0.2	<0.2	<0.2



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Mr. John Blasco
 Harding Lawson and Associates
 7655 Redwood Blvd.
 Novato, CA 94947

Project: 18247.001.02

REPORT OF ANALYTICAL RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED				
06-333-1	8706001	15 JUN 87				
06-333-2	8706002	15 JUN 87				
06-333-3	8706003	15 JUN 87				
06-333-4	8706004	15 JUN 87				
06-333-5	8706005	15 JUN 87				
PARAMETER	06-333-1	06-333-2	06-333-3	06-333-4	06-333-5	
Chloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Dibromochloromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Ethylbenzene, mg/kg	<0.2	<0.2	<0.2	6	1.2	
Methylene chloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Tetrachloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Trichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Trichlorofluoromethane, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Toluene, mg/kg	<0.2	<0.2	<0.2	130	0.6	
Vinyl chloride, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
trans-1,2-Dichloroethylene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
trans-1,3-Dichloropropene, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
Semi-Quantified Results **						
C5H12, mg/kg	---	---	4	---	---	
C6H12, mg/kg	---	---	---	2000	---	
C6H14, mg/kg	---	---	---	400	---	
C7H14, mg/kg	---	---	---	100	---	
C7H16, mg/kg	---	---	---	80	---	
C8H16, mg/kg	---	---	---	---	0.7	
C9H16, mg/kg	---	---	---	---	0.2	
C9H18, mg/kg	---	---	---	---	2	



LOG NO: E87-06-333

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Mr. John Blasco
Harding Lawson and Associates
7655 Redwood Blvd.
Novato, CA 94947

Project: 18247.001.02

REPORT OF ANALYTICAL RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
06-333-1	8706001	15 JUN 87
06-333-2	8706002	15 JUN 87
06-333-3	8706003	15 JUN 87
06-333-4	8706004	15 JUN 87
06-333-5	8706005	15 JUN 87

PARAMETER	06-333-1	06-333-2	06-333-3	06-333-4	06-333-5
Unidentified Compound, mg/kg	---	---	---	5000	---
Xylene Isomers, mg/kg	---	---	---	20	6

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.



LOG NO: E87-06-333

Received: 16 JUN 87

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Mr. John Blasco
Harding Lawson and Associates
7655 Redwood Blvd.
Novato, CA 94947

Project: 18247.001.02

REPORT OF ANALYTICAL RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED	
06-333-6	8706SB1	15 JUN 87	
06-333-7	8706SB2	15 JUN 87	
PARAMETER		06-333-6	06-333-7
Total Fuel Hydrocarbons, mg/kg		<10	<10



LOG NO: E87-06-333

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Mr. John Blasco
 Harding Lawson and Associates
 7655 Redwood Blvd.
 Novato, CA 94947

Project: 18247.001.02

REPORT OF ANALYTICAL RESULTS

Page 6

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED	
06-333-6	8706SB1	15 JUN 87	
06-333-7	8706SB2	15 JUN 87	
PARAMETER		06-333-6	06-333-7
Purgeable Priority Pollutants			
Extraction		06.17.87	06.17.87
1,1,1-Trichloroethane, mg/kg		<0.2	<0.2
1,1,2,2-Tetrachloroethane, mg/kg		<0.2	<0.2
1,1,2-Trichloroethane, mg/kg		<0.2	<0.2
1,1-Dichloroethane, mg/kg		<0.2	<0.2
1,1-Dichloroethylene, mg/kg		<0.2	<0.2
1,2-Dichloroethane, mg/kg		<0.2	<0.2
1,2-Dichloropropane, mg/kg		<0.2	<0.2
1,3-Dichloropropene, mg/kg		<0.2	<0.2
2-Chloroethylvinylether, mg/kg		<0.2	<0.2
Acrolein, mg/kg		<2	<2
Acrylonitrile, mg/kg		<2	<2
Bromodichloromethane, mg/kg		<0.2	<0.2
Bromomethane, mg/kg		<0.2	<0.2
Benzene, mg/kg		<0.2	<0.2
Chlorobenzene, mg/kg		<0.2	<0.2
Carbon Tetrachloride, mg/kg		<0.2	<0.2
Chloroethane, mg/kg		<0.2	<0.2
Bromoform, mg/kg		<0.2	<0.2
Chloroform, mg/kg		0.3	<0.2
Chloromethane, mg/kg		<0.2	<0.2
Dibromochloromethane, mg/kg		<0.2	<0.2
Ethylbenzene, mg/kg		<0.2	<0.2



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Harding Lawson and Associates
7655 Redwood Blvd.
Novato, CA 94947

Project: 18247.001.02

REPORT OF ANALYTICAL RESULTS


Page 7

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED	
06-333-6	8706SB1	15 JUN 87	
06-333-7	8706SB2	15 JUN 87	
PARAMETER		06-333-6	06-333-7
Methylene chloride, mg/kg		<0.2	<0.2
Tetrachloroethylene, mg/kg		<0.2	<0.2
Trichloroethylene, mg/kg		<0.2	<0.2
Trichlorofluoromethane, mg/kg		<0.2	<0.2
Toluene, mg/kg		<0.2	<0.2
Vinyl chloride, mg/kg		<0.2	<0.2
trans-1,2-Dichloroethylene, mg/kg		<0.2	<0.2
trans-1,3-Dichloropropene, mg/kg		<0.2	<0.2

Semi-Quantified Results **

Xylene Isomers, mg/kg 1 ---

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.


D. A. McLean, Laboratory Director

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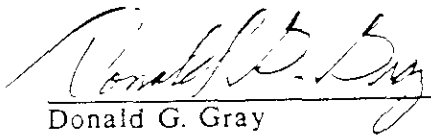
ENVIRONMENTAL ASSESSMENT
ENCINAL MARINA
ALAMEDA, CALIFORNIA
July 17, 1987

COPY NO. 1

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1 copy:	Bound Report File	5

JCB/CAH/ljc/B0826-R

QUALITY CONTROL REVIEWER


Donald G. Gray
Civil Engineer

