RO4K

PORT OF OAKLAND

There is evidence that D.O. is being consumed & reductive conditions maybe returning. May need to reinject ORC.

July 12, 1999

Mr. Barney Chan
Alameda County Health Care Services Agency
Environmental Protection Division
1131 Harbor Bay Parkway, #250
Alameda, CA 94502-6577

SUBJECT: QUARTERLY GROUNDWATER MONITORING REPORT - FORMER TANK NUMBERS MF-25 AND MF-26, METROPOLITAN OAKLAND INTERNATIONAL AIRPORT, UNITED AIRLINES HANGAR AREA - ECONOMY PARKING LOT SITE, 1100 AIRPORT DRIVE, OAKLAND, CALIFORNIA

Dear Mr. Chan:

Enclosed is a copy of the July 9, 1999 "*Quarterly Groundwater Monitoring Report, April 1, through June 30, 1999, United Airlines Hangar - Economy Parking Lot Site, Metropolitan Oakland International Airport (MOIA)*", 1100 Airport Drive, Oakland, California. Monitoring activities were performed by Harding Lawson Associates, (HLA), one of the as-needed consultants retained by the Port of Oakland (Port).

Should you have any questions or need additional information, please contact me at 272-1118. Thank you for your on-going assistance and support on this project.

Sincerely,

Dale Klettke

Dale Klettke, CHMM
Associate Environmental Scientist
Environmental Health & Safety Compliance

enclosure

c: Neil Werner - EH & SC (w/o enc)
Files - EH & SC (w/o enc)
Michael Sides - HLA (w/o enc)
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530 Water Street ■ Jack London Square ■ P.O. Box 2064 ■ Oakland, California 94604-2064
Telephone (510) 272-1100 ■ Fax (510) 272-1172 ■ TDD (510) 763-5703 ■ Cable address, PORTOFOAK, Oakland

Harding Lawson Associates

July 9, 1999

43145.4

Mr. Dale H. Klettke, CHMM
Port of Oakland
Environmental Health & Safety Compliance
530 Water Street, 2nd Floor
Oakland, California 94607

Quarterly Groundwater Monitoring Report
April 1 through June 30, 1999
United Airlines Hangar Area – Economy Parking Lot Site
Metropolitan Oakland International Airport
Oakland, California

Dear Mr. Klettke:

Harding Lawson Associates (HLA) presents this groundwater monitoring report summarizing groundwater conditions observed during the second quarter of 1999 in eight monitoring wells at the United Airlines Hangar Area - Economy Parking Lot Site, Metropolitan Oakland International Airport (MOIA), Oakland, California (Plate 1). This report is the third of eight quarterly groundwater monitoring events that HLA will perform for the Port of Oakland in accordance with the *Work Plan for Installation of Oxygen Releasing Compound (ORC)*, dated December 18, 1999.

BACKGROUND

In March 1992, two underground storage tanks (USTs) MF-25 and MF-26 were removed. Approximately 700 cubic yards of impacted soil was removed and confirmation soil samples were collected following soil removal. The former UST excavation (approximately 80-feet by 80-feet) was reportedly backfilled with permeable material. The area is now paved and used for parking (Plate 2). Monitoring well MW-1 was installed in 1992 where total petroleum hydrocarbons as diesel (TPHd) and petroleum hydrocarbons as motor oil (TPHmo) were reported with elevated concentrations.- Two additional monitoring wells, MW-2 and MW-3, were installed in 1995. Free product was observed in MW-2 and MW-3 in 1996 and 1997. Monitoring wells MW-4 though MW-8 were installed in 1998 and sheen was observed on groundwater from MW-2 and MW-4.

A batch treatment of ORC was installed on December 23, 1998 after checking that no free product was present in the monitoring wells. A total of 780 pounds of time-release ORC was installed along the upgradient edge of the former UST excavation at 11 locations. A direct-push rig injected at total of 780 pounds of time-release ORC mixed into 60 gallons of water down 2-inch diameter rods to a depth of 4 to 8 feet below ground surface.

GROUNDWATER SAMPLING AND ANALYSIS

HLA measured dissolved oxygen (DO) concentrations in the eight monitoring wells on a monthly basis between April 1 and June 30, 1999. On May 20, HLA measured groundwater elevations and collected groundwater samples for chemical analyses. Prior to purging or sampling the monitoring wells, HLA measured DO concentrations, reduction oxidation potential (Redox), water levels, and checked for free product with an interface probe. HLA monitored the pH, conductivity, and temperature of the groundwater during purging. The monitoring wells were sampled after purging at least three well volumes of groundwater and after parameters had stabilized to within 10 percent; the groundwater sampling forms with the field data are included in Appendix A. Water samples were collected using a disposable Teflon bailer and all sampling equipment was decontaminated with a non-phosphate cleaning solution and rinsed with distilled water. HLA contained purged water in a 55-gallon drum for subsequent disposal by the Port of Oakland.

The water samples were placed in ice-chilled coolers and submitted to Sequoia Analytical of Walnut Creek, California under chain-of-custody protocol. The samples were analyzed for the following analytes:

- Total petroleum hydrocarbons as gasoline (TPHg) by EPA Test Method 8015 (modified)
- Benzene, toluene, ethylbenzene (BTEX) and methyl t-butyl ether (MTBE) by EPA Test Method 8020
- TPHd, TPHj(A), TPHmo by EPA Method 8015 with a silica gel cleanup procedure
- Purgeable halocarbons by EPA Method 8010
- Ferrous Iron, Ferric Iron, Nitrate, sulfate, orthophosphate
- Total organic carbon (TOC) by EPA Method 415.2
- Halogenated/Aromatic Volatile Organics by EPA Method 8010/8020

MONITORING RESULTS

No free produce was observed in any of the eight monitoring wells and recent data indicate that ORC is reducing dissolved hydrocarbon concentrations. Groundwater elevations are presented in Table 1 and shown on Plate 3 with an apparent gradient towards the southwest. Chemical concentration results are shown in Tables 2, 3, and 4. DO concentrations are summarized in Table 5. The laboratory report and chain-of-custody forms are presented in Appendix B.

The ORC treatment appears to be stimulating the biological degradation of dissolved petroleum hydrocarbons in the vicinity of the former USTs, with the most significant improvement seen for TPHj which is the hydrocarbon range most commonly quantified by the laboratory for this site. TPHj continued to decrease this quarter at MW-4 (located within the former UST excavation), with a 95 percent reduction

since the ORC application (from 41,000 to the current 1,900 micrograms per liter (µg/L)). TPHg and TPHmo have also decreased at MW-4, although not as dramatically.

Successful ORC treatment is also supported by a comparison of monitoring parameters from before and after the ORC application. Elevated DO concentrations continue to be observed at MW-1, indicating that oxygen is still being released by ORC. In comparison, microbial activity appears to be stimulated at MW-4 where oxygen is being utilized as quickly as it is being released. Active biodegradation is also indicated by apparent sulfate utilization at MW-4 where sulfate concentrations are much lower than in the wells that don't have hydrocarbons for microbes to consume (MW-5, MW-6, MW-7, and MW-8).

Less microbial stimulation is apparent adjacent to the former excavation at MW-2. Although TPHj has decreased from 31,000 µg/L to 15,000 µg/L since the ORC application, a review of MW-2 historic data indicates relatively minor changes in dissolved hydrocarbon concentrations. Based on these results, another ORC application may be warranted in the proximity of MW-2.

Chlorinated volatile organic compounds (VOCs) have been observed in all wells except downgradient wells MW-5 and MW-6. The highest chlorinated VOC concentrations have been observed at upgradient well MW-8 and adjacent to the former UST excavation at MW-2. Several VOCs have been detected at concentrations above the Maximum Contaminant Levels (MCLs).

CLOSURE

If you have any questions or need additional information, please contact the undersigned at (510) 451-1001.

Sincerely,

HARDING LAWSON ASSOCIATES

FOR Heather Lee
Staff Engineer

Michael A. Sides
Civil Engineer

Attachments:
Table 1 - Groundwater Elevations
Table 2 - Groundwater Analytical Results – Petroleum Hydrocarbons
Table 3 - Groundwater Analytical Results – VOCs
Table 4 - Groundwater Analytical Results – Inorganics
Table 5 - Dissolved Oxygen Concentrations
Plate 1 - Vicinity Map
Plate 2 - Site Map
Plate 3 – Groundwater Elevation Map
Appendix A- Groundwater Sampling Forms
Appendix B - Laboratory Reports

Table 1. Groundwater Elevations
United Airlines Hanger - Economy Parking Lot
Metropolitan Oakland International Airport

Well Name	Top of Casing Elevation (feet)	Date	Depth to Water (feet)	Groundwater Elevation (feet)	Product Thickness (feet)	Note
MW-1	6.91	15-May-92	3.10	3.81	--	1
		7-Aug-92	3.20	3.71	--	1
		24-Nov-92	4.04	2.87	--	1
		12-Feb-93	--	--	--	1
		11-Mar-93	2.09	4.82	--	1
		17-May-93	3.14	3.77	--	1
		3-Aug-93	3.15	3.76	--	1
		25-Nov-93	3.59	3.32	--	1
		24-Mar-94	3.21	3.70	--	1
		9-May-94	2.99	3.92	--	1
		29-Aug-94	3.34	3.57	--	1
		27-Sep-94	3.51	3.40	--	1
		25-Apr-95	2.38	4.53	--	1
		11-Aug-95	3.08	3.83	--	1
		3-Nov-95	3.52	3.39	--	1
		19-Jun-96	2.93	3.98	--	1
		24-Oct-96	3.52	3.39	--	1
		22-Jan-97	2.61	4.30	--	1
		25-Apr-97	2.77	4.14	--	1
		6-Aug-97	3.27	3.64	--	1
		23-Dec-97	3.14	3.77	--	1
		26-Mar-98	2.09	4.82	--	1
		13-May-98	--	--	--	2
		16-Dec-98	2.95	3.96	--	
		26-Feb-99	5.83	1.08	--	
		20-May-99	2.62	4.29	--	
MW-2	6.63	25-Apr-95	2.20	4.43	--	1
		11-Aug-95	3.11	3.52	--	1
		3-Nov-95	3.28	3.35	--	1
		19-Jun-96	2.53	4.14	0.05	1,3
		24-Oct-96	3.44	3.31	0.16	1,3
		22-Jan-97	2.45	4.20	0.02	1,3
		25-Apr-97	2.60	4.05	0.03	1,3
		30-Jul-97	--	--	0.14	1,4
		6-Aug-97	2.96	3.67	--	1
		23-Dec-97	2.85	3.97	0.25	1,3
		26-Mar-98	1.72	4.92	0.005	1,3
	6.58	13-May-98	1.80	4.78	--	2,5
		16-Dec-98	2.60	3.98	--	
		26-Feb-99	2.06	4.52	--	
		20-May-99	2.40	4.18	--	

Table 1. Groundwater Elevations
United Airlines Hanger - Economy Parking Lot
Metropolitan Oakland International Airport

Well Name	Top of Casing Elevation (feet)	Date	Depth to Water (feet)	Groundwater Elevation (feet)	Product Thickness (feet)	Note
MW-3	7.36	25-Apr-95	2.20	5.16	--	1
		11-Aug-95	3.11	4.25	--	1
		3-Nov-95	3.28	4.08	--	1
		19-Jun-96	2.53	4.14	0.05	1,3
		24-Oct-96	3.44	3.31	0.16	1,3
		22-Jan-97	2.45	4.20	0.02	1,3
		25-Apr-97	3.13	4.24	0.01	1,3
		30-Jul-97	NM	NM	0.03	1,4
		6-Aug-97	3.76	3.60	--	1
		23-Dec-97	3.48	3.88	--	1
		26-Mar-98	2.36	5.00	0.005	1,3
		13-May-98	--	--	--	2
		16-Dec-98	3.40	3.96	--	
		26-Feb-99	2.49	4.87	--	
		20-May-99	2.96	4.40	--	
MW-4	6.92	13-May-98	2.01	4.91	--	2
		16-Dec-98	2.84	4.08	--	
		26-Feb-99	1.94	4.98	--	
		20-May-99	2.47	4.45	--	
MW-5	5.79	13-May-98	1.05	4.74	--	2
		16-Dec-98	1.95	3.84	--	
		26-Feb-99	1.50	4.29	--	
		20-May-99	2.05	3.74	--	
MW-6	6.39	13-May-98	1.91	4.48	--	2
		16-Dec-98	2.64	3.75	--	
		26-Feb-99	1.89	4.50	--	
		20-May-99	2.65	3.74	--	
MW-7	5.86	13-May-98	1.51	4.35	--	2
		16-Dec-98	2.13	3.73	--	
		26-Feb-99	1.58	4.28	--	
		20-May-99	2.23	3.63	--	
MW-8	7.56	13-May-98	2.46	5.10	--	2
		16-Dec-98	3.51	4.05	--	
		26-Feb-99	2.59	4.97	--	
		20-May-99	3.06	4.50	--	

Notes
1 - Data from Table 1-Results of Groundwater Sampling and Analysis, Port of Oakland, Oakland International Airport, United Airlines Hanger Area-Economy Parking Lot Site, by ITSI
2 - Data from Table 1of Results of Additional Site Investigation, Port of Oakland, Oakland International Airport, United Airlines Hanger Area-Economy Parking Lot Site, dated October 21, 1998 by ITSI
3 - GroundWater elevation calculated assuming a specific gravity of 0.75 for product.
4 - Free product removed from well during redevelopment (July 30, 1997).
5 - Well MW-2 was reconstructed in May 1998.

