Prepared for

Port of Oakland

530 Water Street, Oakland, California

Final Report

Report of Monitoring Well Installations at Keep on Trucking, 370 8th Avenue, Oakland, California

failed to pass BTEX in MW 4 only.

December 2, 1993 ✓

Prepared by

Uribe & Associates

Environmental Consulting Services

2930 Lakeshore Avenue, Suite 200

Oakland, California 94610-3614

Report of Monitoring Well Installations at Keep on Trucking, 370 8th Avenue, Oakland, California

December 1, 1993

Prepared by

Uribe & Associates
Oakland, California

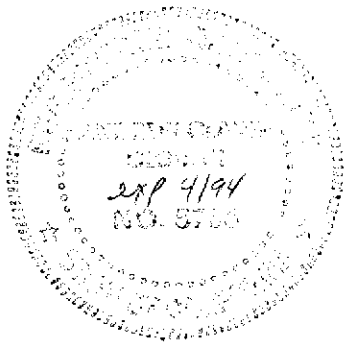
Prepared for

The Port of Oakland
Oakland, California

Certification

Report of Monitoring Well Installations at Keep on Trucking, 370 8th Avenue, Oakland, California

I certify that the information presented in this document was produced with professional standards, and to the best of my knowledge, the data contained here are true and accurate. The field program will be conducted under the supervision of a California Registered Geologist.



Andrew B. Clark-Clough
California Registered Geologist No.5736

12/2/93
Date

Report of Monitoring Well Installations at Keep on Trucking, 370 8th Avenue, Oakland, California

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Introduction

This report documents the installation of four monitoring wells at the Keep on Trucking (KOT) facility located at 370 8th Avenue, Oakland, California (Figure 1). Uribe & Associates (U&A) supervised the installation of three of the wells on August 26, 1993, and the fourth on September 8, 1993. The site is owned by the Port of Oakland (Port) and is leased to KOT. The wells were installed as part of the investigation and remediation efforts at the site after the discovery and removal of a leaking underground diesel pipeline associated with KOT's former aboveground storage tank (AST). Copies of the laboratory reports containing soil and groundwater sample results are included as Appendix A.

Site Background

Diesel contamination was noticed in Clinton Basin by the United States Coast Guard (USCG) in late October, 1992. The Port soon discovered that the diesel was present in the storm drains at the Ninth Avenue Terminal. The remediation of the storm drains began immediately. Subsequent investigations by the Port identified the source of the diesel to be a leak in the underground piping associated with an AST diesel fuel dispenser system located at KOT, 370 8th Avenue.

The fuel dispenser system was removed from service on December 30, 1992, and removed from the ground by Bay Area Tank and Marine in February, 1993. A previously unknown underground storage tank (apparently unrelated to the diesel spill) was removed by Riedel Environmental Services in April, 1993. Contaminated soils were excavated by Dillard Environmental Services in April, 1993. More detailed information is contained in the following reports already submitted to the Alameda County Health Care Services Agency, Department of Environmental Health, Hazardous Materials Division (ACDEH):

- *Source Investigation Summary and Workplan to Delineate Soil and Groundwater Contamination*; prepared by U&A and dated January 20, 1993.
- *Report of the Source Area Primary Pathway Investigation at Keep on Trucking*; prepared by U&A and dated March 30, 1993.
- *Investigation of Diesel Spill at Keep on Trucking*; prepared by U&A and dated April 20, 1993.

- *Report of Investigation and Remediation of Contaminated Soil Resulting from the Diesel Spill at Keep on Trucking, 370 8th Avenue, Oakland, California;* prepared by U&A and dated July 1, 1993.

Monitoring Well Installation

Figure 2 shows the locations of the four monitoring wells. Three of the wells (MW-1, MW-2, and MW-3) were drilled by Gregg Drilling (license number 485165) on August 26, 1993, and the fourth (MW-4) was drilled by Great Sierra Explorations (license number 610487) on September 8, 1993. The wells were drilled to depths between 15 and 20 feet below ground surface (bgs). Boring logs and completion information are included in Appendix B. U&A supervised the well installations and collected soil samples approximately every five feet. Appendix C contains the U&A standard operating procedures for monitoring well installation and development.

Permits

Drilling permit applications were sent to the Alameda County Flood Control District, Zone 7 on August 16, 1993. Permit number 93461 for all four wells was issued to U&A on August 18, 1993. Appendix D contains a copy of the permit.

Construction Details

All four wells were drilled to depths between 15 and 20 feet bgs using a truck-mounted, eight-inch hollow-stem auger. Two-inch PVC casing was installed from the surface of each well to the top of the screen. The screened interval for each well was ten feet in length. The screens each had a 0.010-inch slot-size and were installed from total depth. A number 2 sized sand filter pack was installed in the annuli of all four wells from total depth to the bottom of the bentonite plugs. One-foot bentonite plugs were installed from four to three feet in monitoring wells MW-1, MW-2, and MW-4. These three wells were filled with cement from a depth of three feet to surface. The one-foot bentonite plug for MW-3 was installed from nine feet to eight feet. The annulus for MW-3 was filled with cement from eight feet to surface. Appendix B contains detailed boring logs and well completion diagrams.

Development Procedures

The four monitoring wells were developed by U&A personnel from September 14 through September 21, 1993. Three of the wells (MW-1, MW-2, and MW-3) recharged

very slowly. However, MW-4 recharged fast enough to allow continuous bailing. U&A personnel stored all purged groundwater in 55-gallon drums on-site. Purged water from monitoring well MW-4 was stored in a separate 55-gallon drum on-site. Appendix B contains the original field notes including the temperature, pH, conductivity and water level readings.

MW-1

On September 14, 1993, the water level for MW-1 was measured at 5.25 feet bgs. The well was bailed dry (approximately seven gallons) and allowed to recharge. The well recharged poorly: five feet to 10.2 bgs in 24 hours. Temperature, conductivity, and pH readings were collected. The following day, the well was surged with a two-inch surge block, and bailed dry again. Two days later (Friday, September 17, 1993) the well had recharged 7.4 feet to 7.6 feet bgs. U&A personnel surged and bailed the well dry again. On Monday, September 20, 1993, the well had recharged to a level of 5.2 feet bgs. U&A personnel bailed the well dry again on September 20, and on September 21, collected a water sample.

MW-2

On September 14, 1993, the water level for MW-2 was measured at 5.1 feet bgs. The well was bailed dry (approximately six gallons) and allowed to recharge. The well recharged poorly: six feet to 9.4 feet bgs in 24 hours. Temperature, conductivity, and pH readings were collected. The following day, the well was surged with a two-inch surge block and bailed dry again. Two days later (Friday, September 17, 1993), the well had recharged five feet to 10.2 feet bgs. U&A personnel surged and bailed the well dry again. On Monday, September 20, the well had recharged to the level of 4.4 feet bgs. U&A personnel bailed the well dry again on September 20, and on September 21, collected a water sample.

MW-3

On September 14, 1993, the water level of MW-3 was measured at 13.8 feet bgs. The well was bailed dry (approximately three gallons) and allowed to recharge. The well recharged poorly: three feet to 17 feet bgs in 24 hours. Temperature, conductivity, and pH readings were collected. The following day, the well was surged with a two-inch surge block and bailed dry again. Two days later (Friday, September 17, 1993), the well had recharged four feet to 15.9 feet bgs. U&A personnel surged and bailed the well dry again. On Monday, September 20, 1993, the water level was measured at 15.2 feet bgs. U&A personnel bailed the well dry again on September 20, and on September 21, collected a water sample.

MW-4

On September 14, 1993, the water level of MW-4 was measured at 5.3 feet bgs. Approximately four inches of floating diesel fuel were observed in the first bail collected from the well. U&A personnel continued to bail the well until approximately 15 gallons of water and diesel were removed. The well recharged fast enough to allow continuous bailing. Temperature, conductivity, and pH readings were collected during the bailing. Three days later (Friday, September 17, 1993), the well had recharged ten feet to 5.2 feet bgs. One foot of floating diesel was observed. U&A personnel bailed the well until floating diesel was no longer visible (approximately three gallons of water and diesel). On Monday, September 20, 1993, the water level was measured at 5.8 feet bgs with eight inches of floating diesel. U&A personnel bailed approximately eight gallons on September 20. The following day, U&A personnel bailed an additional five gallons including 18 inches of floating diesel, and then collected a water sample.

Table 1 Groundwater Information Collected September 21, 1993

Well ID	Time of Sampling	Water Level (ft bgs)*	Temperature (deg F)	pH	Conductivity mmhos/cm
MW-1	11:10	16.6	72.0	5.9	>20,000
MW-2	11:55	6.2	77.9	6.80	12,640
MW-3	12:15	4.7	78.5	6.9	13,430
MW-4	12:45	6.2	67.3	6.8	7,180

* feet below ground surface

Elevation Survey

On October 1, 1993, U&A personnel met with Bissel & Karn personnel at the Keep on Trucking facility to survey the elevations of the four monitoring wells. Table 2 contains the survey results. Appendix B contains the elevation survey report provided by Bissel and Karn. The groundwater flow direction was not calculated due the anomolous water elevation found in monitoring well MW-3. The results from MW-3 support the presence of heterogeneous fill material and the possibility that no laterally continous water bearing-zone exists beneath the site. In the absence of a laterally contiuous water-bearing zone, the groundwater flow direction can not be accurately determined. However, a review of the water elevation measurements indicates that the groundwater probably flows away from the building to the northwest.