Table 2. Groundwater Analytical Results - Petroleum Hydrocarbos
United Airlines Hanger Economy Parking
Metropolitan Oakland International Airport

Monitoring Well ID	Date	Benzene (µg/L)	Toluene (µg/L)	Ethyl - benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TPHg (µg/L)	TPH Diesel (C1-C-22) (µg/L)	TPH Jet Fuel A (C9-C16) (µg/L)	TPH Motor Oil (>C16) (µg/L)	Unidentifled Extractable Hydrocarbons (µg/L)	Note
MW-1	5/15/92	<0.4	<0.3	<0.3	<0.4	--	<50	--	--	--	--	1
	8/7/92	<0.4	<0.3	<0.3	<0.4	--	<50	--	800	--	--	1
	11/24/92	<0.4	<0.3	<0.3	<0.4	--	<50	--	<50	--	--	1
	2/12/93	<0.4	<0.3	<0.3	<0.4	--	<50	--	--	--	--	1
	5/17/93	<0.4	<0.3	<0.3	<0.4	--	<50	--	--	--	--	1
	8/3/93	<0.5	<0.5	<0.5	<0.5	--	<50	5200	--	--	--	1
	11/25/93	<0.5	<0.5	<0.5	0.6	--	70	--	--	--	--	1
	5/9/94	<0.5	<0.5	<0.5	<0.5	--	<50	--	--	--	--	1
	8/29/94	<0.5	<0.5	2.7	<0.5	--	<50	--	--	--	--	1
	4/25/95	<5	<5	<5	<5	--	<50	1,400	<50	610	--	1
	8/11/95	<0.4	<0.3	<0.3	<0.4	--	<50	1,900	<50	1,200	--	1
	11/3/95	0.4	0.4	<0.3	<0.4	--	<50	4,200	<50	1,800	--	1
	6/19/96	0.99	<0.5	1.1	<1.0	--	<50	11,000	<500	820	--	1
	10/24/96	1.9	<0.5	<0.5	1.3	--	57	<250	<500	<250	--	1
	1/22/97	<0.5	<0.5	<0.5	<1.0	--	<50	220	<500	<250	--	1
	4/25/97	1.2	<0.5	1.0	1.2	--	110	<50	<500	<250	--	1
	8/6/97	2.1	<0.5	<0.5	<1.0	--	100	340	<500	<250	--	1
	12/23/97	0.7	<0.5	<0.5	<1.0	--	<50	<50	<50	<300	--	1
	3/26/98	<0.5	<0.5	<0.5	<1.0	--	<50	<48	<48	<290	--	2
	12/16/98	1.8	<0.5	<0.5	<0.5	<2.5	120	640	<50	<250	340	--
	2/26/99	0.96	<0.5	<0.5	<0.5	2.6	69	670	<50	350	<50	4
	5/20/99	1.7	<0.5	<0.5	<0.5	<2.5	85	380	<50	<250	<50	--
MW-2	04/25/95	340	570	110	580	--	5,200	<10,000	13,000	19,000	--	1
	08/11/95	320	680	110	510	--	5,500	<8,000	7,900	20,000	--	1
	11/03/95	200	400	27	360	--	3,800	<11,000	11,000	4,200	--	1
	06/19/96	--[3]	--[3]	--[3]	--[3]	--	--[3]	--[3]	--[3]	--[3]	--	1
	10/24/96	--[3]	--[3]	--[3]	--[3]	--	--[3]	--[3]	--[3]	--[3]	--	1
	01/22/97	--[3]	--[3]	--[3]	--[3]	--	--[3]	--[3]	--[3]	--[3]	--	1
	04/25/97	--[3]	--[3]	--[3]	--[3]	--	--[3]	--[3]	--[3]	--[3]	--	1
	08/06/97	170	270	92	410	--	9,900	12,000	<1,000	2,300	--	1
	12/23/97	--[3]	--[3]	--[3]	--[3]	--	--[3]	--[3]	--[3]	--[3]	--	1
	03/26/98	--[3]	--[3]	--[3]	--[3]	--	--[3]	--[3]	--[3]	--[3]	--	1
	05/13/98	150	270	94	440	--	4,000	2,600	3,400	<290	--	2,3,4
	12/16/98	130	180	71	330	<50	4,600	<1,000	31,000	8,200	<1,000	--
	02/26/99	86	210	64	350	<100	4,700	<1,000	18,000	7,800	<1,000	--
	05/20/99	120	280	76	360	<2.5	4,700	<50	15,000	5,800	<50	--
MW-3	04/25/95	150	600	100	580	--	7,200	<40000	38,000	31,000	--	1
	08/11/95	--	--	--	--	--	--	--	--	--	--	1,5
	11/03/95	--	--	--	--	--	--	--	--	--	--	1,5
	06/19/96	--	--	--	--	--	--	--	--	--	--	1,5
	10/24/96	--	--	--	--	--	--	--	--	--	--	1,5
	01/22/97	--	--	--	--	--	--	--	--	--	--	1,5
	04/25/97	--	--	--	--	--	--	--	--	--	--	1,5
	08/06/97	4	16	14	90	--	4,200	1,400	<500	<250	--	1,5

Table 2. Groundwater Analytical Results - Petroleum Hydrocarbos
United Airlines Hanger Economy Parking
Metropolitan Oakland International Airport

Monitoring Well ID	Date	Benzene (µg/L)	Toluene (µg/L)	Ethyl - benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TPHg (µg/L)	TPH Diesel (C1-C-22) (µg/L)	TPH Jet Fuel A (C9-C16) (µg/L)	TPH Motor Oil (>C16) (µg/L)	Unidentified Extractable Hydrocarbons (µg/L)	Note
	12/23/97	13	16	9	116	--	2,200	79,000	110,000	8,200	--	1,5
	03/26/98	--	--	--	--	--	--	--	--	--	--	2,5
	12/16/98	<10	12	<10	43	<50	2,300	--	--	--	--	--
MW-3	2/26/99	16	16	10	40	<100	5,700	--	--	--	--	--
	5/20/99	20	25	7.8	37	<2.5	2,700	--	--	--	--	--
MW-4	05/13/98	9.8	23	13	79	--	1,400	2,000	2,300	<310	--	2,3,4
	12/16/98	<10	<10	<10	58	<50	1,900	<1,000	40,000	8,800	<1,000	--
(Dup)	12/16/98	<10	<10	<10	51	<50	1,700	<1,000	41,000	9,400	<1,000	--
	2/26/99	13	<10	<10	22	<50	1,200	<500	5,500	<2,500	<500	--
(Dup)	02/26/99	16	<2.5	6.2	20	<10	1,200	<500	5,200	<2,500	<500	--
	05/20/99	16	0.83	3.0	10	5.5	670	<50	1,900	560	<50	
(Dup)	05/20/99	15	0.78	3.0	11	5.4	1,100	<50	1,200	290	<50	
MW-5	05/13/98	<0.5	<0.5	<0.5	<1.0	--	<50	<50	<50	<300	--	2
	12/16/98	<0.5	<0.5	<0.5	<0.5	<2.5	<50	<50	<50	<250	260	--
	02/26/99	<0.5	<0.5	<0.5	<0.5	<2.5	<50	69	<50	<250	<50	--
	05/20/99	<0.5	<0.5	<0.5	<0.5	<2.5	<50	<50	<50	<250	<50	
MW-6	05/13/98	<0.5	<0.5	<0.5	<1.0	--	<50	<48	<48	<290	--	2
	12/16/98	<0.5	<0.5	<0.5	<0.5	<2.5	<50	<50	<50	<250	<50	--
	02/26/99	<0.5	<0.5	<0.5	<0.5	<2.5	<50	83	<50	<250	<50	--
	05/20/99	<0.5	<0.5	<0.5	<0.5	<2.5	<50	<50	<50	<250	<50	
MW-7	05/13/98	<0.5	0.6	<0.5	<1.0	--	<50	<51	<51	<310	--	2
	12/16/98	<0.5	<0.5	<0.5	<0.5	<2.5	<50	<50	<50	<250	<50	--
	02/26/99	<0.5	<0.5	<0.5	<0.5	<2.5	<50	<50	<50	<250	<50	--
	05/20/99	<0.5	<0.5	<0.5	<0.5	<2.5	<50	<50	<50	<250	<50	
MW-8	05/13/98	2	<0.5	<0.5	<1.0	--	<50	<47	<47	<280	--	2
	12/16/98	4.1	<0.5	<0.5	<0.5	2.9	53	<50	200	<250	<50	6
	2/26/99	3.5	<0.5	<0.5	<0.5	2.7	<50	<50	<50	<250	<50	6
	5/20/99	2.8	<0.5	<0.5	<0.5	<2.5	<50	150	<50	<250	<50	--
MCLs		1	150	700	1,750	--	--	--	--	--	--	--

why weren't these run?

Note:

1. Data from Table 2-Summary of Laboratory Results Tanks MF25 and MF26 (United Airlines Hanger Area - Economy Parking Lot Site) Metropolitan Oakland International Airport (MOIA), 1100 Airport Drive, Oakland California by ITSI.
2. Data from Table 3 of Results of Additional Site Investigation, Port of Oakland, Oakland Internatinonal Airport, United Airlines Hanger Area-Economy Parking Lot Site, dated October 21, 1998 by ITSI dated October 21, 1998 by ITSI
3. Hydrocarbons for TPHd do not match profile for laboratory standards
4. Hydrocarbons for TPHd are lighter than indicated standard
5. Not analyzed due to the presence of free product
6. MTBE detected by GC methods at slightly over reporting limit has not been confirmed by MS.

MCLs - Maximum Contaminant Levels

- Shaded areas indicate detected concentration exceeds MCL.

Table 3. Groundwater Analytical Results - VOCs
United Airlines Hanger Economy Parking
Metropolitan Oakland International Airport

Monitoring Well ID	Date	Acetone (µg/L)	2-Butanone (µg/L)	Chloroform (µg/L)	1,1-DCA (µg/L)	(cis/trans) 1,2-DCE (µg/L)	4-Methyl-2-Pentanone (µg/L)	1,1,1-TCA (µg/L)	TCE (µg/L)	PCE (µg/L)	Chloroethane (µg/L)	1,2-DCA (µg/L)	1,1-DCE (µg/L)	Vinyl Chloride (µg/L)	Notes
MW-1	11/24/92	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	1
	2/12/93	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	1
	5/17/93	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	1
	8/3/93	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	1
	11/25/93	ND	ND	ND	ND	6.0	ND	ND	ND	ND	--	--	--	--	1
	5/9/94	ND	ND	ND	ND	ND	ND	ND	ND	5.5	--	--	--	--	1
	9/27/94	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	1
	1/25/95	<20	<20	<5	<5	<5	<20	--	--	<5	--	--	--	--	1
	8/11/95	--	--	<0.5	4.3	13	--	2.0	1.8	0.6	--	--	--	--	1
	11/3/95	--	--	<0.5	1.3	3.7	--	0.6	0.5	<0.5	--	--	--	--	1
	6/19/96	--	--	<0.5	5.4	<0.5	--	<0.5	1.2	<0.5	--	--	--	--	1
	10/24/96	--	--	<0.5	12	<1.0	--	<0.5	1.4	<0.5	--	--	--	--	1
	1/22/97	--	--	<0.5	3.9	8.4	--	<0.5	1.7	<0.5	--	--	--	--	1
	4/25/97	--	--	<0.5	6.2	10	--	<0.5	1.2	0.62	--	--	--	--	1
	8/6/97	--	--	<0.5	14	19	--	<0.5	2.5	0.54	--	--	--	--	1
	12/23/97	--	--	<1.0	6.6	9.3	--	<1.0	<1.0	<1.0	--	--	--	--	1
	3/26/98	--	--	<1.0	5.3	8.1	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	3
	12/16/98	--	--	<0.5	20	18	--	<0.5	<0.5	<0.5	<1.0	<0.5	1.5	<1.0	
	2/26/99	--	--	<0.5	15	9.6	--	2.9	<0.5	<0.5	<1.0	<0.5	0.79	<1.0	
	5/20/99	--	--	<0.5	22	17	--	<0.5	<0.5	<0.5	<1.0	<0.5	1.5	1.2	
MW-2	4/25/95	<200	200	<50	50	<50	<200	--	--	<50	--	--	--	--	1
	8/11/95	--	--	5.0	79	26	--	20	4.0	9.0	--	--	--	--	1
	11/3/95	--	--	<0.5	73	24	--	4.8	6.7	6.8	--	--	--	--	1
	6/19/96	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
	10/24/96	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
	1/22/97	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
	4/25/97	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
	8/6/97	--	--	<5	69	160	--	<5	<12	<5	--	--	--	--	1
	12/23/97	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
	3/26/98	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
	5/13/98	--	--	--	51	140	--	--	ND	<1.0	3.4	<1.0	<1.0	<2.0	3
	12/16/98	--	--	<5.0	58	220	--	<2.5	<2.5	<2.5	<1.0	<2.5	<2.5	<5.0	
	2/26/99	--	--	<1.3	19	57	--	2.9	<1.3	<1.3	<2.5	<1.3	<1.3	<2.5	
	5/20/99	--	--	<0.5	63	191.5	--	5.8	1.1	1.5	4.4	<0.5	0.82	<1.0	
MW-3	4/25/95	300	300	--	30	<30	200	--	--	<30	--	--	--	--	1
	8/11/95	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
	11/3/95	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
MW-3	6/19/96	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2