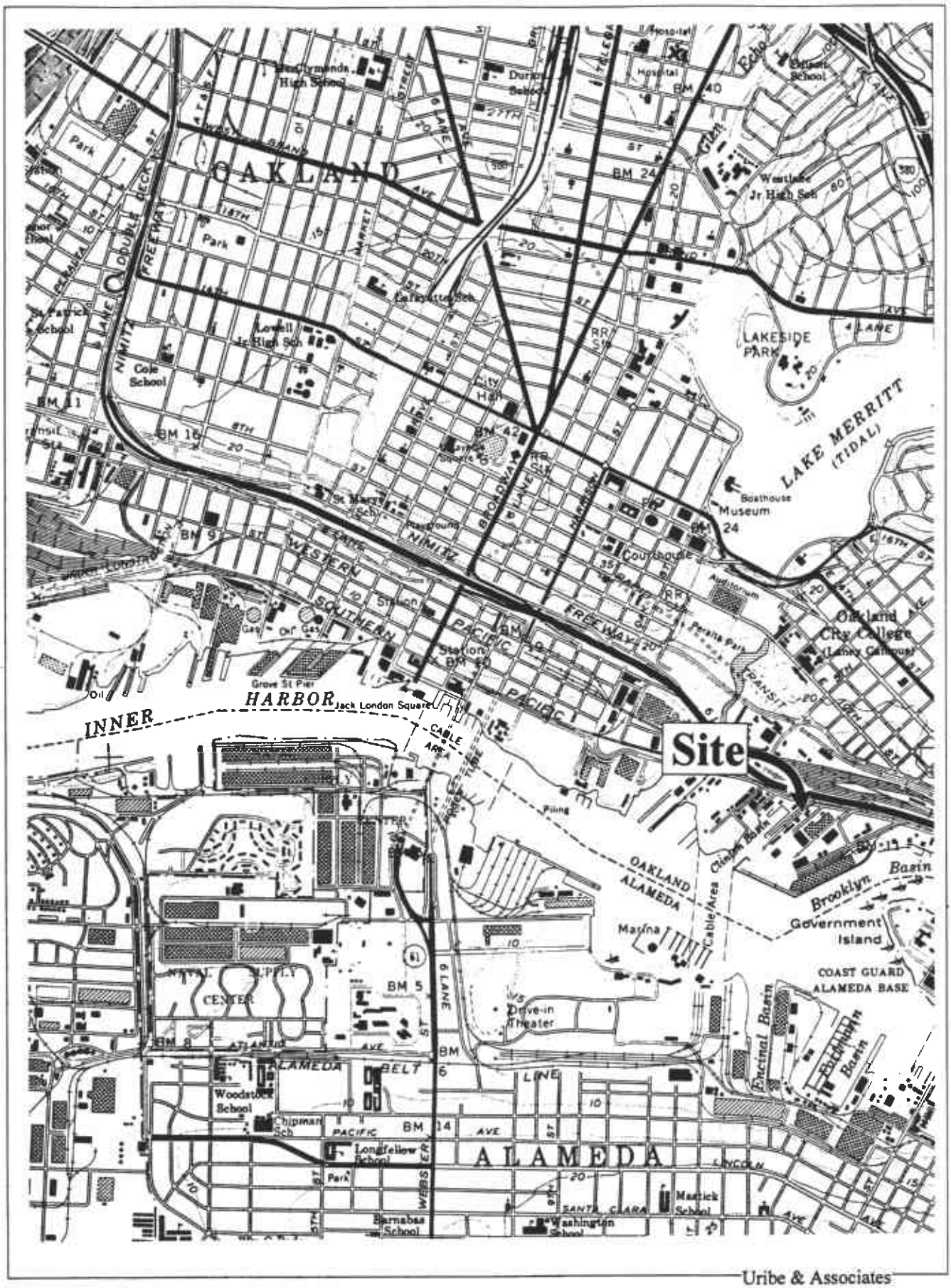


Figure 1: Site Location Map

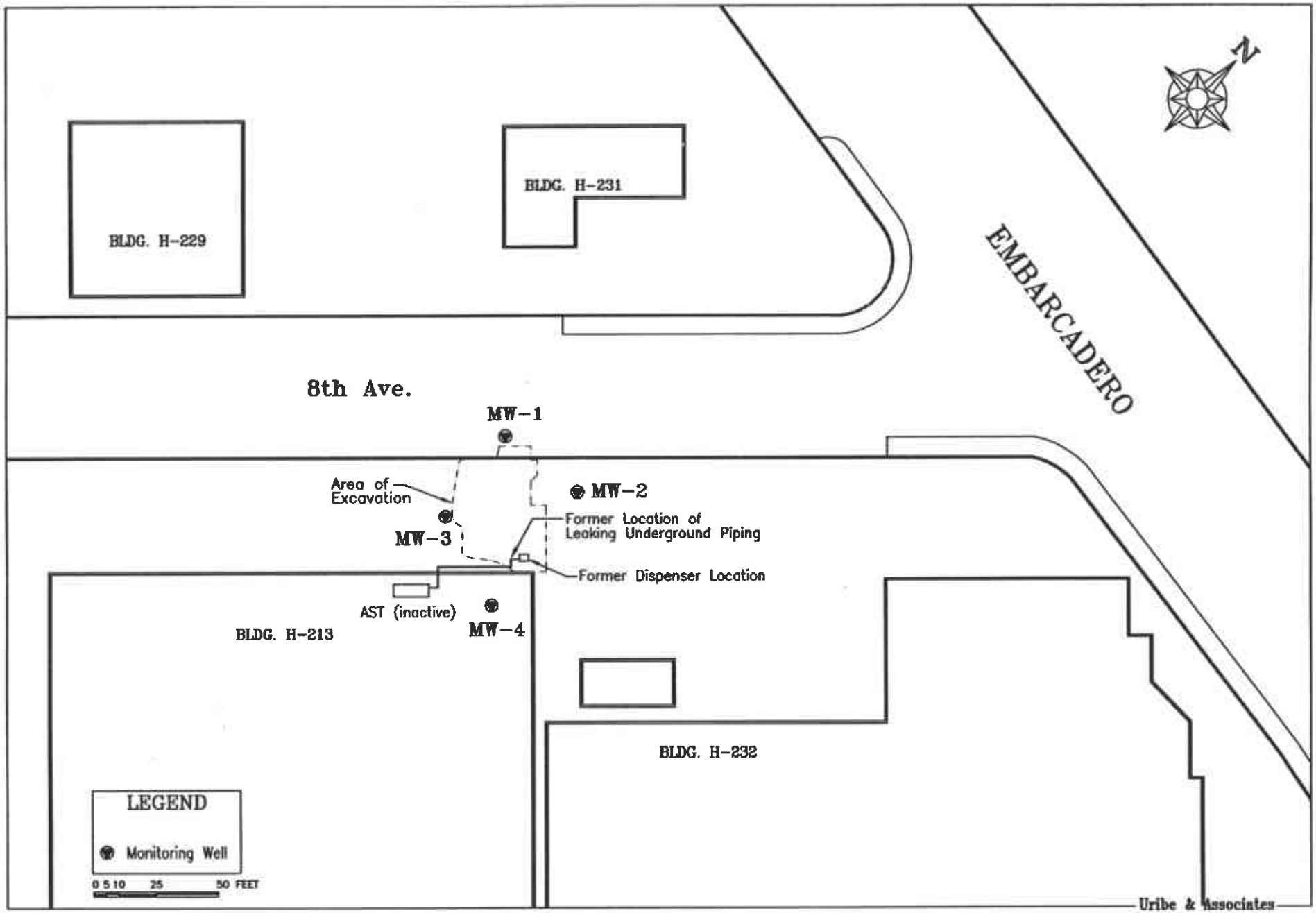


Figure 2: Site Plan, Showing Monitoring Well Locations

Appendix A

Laboratory Data Sheets

Analytical Results
for
Uribe & Associates/ Port of Oakland
Client Reference: 96-203
Clayton Project No. 93090.05

Sample Identification: See Below
Lab Number: 9309005
Sample Matrix/Media: SOIL
Extraction Method: EPA 3550
Method Reference: EPA 8015 (Modified)

Date Received: 09/01/93
Date Extracted: 09/01/93
Date Analyzed: 09/09/93

Lab Number	Sample Identification	Date Sampled	TPH-D (mg/kg)		Method Detection Limit (mg/kg)
-01	MW-1-10.5	08/26/93	9	a	1
-02	MW-1-16.0	08/26/93	ND		1
-04	MW-2-6.0	08/26/93	ND		1
-05	MW-2-10.5	08/26/93	1	b	1
-06	MW-2-15.5	08/26/93	ND		1
-08	MW-3-5.0	08/26/93	120	c	1
-09	MW-3-15.0	08/26/93	3	a	1
-10	MW-3-20.0	08/26/93	ND		1
-11	METHOD BLANK	--	ND		1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Results are reported on a wet-weight basis, as received.
TPH-D = Extractable petroleum hydrocarbons from C10 to C42 quantitated as diesel.
a Hydrocarbons present in the range of C16 to C38. Sample does not match typical diesel pattern.
b Hydrocarbons present in the range of C16 to C36. Sample does not match typical diesel pattern.
c Diesel present, heavier hydrocarbons also present in the range of C26 to C40.

Clayton
ENVIRONMENTAL CONSULTANTS
A Marsh & McLennan Company

REQUEST FOR LABORATORY ANALYTICAL SERVICES

Port of Oakland Project No. 26815 (N)

For Clayton Use Only	Page 1 of 1
Project No.	
Batch No. 930525	
Ind. Code	W.P.
Date Logged In 9/22/93	By TJ

REPORT RESULTS TO

Name: Tom Barnes — Title: Tech
Company: Uribe : Assoc — Dept.:
Mailing Address: 2930 Lakeshore Ave Ste 200
City, State, Zip: Oakland CA 94610
Telephone No.: (510) 832-2233 — Telefax No.: 832-2237

Purchase Order No.: 96-203 — Client Job No.:

SEND INVOICE TO

Name: SAME
Company: — Dept.:
Address:
City, State, Zip:

Date Results Req.: — Rush Charges Authorized? ☐ Yes ☒ No — Phone / Fax Results ☐ ☐

Special Instructions: (method, limit of detection, etc.)

* Explanation of Preservative: P = HCl

Samples are: (check if applicable)
☐ Drinking Water
☐ Collected in the State of New York

CLIENT SAMPLE IDENTIFICATION	DATE SAMPLED	MATRIX/ MEDIA	AIR VOLUME (specify units)	Number of Containers	TPH-Diesel	BTEX (8020)	HOLD TS	FOR LAB USE ONLY
MW-3	9/21/93	W	40ml @ 12	4	XP	XP		01A,B,C,D
MW-1	"	W		4	XP	XP		02
MW-2	"	W		4	XP	XP		03
MW-4	"	W		4	XP	XP		04
Trip Blank		H2O	40ml	2			XP	05A,B

ANALYSIS REQUESTED (Enter an 'X' in the box below to indicate request; Enter a 'P' if Preservative added. *)

CHAIN OF CUSTODY

Collected by: (print) Tom Barnes
Relinquished by: Tom Barnes — Date/Time 9-22-93 @ 11:20 AM
Relinquished by: Jean Mitchell — Date/Time 9-22-93 @ 1305
Method of Shipment:

Collector's Signature:
Received by: Jean Mitchell — Date/Time 9-22-93 @ 11:20 AM
Received at Lab by: Tonny Sutton — Date/Time 9/22/93 1:05 pm
Sample Condition Upon Receipt: ☒ Acceptable ☐ Other (explain)

Authorized by: _____ Date _____
(Client Signature Must Accompany Request)

Please return completed form and samples to one of the Clayton Environmental Consultants, Inc. labs listed below:

22345 Roethel Drive, Novi, MI 48375, (313) 344-1770
Raritan Center, 160 Fieldcrest Ave., Edison, NJ 08837, (908) 225-6040
400 Chastain Center Blvd., N.W., Suite 490, Kennesaw, GA 30144, (404) 499-7500
1252 Quarry Lane, Pleasanton, CA 94566, (510) 426-2657

2/92

DISTRIBUTION:
WHITE - Clayton Laboratory
YELLOW - Clayton Accounting
PINK - Client Retains

Analytical Results
for
Uribe & Associates/ Port of Oakland
Client Reference: 96-203
Clayton Project No. 93092.25

Sample Identification:	MW-1	Date Sampled:	09/21/93
Lab Number:	9309225-02C	Date Received:	09/22/93
Sample Matrix/Media:	WATER	Date Prepared:	09/24/93
Preparation Method:	EPA 5030	Date Analyzed:	09/24/93
Analytical Method:	EPA 8020	Analyst:	NAN

Analyte	CAS #	Concentration (ug/L)	Limit of Detection (ug/L)
BTEX			
Benzene	71-43-2	ND	0.4
Ethylbenzene	100-41-4	ND	0.3
Toluene	108-88-3	ND	0.3
o-Xylene	95-47-6	ND	0.4
p,m-Xylenes	--	ND	0.4
Surrogates		Recovery (%)	QC Limits (%)
a,a,a-Trifluorotoluene	98-08-8	105	50 - 150

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Uribe & Associates/ Port of Oakland
Client Reference: 96-203
Clayton Project No. 93092.25

Sample Identification:	MW-2	Date Sampled:	09/21/93
Lab Number:	9309225-03C	Date Received:	09/22/93
Sample Matrix/Media:	WATER	Date Prepared:	09/24/93
Preparation Method:	EPA 5030	Date Analyzed:	09/24/93
Analytical Method:	EPA 8020	Analyst:	NAN

Analyte	CAS #	Concentration (ug/L)	Limit of Detection (ug/L)
BTEX			
Benzene	71-43-2	0.5	0.4
Ethylbenzene	100-41-4	ND	0.3
Toluene	108-88-3	ND	0.3
o-Xylene	95-47-6	ND	0.4
p,m-Xylenes	--	ND	0.4
Surrogates		Recovery (%)	QC Limits (%)
a,a,a-Trifluorotoluene	98-08-8	102	50 - 150

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Analytical Results
for
Uribe & Associates/ Port of Oakland
Client Reference: 96-203
Clayton Project No. 93092.25

Sample Identification:	MW-4	Date Sampled:	09/21/93
Lab Number:	9309225-04C	Date Received:	09/22/93
Sample Matrix/Media:	WATER	Date Prepared:	09/24/93
Preparation Method:	EPA 5030	Date Analyzed:	09/24/93
Analytical Method:	EPA 8020	Analyst:	NAN

Analyte	CAS #	Concentration (ug/L)	Limit of Detection [a] (ug/L)
BTEX			
Benzene	71-43-2	140	2
Ethylbenzene	100-41-4	40	2
Toluene	108-88-3	110	2
o-Xylene	95-47-6	85	2
p,m-Xylenes	--	150	2
Surrogates		Recovery (%)	QC Limits (%)
a,a,a-Trifluorotoluene	98-08-8	103	50 - 150

ND: Not detected at or above limit of detection
--: Information not available or not applicable

[a] Detection limits increased due to dilution necessary for quantitation.

Analytical Results
for
Uribe & Associates/ Port of Oakland
Client Reference: 96-203
Clayton Project No. 93092.25

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9309225-06A	Date Received:	09/22/93
Sample Matrix/Media:	WATER	Date Prepared:	09/24/93
Preparation Method:	EPA 5030	Date Analyzed:	09/24/93
Analytical Method:	EPA 8020	Analyst:	NAN

Analyte	CAS #	Concentration (ug/L)	Limit of Detection (ug/L)
BTEX			
Benzene	71-43-2	ND	0.4
Ethylbenzene	100-41-4	ND	0.3
Toluene	108-88-3	ND	0.3
o-Xylene	95-47-6	ND	0.4
p,m-Xylenes	--	ND	0.4
Surrogates		Recovery (%)	QC Limits (%)
a,a,a-Trifluorotoluene	98-08-8	103	50 - 150

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Results of Analysis
for
Uribe & Associates/ Port of Oakland

Client Reference: 96-203
Clayton Project No. 93092.25

Sample Matrix/Media: WATER
Preparation Method: EPA 3510
Analysis Method: EPA 8015 (Modified)

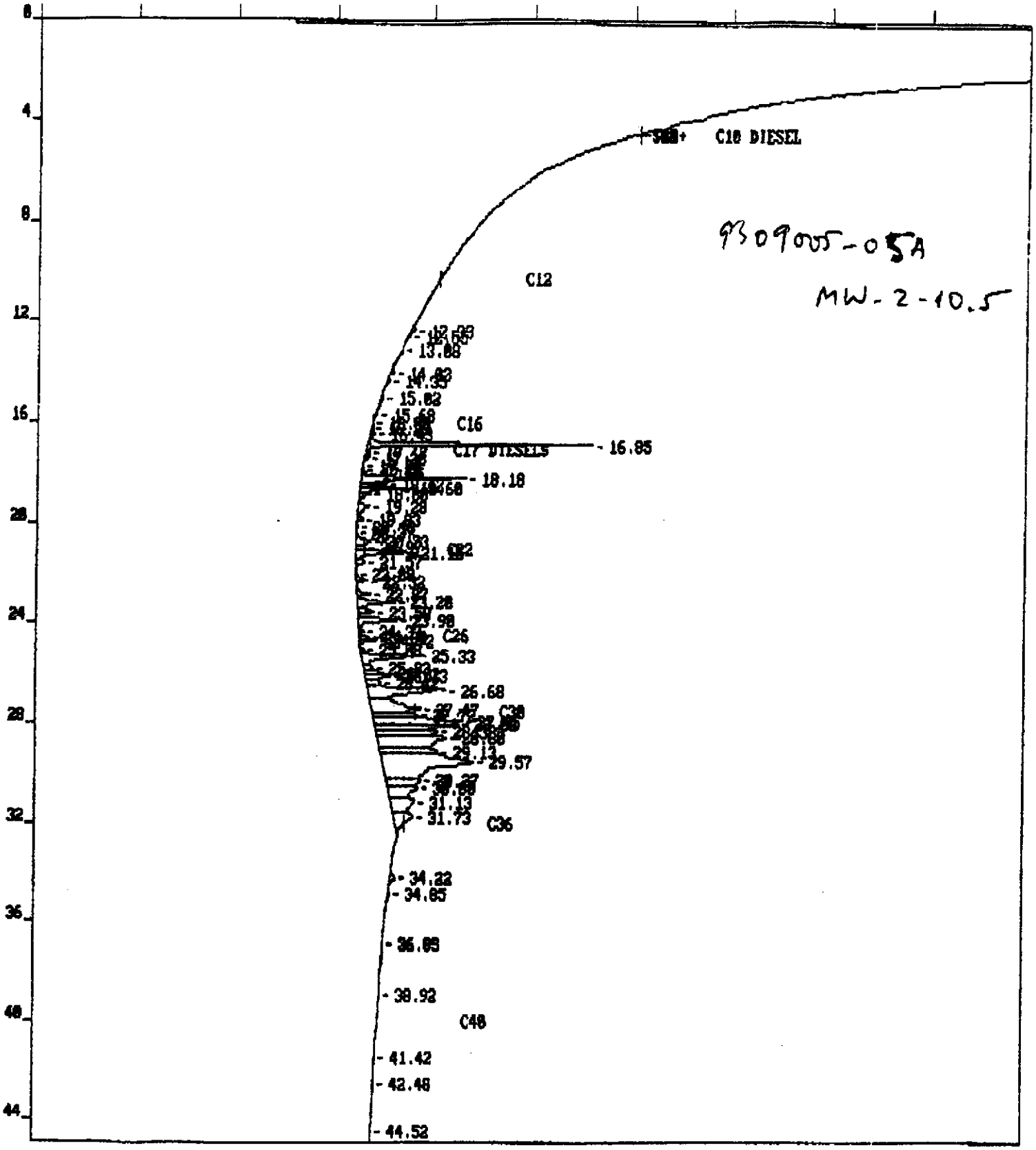
Date Received: 09/22/93
Date Prepared: 09/22/93
Date Analyzed: 09/23/93

Lab No.	Sample Identification	Date Sampled	TPH-D (ug/L)	Detection Limit (ug/L)
01A	MW-3	09/21/93	680a	50
02A	MW-1	09/21/93	1,600a	50
03A	MW-2	09/21/93	1,900a	50
04A	MW-4	09/21/93	1,300	50
06A	METHOD BLANK	--	ND	50

ND: Not detected at or above limit of detection
<: Not detected at or above limit of detection
--: Information not available or not applicable

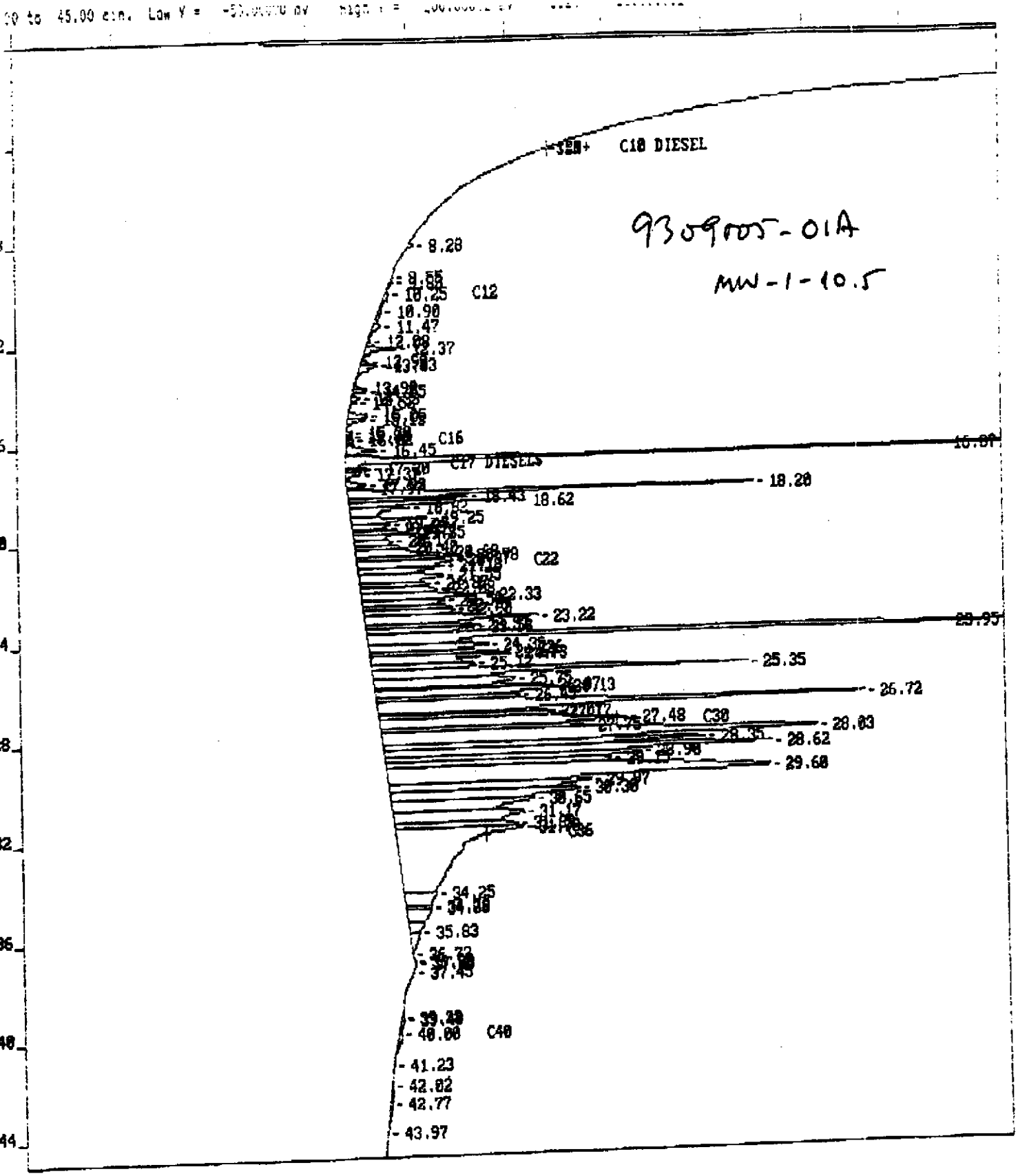
TPH-D = Extractable petroleum hydrocarbons from C10 to C42 quantitated as diesel.