Table 3. Groundwater Analytical Results - VOCs
United Airlines Hanger Economy Parking
Metropolitan Oakland International Airport

Monitoring Well ID	Date	Acetone (µg/L)	2-Butanone (µg/L)	Chloroform (µg/L)	1,1-DCA (µg/L)	(cis/trans) 1,2-DCE (µg/L)	4-Methyl-2-Pentanone (µg/L)	1,1,1-TCA (µg/L)	TCE (µg/L)	PCE (µg/L)	Chloroethane (µg/L)	1,2-DCA (µg/L)	1,1-DCE (µg/L)	Vinyl Chloride (µg/L)	Notes
	10/24/96	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
	1/22/97	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
	4/25/97	--	--	--	--	--	--	--	--	--	--	--	--	--	1,2
	8/6/97	--	--	2.1	3.8	<0.5	--	<0.5	<1.2	0.62	--	--	--	--	1
	12/23/97	--	--	<1.0	4.2	<1.0	--	<1.0	<1.0	<1.0	--	--	--	--	1
	3/26/98	--	--	--	--	--	--	--	--	--	--	--	--	--	3,2
	12/16/98	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--
	2/26/99	--	--	<0.5	4.4	<0.5	--	1.6	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	--
	5/20/99	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--
MW-4	5/13/98	--	--	--	31	9.9	--	--	--	2.8	2.8	<1.0	<1.0	<2.0	3
	12/16/98	--	--	<0.5	53	17	--	<5.0	<0.5	0.94	6.8	<0.5	1.6	<1.0	--
(dup)	12/16/98	--	--	<0.5	52	14	--	<5.0	<0.5	0.88	4.4	<0.5	1.2	<1.0	--
	2/26/99	--	--	<0.5	39	28	--	1.4	<0.5	0.97	6.5	<0.5	<0.5	<1.0	--
(dup)	2/26/99	--	--	<0.5	43	36	--	1.7	<0.5	1.3	8.3	<0.5	2.8	<1.0	--
	5/20/99	--	--	<0.5	45	42.1	--	<0.5	0.54	1.7	8.9	<0.5	2.8	<1.0	--
(dup)	5/20/99	--	--	<0.5	46	39.4	--	3.9	0.59	1.9	8.6	<0.5	2.5	<1.0	--
MW-5	5/13/98	--	--	--	<1.0	<1.0	--	--	--	<1.0	<2.0	<1.0	<1.0	<2.0	3
	12/16/98	--	--	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	--
	2/26/99	--	--	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	--
	5/20/99	--	--	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	--
MW-6	5/13/98	--	--	--	<1.0	<1.0	--	--	--	<1.0	<2.0	<1.0	<1.0	<2.0	3
	12/16/98	--	--	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	--
	2/26/99	--	--	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	--
	5/20/99	--	--	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	--
MW-7	5/13/98	--	--	--	8	<1.0	--	--	--	<1.0	<2.0	<1.0	3.4	<2.0	3
	12/16/98	--	--	<0.5	12	<0.5	--	<0.5	<0.5	<0.5	<1.0	<0.5	5.0	<1.0	--
	2/26/99	--	--	<0.5	15	<0.5	--	<0.5	<0.5	<0.5	<1.0	<0.5	6.8	<1.0	--
	5/20/99	--	--	<0.5	19	0.74	--	<0.5	<0.5	<0.5	<1.0	<0.5	7.3	<1.0	--
MW-8	5/13/98	--	--	--	180	1.9	--	--	--	<1.0	<2.0	2.7	180	6.0	3
	12/16/98	--	--	<0.5	440	1.2	--	<0.5	<0.5	<0.5	<1.0	10	520	6.6	--
	2/26/99	--	--	<2.5	390	<2.5	--	<2.5	<2.5	<2.5	<5.0	6.9	490	10	--
	5/20/99	--	--	<0.5	410	1.2	--	<0.5	<0.5	<0.5	<1.0	8.3	480	3.9	--
MCLs (California/Fed)		--	--	--	5/-	6/70	--	--	5/5	5/5	--	0.5/5	6/7	0.5/2	

Notes:

Table 3. Groundwater Analytical Results - VOCs
United Airlines Hanger Economy Parking
Metropolitan Oakland International Airport

Notes:

1 - Data from Table 3-Summary of Laboratory Results for Volatile Organic Compounds Tanks MF25 and MF26 (United Airlines Hanger Area - Economy Parking Lot Site) Metropolitan Oakland International Airport (MOIA), 1100 Airport Drive, Oakland California by ITSI.

2 - Not sampled due to the presence of free product in monitoring well.

3 - Data from Table 4 of Results of Additional Site Investigation, Port of Oakland, Oakland International Airport, United Airlines Hanger Area - Economy Parking Lot Site, dated October 21, 1998 by ITSI

MCLs - Maximum Contaminant Levels

 - Shaded areas indicate detected concentration exceeds MCL.

Table 4. Groundwater Analytical Results - Inorganics
United Airlines Hanger Economy Parking
Metropolitan Oakland International Airport

non potable water

Monitoring Well ID	Date	Ferrous Iron Fe^{+2} (mg/L)	Ferric Iron Fe^{+3} (mg/L)	Total Iron (mg/L)	Nitrate NO_3 (mg/L)	Sulfate (mg/L)	Ortho-phosphate PO_4 (mg/L)	TDS (mg/L)	TOC (mg/L)	Redox (millivolts)	Notes
MW-1	5/15/92	--	--	--	--	--	--	5,900	<5	--	1
	8/7/92	--	--	--	--	--	--	--	<5	--	1
	11/24/92	--	--	--	--	--	--	--	<5	--	1
	2/12/93	--	--	--	--	--	--	--	<5	--	1
	5/17/93	--	--	--	--	--	--	4,100	<5	--	1
	8/3/93	--	--	--	--	--	--	7,700	<5	--	1
	11/25/93	--	--	--	--	--	--	3,790	<5	--	1
	5/9/94	--	--	--	--	--	--	9,600	<0.93	--	1
	8/29/94	--	--	--	--	--	--	3,900	<1.0	--	1
	4/25/95	--	--	--	--	--	--	4,000	--	--	1
	8/11/95	--	--	--	--	--	--	8,500	--	--	1
	11/3/95	--	--	--	--	--	--	6,600	--	--	1
	6/19/96	--	--	--	--	--	--	3,040	--	--	1
	10/24/96	--	--	--	--	--	--	3,090	--	--	1
	1/22/97	--	--	--	--	--	--	4,240	--	--	1
	4/25/97	--	--	--	--	--	--	2,770	--	--	1
	8/6/97	--	--	--	--	--	--	2,430	--	--	1
	12/23/97	<0.2	3.9	--	<0.2	120	--	3,570	--	--	1
	3/26/98	0.41	2.1	--	<0.2	110	--	3,240	--	--	3
	12/16/98	--	--	3.3	<0.1	70	<0.5	--	32	40	--
	2/26/99	0.21	--	0.57	<0.1	110	1.1	--	30	147	--
	5/20/99	0.26	1.2	--	<0.1	97	1.5	--	22	96	--
MW-2	4/25/95	--	--	--	--	--	--	1,700	--	--	1
	8/11/95	--	--	--	--	--	--	2,500	--	--	1
	11/3/95	--	--	--	--	--	--	2,000	--	--	1
	6/19/96	--	--	--	--	--	--	--	--	--	1
	10/24/96	--	--	--	--	--	--	--	--	--	1
	1/22/97	--	--	--	--	--	--	--	--	--	1
	4/25/97	--	--	--	--	--	--	--	--	--	1
	8/6/97	--	--	--	--	--	--	--	--	--	1
	4/25/97	--	--	--	--	--	--	--	--	--	1

Table 4. Groundwater Analytical Results - Inorganics
United Airlines Hanger Economy Parking
Metropolitan Oakland International Airport

Monitoring Well ID	Date	Ferrous Iron Fe^{+2} (mg/L)	Ferric Iron Fe^{+3} (mg/L)	Total Iron (mg/L)	Nitrate NO_3 (mg/L)	Sulfate (mg/L)	Ortho-phosphate PO_4 (mg/L)	TDS (mg/L)	TOC (mg/L)	Redox (millivolts)	Notes
MW-2	12/23/97	--	--	--	--	--	--	--	--	--	1,2
	5/13/98	0.53	8.0	--	<0.05	12	0.72	3,240	--	123	3
	12/16/98	--	--	28	<0.1	21	<0.5	--	210	146	--
	2/26/99	17	--	36	<0.1	27	0.59	--	100	-235	--
	5/20/99	8.9	36	--	<0.1	2	<1.0	--	130	-124	--
MW-3	4/25/95	--	--	--	--	--	--	5,600	--	--	1
	8/11/95	--	--	--	--	--	--	--	--	--	1
	11/3/95	--	--	--	--	--	--	--	--	--	1
	6/19/96	--	--	--	--	--	--	--	--	--	1
	10/24/96	--	--	--	--	--	--	--	--	--	1
	1/22/97	--	--	--	--	--	--	--	--	--	1
	4/25/97	--	--	--	--	--	--	--	--	--	1
	8/6/97	--	--	--	--	--	--	15,100	--	--	1
	4/25/97	--	--	--	--	--	--	13,900	--	--	1
	12/23/97	--	--	--	--	--	--	--	--	--	1
	3/26/98	--	--	--	--	--	--	--	--	--	3,2
	12/16/98	--	--	--	--	--	--	--	240	157	--
	2/26/99	--	--	--	--	--	--	--	100	-142	--
	5/20/99	--	--	--	--	--	--	--	84	-125	--
MW-4	5/13/98	0.53	2.9	--	<0.05	20	2.1	1,420	66	168	3
	12/16/98	--	--	13	<0.1	2.8	4.1	--	140	118	-
	12/16/98	--	--	11	<0.1	2.6	4.6	--	110	118	--
	2/26/99	<0.01	--	2.7	1.6	56	2.8	--	60	81	--
	2/26/99	<0.01	--	2.9	1.3	54	2.9	--	95	81	--
	5/20/99	<0.01	3.7	--	<0.1	44	3.3	--	36	89	--
	5/20/99	<0.01	2.9	--	0.22	56	2.2	--	39	89	--
MW-5	5/13/98	<0.2	0.7	--	0.36	250	0.47	2,300	20	150	3
	12/16/98	--	--	10	<0.1	340	0.57	--	32	46	--
	2/26/99	0.64	--	23	<0.1	260	1.2	--	22	230	--
	5/20/99	0.75	11	--	0.11	260	<1.0	--	15	209	--
MW-6	5/13/98	<0.2	0.69	--	2.1	400	0.15	4,240	13	126	3

Table 4. Groundwater Analytical Results - Inorganics
United Airlines Hanger Economy Parking
Metropolitan Oakland International Airport

Monitoring Well ID	Date	Ferrous Iron Fe^{+2} (mg/L)	Ferric Iron Fe^{+3} (mg/L)	Total Iron (mg/L)	Nitrate NO_3 (mg/L)	Sulfate (mg/L)	Ortho-phosphate PO_4 (mg/L)	TDS (mg/L)	TOC (mg/L)	Redox (millivolts)	Notes
MW-6	12/16/98	--	--	26	0.45	400	0.65	--	22	47	--
	2/26/99	0.44	--	16	4.3	380	0.89	--	42	262	--
	5/20/99	1.2	8.7	--	7.5	300	<1.0	--	22	227	--
MW-7	5/13/98	<0.2	0.62	--	0.9	100	<0.03	1,380	7	132	3
	12/16/98	--	--	19	6.9	100	0.53	--	7.7	159	--
	2/26/99	0.15	--	14	8.3	82	0.78	--	20	272	--
	5/20/99	0.89	13	--	4.3	160	<1.0	--	6.8	243	--
MW-8	5/13/98	<0.2	2.2	--	<0.5	500	0.08	8,300	99	60.4	3
	12/16/98	--	--	37	<0.1	360	<0.5	--	2.4	83	--
	2/26/99	0.076	--	26	<0.1	290	0.69	--	63	280	--
	5/20/99	2.0	26	--	17	440	<1.0	--	21	196	--

Notes

1 - Data from Table 4-Summary of Laboratory Results for Inorganic Anaalytes Tanks MF25 and MF26 (United Airlines Hanger Area - Economy Parking Lot Site) Metropolitan Oakland International Airport (MOIA), 1100 Airport Drive, Oakland California by ITSI.

2 - Not sampled due to presence of free product in monitoring well.

3 - Data from Table 5 of Results of Additional Site Investigation, Port of Oakland, Oakland International Airport, United Airlines Hanger Area Economy Parking Lot Site, dated October 21, 1998

Table 5 - Dissolved Oxygen Concentrations
United Airlines Hanger Economy Parking
Metropolitan Oakland International Airport

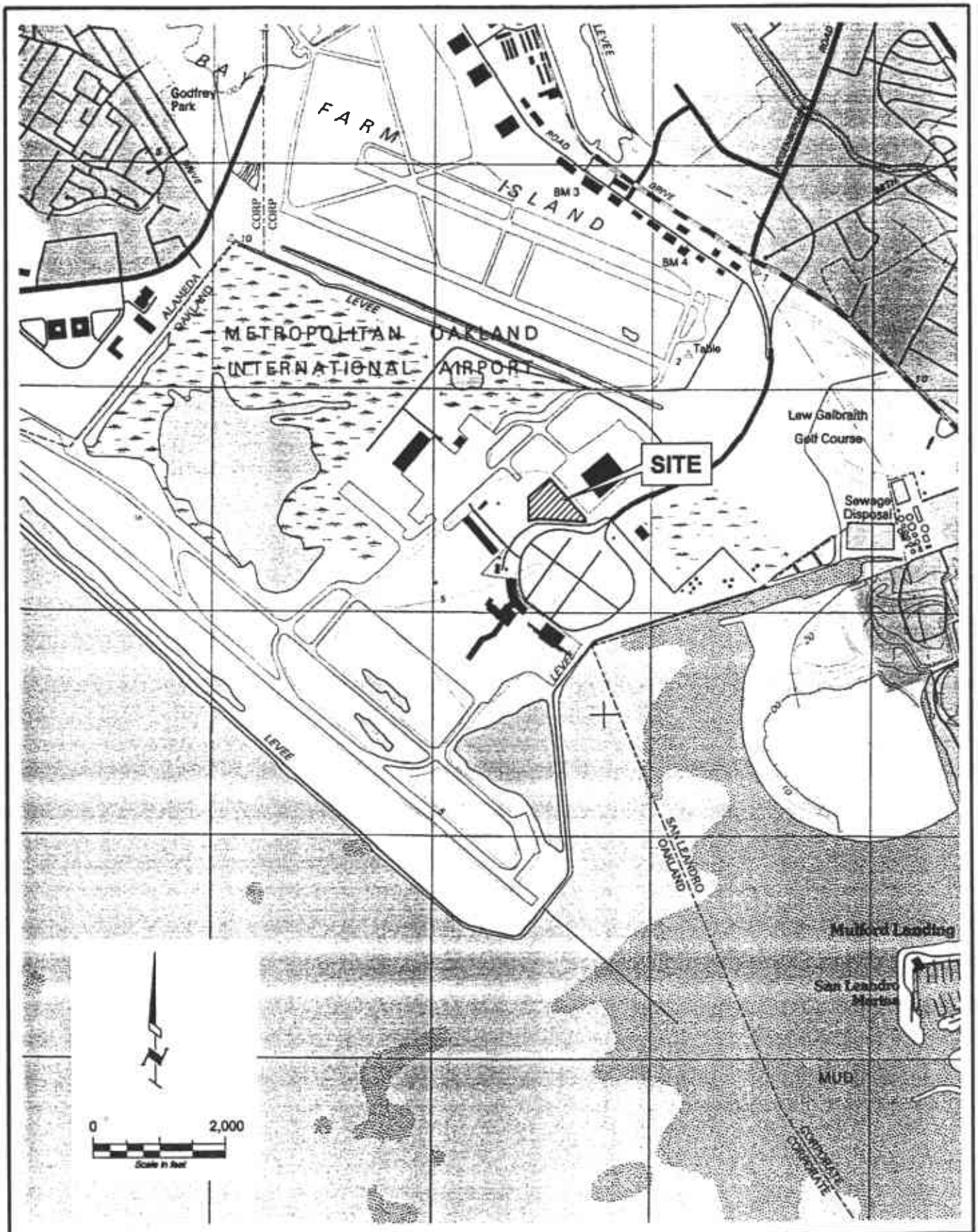
	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6		MW-7		MW-8
16-Dec-98	2.0		1.2		0.5		1.2		2.0		1.1		2.4		0.8
23-Dec-98		ORC injected in former UST cavity.													
6-Jan-99	>15	1	1.1	2	0.9		>15	1,2	1.3		2.8		3.0		0.6
12-Jan-99	>15	1	0.8		1.0		8.0		0.7		2.4		3.2		0.7
22-Jan-99	>15	1	0.6		0.8		1.4		1.1		3.1		4.7		1.4
30-Jan-99	>15	1	0.6		1.6		1.0		1.6		4.8		2.6		2.8
26-Feb-99	>15		0.5		0.5		1.4		1.1		4.4		4.0		5.2
30-Mar-99	>15		0.5	2	0.8		1.0		1.2		1.1		4.2		1.6
20-May-99	>15		1.0	2	1.4	2	1.5		1.7		1.9		3.2		1.2
23-Jun-99	>15		0.5	2	0.4	2	0.6		0.6		1.0		0.8		0.6

All concentrations are presented in milligrams per liter (mg/L)

Notes:

1 Milky water; ORC is visibly present in well.

2 Diesel odor



econpark0699.dwg

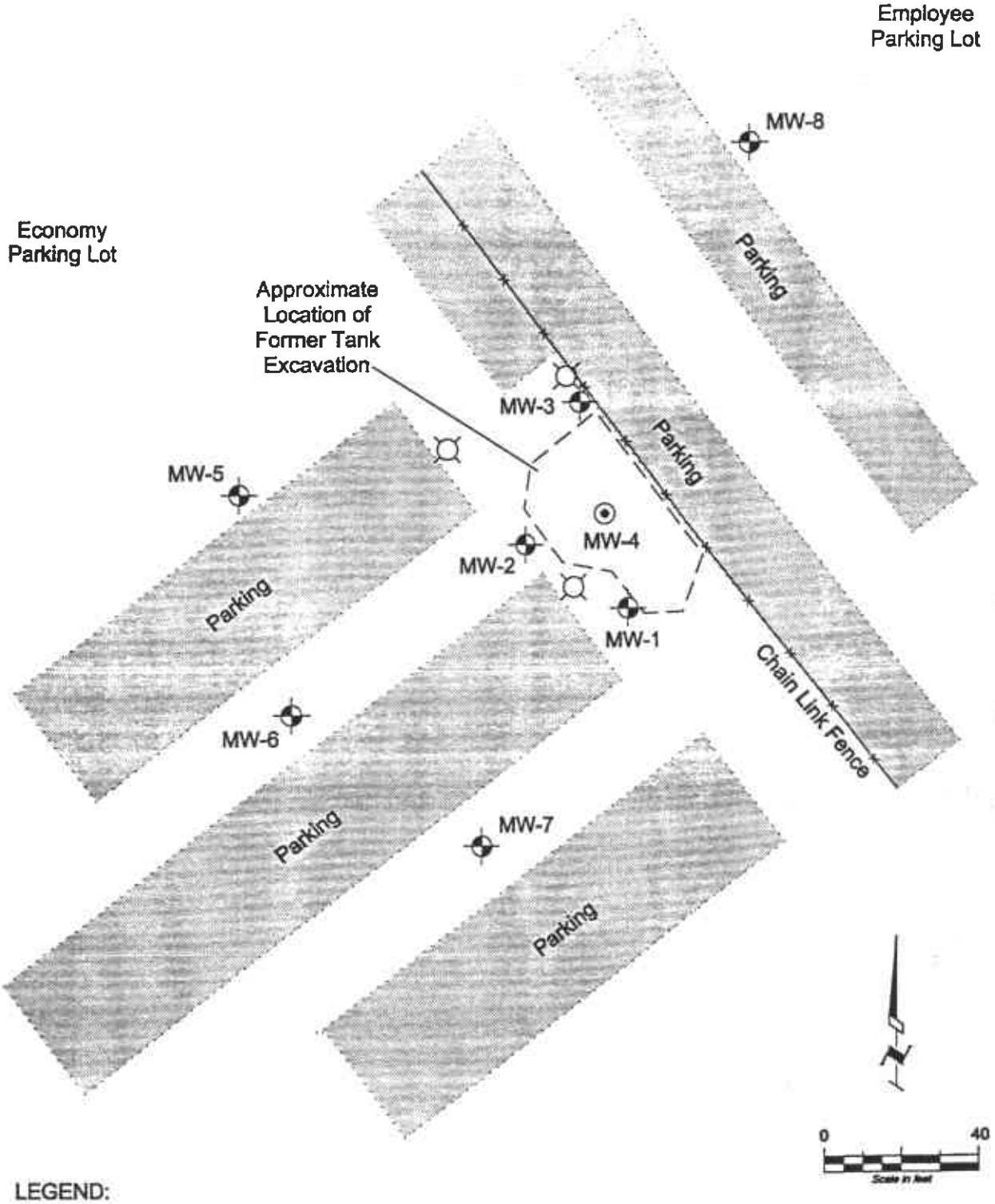
Harding Lawson Associates
Engineering and
Environmental Services

Site Location Map

Economy Parking Lot - United Airlines Hanger Site
Oakland International Airport
1100 Airport Drive, Oakland, California

PLATE
1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AJW	43145.2	MS	6/22/99	---



LEGEND:

- Monitoring Well (2-in. diameter)
- Remediation Well (1-in. diameter)
- Light Pole

Reference:
Map based on a figure prepared by
Innovative Technologies Solutions, Inc.

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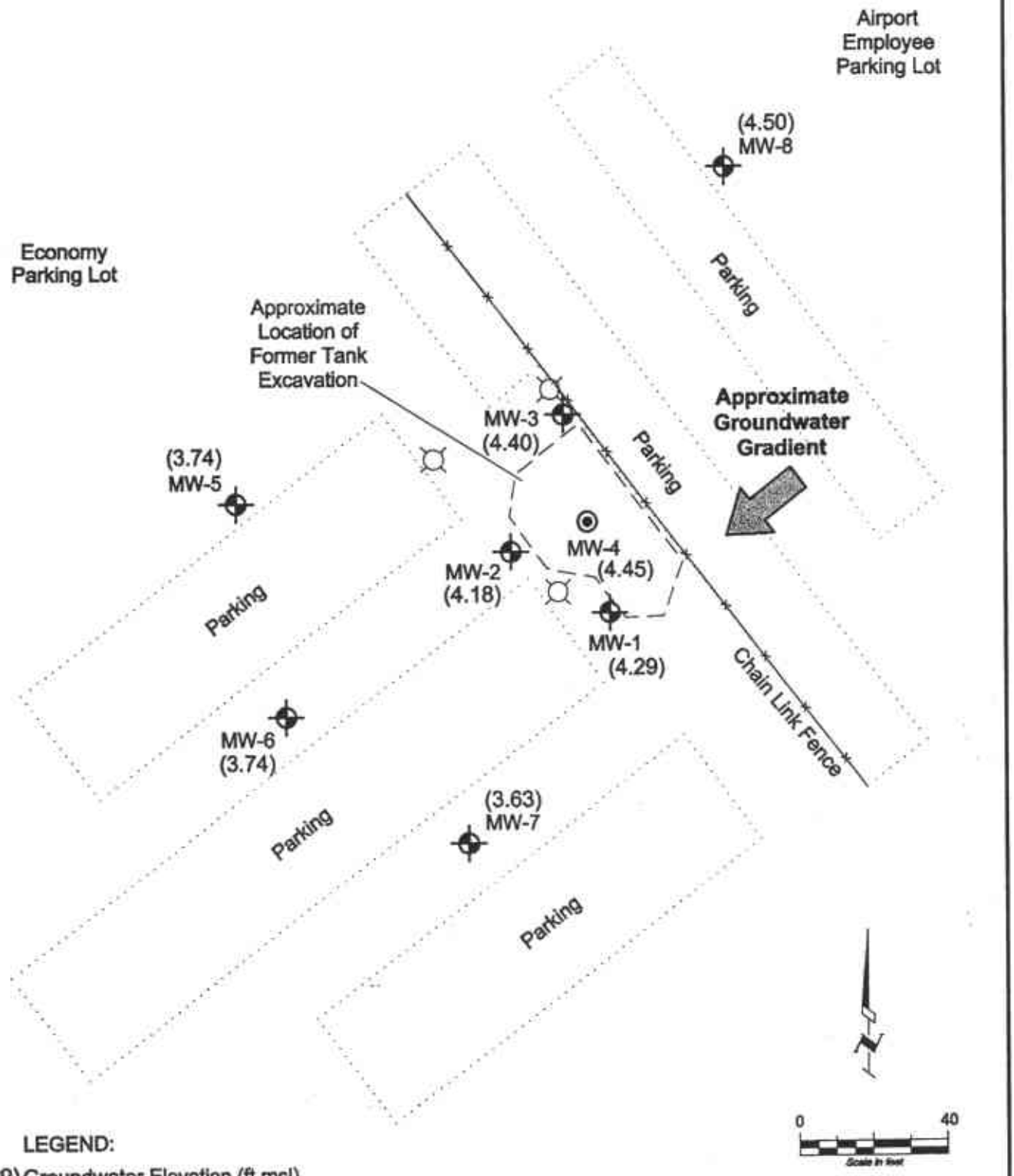
Site Plan
Economy Parking Lot - United Airlines Hanger Site
Oakland International Airport
1100 Airport Drive, Oakland, California

PLATE
2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AJW	43145.2	MS	4/29/99	...