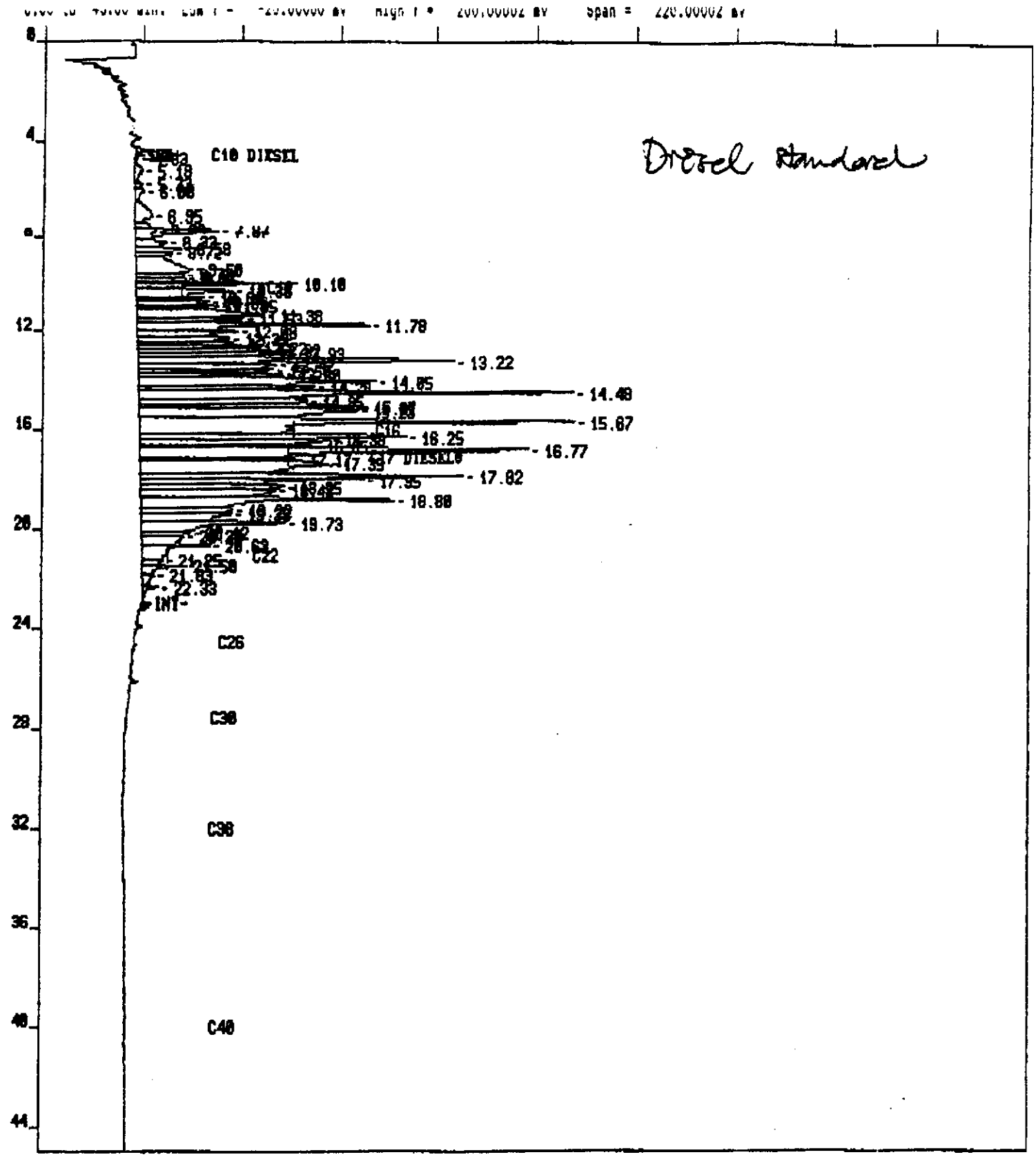
a Sample does not match the typical diesel pattern.



930905-05A

MW-2-10.5


C10 DIESEL
9309005-01A
MW-1-10.5
C12
C16
C17 DIESELS
C22
C30
C40
8.28
10.25
10.90
11.47
16.45
18.20
18.62
23.22
25.35
26.72
27.48
28.03
28.62
29.60
34.25
35.83
41.23
42.82
42.77
43.97


Span =
C10 DIESEL
Diesel Standard
- 11.78
- 13.22
- 14.48
- 15.67
- 16.77
- 17.82
- 18.88
- 19.73
C22
C26
C30
C36
C40

Results of Analysis
for
Uribe & Associates/ Port of Oakland

Client Reference: 96-203
Clayton Project No. 93090.80

Sample Matrix/Media: SOIL
Preparation Method: EPA 3550
Analysis Method: EPA 8015 (Modified)

Date Received: 09/09/93
Date Prepared: 09/13/93
Date Analyzed: 09/14/93

Lab No.	Sample Identification	Date Sampled	TPH-D (mg/Kg)	Detection Limit (mg/Kg)
01A	MW-4-5.5	09/08/93	7,100a	1
02A	MW-4-10.5	09/08/93	520a	1
03A	MW-4-15.5	09/08/93	6b	1
04A	METHOD BLANK	--	ND	1

ND: Not detected at or above limit of detection
<: Not detected at or above limit of detection
--: Information not available or not applicable

Results are reported on a wet-weight basis, as received.
TPH-D = Extractable petroleum hydrocarbons from C10 to C42 quantitated as diesel.

a Sample does not match the typical diesel pattern.
Sample appears to be a mixture of diesel and oil.

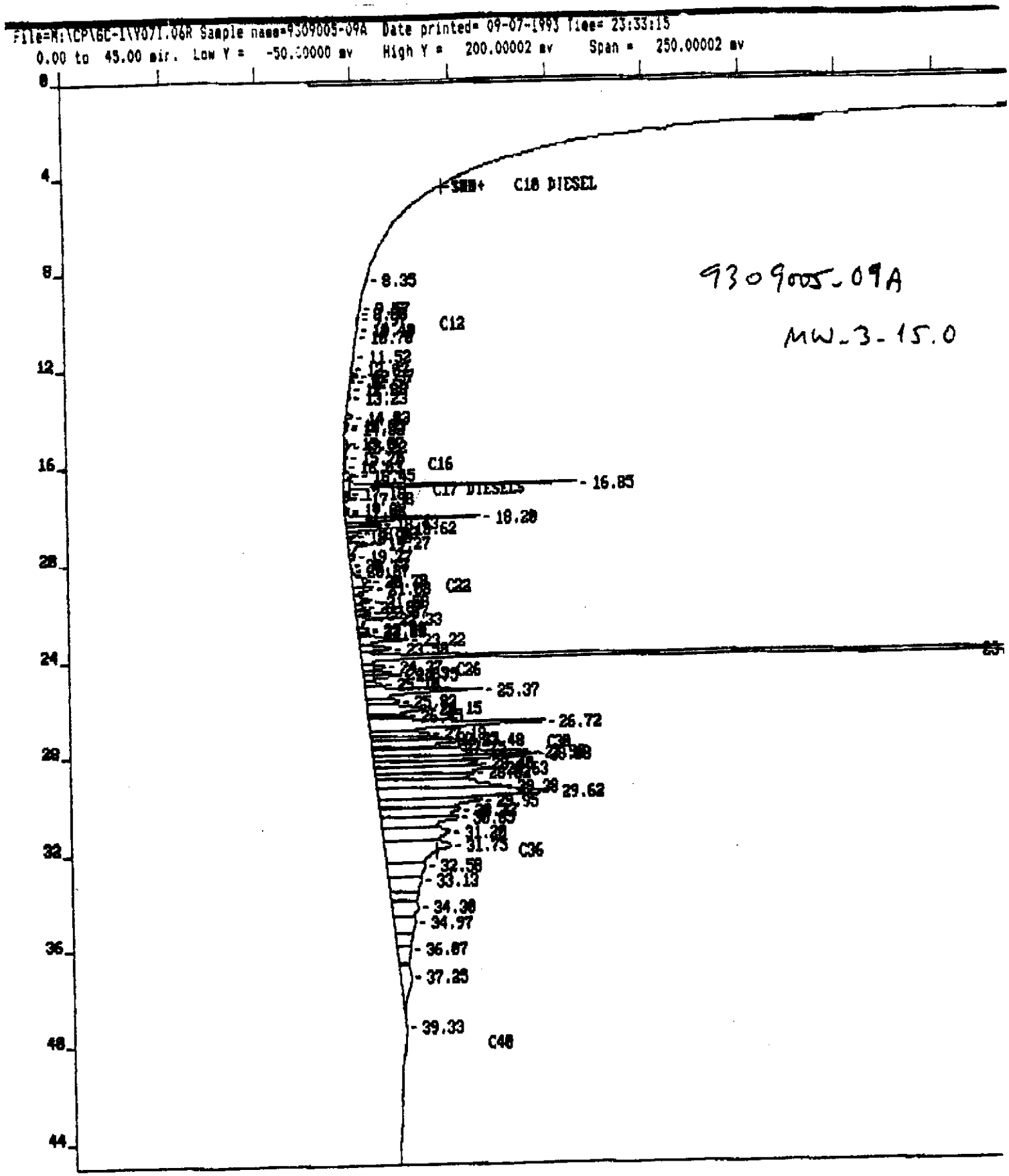
b Sample does not match the typical diesel pattern.

Analytical Results
for
Uribe & Associates/ Port of Oakland
Client Reference: 96-203
Clayton Project No. 93092.25

Sample Identification:	MW-3	Date Sampled:	09/21/93
Lab Number:	9309225-01C	Date Received:	09/22/93
Sample Matrix/Media:	WATER	Date Prepared:	09/24/93
Preparation Method:	EPA 5030	Date Analyzed:	09/24/93
Analytical Method:	EPA 8020	Analyst:	NAN

Analyte	CAS #	Concentration (ug/L)	Limit of Detection (ug/L)
BTEX			
Benzene	71-43-2	ND	0.4
Ethylbenzene	100-41-4	ND	0.3
Toluene	108-88-3	0.3	0.3
o-Xylene	95-47-6	ND	0.4
p,m-Xylenes	--	ND	0.4
Surrogates		Recovery (%)	QC Limits (%)
a,a,a-Trifluorotoluene	98-08-8	104	50 - 150

ND: Not detected at or above limit of detection
--: Information not available or not applicable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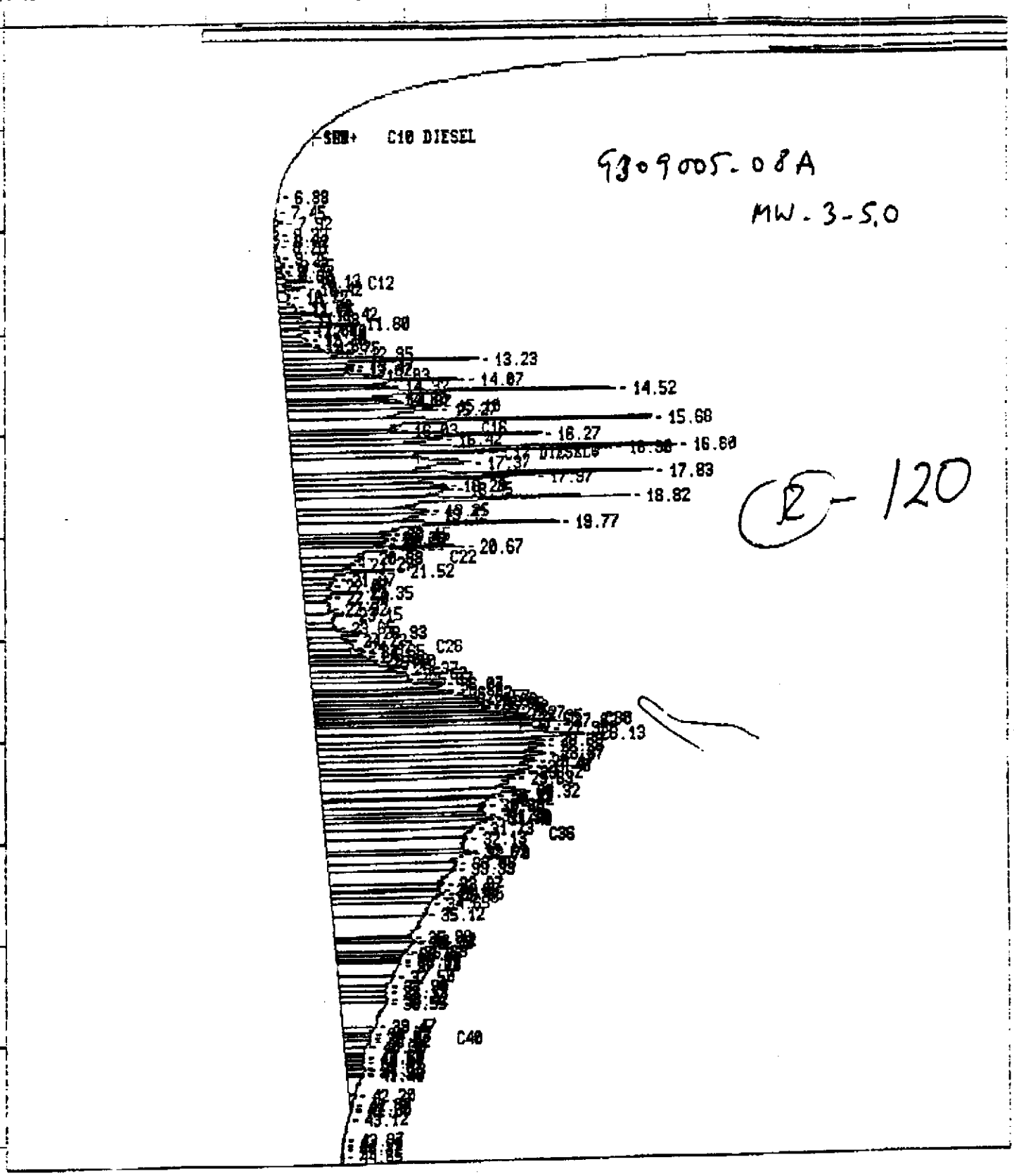
C10 DIESEL
9309005-09A
MW-3-15.0
8.35
C12
C16
16.85
C17 DIESELS
18.20
C22
C26
25.37
26.72
29.62
C36
32.58
33.13
34.30
34.97
36.87
37.25
39.33
C48