LEGEND:

(4.29) Groundwater Elevation (ft msl)

Monitoring Well (2-in. diameter)

Remediation Well (1-in. diameter)

Light Pole

Reference:
Map based on a figure prepared by
Innovative Technologies Solutions, Inc.

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Environmental Services

Groundwater Elevation Map
Economy Parking Lot - United Airlines Hanger Site
Oakland International Airport
1100 Airport Drive, Oakland, California

PLATE
3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AJW	43145.2	MS	6/22/99	---

APPENDIX A

GROUNDWATER SAMPLING REPORTS

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name Port of Oakland-ORC Inj
Job Number 43145.4
Recorded by Heather D Lee (Signature)

Well No. MW-1
Well Type: ☒ Monitor ☐ Extraction ☐ Other ____
Well Material: ☒ PVC ☐ St. Steel ☐ Other ____
Date 5/20/99 Time 1125
Sampled by HDL (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other ____
Total Depth of Casing (TD in feet BTOC): 13.09
Water Level Depth (WL in feet BTOC): 2.62
Number of Well Volumes to be purged (# Vols)
☒ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other ____

PURGE METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.: ____
☐ Other - Type: ____

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other ____
Depth in feet (BTOC): ____ Screen Interval in Feet (BTOC) from ____ to ____

PURGE VOLUME CALCULATION

$(13.09 \text{ (TD)} - 2.62 \text{ (WL)}) \times 2^2 \text{ (D)} \times 3 \text{ (\# Vols)} \times 0.0408 = 5.1$ gallons (Calculated Purge Volume)

PURGE TIME

1100 Start 1120 Stop 20 Elapsed

PURGE RATE

Initial ____ gpm Final ____ gpm

ACTUAL PURGE VOLUME

6 gallons

FIELD PARAMETER MEASUREMENT

~~Minutes~~ Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other ____
Initial	10.01	11030	62.8	
2	8.27	8300	64.3	
4	7.80	5520	64.6	
6	8.19	6030	64.3	

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other ____
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): no odor, cloudy white.
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other 55 gal drum

WELL SAMPLING

SAMPLING METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.: ____
☐ Same As Above
☐ Grab - Type: ____
☐ Other - Type: ____

SAMPLING DISTRIBUTION

Sample Series: 9920

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
EP07	2 VOA	8020/MTBE/BTEX	HCl	Sequoia	
	2 VOA	TPHg 8015	HCl		
	1 VOA Amber	TOC (415.1)	HCl		
	1 LA	TPHd, mo, j(A)	none		
	500mL P	Ferrous Iron	none		24 hr Holdtime
	500 mL P	NO_3, SO_4, PO_4	none		
	500 mL P	Ferric Iron	HNO_3		

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name Port of Oakland - ORC Inj
Job Number 43145.4
Recorded by Heather D Lee (Signature)

Well No. MW-2
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date 5/20/99 Time 1040
Sampled by HDL (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 10.89
Water Level Depth (WL in feet BTOC): 2.40
Number of Well Volumes to be purged (# Vols)
☒ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC) from to

PURGE VOLUME CALCULATION:

(10.89 TD (feet) - 2.40 WL (feet)) X 2 D (inches) ^{2} X 3 # Vols X 0.0408 = 4.2 Calculated Purge Volume gallons

PURGE TIME

1220 Start 1611 Stop 1714 Elapsed

PURGE RATE

Initial gpm Final gpm

ACTUAL PURGE VOLUME

4.5 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☒ °F	Other
Initial	6.95	8750	63.1	
1.5	6.98	3580	65.2	
3.0	6.81	3480	65.8	
4.5	6.79	3160	66.8	

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): sheen, strong fuel odor, dark grey color
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other 55 gal Drum

WELL SAMPLING

SAMPLING METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series: 9920

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
EP06	2 VOA	8020/MTBE/BTEX	HCl	Sequoia	
	2 VOA	TPHg 8015	HCl		
	1 VOA Amber	TOC	HCl		
	1 LA	TPHd, mo, j(A)	none		
	500 mL P	Ferrous Iron	none		24 hr Holding
	500 mL P	NO_3, SO4, Alk	none		
	500 mL P	Ferric Iron	HNO_3		

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name: Port of Oakland-ORC Inj
Job Number: 43145.4
Recorded by: Heather D Lee (Signature)

Well No.: MW-3
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 5/20/99 Time: 0735
Sampled by: HDL (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 11.06
Water Level Depth (WL in feet BTOC): 2.96
Number of Well Volumes to be purged (# Vols)
☒ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC) from to

PURGE VOLUME CALCULATION

(11.06 (TD feet) - 2.96 (WL feet)) X 2 (D inches)^2 X 3 (# Vols) X 0.0408 = 3.96 gallons (Calculated Purge Volume)

PURGE TIME

0712 Start 0720 Stop 8 Elapsed

PURGE RATE

Initial ____ gpm Final ____ gpm

ACTUAL PURGE VOLUME

Dry at 2.5 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☒ °F	Other
Initial	8.54	2610	60.7	
1.0	8.60	5330	62.0	
2.5	8.59	6990	61.7	
4.0				

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): sheen, fuel odor, light grey/green color
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other 55 gal drum

WELL SAMPLING

SAMPLING METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series: 9920

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
EP01	2 VOA	8020/BTEX/MTBE	HCl	Sequoia	
1	2 VOA	TPHg (8015)	1		
EP10	1 VOA Amber	TOC	1		
	1 LA	TPHd, major CA	none		
EP10	500 mL P	Ferrous Iron	1		24 hour
	500 mL P	NO_3, SO_4, PO_4	1		
	500 mL P	Ferric Iron	HNO_3		

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and Environmental Services

GROUND-WATER SAMPLING FORM

Job Name Port of Oakland-ORC Inj
Job Number 43145.4
Recorded by Heather O'Lee (Signature)

Well No. MW-4
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date 5/20/99 Time 1200
Sampled by HOL (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☒ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 9.97
Water Level Depth (WL in feet BTOC): 2.47
Number of Well Volumes to be purged (# Vols)
☒ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☒ Bailer - Type: ~~teflon~~ HDL PVC
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC) from to

PURGE VOLUME CALCULATION

(9.97 TD (feet) - 2.47 WL (feet)) x 4 D (inches)^2 x 3 # Vols x 0.0408 = 14.7 gallons
Calculated Purge Volume

PURGE TIME

1145 Start 1157 Stop 12 Elapsed

PURGE RATE

Initial ____ gpm Final ____ gpm

ACTUAL PURGE VOLUME

15 gallons

FIELD PARAMETER MEASUREMENT

~~Minutes~~ Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☒ °F	Other
Initial	9.24	2970	63.7	
5	9.56	3540	65.7	
10	9.35	3500	66.5	
15	9.32	3290	66.4	

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): milky white, frothy, no odor, sheen
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other 55 gal drum

WELL SAMPLING

SAMPLING METHOD

☒ Bailer - Type: tefla
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:

☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series: 9920

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
EP08	2 VOA	8020/MTBE/BTEX	HCl	Sequoia	
	2 VOA	TPHg 8015	↓		
	1 VOA Amber	TOC			
	1 LA	TPHd, no si(A)	none		
	500mL P	Ferrous Iron	↓		24 Hour
	500mL P	NO_3, SO_4, PO_4			
	500mL P	Ferric Iron	HNO_3		

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.
9920EP08 (1200)	9920EP09 (1230)

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name: Port of Oakland - OEC Ing.
Job Number: 43145.4
Recorded by: Heather Lee (Signature)

Well No.: MW-5
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 5/20/99 Time: 1005
Sampled by: HDL (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 7.92
Water Level Depth (WL in feet BTOC): 2.05
Number of Well Volumes to be purged (# Vols)
☒ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC) from ___ to ___

PURGE VOLUME CALCULATION:

$(7.92 - 2.05) \times 2^2 \times 3 \times 0.0408 = 2.8$ gallons

TD (feet) - WL (feet), D (inches), # Vols, Calculated Purge Volume

PURGE TIME

0952 Start 1000 Stop 8 Elapsed

PURGE RATE

Initial ___ gpm Final ___ gpm

ACTUAL PURGE VOLUME

3 gallons

FIELD PARAMETER MEASUREMENT

~~Minutes~~ (vol) Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☒ °F	Other
Initial	7.09	12450	68.6	
1	7.67	5150	65.6	
2	7.46	6760	66.2	
3	7.48	8580	65.5	

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): grey, no odor
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other 55 gal drum

WELL SAMPLING

SAMPLING METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series: 9920

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
EP05	2 VOA	8020/MTBE/BTEX	HCl	Sequoia	
↓	2 VOA	TPHg 8015	↓	↓	
↓	1 VOA Amber	TOC	↓	↓	
↓	1 LA	TPHd, mo, (CA)	none	↓	
↓	500 mL P	Ferrous Iron	↓	↓	
↓	500 mL P	NO_3, SO_4, PO_4	↓	↓	
↓	500 mL P	Ferric Iron	HNO_3	↓	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name Port of Oakland - ORC Inj
Job Number 43145.4
Recorded by Heath D Lee (Signature)

Well No. MW-6
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date 5/20/99 Time 0855
Sampled by HDL (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 8.13
Water Level Depth (WL in feet BTOC): 2.65
Number of Well Volumes to be purged (# Vols)
☒ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC) from to

PURGE VOLUME CALCULATION:

(8.13 (TD feet) - 2.65 (WL feet)) X 2 (D inches) ^{2} X 3 (# Vols) X 0.0408 = 2.68 gallons (Calculated Purge Volume)

PURGE TIME

0946 Start 0949 Stop 3 Elapsed

PURGE RATE

Initial gpm Final gpm

ACTUAL PURGE VOLUME

4 gallons

FIELD PARAMETER MEASUREMENT

~~Minutes~~ Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☒ °F	Other
Initial	7.49	10490	62.6	
1	7.71	6170	65.2	
2	7.60	7960	105.5	
3	7.51	9950	66.0	

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): no odor, yellowish brown, sheen
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other 55 gal. Drum

WELL SAMPLING

SAMPLING METHOD

☒ Bailer - Type: tefla
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series: 9920

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
EP03	2 VOA	8020/MTBE/BEX	HCl	Sequoia	
	2 VOA	TPHg 8015			
	1 VOA Amb	TOC			
	1 LA	TPHd,mo;(CA)	none		
	500 mLP	Ferrous Iron		~~24 hr HF~~ ADL	24 hour
	500 mLP	NO_3, SO_4, PO_4			
	500 mLP	Ferric Iron	HNO_3		

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and Environmental Services

GROUND-WATER SAMPLING FORM

Job Name: Port of Oakland - ORC Inj
Job Number: 43145.4
Recorded by: Heather D. Lee (Signature)

Well No.: MW-7
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 5/20/99 Time: 0930
Sampled by: HDL (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 8.43
Water Level Depth (WL in feet BTOC): 2.23
Number of Well Volumes to be purged (# Vols)
☒ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): _____ Screen Interval in Feet (BTOC) from _____ to _____

PURGE VOLUME CALCULATION

$$\left(\frac{8.43}{\text{TD (feet)}} - \frac{2.23}{\text{WL (feet)}}\right) \times \frac{2}{\text{D (inches)}}^{2} \times \frac{3}{\text{\# Vols}} \times 0.0408 = \frac{3.04}{\text{Calculated Purge Volume}} \text{ gallons}$$

PURGE TIME

0913 Start 0925 Stop 12 Elapsed

PURGE RATE

Initial _____ gpm Final _____ gpm

ACTUAL PURGE VOLUME

3.1 gallons

FIELD PARAMETER MEASUREMENT

~~Minutes~~ Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Initial	7.58	6640	62.7	
1	7.66	5240	65.5	
2	7.75	4540	66.7	
3.1	7.79	5070	66.7	

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): light brown, no odor
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other 55 gal Drum

WELL SAMPLING

SAMPLING METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series: 9920

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
EPD4	2 VOA	8020/MTBE/BTEX	HCl	Sequoia	
	2 VOA	TPH$_g$ 8015	↓	↓	
	1 VOA	TOC	↓		
	1 LA	TPH$_d$, mo, j (A)	none		
	500 mLP	Ferrous Iron	↓		
	500 mLP	NO_3, SO_4, PO_4	↓		
↓	500 mLP	Ferric Iron	HNO_3	↓	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name: Port of Oakland-ORC Inj
Job Number: 43145.4
Recorded by: Heather D Lee (Signature)

Well No.: MW-8
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 5/20/99 Time: 0805
Sampled by: HDL (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 11.02
Water Level Depth (WL in feet BTOC): 3.06
Number of Well Volumes to be purged (# Vols)
☒ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC) from to

PURGE VOLUME CALCULATION:

$(11.02 - 3.06) \times 2^2 \times 3 \times 0.0408 = 3.9$ gallons

(TD (feet) − WL (feet)) × D (inches)² × # Vols × 0.0408 = Calculated Purge Volume

PURGE TIME

0750 Start 0800 Stop 10 Elapsed

PURGE RATE

Initial ____ gpm Final ____ gpm

ACTUAL PURGE VOLUME

4.0 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☒ °F	Other
Initial	7.15	19,960	59.5	
1.0	7.20	9080	64.1	
2.5	7.20	11,090	64.6	
4.0	7.17	11270	64.0	

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): grey, no odor
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other 55 gal Drum

WELL SAMPLING

SAMPLING METHOD

☒ Bailer - Type: teflon
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series: 9920

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
EP02	2 VOA	8020/MTBE/BTEX	HCl	Sequoia	
	2 VOA	TPHg 8015	↓		
	1 VOA Amber	TOC			
	1 VA	TPHd, motif(A)	none		
	500 mL P	Fermentation	↓		
	500 mL P	NO_3, SO_4, PO_4			
	500 mL P	Ferric Iron	HNO_3	↓	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

APPENDIX B

LABORATORY REPORTS

Harding Lawson Associates
383 Fourth Street, Third Floor
Oakland California 94607
(510) 451-1001

CHAIN OF CUSTODY FORM

Lab: № 2172 Sequoia

Samplers: Heather Lee 9905478

Job Number: 43145.4

Name/Location: Port of Oakland - ORC Inj / Oakland Airport

Project Manager: Mike Sides

Recorder: Heather Lee (Signature Required)

Source Code	Water	Sediment	Soil	Oil	Unpres.	H_2SO_4	HNO_3	HCL	Ice	Sample No. Yr	Wk	Seq	Date Yr	Mo	Day	Time	Station Description/Notes	EPA 601/8010 purgeable halocarbons	EPA 602/8020	EPA 624/8240	EPA 625/8270	METALS	EPA 8015M/TPHg	EPA 8020/BTEX/MTBE	EPA 8015M/TPHd.o	TPH mo, TPHi(A)	EPA 415.1 TOC	Nitrate	Sulfate	Orthophosphate	Ferrous Iron*	Ferric Iron		
	x							4		99	20	EP01	99	05	20	0735	9051620						X	X										
	x				3		1	5		99	20	EP02	99	05	20	0805	9051621 A-I	X					X	X	X	X	X	X	X	X	X	X		
	x				3		1	5		99	20	EP03	99	05	20	0855	9051622 ↓	X					X	X	X	X	X	X	X	X	X	X		
	x				3		1	5		99	20	EP04	99	05	20	0930	9051623	X					X	X	X	X	X	X	X	X	X	X		
	x				3		1	5		99	20	EP05	99	05	20	1005	9051624	X					X	X	X	X	X	X	X	X	X	X		
	x				3		1	5		99	20	EP06	99	05	20	1040	9051625	X					X	X	X	X	X	X	X	X	X	X		
	x				3		1	5		99	20	EP07	99	05	20	1125	9051626	X					X	X	X	X	X	X	X	X	X	X		
	x				3		1	5		99	20	EP08	99	05	20	1200	9051627	X					X	X	X	X	X	X	X	X	X	X		
	x				3		1	5		99	20	EP09	99	05	20	1230	9051628 ↓	X					X	X	X	X	X	X	X	X	X	X		
	x				1			1		99	20	EP10	99	05	20	1245	9051629 AB										X				X			

Lab Number Yr	Wk	Seq	Depth in Feet	Col Mtd CD	QA Code	Miscellaneous
						* Ferrous Iron 24 hr Hold Time
						Standard TAT

CHAIN OF CUSTODY RECORD

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Heather Lee	Kurt Putthale	5/20/99 1530
Kurt Putthale 5/20/99 1555	Donald C. Jensen	5/20/99 15:55

Dispatched by: (Signature)	Date/Time	Received for lab by: (Signature)	Date/Time

METHOD OF SHIPMENT

SAMPLE CONDITION WHEN RECEIVED BY THE LABORATORY

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
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1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled: May 20, 1999
383 Fourth Street, 3rd Floor	Sample Matrix:	Water	Received: May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 5030/8015 Mod./8020	Reported: Jun 18, 1999
Attention: Mike Sides	First Sample #:	905-1620	

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX / MTBE

Analyte	Reporting Limit µg/L	Sample I.D. 905-1620 9920EPO1	Sample I.D. 905-1621 9920EPO2	Sample I.D. 905-1622 9920EPO3	Sample I.D. 905-1623 9920EPO4	Sample I.D. 905-1624 9920EPO5	Sample I.D. 905-1625 9920EPO6
QC Batch Number:		GC052599 802004A	GC052499 802002A	GC052499 802002A	GC052499 802002A	GC052599 802002A	GC052599 802002A
Purgeable Hydrocarbons	50	2,700	N.D.	N.D.	N.D.	N.D.	4,700
Benzene	0.50	20	2.8	N.D.	N.D.	N.D.	120
Toluene	0.50	25	N.D.	N.D.	N.D.	N.D.	280
Ethyl Benzene	0.50	7.8	N.D.	N.D.	N.D.	N.D.	76
Total Xylenes	0.50	37	N.D.	N.D.	N.D.	N.D.	360
MTBE	2.5	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Chromatogram Pattern:		Gasoline & Unidentified Hydrocarbons >C10	--	--	--	--	Gasoline
Quality Control Data							
Report Limit Multiplication Factor:		10	1.0	1.0	1.0	1.0	20
Date Analyzed:		5/25/99	5/24/99	5/24/99	5/24/99	5/25/99	5/25/99
Instrument Identification:		HP-4	HP-2	HP-2	HP-2	HP-2	HP-2
Surrogate Recovery, %: (QC Limits = 70-130%)		100	94	94	100	97	104

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
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1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled: May 20, 1999
383 Fourth Street, 3rd Floor	Sample Matrix:	Water	Received: May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 5030/8015 Mod./8020	Reported: Jun 18, 1999
Attention: Mike Sides	First Sample #:	905-1626	

QC Batch Number: GC052599 802002A | GC052599 802002A | GC052599 802002A

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX / MTBE

Analyte	Reporting Limit µg/L	Sample I.D. 905-1626 9920EPO7	Sample I.D. 905-1627 9920EPO8	Sample I.D. 905-1628 9920EPO9
Purgeable Hydrocarbons	50	85	670	1,100
Benzene	0.50	1.7	16	15
Toluene	0.50	N.D.	0.83	0.78
Ethyl Benzene	0.50	N.D.	3.0	3.0
Total Xylenes	0.50	N.D.	10	11
MTBE	2.5	N.D.	5.5	5.4
Chromatogram Pattern:		Gasoline	Gasoline & Unidentified Hydrocarbons >C10	Gasoline & Unidentified Hydrocarbons >C10

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0
Date Analyzed:	5/25/99	5/25/99	5/25/99
Instrument Identification:	HP-2	HP-2	HP-2
Surrogate Recovery, %: (QC Limits = 70-130%)	103	139 *	130

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

Please Note:
* Surrogate recovery was outside of the upper control limit due to sample coelution.

Sequoia Analytical

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Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled: May 20, 1999
383 Fourth Street, 3rd Floor	Sample Matrix:	Water	Received: May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 3510/3630/8015 Modified	Reported: Jun 18, 1999
Attention: Mike Sides	First Sample #:	905-1621	

FUEL FINGERPRINT WITH SILICA GEL CLEAN-UP

Analyte	Reporting Limit µg/L	Sample I.D. 905-1621 9920EPO2	Sample I.D. 905-1622 9920EPO3	Sample I.D. 905-1623 9920EPO4	Sample I.D. 905-1624 9920EPO5	Sample I.D. 905-1625 9920EPO6	Sample I.D. 905-1626 9920EPO7
QC Batch Number:		SP052499 8015EXA	SP052499 8015EXA	SP052499 8015EXA	SP052499 8015EXA	SP052499 8015EXA	SP052499 8015EXA
Diesel (C9-C24)	50	150	N.I.	N.I.	N.I.	N.I.	380
Jet Fuel A (C9-C17)	50	N.I.	N.I.	N.I.	N.I.	15,000	N.I.
Motor Oil (>C16)	250	N.I.	N.I.	N.I.	N.I.	5,800	N.I.
Unidentified Extractable Hydrocarbons	50	N.I.	N.I.	N.I.	N.I.	N.I.	N.I.

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	1.0	10	1.0
Date Extracted:	5/24/99	5/24/99	5/24/99	5/24/99	5/24/99	5/24/99
Date Analyzed:	6/1/99	6/1/99	6/1/99	6/1/99	6/2/99	6/1/99
Instrument Identification:	HP-3A	HP-3A	HP-3B	HP-3B	HP-3A	HP-3B

Unidentified Extractable Hydrocarbons are quantitated against a fresh diesel standard.
Analytes reported as N.I. (None Identified) were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

9051620.HLA <3>

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
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1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled: May 20, 1999
383 Fourth Street, 3rd Floor	Sample Matrix:	Water	Received: May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 3510/3630/8015 Modified	Reported: Jun 18, 1999
Attention: Mike Sides	First Sample #:	905-1627	

QC Batch Number: SP052499 SP052499

8015EXA 8015EXA

FUEL FINGERPRINT WITH SILICA GEL CLEAN-UP

Analyte	Reporting Limit µg/L	Sample I.D. 905-1627 9920EPO8	Sample I.D. 905-1628 9920EPO9
Diesel (C9-C24)	50	N.I.	N.I.
Jet Fuel A (C9-C17)	50	1,900	1,200
Motor Oil (>C16)	250	560	290
Unidentified Extractable Hydrocarbons	50	N.I.	N.I.

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0
Date Extracted:	5/24/99	5/24/99
Date Analyzed:	6/1/99	6/1/99
Instrument Identification:	HP-3B	HP-3B

Unidentified Extractable Hydrocarbons are quantitated against a fresh diesel standard.
Analytes reported as N.I. (None Identified) were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
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1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled:	May 20, 1999
383 Fourth Street, 3rd Floor	Sample Descript:	Water, 9920EPO2	Received:	May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 8010	Analyzed:	May 25, 1999
Attention: Mike Sides	Lab Number:	905-1621	Reported:	Jun 18, 1999

QC Batch Number: GC052599801006A

Instrument ID: HP-6

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	0.50	N.D.
Bromoform	0.50	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	0.50	N.D.
Chlorobenzene	0.50	N.D.
Chloroethane	1.0	N.D.
Chloroform	0.50	N.D.
Chloromethane	1.0	N.D.
Dibromochloromethane	0.50	N.D.
1,3-Dichlorobenzene	0.50	N.D.
1,4-Dichlorobenzene	0.50	N.D.
1,2-Dichlorobenzene	0.50	N.D.
1,1-Dichloroethane	25	410
1,2-Dichloroethane	0.50	8.3
1,1-Dichloroethene	25	480
cis-1,2-Dichloroethene	0.50	1.2
trans-1,2-Dichloroethene	0.50	N.D.
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	0.50	N.D.
trans-1,3-Dichloropropene	0.50	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	N.D.
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	N.D.
Trichlorofluoromethane	0.50	N.D.
Vinyl chloride	1.0	3.9

Surrogates	Control Limit %		% Recovery
Dibromodifluoromethane	50	150	140
4-Bromofluorobenzene	50	150	100

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
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1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled: May 20, 1999
383 Fourth Street, 3rd Floor	Sample Descript:	Water, 9920EPO3	Received: May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 8010	Analyzed: May 25, 1999
Attention: Mike Sides	Lab Number:	905-1622	Reported: Jun 18, 1999

QC Batch Number: GC052599801006A

Instrument ID: HP-6

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	0.50	N.D.
Bromoform	0.50	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	0.50	N.D.
Chlorobenzene	0.50	N.D.
Chloroethane	1.0	N.D.
Chloroform	0.50	N.D.
Chloromethane	1.0	N.D.
Dibromochloromethane	0.50	N.D.
1,3-Dichlorobenzene	0.50	N.D.
1,4-Dichlorobenzene	0.50	N.D.
1,2-Dichlorobenzene	0.50	N.D.
1,1-Dichloroethane	0.50	N.D.
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	0.50	N.D.
cis-1,2-Dichloroethene	0.50	N.D.
trans-1,2-Dichloroethene	0.50	N.D.
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	0.50	N.D.
trans-1,3-Dichloropropene	0.50	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	N.D.
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	N.D.
Trichlorofluoromethane	0.50	N.D.
Vinyl chloride	1.0	N.D.

Surrogates	Control Limit %		% Recovery
Dibromodifluoromethane	50	150	133
4-Bromofluorobenzene	50	150	115

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
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1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled:	May 20, 1999
383 Fourth Street, 3rd Floor	Sample Descript:	Water, 9920EPO4	Received:	May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 8010	Analyzed:	May 25, 1999
Attention: Mike Sides	Lab Number:	905-1623	Reported:	Jun 18, 1999

QC Batch Number: GC052599801006A

Instrument ID: HP-6

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	0.50	N.D.
Bromoform	0.50	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	0.50	N.D.
Chlorobenzene	0.50	N.D.
Chloroethane	1.0	N.D.
Chloroform	0.50	N.D.
Chloromethane	1.0	N.D.
Dibromochloromethane	0.50	N.D.
1,3-Dichlorobenzene	0.50	N.D.
1,4-Dichlorobenzene	0.50	N.D.
1,2-Dichlorobenzene	0.50	N.D.
1,1-Dichloroethane	0.50	19
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	0.50	7.3
cis-1,2-Dichloroethene	0.50	0.74
trans-1,2-Dichloroethene	0.50	N.D.
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	0.50	N.D.
trans-1,3-Dichloropropene	0.50	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	N.D.
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	N.D.
Trichlorofluoromethane	0.50	N.D.
Vinyl chloride	1.0	N.D.