SBB+ C10 DIESEL
930905-08A
MW-3-5.0
E-120
C12
C16
C22
C26
C36
C40
6.89
7.45
11.60
13.23
14.07
14.52
15.68
16.27
16.80
17.83
18.82
19.77
20.67
21.52
28.13
35.12
8
12
16
20
24
28
32
36
40
44

Clayton ENVIRONMENTAL CONSULTANTS

A Marsh & McLennan Company

REQUEST FOR LABORATORY ANALYTICAL SERVICES

For Clayton Use Only	Page ____ of ____
Project No.	
Batch No.	9309080
Ind. Code	W.P.
Date Logged In 9/9/93	By T. ALTON

REPORT RESULTS TO

Name: John Borrego | Title: Geologist
Company: Uribe & Associates | Dept.:
Mailing Address: 2330 Lakeshore #200
City, State, Zip: Oakland CA 94610
Telephone No.: 510-832-2233 | Telefax No.: 832-2237

SEND INVOICE TO

Purchase Order No.: 26815 | Client Job No.: 96-203
Name: Port of Oakland
Company: | Dept.:
Address:
City, State, Zip:

Date Results Req.:
Rush Charges Authorized? ☐ Yes ☒ No
Phone / Fax Results ☐ ☒

Special Instructions: (method, limit of detection, etc.)

* Explanation of Preservative:

Samples are: (check if applicable)
☐ Drinking Water
☐ Collected in the State of New York

CLIENT SAMPLE IDENTIFICATION	DATE SAMPLED	MATRIX/ MEDIA	AIR VOLUME (specify units)	Number of Containers	TPH-Diesel	FOR LAB USE ONLY
MW-4-5.5	9/8/93	Soil	—	1	X	01A
MW-4-10.5	"	"	—	1	X	02
MW-4-15.5	"	"	—	1	X	03

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request; Enter a 'P' if Preservative added. *)

CHAIN OF CUSTODY

Collected by: John Borrego (print) | Collector's Signature: John C Borrego
Relinquished by: John C Borrego for John Borrego | Date/Time 9/9/93 12:00 | Received by: Jim Mitchell | Date/Time 9-9-93 @ 12:00 pm
Relinquished by: Jim Mitchell | Date/Time 9-9-93 @ 1440 | Received at Lab by: Jennifer Alton | Date/Time 9/9/93 @ 2:45
Method of Shipment:
Sample Condition Upon Receipt: ☒ Acceptable ☐ Other (explain)

Authorized by: John C Borrego Date 9/5/93
(Client Signature Must Accompany Request)

Please return completed form and samples to one of the Clayton Environmental Consultants, Inc. labs listed below:

22345 Roethel Drive
Novi, MI 48375
(313) 344-1770

Raritan Center
160 Fieldcrest Ave.
Edison, NJ 08837
(908) 225-6040

400 Chastain Center Blvd., N.W.
Suite 490
Kennesaw, GA 30144
(404) 499-7500

1252 Quarry Lane
Pleasanton, CA 94566
(510) 426-2657

2/92

DISTRIBUTION:
WHITE - Clayton Laboratory
YELLOW - Clayton Accounting
PINK - Client Retains

URIBE & ASSOCIATES
2930 LAKESHORE AVENUE
SUITE TWO HUNDRED
OAKLAND, CALIFORNIA 94610
510-832-2233
FAX 510-832-2237

PROJECT MANAGER: Andrew Clark-Clough
96-203

CHAIN OF CUSTODY RECORD

9309005

PROJ. NO. 26815 | PROJECT NAME 370 8th Ave.

SAMPLERS: (Signature) JOHN BORREGO

NO	DATE (1993)	TIME	COMP	GRAB	SAMPLE I.D.	NO. OF CONTAINERS	ANALYSIS TPH-D	REMARKS
1	8/26	0850		X	MW-1-10.5	1	X	STD. TAT
2	8/26	0910		X	MW-1-16.0	1	X	OK
3	8/26	1010		X	MW-2-1.5	1	X	(HOLD)
4	8/26	1030		X	MW-2-6.0	1	X	
5	8/26	1035		X	MW-2-10.5	1	X	
6	8/26	1045		X	MW-2-15.5	1	X	
7	8/26	1135		X	MW-3-1.0	1	X	(HOLD)
8	8/26	1145		X	MW-3-5.0	1	X	
9	8/26	1200		X	MW-3-15.0	1	X	
10	8/26	1310		X	MW-3-20.0	1	X	

CHECK IF RUSH

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
		[signature]	[signature]	9/1/93 10:35 AM	Jim Mitchell
Relinquished by: (Signature) Jim Mitchell	Date/Time 9/1/93 11:10 AM	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature) Terry Hales	Date/Time 9/1/93 11:10AM	NAME ADDRESS	

Table 2 Elevation Survey Results and Groundwater Elevation as Measured on September 14, 1993, before Well Development			
Well ID	Elevation* (ft above sea level)	Water Level 9/14/93 (ft below ground surface)	Groundwater Elevation (ft above sea level)
MW-1	10.28	5.25	5.03
MW-2	10.69	5.1	5.59
MW-3	10.54	13.8	-3.26
MW-4	12.33	5.3	7.03

* Relative to Port of Oakland datum, Mean Lower Low Water (MLLW).

Additional Bailing of Monitoring Well MW-4

U&A personnel visited the site once per week (9/27/93, 10/4/93, 10/14/93, 10/18/93, 10/26/93, 11/1/93) to bail diesel product from monitoring well MW-4. During each visit, approximately two to four gallons of liquid were bailed from the well with a disposable bailer until the floating product was removed. The purged water is stored in the 55-gallon drum set aside for MW-4. The diesel level receded with each consecutive week, until two consecutive visits found only a sheen on the water. Bailing activities ceased after November 1, 1993, due the successful removal of the floating diesel. Table 3 summarizes the diesel removal from MW-4.

Table 3 Diesel and Water Bailed from Monitoring Well MW-4		
Date	Amount of Fluid Bailed	Observed Diesel in First Bail
September 14, 1993	15 gallons	4 inches
September 17, 1993	3 gallons	12 inches
September 20, 1993	8 gallons	8 inches
September 27, 1993	3 gallons	8 inches
October 4, 1993	3 gallons	6 inches
October 14, 1993	2 gallons	5 inches
October 18, 1993	2 gallons	2 inches
October 26, 1993	2 gallons	sheen
November 1, 1993	3 gallons	sheen

Soil and Groundwater Sample Results

During the well installations, U&A personnel collected soil samples approximately every five feet. The samples were analyzed for total petroleum hydrocarbons (TPH) in the diesel range. Table 4 summarizes the results of these analyses.

Table 4 Soil Sample Results from Monitoring Well Borings
Concentrations in mg/kg

Sample ID	TPH-Diesel
MW-1-10.5	9[a]
MW-1-16.0	<1
MW-2-6.0	<1
MW-2-10.5	1[a]
MW-2-15.5	<1
MW-3-5.0	120[a,b]
MW-3-15.0	3[a]
MW-3-20.0	<1
MW-4-5.5	7,100[c]
MW-4-10.5	520[c]
MW-4-15.5	6[a]

Laboratory Notes:

[a] Sample does not match the typical diesel pattern.

[b] Heavier hydrocarbons also present in the range of C26 to C40

[c] Sample does not match the typical diesel pattern. Sample appears to be a mixture of diesel and oil.

After the wells were developed, U&A personnel collected water samples and had them analyzed for TPH-diesel. The results of these analyses are included in Table 5. Appendix A contains copies of the laboratory data sheets for soil and groundwater samples.

Table 5 Groundwater Sample Results from Monitoring Wells Concentrations in ug/L				
Sample ID	**MW-1**	**MW-2**	**MW-3**	**MW-4**
Diesel	1,600[a]	1,900[a]	680[a]	1,300
Benzene	<0.4	0.5	<0.4	140
Toluene	<0.3	<0.3	0.3	110
Ethylbenzene	<0.3	<0.3	<0.3	40
o-Xylene	<0.4	<0.4	<0.4	85
p,m-Xylenes	<0.4	<0.4	<0.4	150

[a] Laboratory Note: Sample does not match the typical diesel pattern.

Discussion

Monitoring well MW-4 was observed to contain approximately four to twelve inches of diesel during well development. The purged water from this well has been stored separately from the other three wells to avoid cross-contamination of wastes and to simplify disposal. The well was purged once per week from September 14, 1993 to November 1, 1993 in an effort to remove the diesel found in the well. MW-4 is the only well installed at the site which recharges quickly. Bailing activities ceased on November 1, 1993, after all the diesel had apparently been removed. The last two weeks of bailing recorded only a sheen still present on the water.

During the removal of contaminated soils from the source area in March and April, 1993, diesel was observed pooling within sand lenses and wood debris. The boring log for monitoring well MW-4 includes a small interval of sandy silt and wood fragments, indicating that the boring may have hit a pocket of diesel fuel. This is corroborated by the fact that the diesel found in MW-4 amounted to only three to four gallons total. The foundation of Building H-213 limited the extent of the excavation and removal of contaminated soils toward the south. Therefore, the lateral extent of contamination or the possible presence of additional pockets of pooling diesel beneath the building remains unknown.

Monitoring wells MW-1, MW-2, and MW-3 recharge very slowly. Surging procedures performed during development did not increase the recharge rates significantly. For future quarterly sampling events, the wells will be bailed dry and allowed to recharge overnight. A U&A technician will return on the following day to collect a water sample.

Due to the slow recharge rates and nature of the fill material within the screened interval, the wells may not be useful in accurately determining a groundwater flow direction at the site. The site geology consists primarily of heterogeneous fill material, which may not support a laterally continuous water bearing-zone. The water table occurs in each well within this zone of fill material. The homogeneous layer of Bay Mud found beneath the layer of fill in each well is generally of very low permeability. U&A will continue to measure water levels before each quarterly sampling event.

The soil samples collected from MW-1, MW-2, and MW-3 contain hydrocarbons that do not match a generalized diesel standard. Chromatographs run on each of the samples indicate that many of the samples contain long-chain hydrocarbons indicating the presence of heavier oils. Sample MW-3-5.0 and the samples from MW-4 apparently show a combination of diesel and long-chain hydrocarbons. The source of these heavier hydrocarbons has not been determined. Chromatographs are included in Appendix A.

The groundwater samples from monitoring wells MW-1, MW-2, and MW-3 each contain small amounts of diesel. The laboratory has footnoted each of these samples with the following: "Sample does not match the typical diesel pattern." Monitoring well MW-4, the only well with floating diesel product, contained 1,300 ug/L diesel, which apparently did match the typical diesel pattern. The reason for the disparity between the types of diesel-range hydrocarbons in the wells is unclear.

Conclusions

Diesel fuel found in MW-4 confirms that the lateral extent of contamination has not been delineated to the south, beneath Building H-213. However, the diesel in MW-4 amounted to only three to four gallons, indicating that the monitoring well may have hit a small pocket of diesel. The fuel probably migrated along a preferential pathway formed by silty sand lenses and wood debris. The presence of other small pockets of diesel is possible.

Some heavier, long-chain hydrocarbons of undetermined origin were detected in the soil samples collected during the monitoring well installations. The source of these long-

chain hydrocarbons could have been from spills or surface runoff (possibly leaking from the ruptured stormdrain line), or they may have been deposited with the fill material.

Groundwater samples from all four wells show the presence of dissolved phase contamination: maximum concentrations of 1.9 mg/L diesel and 0.14 mg/L benzene from MW-4. MW-2

Appendix B

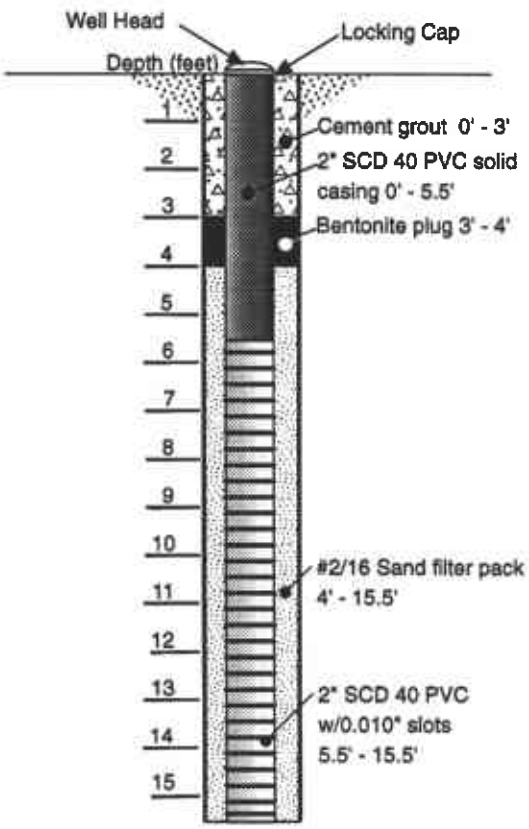
Boring Logs, Field Notes, and Elevation Survey Report

Port of Oakland - Keep On Trucking

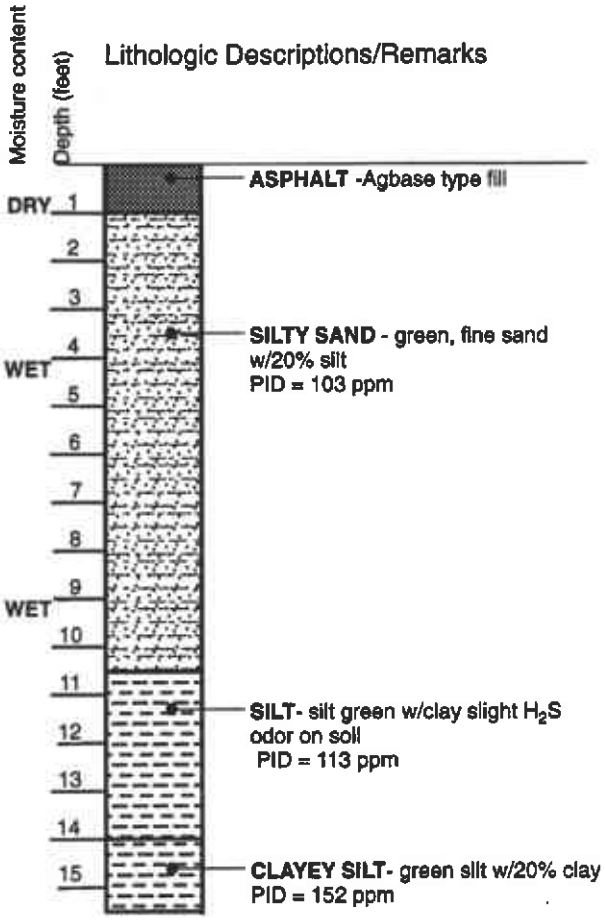
Bore Hole MW-1

Date	8/26/93
Drilling Method	HS Auger
Sampling Method	24" Split spoon
Surface Elevation	10.28'
Hole Diameter	8.5"
Recorded By	JC Borrego
Registered Geologist	

Well As-Built



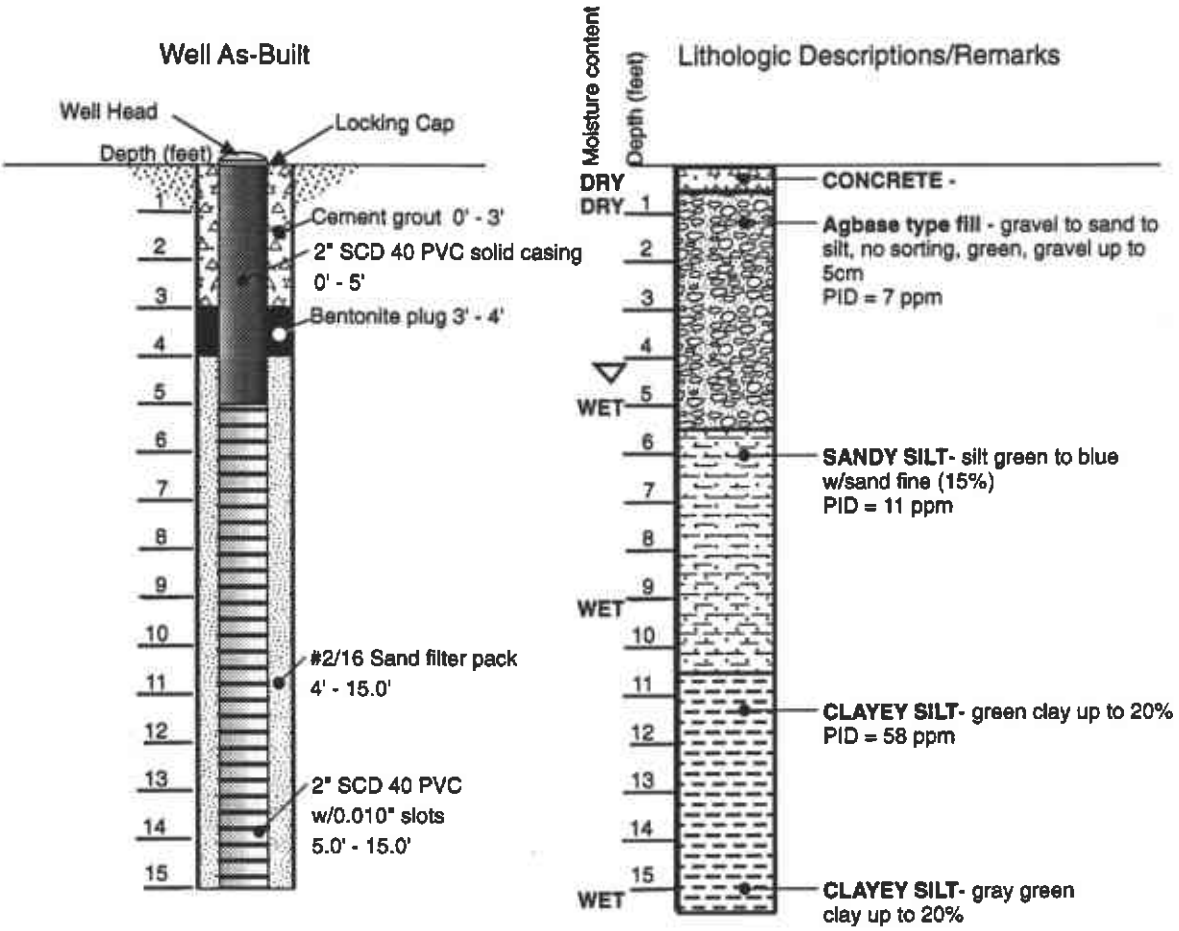
Lithologic Descriptions/Remarks



Port of Oakland - Keep On Trucking

Bore Hole MW-2

Date 8/26/93
Drilling Method HS Auger
Sampling Method 24" Split spoon
Surface Elevation 10.69'
Hole Diameter 8.5"
Recorded By JC Borrego
Registered Geologist

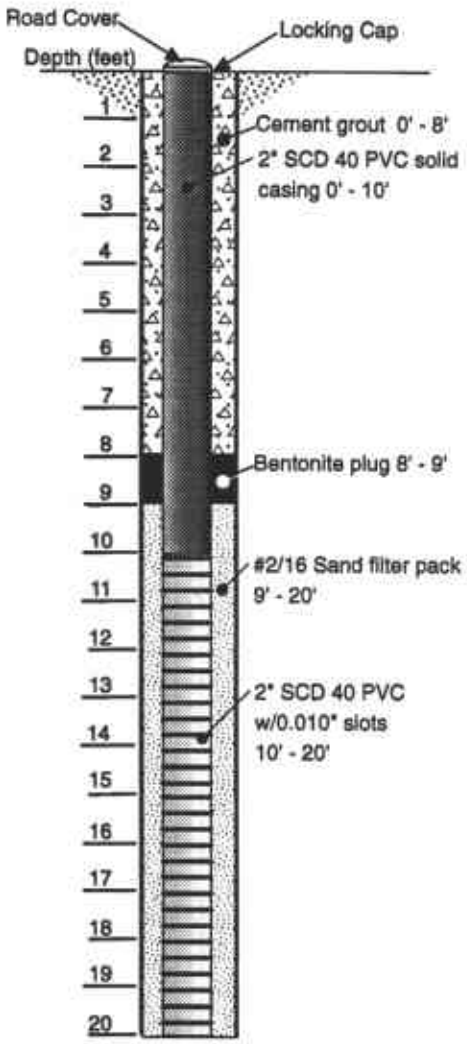


Port of Oakland - Keep On Trucking

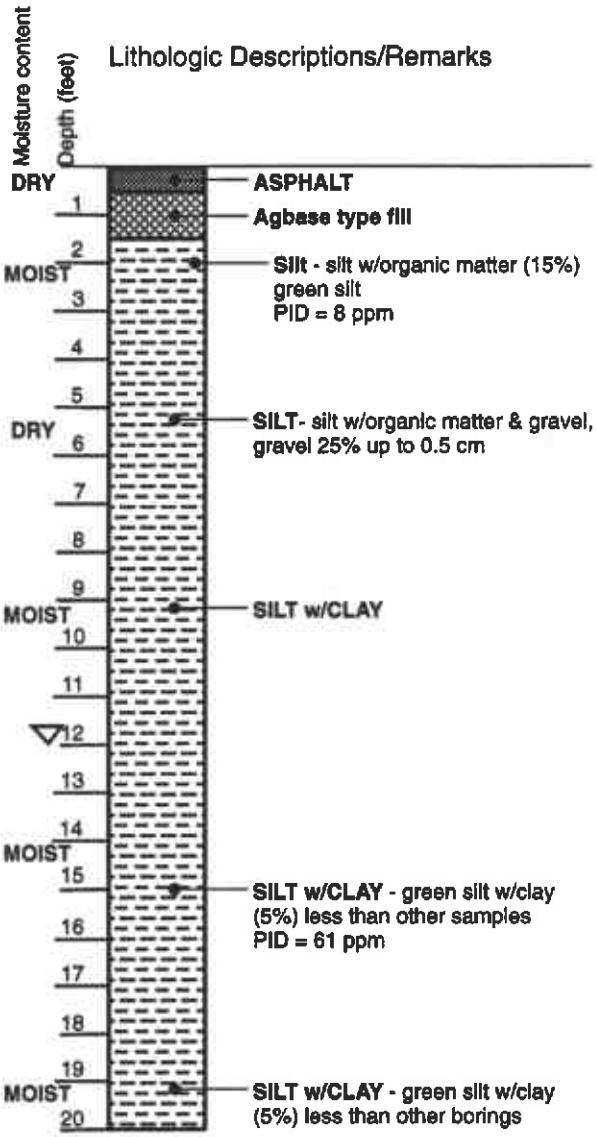
Bore Hole MW-3

Date 8/26/93
Drilling Method HS Auger
Sampling Method 24" 21/2"diam. Split spoon
Surface Elevation 10.54'
Hole Diameter 8.5"
Recorded By JC Borrego
Registered Geologist