Surrogates	Control Limit %		% Recovery
Dibromodifluoromethane	50	150	118
4-Bromofluorobenzene	50	150	95

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
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Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled:	May 20, 1999
383 Fourth Street, 3rd Floor	Sample Descript:	Water, 9920EPO5	Received:	May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 8010	Analyzed:	May 25, 1999
Attention: Mike Sides	Lab Number:	905-1624	Reported:	Jun 18, 1999

QC Batch Number: GC052599801006A

Instrument ID: HP-6

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	0.50	N.D.
Bromoform	0.50	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	0.50	N.D.
Chlorobenzene	0.50	N.D.
Chloroethane	1.0	N.D.
Chloroform	0.50	N.D.
Chloromethane	1.0	N.D.
Dibromochloromethane	0.50	N.D.
1,3-Dichlorobenzene	0.50	N.D.
1,4-Dichlorobenzene	0.50	N.D.
1,2-Dichlorobenzene	0.50	N.D.
1,1-Dichloroethane	0.50	N.D.
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	0.50	N.D.
cis-1,2-Dichloroethene	0.50	N.D.
trans-1,2-Dichloroethene	0.50	N.D.
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	0.50	N.D.
trans-1,3-Dichloropropene	0.50	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	N.D.
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	N.D.
Trichlorofluoromethane	0.50	N.D.
Vinyl chloride	1.0	N.D.

Surrogates	Control Limit %		% Recovery
Dibromodifluoromethane	50	150	120
4-Bromofluorobenzene	50	150	102

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Project Manager

Sequoia Analytical

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Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled:	May 20, 1999
383 Fourth Street, 3rd Floor	Sample Descript:	Water, 9920EPO6	Received:	May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 8010	Analyzed:	May 25, 1999
Attention: Mike Sides	Lab Number:	905-1625	Reported:	Jun 18, 1999

QC Batch Number: GC052599801006A

Instrument ID: HP-6

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	0.50	N.D.
Bromoform	0.50	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	0.50	N.D.
Chlorobenzene	0.50	N.D.
Chloroethane	1.0	4.4
Chloroform	0.50	N.D.
Chloromethane	1.0	N.D.
Dibromochloromethane	0.50	N.D.
1,3-Dichlorobenzene	0.50	N.D.
1,4-Dichlorobenzene	0.50	N.D.
1,2-Dichlorobenzene	0.50	N.D.
1,1-Dichloroethane	0.50	63
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	0.50	0.82
cis-1,2-Dichloroethene	25	190
trans-1,2-Dichloroethene	0.50	1.5
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	0.50	N.D.
trans-1,3-Dichloropropene	0.50	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	1.5
1,1,1-Trichloroethane	0.50	5.8
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	1.1
Trichlorofluoromethane	0.50	N.D.
Vinyl chloride	1.0	N.D.

Surrogates	Control Limit %		% Recovery
Dibromodifluoromethane	50	150	139
4-Bromofluorobenzene	50	150	92

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342
1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled:	May 20, 1999
383 Fourth Street, 3rd Floor	Sample Descript:	Water, 9920EPO7	Received:	May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 8010	Analyzed:	May 25, 1999
Attention: Mike Sides	Lab Number:	905-1626	Reported:	Jun 18, 1999

QC Batch Number: GC052599801006A

Instrument ID: HP-6

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	0.50	N.D.
Bromoform	0.50	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	0.50	N.D.
Chlorobenzene	0.50	N.D.
Chloroethane	1.0	N.D.
Chloroform	0.50	N.D.
Chloromethane	1.0	N.D.
Dibromochloromethane	0.50	N.D.
1,3-Dichlorobenzene	0.50	N.D.
1,4-Dichlorobenzene	0.50	N.D.
1,2-Dichlorobenzene	0.50	N.D.
1,1-Dichloroethane	0.50	22
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	0.50	1.5
cis-1,2-Dichloroethene	0.50	17
trans-1,2-Dichloroethene	0.50	N.D.
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	0.50	N.D.
trans-1,3-Dichloropropene	0.50	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	N.D.
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	N.D.
Trichlorofluoromethane	0.50	N.D.
Vinyl chloride	1.0	1.2

Surrogates	Control Limit %		% Recovery
Dibromodifluoromethane	50	150	124
4-Bromofluorobenzene	50	150	108

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342
1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled:	May 20, 1999
383 Fourth Street, 3rd Floor	Sample Descript:	Water, 9920EPO8	Received:	May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 8010	Analyzed:	May 25, 1999
Attention: Mike Sides	Lab Number:	905-1627	Reported:	Jun 18, 1999

QC Batch Number: GC052599801006A

Instrument ID: HP-6

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	0.50	N.D.
Bromoform	0.50	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	0.50	N.D.
Chlorobenzene	0.50	N.D.
Chloroethane	1.0	8.9
Chloroform	0.50	N.D.
Chloromethane	1.0	N.D.
Dibromochloromethane	0.50	N.D.
1,3-Dichlorobenzene	0.50	N.D.
1,4-Dichlorobenzene	0.50	N.D.
1,2-Dichlorobenzene	0.50	N.D.
1,1-Dichloroethane	2.5	45
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	0.50	2.8
cis-1,2-Dichloroethene	0.50	41
trans-1,2-Dichloroethene	0.50	1.1
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	0.50	N.D.
trans-1,3-Dichloropropene	0.50	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	1.7
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	0.54
Trichlorofluoromethane	0.50	N.D.
Vinyl chloride	1.0	N.D.

Surrogates	Control Limit %		% Recovery
Dibromodifluoromethane	50	150	141
4-Bromofluorobenzene	50	150	108

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342
1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled: May 20, 1999
383 Fourth Street, 3rd Floor	Sample Descript:	Water, 9920EPO9	Received: May 20, 1999
Oakland, CA 94607	Analysis Method:	EPA 8010	Analyzed: May 25, 1999
Attention: Mike Sides	Lab Number:	905-1628	Reported: Jun 18, 1999

QC Batch Number: GC052599801006A

Instrument ID: HP-6

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	0.50	N.D.
Bromoform	0.50	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	0.50	N.D.
Chlorobenzene	0.50	N.D.
Chloroethane	1.0	8.6
Chloroform	0.50	N.D.
Chloromethane	1.0	N.D.
Dibromochloromethane	0.50	N.D.
1,3-Dichlorobenzene	0.50	N.D.
1,4-Dichlorobenzene	0.50	N.D.
1,2-Dichlorobenzene	0.50	N.D.
1,1-Dichloroethane	2.5	48
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	0.50	2.5
cis-1,2-Dichloroethene	0.50	38
trans-1,2-Dichloroethene	0.50	1.4
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	0.50	N.D.
trans-1,3-Dichloropropene	0.50	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	1.9
1,1,1-Trichloroethane	0.50	3.9
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	0.59
Trichlorofluoromethane	0.50	N.D.
Vinyl chloride	1.0	N.D.

Surrogates	Control Limit %		% Recovery
Dibromodifluoromethane	50	150	143
4-Bromofluorobenzene	50	150	112

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342
1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates
383 Fourth Street, 3rd Floor
Oakland, CA 94607
Attention: Mike Sides

Client Project ID: Port of Oakland
Sample Descript: Water
Analysis for: Iron
First Sample #: 905-1621

Sampled: May 20, 1999
Received: May 20, 1999
Digested: Jun 11, 1999
Analyzed: Jun 17, 1999
Reported: Jun 18, 1999

LABORATORY ANALYSIS FOR: Iron

Sample Number	Sample Description	Detection Limit mg/L	Sample Result mg/L	QC Batch Number	Instrument ID
905-1621	9920EPO2	0.010	26	ME0611992007MDA	MV-3
905-1622	9920EPO3	0.010	8.7	ME0611992007MDA	MV-3
905-1623	9920EPO4	0.010	13	ME0611992007MDA	MV-3
905-1624	9920EPO5	0.010	11	ME0611992007MDA	MV-3
905-1625	9920EPO6	0.010	36	ME0611992007MDA	MV-3
905-1626	9920EPO7	0.010	1.2	ME0611992007MDA	MV-3
905-1627	9920EPO8	0.010	3.7	ME0611992007MDA	MV-3
905-1628	9920EPO9	0.010	2.9	ME0611992007MDA	MV-3

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342
1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates
383 Fourth Street, 3rd Floor
Oakland, CA 94607
Attention: Mike Sides

Client Project ID: Port of Oakland
Sample Descript: Water
Analysis for: Ferrous Iron
First Sample #: 905-1621

Sampled: May 20, 1999
Received: May 20, 1999
Digested: May 27, 1999
Analyzed: Jun 7, 1999
Reported: Jun 18, 1999

LABORATORY ANALYSIS FOR: Ferrous Iron

Sample Number	Sample Description	Detection Limit mg/L	Sample Result mg/L	QC Batch Number	Instrument ID
905-1621	9920EPO2	0.010	2.0	ME0527992007MDB	MV-3
905-1622	9920EPO3	0.010	1.2	ME0527992007MDB	MV-3
905-1623	9920EPO4	0.010	0.89	ME0527992007MDB	MV-3
905-1624	9920EPO5	0.010	0.75	ME0527992007MDB	MV-3
905-1625	9920EPO6	0.010	8.9	ME0527992007MDB	MV-3
905-1626	9920EPO7	0.010	0.26	ME0527992007MDB	MV-3
905-1627	9920EPO8	0.010	N.D.	ME0527992007MDB	MV-3
905-1628	9920EPO9	0.010	N.D.	ME0527992007MDB	MV-3

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342
1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates
383 Fourth Street, 3rd Floor
Oakland, CA 94607
Attention: Mike Sides

Client Project ID: Port of Oakland
Sample Descript: Water
Analysis for: Total Organic Carbon
First Sample #: 905-1621

Sampled: May 20, 1999
Received: May 20, 1999
Analyzed: May 28, 1999
Reported: Jun 18, 1999

LABORATORY ANALYSIS FOR: Total Organic Carbon

Sample Number	Sample Description	Detection Limit mg/L	Sample Result mg/L	QC Batch Number	Instrument ID
905-1621	9920EPO2	4.0	21	9050894	-
905-1622	9920EPO3	8.0	22	9050894	-
905-1623	9920EPO4	4.0	6.8	9050894	-
905-1624	9920EPO5	4.0	15	9050894	-
905-1625	9920EPO6	20	130	9050894	-
905-1626	9920EPO7	4.0	22	9050894	-
905-1627	9920EPO8	4.0	36	9050894	-
905-1628	9920EPO9	4.0	39	9050894	-
905-1629	9920EP10	20	84	9050894	-

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #2245

Melissa A. Brewer

Melissa A. Brewer
Project Manager

9051620.HLA <15>

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
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1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates
383 Fourth Street, 3rd Floor
Oakland, CA 94607
Attention: Mike Sides

Client Project ID: Port of Oakland
Sample Descript: Water
Analysis for: Nitrate as NO3
First Sample #: 905-1621

Sampled: May 20, 1999
Received: May 20, 1999

Analyzed: May 21, 1999
Reported: Jun 18, 1999

LABORATORY ANALYSIS FOR: Nitrate as NO3

Sample Number	Sample Description	Detection Limit mg/L	Sample Result mg/L	QC Batch Number	Instrument ID
905-1621	9920EPO2	0.10	17	IN052199300011A	INIC-1
905-1622	9920EPO3	0.10	7.5	IN052199300011A	INIC-1
905-1623	9920EPO4	0.10	4.3	IN052199300011A	INIC-1
905-1624	9920EPO5	0.10	0.11	IN052199300011A	INIC-1
905-1625	9920EPO6	0.10	N.D.	IN052199300011A	INIC-1
905-1626	9920EPO7	0.10	N.D.	IN052199300011A	INIC-1
905-1627	9920EPO8	0.10	N.D.	IN052199300011A	INIC-1
905-1628	9920EPO9	0.10	0.22	IN052199300011A	INIC-1

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342
1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates	Client Project ID:	Port of Oakland	Sampled:	May 20, 1999
383 Fourth Street, 3rd Floor	Sample Descript:	Water	Received:	May 20, 1999
Oakland, CA 94607	Analysis for:	Sulfate		
Attention: Mike Sides	First Sample #:	905-1621	Analyzed:	May 21, 1999
			Reported:	Jun 18, 1999

LABORATORY ANALYSIS FOR: Sulfate

Sample Number	Sample Description	Detection Limit mg/L	Sample Result mg/L	QC Batch Number	Instrument ID
905-1621	9920EPO2	10	440	IN05219300011A	INIC-1
905-1622	9920EPO3	10	300	IN05219300011A	INIC-1
905-1623	9920EPO4	1.0	160	IN05219300011A	INIC-1
905-1624	9920EPO5	2.0	260	IN05219300011A	INIC-1
905-1625	9920EPO6	0.10	2.0	IN05219300011A	INIC-1
905-1626	9920EPO7	1.0	97	IN05219300011A	INIC-1
905-1627	9920EPO8	1.0	44	IN05219300011A	INIC-1
905-1628	9920EPO9	1.0	56	IN05219300011A	INIC-1