Well As-Built



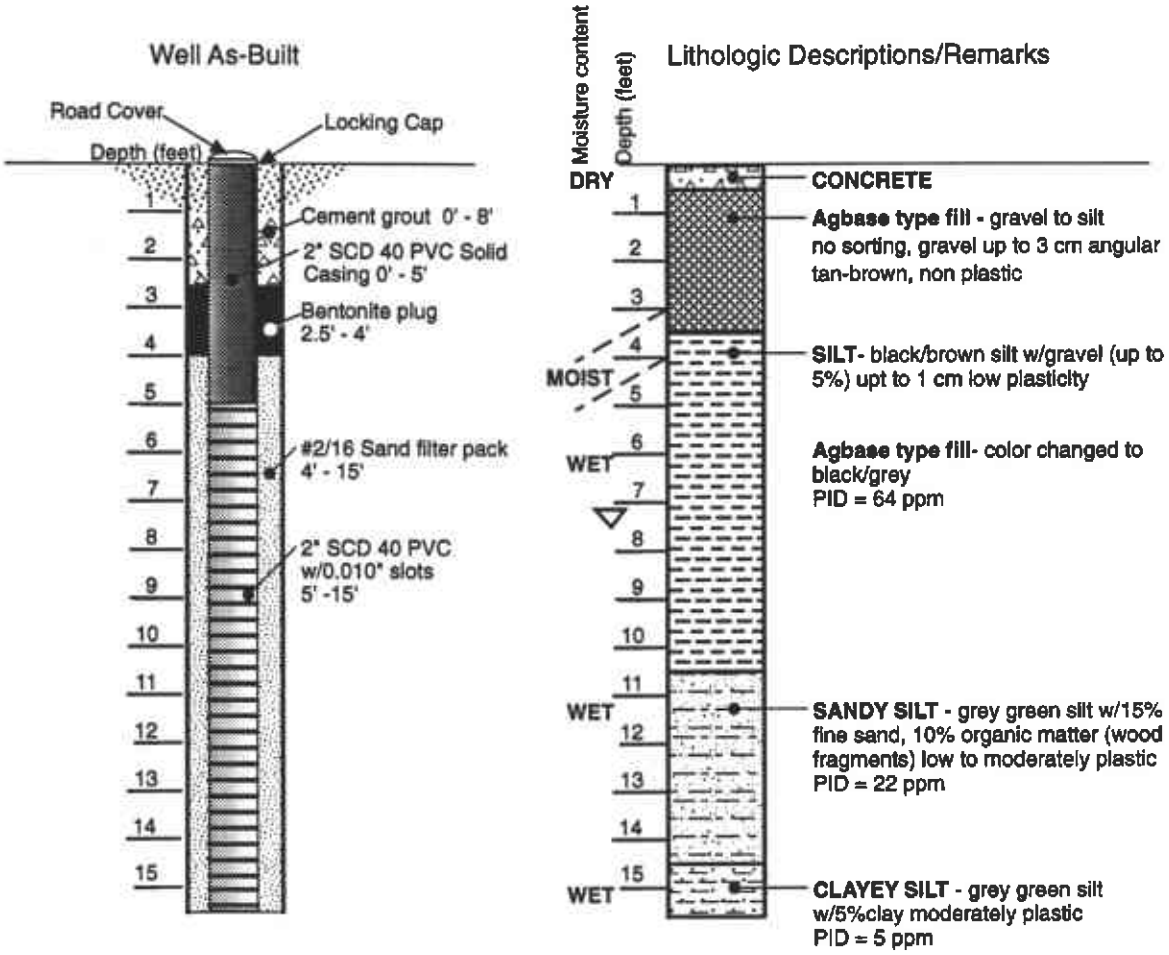
Lithologic Descriptions/Remarks



Port of Oakland - Keep On Trucking

Bore Hole MW-4

Date 8/26/93
Drilling Method HS Auger
Sampling Method 24" Split spoon
Surface Elevation 12.53'
Hole Diameter 8"
Recorded By IC Borrego
Registered Geologist



Site Location: KOT
Well Location:

Date: 9/21/93
Project Reference #: 96-207

Well #	Time of Sampling	Water Level	Free Product Thickness	Total Depth	Well Volume	Temperature	pH	Electric Conductivity
MW-3	11:10	16.6	NA			72.0	5.90	>20,000
						Sample	taken	
MW-1	11:55	6.2	NA			77.9	6.80 6.45	12,640 12,640
						Sample	taken	
MW-2	12:15	4.7	NA			>85	6.9	13,130
						Sample	taken	
MW-4	12:45	6.2	15'			67.3	6.8	7,180
						35'		

Water Level Measurement Method:
Solinst tape

Free Product Thickness Measurement Method:
bailer

Well Purging Procedures:
none

Well-Purge Water Characterization and Disposal Methods:

Comments:

Sampling Performed by:

U&A Form: H2Omonit.xls

Monitoring Well Sampling Form

Site Location: Keegan Trucking (Port)
Well Location:

Date: 9/20/93
Project Reference #: 96-203

Well #	Time of Sampling	Water Level	Free Product Thickness	Total Depth	Well Bailed Volume	Temperature	pH	Electric Conductivity
MW-3	10:25	15.2	NA	20	1gal	Bailed Dry		
		Heavy sulpher smell		water is clearing up (yellowish)				
		This well always has built up pressure when I remove cap						
MW-1	10:45	5.2	NA	15	5 gal	Bailed	dry	
				clear/grey water				
MW-2	11:00	4.4	NA	15	5 gal	Bailed	dry	
				water is very clear				
MW-4	11:25	5.8	8"	15	8 gal			
			(disposable bailer)	Clearing water, sulpher smell				

Water Level Measurement Method:
Solinst Tape

Free Product Thickness Measurement Method:
Bailer

Well Purging Procedures:
No Surging today

Well-Purge Water Characterization and Disposal Methods:

Comments: Will return tomorrow to collect samples

Sampling Performed by: TCB

U&A Form: H2Omonit.xls

Monitoring Well Sampling Form

Site Location: KAT
Well Location: MW-4, MW-3, MW-2, MW-1

Date: 9/17/93
Project Reference #: 96-203

Well #	Time of Sampling	Water Level	Free Product Thickness	Total Depth	Well Volume	Temperature	pH	Electric Conductivity
MW-3	9.15	15.9	NA	20'		Bailed dry approx 1 gal		
		17.2 after surging						
MW-1	9:50	7.6	NA	15'		Bailed dry approx 2 gal		
		5.5 after surging						
MW-2	10:10	10.2	NA	15'		Bailed dry approx 2 gal		
		10 2	NA					
MW-4	10:40	5.2	8"-1'	15'		diesel was gone		
					Bailed until approx 3 gal			

Water Level Measurement Method:

Free Product Thickness Measurement Method:

Well Purging Procedures:

Well-Purge Water Characterization and Disposal Methods:

Comments:

Sampling Performed by: TCB

U&A Form: H2OmoniLxls

Monitoring Well Sampling Form

Site Location: KOT
Well Location: MW-3, MW-1, MW-2

Date: 9/14/93
Project Reference #: 96-203

Well #	Time of Sampling	Water Level	Free Product Thickness	Total Depth	~~Well~~ Bailed Volume	Temperature	pH	Electric Conductivity
MW3	9:35	13.8'	NA	19.4	3 gal	(8:30 9/15) 62.4	7.77	>20,000
		took sample at		4:00	9/15			
MW-1 eastern	10:25	5.25	NA	15.2	5 gal	(11:35) 74.4	6.70	>20,000
	2:35				7 gal	72.8	7.38	>20,000
	9:30 9/15	10.2				64.7	7.45	17,100
				took sample at		9:35 9/15		
MW-2 Eastern	10:35	5.1	NA	15.2	~~7 gal~~ 5 gal	(12:00) 70.5	7.40	>20,000
	~~12:39~~ 3:20				6 gal	76.1	7.63	>20,000
	10:00 9/15	9.4				65.1	7.37	19,000

took sample at 10:10

Water Level Measurement Method: Solinst tape

Free Product Thickness Measurement Method: NA

Well Purging Procedures: Teflon Bailer

Well-Purge Water Characterization and Disposal Methods:

Comments:

Sampling Performed by: TCB

U&A Form: H2Omonit.xls

Monitoring Well Sampling Form

Site Location: KOT
Well Location: MW-4

Date: 9/14/43
Project Reference #: 96-203

Well #	Time of Sampling	Water Level	Free Product Thickness	Total Depth	~~Purge~~ Well Volume	Temperature	pH	Electric Conductivity
MW-4	10:55	5.3	1"-4"	15.2	5 gal	(12:45) 67.8	7.53	12,340
	1:00				10 gal	66.4	7.29	14,740
	1:10				13 gal	66.0	7.38	15,120
	2:00				15 gal	67.9	7.83	7,880
			Took sample at 2:10			9/14		

Water Level Measurement Method: Solinst tape

Free Product Thickness Measurement Method: visual

Well Purging Procedures: disposable bailer

Well-Purge Water Characterization and Disposal Methods:

Comments:

Sampling Performed by: TCB

U&A Form: H2Omonit.xls

1333		Uribe & Asso.		T. Baens
		H1145.42		10-1-93
	BS	HI	FS	
	+		−	EL
BM				9.764
E	1.64	10.80		
[illegible]			4.60	6.20
[illegible]	5.16	9.30		
			5.13	4.17
	4.86	9.03		
			4.75	4.28
"□"	5.82	10.10		
MW-2	Rim		5.62	Rim 4.48
MW-1			6.02	Rim 4.08
MW-3			5.76	4.34
"□"	6.94	11.22		
MW-2	Rim		6.74	Rim 4.43
MW 4	Rim		5.09	Rim 6.13
"□"	6.81	11.01		
"□"	4.94	9.22		

Keep on Trucken - 370 ft to Oak

City of Oak Datum

Was 951 USC&GS BM 4.3 above ground on North west corner column 5th Ave under crossing

"□" TC on dot NW return for 8th Ave.

	DATUM City Oak	DATUM Port Oak
MW-1	4.08	10.28
MW-2	4.48	10.69
MW-3	4.34	10.54
MW-4	6.13	12.33

City of Oak Datum

Port of Oak Datum

Appendix C

Standard Operating Procedures

HOLLOW-STEM AUGER DRILLING, LOGGING AND SOIL SAMPLING

Introduction:

For environmental investigations of sites underlain by most unconsolidated formations, anticipated total depths (TDs) of less than 100 feet, and especially when wells or piezometers will be installed, hollow-stem augers are the preferred method of drilling. Borings are drilled with augers of a sufficient diameter to allow sampling and if necessary, the completion a monitoring well. Typically, 8-inch diameter augers are used. These allow for a minimum two-inch annulus, as required by most regulatory agencies, when a 4-inch casing is used.

Procedure for Clearing Boring Locations:

Prior to drilling any borehole, a drilling objective and program for each boring, including possible variations, will be determined by the supervising professional (registered geologist or civil engineer) and project manager, and defined in the scope of work. This will include a review of the anticipated formations, depth to first water, sampling frequency and anticipated total depth (TD). All locations will be cleared for subsurface utilities, by Underground Service Alert (USA), a utilities locating contractor. At a minimum, the upper five feet of the subsurface will be hand augered, to verify the absence of any unidentified utilities. Hand augering may continue at the discretion of the field geologist. If any obstructions are encountered the project manager will be notified. A new location will be determined and cleared.

Drilling Program:

Borings will be drilled to meet drilling objectives described in the scope of work, i.e., characterization of the vadose zone and the first water-bearing zone. Because of the extreme heterogeneity of most unconsolidated formations, continuous sampling is performed to ensure complete hydrogeologic characterization. In some instances continuous sampling may not be desirable, or practical, and an alternative sampling frequency will be determined. Borings may be extended to deeper depths, if obvious contamination is encountered at the drilling objective TD. Furthermore, drilling program objectives may be modified in consideration of information obtained during drilling. All drilling and sampling equipment which enters the borehole, will be thoroughly steam

cleaned and/or decontaminated with Tri-sodium phosphate (TSP) and rinsed with distilled water prior to drilling.

Borehole Logging:

All boreholes will be logged by a registered geologist or civil engineer, or a geologist trained with logging procedures and working under the direct supervision of a registered geologist or civil engineer. All materials encountered in the borehole will be described according to the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) ASTM D 2488-90. All fluids encountered in the borehole will be described and liquid levels will be determined according to ASTM procedure 4750-87. To determine the depth and nature of fluid occurrence in the borehole, drilling may be stopped at the direction of the drilling program or the field geologist, and the borehole will be allowed to stand open while fluid-level measurements are taken. The fluid content of all materials encountered will be described. If necessary, a grab sample of fluids for chemical analysis may be collected with a bailer. The depth drilled, date and time of sample collection will be noted.

Geophysical Logging:

If necessary, boreholes will be logged with geophysical equipment as determined by the project manager and supervising professional. All geophysical logging equipment will be cleaned prior to entering the borehole(s).

SOIL SAMPLING:

During boring activities, soil samples for chemical analysis will be collected at 5-foot intervals, as required by regulations, and more frequently if warranted. Samples will be collected in decontaminated brass sleeves inserted into the sampler. Upon recovery, the sampler will be opened, and the sleeves separated and immediately covered with Teflon tape and plastic end-caps. Samples will be placed in a cooler, chilled to 4°C, and transported to the analytical laboratory under chain-of-custody. Each sample will be labelled with an identification number appropriate for the project written in indelible ink. The sample label will also include the date, company name, project number, preservative used, and sampler's initials. The number will be included on the chain-of-custody form along with any special information necessary to identify the sample.

Grab samples will also be collected in brass sleeves and capped with Teflon and plastic end caps. Grab sample frequency and distribution will vary according to the project. Generally, a minimum of one discreet grab sample will be collected from each 20 cubic yards of soil. Sample locations will be determined using a nine-point random grid system. Transportation and chain-of-custody procedures will be identical to boring samples.

All sampling equipment will be decontaminated after each use with simple green™ or Tri-Sodium Phosphate.

GROUNDWATER MONITORING WELL AND PIEZOMETER CONSTRUCTION

Introduction:

Groundwater monitoring well and piezometer design will be determined by the supervising professional and project manager. Wells or piezometers will be designed to satisfy the requirements of the drilling objective and provide the information needed for the investigation. Generally, it is desirable to complete wells in water-bearing formations (i.e., those which will produce some minimal amount of water such that a representative samples can be collected from the well in a reasonable amount of time). Typically water-bearing zones are of moderate- or higher-estimated permeability. However, because of the requirements of the investigation, it may be necessary to set well screens in low-estimated permeability formations, such as clays and silts.

Borehole Design:

Boreholes for wells or piezometers will be a minimum of 6 inches in diameter to allow for a minimum annulus of 2 inches.

Monitoring Well Construction Materials:

Monitoring wells will be generally constructed with flush thread, schedule 40 PVC casing: blank and slotted. Casing lengths are typically 5 or 10 feet. The bottom of the casing string will be fitted with a PVC endcap. Slotted intervals and sand packs will be set adjacent to the appropriate water-bearing formation or saturated formation, depending on the goal(s) of the investigation. In all instances, no well will be constructed so as to permit cross contamination between water-bearing units or between uncontaminated water and contaminated soils.

Slot openings will generally be 0.020 inch. Sand for sand packs will be matched to screen slot size and formation to the extent possible. Only new, factory washed sand will be used. Generally some settling of the sand pack will occur during development. As a countermeasure, depending on borehole conditions

and formation characteristics, sand packs will generally extend 1 foot above the top of the well screen, prior to well development.

A bentonite seal will be placed above the sand pack. Generally, one 5 gallon bucket of bentonite pellets is sufficient to create a 2 foot seal above the sand pack. The purpose of the seal is to prevent grout in the annulus from permeating the sand pack, and thus reduce or eliminate the flow of water into the well.

Annular space above the sand pack and bentonite seal will be sealed with a mixture of Portland cement and up to 5 % bentonite powder (grout).

Well Design:

For hydrocarbon investigations, generally the uppermost saturated formation is the target of the investigation. It may be necessary to complete wells in low-estimated permeability formations, where groundwater first occurs. If the zone of interest is unconfined (i.e., the water table can fluctuate freely) and/or free product may be encountered, the well screen will extend from the anticipated high water level, from unsaturated formation to saturated formation, to a maximum of twenty feet below the first occurrence of water (i.e., the water level at the time of well completion).

For shallow, confined water-bearing zones (i.e., groundwater is prevented from rising by an overlying aquitard) the borehole will be advanced through the water-bearing zone to a competent aquitard (at least 3 feet of low permeability materials) or a maximum of 20 feet below the top of the water-bearing zone (the bottom of the overlying confining aquitard). The screen will generally be set from the top of the water-bearing formation to the top of the bottom confining aquitard or a maximum of 20 feet below the top of the water-bearing formation, whichever is less. If the borehole is overdrilled, it will be backfilled back to a depth of 20 feet below the top of the water-bearing zone, before the well is completed. Under no circumstances, will the screen interval and/or sand pack extend across aquitard(s).

For deep, confined water-bearing zones the borehole will be advanced to the water-bearing zone of interest, and if necessary beyond to allow for complete geophysical logging. Once logging is completed, excess borehole will be backfilled. Generally, deeper zone wells will be drilled with rotary drilling techniques, and may involve setting surface casing through upper aquifers.

However, hollow-stem augers may be used to drill deeper wells, as the augers act as a casing during drilling. As with shallow completions, well screen interval will match the thickness of the confined water-bearing zone and not exceed twenty feet. Under no circumstances, will the screen interval and/or sand pack extend across aquitard(s).

Well Completion:

Well construction materials will be used uncontaminated from straight of the factory box or decontaminated by steam cleaning or cleaned with TSP and clean water. The casing string will be assembled one piece at a time and lowered through the hollow stem augers. The casing will be held under tension to the degree possible to ensure straightness. Once in position, the augers will be lifted up, a few feet at a time, and the sand for the sand pack will be added, slowly, to avoid bridging in the open borehole and/or locking the casing in the augers. The sand pack will be followed by the bentonite seal, and finally grout. Grout will be emplaced by lowering a tremmie pipe to a foot above the bentonite seal, and then pumping grout until it rises to the ground surface and displaces any borehole fluids and/or cuttings. The top of the casing will be trimmed, and a water tight, lockable cap will be fitted.

Generally, some settling of the grout will occur, and depending on the amount of settlement, more grout may be added. The remaining annular space will be filled with concrete and a well cover will be set. Flush mounted covers will be set slightly above ground level and the concrete finished so that surface fluids will move away from the well. If a stove pipe cover is used, traffic barriers will be installed to prevent damage to the cover and well. The well will be identified on its' casing and a survey mark will be inscribed on the top, northern side of the casing. All well-sites will be secured and cleaned to their previous condition or better.

Piezometer Design and Completion:

Piezometer design will be determined by the project manager and the supervising professional. Piezometers will be constructed with short screen well points or PVC casing, both 2-inch diameter, and will not exceed 5 feet in length. Piezometers will generally be temporary and will therefore not be set with grout. Instead, fine sand will be used instead of grout as annular fill. Piezometer screens will be set following the same guidelines for the various well completion

scenarios. Piezometers will be fitted with water-tight, locking caps, and generally will not have well head protection cemented in place, instead a protective stove pipe may be set in place, temporarily. Piezometers will be identified and marked with a reference point for surveying.

WELL DEVELOPMENT

Introduction:

Once monitoring wells or piezometers are installed, it is desirable, and generally required by regulations, to develop the well to improve or restore the hydraulic conductivity of the formation and the sand pack; both may have been impaired during drilling and well construction. The goal of development is to dislodge fines and draw them into the well casing, and once there remove them from the casing. Generally, well development activities will improve the flow rate of the well. Typically, wells will be developed for 4 hours and/or until the well no longer yields sediment and water is clear. This may not be possible for wells completed in fine-grained or extremely heterogeneous formations.

Development Methods:

Methods of choice are surging, bailing, jetting and pumping. Surging consists of moving a tightly fitting surge block or disc up and down in the well casing, which creates suction in the casing, below the surge block. Bailing consists of removing fluids with a bailer, which is simply a tube or pipe with a check valve fixed to the bottom of it. Both of these methods are accomplished by using the sand line winch on the drill or development rig. Jetting consists of lowering a special tool into the well which will direct compressed air against the well screen slots. Jet-air lifting is a method of pumping and also uses compressed air. It has the advantage of directing suction locally against the well screen. Pumping can be accomplished with a bladder pump or electric submersible.

For wells completed in fine grained or clayey formations, it may be necessary to add a fluid to assist in development; clean water is not recommended as it may hydrate clays and further reduce porosity and permeability. If necessary an engineered development fluid will be obtained.

Generally, the most rapid improvements from development are noted when development is performed as soon as possible, shortly after the sand pack and bentonite seal have been set.

Development Procedures:

All development equipment will be decontaminated prior to use. Development will usually begin by noting fluid-level measurements, and then proceeding slowly, so as to not impact the formation or damage the well screen. Next, a bailer may be used to remove fines which have probably settled in the casing, through the screen during well construction. Typically, a surge block, which is capable of creating significant suction may be used for low flow rate wells. If development is proceeding, or if the formation is of moderate- or high-estimated permeability, pumping may be sufficient to complete development. Development will proceed for 4 hours or until produced groundwater is clear and sand free. All fluids and materials added to and removed from the well will be noted. An initial estimate of the well flow rate will be made, based on well recovery rates or pumping rates. Temperature, conductivity and pH will be monitored during development.

All fluids and materials removed from the well will be stored on-site in drums, pending sampling and analysis. All fluids and materials used and generated by the well installation and development activities will be properly disposed of.

Appendix D

Drilling Permit

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588 VOICE (510) 484-2600
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 370 8Th Ave
Oakland

CLIENT
Name Port of Oakland
Address 530 Water St. Voice
City Oakland Zip 94604

APPLICANT
Name Andrew Clark-Clough
Uribe&Associates Fax 832-2237
Address 2930 Lakeshore Voice 832-2233
City Oakland Zip 94610

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection		General	
Water Supply		Contamination	
Monitoring	X	Well Destruction	

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other ___
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger X
Cable ___ Other ___

DRILLER'S LICENSE NO. 564979

WELL PROJECTS

Drill Hole Diameter	8	in.	Maximum		
Casing Diameter	2	in.	Depth	20	ft.
Surface Seal Depth	8	ft.	Number	4	

GEOTECHNICAL PROJECTS

Number of Borings			Maximum		
Hole Diameter		in.	Depth		ft.

ESTIMATED STARTING DATE 8/2[illegible]
ESTIMATED COMPLETION DATE 8/2[illegible]

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S [signature]

FOR OFFICE USE

PERMIT NUMBER 93461
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 18 Aug 93
Wyman Hong