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
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1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates
383 Fourth Street, 3rd Floor
Oakland, CA 94607
Attention: Mike Sides

Client Project ID: Port of Oakland
Sample Descript: Water
Analysis for: Ortho Phosphate
First Sample #: 905-1621

Sampled: May 20, 1999
Received: May 20, 1999
Analyzed: May 21, 1999
Reported: Jun 18, 1999

LABORATORY ANALYSIS FOR: Ortho Phosphate

Sample Number	Sample Description	Detection Limit mg/L	Sample Result mg/L	QC Batch Number	Instrument ID
905-1621	9920EPO2	1.0	N.D.	IN05219930001A	INIC-1
905-1622	9920EPO3	1.0	N.D.	IN05219930001A	INIC-1
905-1623	9920EPO4	1.0	N.D.	IN05219930001A	INIC-1
905-1624	9920EPO5	1.0	N.D.	IN05219930001A	INIC-1
905-1625	9920EPO6	1.0	N.D.	IN05219930001A	INIC-1
905-1626	9920EPO7	1.0	1.5	IN05219930001A	INIC-1
905-1627	9920EPO8	1.0	3.3	IN05219930001A	INIC-1
905-1628	9920EPO9	1.0	2.2	IN05219930001A	INIC-1

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
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1551 Industrial Road, San Carlos, CA 94070-4111, (650) 232-9600, FAX (650) 232-9612

Harding Lawson Associates
383 Fourth Street, 3rd Floor
Oakland, CA 94607
Attention: Mike Sides

Client Project ID: Port of Oakland
Matrix: Liquid
QC Sample Group: 9051620-629
Reported: Jun 18, 1999

QUALITY CONTROL DATA REPORT

Analyte:	Benzene	Toluene	Ethyl Benzene	Xylenes
QC Batch#:	GC052599	GC052599	GC052599	GC052599
	802004A	802004A	802004A	802004A
Analy. Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Prep. Method:	EPA 5030	EPA 5030	EPA 5030	EPA 5030
Analyst:	J. Minkel	J. Minkel	J. Minkel	J. Minkel
MS/MSD #:	9051572	9051572	9051572	9051572
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Prepared Date:	5/25/99	5/25/99	5/25/99	5/25/99
Analyzed Date:	5/25/99	5/25/99	5/25/99	5/25/99
Instrument I.D.#:	HP-4	HP-4	HP-4	HP-4
Conc. Spiked:	20 µg/L	20 µg/L	20 µg/L	60 µg/L
Result:	19	16	17	59
MS % Recovery:	95	80	85	98
Dup. Result:	19	16	17	60
MSD % Recov.:	95	80	85	100
RPD:	0.0	0.0	0.0	1.7
RPD Limit:	0-20	0-20	0-20	0-20

LCS #:	4LCS052599	4LCS052599	4LCS052599	4LCS052599
Prepared Date:	5/25/99	5/25/99	5/25/99	5/25/99
Analyzed Date:	5/25/99	5/25/99	5/25/99	5/25/99
Instrument I.D.#:	HP-4	HP-4	HP-4	HP-4
Conc. Spiked:	20 µg/L	20 µg/L	20 µg/L	60 µg/L
LCS Result:	19	16	17	59
LCS % Recov.:	95	80	85	98

MS/MSD LCS Control Limits	70-130	70-130	70-130	70-130

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

Please Note:
The LCS is a control sample of known, interferent-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

** MS = Matrix Spike, MSD = MS Duplicate, RPD = Relative % Difference

Sequoia Analytical

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Harding Lawson Associates
383 Fourth Street, 3rd Floor
Oakland, CA 94607
Attention: Mike Sides

Client Project ID: Port of Oakland
Matrix: Liquid

QC Sample Group: 9051620-629

Reported: Jun 18, 1999

QUALITY CONTROL DATA REPORT

Analyte:	Benzene	Toluene	Ethyl Benzene	Xylenes
QC Batch#:	GC052499	GC052499	GC052499	GC052499
	802002A	802002A	802002A	802002A
Analy. Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Prep. Method:	EPA 5030	EPA 5030	EPA 5030	EPA 5030
Analyst:	J. Minkel	J. Minkel	J. Minkel	J. Minkel
MS/MSD #:	9051465	9051465	9051465	9051465
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Prepared Date:	5/24/99	5/24/99	5/24/99	5/24/99
Analyzed Date:	5/24/99	5/24/99	5/24/99	5/24/99
Instrument I.D.#:	HP-2	HP-2	HP-2	HP-2
Conc. Spiked:	20 µg/L	20 µg/L	20 µg/L	60 µg/L
Result:	16	15	16	53
MS % Recovery:	80	75	80	88
Dup. Result:	16	15	17	54
MSD % Recov.:	80	75	85	90
RPD:	0.0	0.0	6.1	1.9
RPD Limit:	0-20	0-20	0-20	0-20
LCS #:	2LCS052499	2LCS052499	2LCS052499	2LCS052499
Prepared Date:	5/24/99	5/24/99	5/24/99	5/24/99
Analyzed Date:	5/24/99	5/24/99	5/24/99	5/24/99
Instrument I.D.#:	HP-2	HP-2	HP-2	HP-2
Conc. Spiked:	20 µg/L	20 µg/L	20 µg/L	60 µg/L
LCS Result:	17	17	18	58
LCS % Recov.:	85	85	90	97
MS/MSD LCS Control Limits	70-130	70-130	70-130	70-130

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

Please Note:
The LCS is a control sample of known, interferent-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

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Harding Lawson Associates
383 Fourth Street, 3rd Floor
Oakland, CA 94607
Attention: Mike Sides

Client Project ID: Port of Oakland
Matrix: Liquid
QC Sample Group: 9051620-629
Reported: Jun 18, 1999

QUALITY CONTROL DATA REPORT

Analyte:	Benzene	Toluene	Ethyl Benzene	Xylenes	Diesel
QC Batch#:	GC052599	GC052599	GC052599	GC052599	SP052499
	802002A	802002A	802002A	802002A	8015EXA
Analy. Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8015
Prep. Method:	EPA 5030	EPA 5030	EPA 5030	EPA 5030	EPA 3510
Analyst:	J. Minkel	J. Minkel	J. Minkel	J. Minkel	K. Grubb
MS/MSD #:	9051624	9051624	9051624	9051624	BLK052499
Sample Conc.:	N.D.	N.D.	N.D.	N.D.	N.D.
Prepared Date:	5/25/99	5/25/99	5/25/99	5/25/99	5/24/99
Analyzed Date:	5/25/99	5/25/99	5/25/99	5/25/99	6/1/99
Instrument I.D.#:	HP-2	HP-2	HP-2	HP-2	HP-3A
Conc. Spiked:	20 µg/L	20 µg/L	20 µg/L	60 µg/L	500 µg/L
Result:	16	15	17	53	350
MS % Recovery:	80	75	85	88	70
Dup. Result:	17	16	18	56	350
MSD % Recov.:	85	80	90	93	70
RPD:	6.1	6.5	5.7	5.5	0.0
RPD Limit:	0-20	0-20	0-20	0-20	0-50
LCS #:	2LCS052599	2LCS052599	2LCS052599	2LCS052599	LCS052499
Prepared Date:	5/25/99	5/25/99	5/25/99	5/25/99	5/24/99
Analyzed Date:	5/25/99	5/25/99	5/25/99	5/25/99	6/1/99
Instrument I.D.#:	HP-2	HP-2	HP-2	HP-2	HP-3A
Conc. Spiked:	20 µg/L	20 µg/L	20 µg/L	60 µg/L	500 µg/L
LCS Result:	17	17	19	59	360
LCS % Recov.:	85	85	95	98	72
MS/MSD LCS Control Limits	70-130	70-130	70-130	70-130	35-125

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Project Manager

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Harding Lawson Associates
383 Fourth Street, 3rd Floor
Oakland, CA 94607
Attention: Mike Sides

Client Project ID: Port of Oakland
Matrix: Liquid
QC Sample Group: 9051620-629
Reported: Jun 18, 1999

QUALITY CONTROL DATA REPORT

Analyte:	1,1-Dichloro-ethene	Trichloro-ethene	Chloro-benzene	Iron	Iron
QC Batch#:	GC052599	GC052599	GC052599	ME061199	ME052799
	801006A	801006A	801006A	2007MDA	2007MDB
Analy. Method:	EPA 8010	EPA 8010	EPA 8010	EPA 200.7	EPA 200.7
Prep. Method:	EPA 5030	EPA 5030	EPA 5030	EPA 200.7	EPA 200.7
Analyst:	P. Kosovskaya	P. Kosovskaya	P. Kosovskaya	J. Kelly	J. Kelly
MS/MSD #:	9051624	9051624	9051624	9051626	9051621
Sample Conc.:	N.D.	N.D.	N.D.	1.2 mg/L	2.0 mg/L
Prepared Date:	5/25/99	5/25/99	5/25/99	6/11/99	5/27/99
Analyzed Date:	5/25/99	5/25/99	5/25/99	6/17/99	6/7/99
Instrument I.D.#:	HP-6	HP-6	HP-6	MV-3	MV-3
Conc. Spiked:	20 µg/L	20 µg/L	20 µg/L	1.0 mg/L	1.0 mg/L
Result:	23	26	21	2.3	2.9
MS % Recovery:	115	130	105	110	90
Dup. Result:	19	27	20	2.4	2.6
MSD % Recov.:	95	135	100	120	60
RPD:	19	3.8	4.9	4.3	11
RPD Limit:	0-25	0-25	0-25	0-20	0-20

LCS #:	LCS052599	LCS052599	LCS052599	LCS061199	LCS052799B
Prepared Date:	5/25/99	5/25/99	5/25/99	6/11/99	5/27/99
Analyzed Date:	5/25/99	5/25/99	5/25/99	6/17/99	6/7/99
Instrument I.D.#:	HP-6	HP-6	HP-6	MV-3	MV-3
Conc. Spiked:	20 µg/L	20 µg/L	20 µg/L	1.0 mg/L	1.0 mg/L
LCS Result:	15	18	17	0.96	0.96
LCS % Recov.:	75	90	85	96	96
MS/MSD LCS Control Limits	65-135	70-130	70-130	80-120	80-120

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Project Manager

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Harding Lawson Associates
383 Fourth Street, 3rd Floor
Oakland, CA 94607
Attention: Mike Sides

Client Project ID: Port of Oakland
Matrix: Liquid
QC Sample Group: 9051620-629
Reported: Jun 18, 1999

QUALITY CONTROL DATA REPORT

Analyte:	Nitrate as NO3	Ortho-Phosphate	Sulfate	Total Organic Carbon	Total Organic Carbon
QC Batch#:	IN052199 3000I1A	IN052199 3000I1A	IN052199 3000I1A	9050894	9050894
Analy. Method:	EPA 300.0	EPA 300.0	EPA 300.0	EPA 415.1	EPA 415.1
Prep. Method:	EPA 300.0	EPA 300.0	EPA 300.0	-	-
Analyst:	A. Kemp	A. Kemp	A. Kemp	Petaluma	Petaluma
MS/MSD #:	9051486	9051486	BLK052199	P905550-17	P905550-18
Sample Conc.:	0.99 mg/L	N.D.	N.D.	1.4 mg/L	1.5 mg/L
Prepared Date:	5/21/99	5/21/99	5/21/99	5/28/99	5/28/99
Analyzed Date:	5/21/99	5/21/99	5/21/99	6/8/99	6/8/99
Instrument I.D.#:	INIC-1	INIC-1	INIC-1	-	-
Conc. Spiked:	10 mg/L	20 mg/L	10 mg/L	40 mg/L	40 mg/L
Result:	12	20	10	40	42
MS % Recovery:	110	100	100	95	100
Dup. Result:	12	20	10	41	42
MSD % Recov.:	110	100	100	98	102
RPD:	0.0	0.0	0.0	3.1	2.0
RPD Limit:	0-20	0-20	0-20	0-20	0-20
LCS #:	LCS052199	LCS052199	-	LCS052899	LCS052899
Prepared Date:	5/21/99	5/21/99	-	5/28/99	5/28/99
Analyzed Date:	5/21/99	5/21/99	-	5/28/99	5/28/99
Instrument I.D.#:	INIC-1	INIC-1	-	-	-
Conc. Spiked:	10 mg/L	20 mg/L	-	40 mg/L	40 mg/L
LCS Result:	11	20	-	41	39
LCS % Recov.:	110	100	-	101	97
MS/MSD LCS Control Limits	80-120	80-120	80-120	80-120	80-120

SEQUOIA ANALYTICAL, #1271 & #2245

Melissa A. Brewer
Project Manager

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Harding Lawson Associates	Client Project ID:	Port of Oakland	
383 Fourth Street, 3rd Floor			Received: May 20, 1999
Oakland, CA 94607			
Attention: Mike Sides	Lab Number:	9051620-629	Reported: Jun 18, 1999

LABORATORY NARRATIVE

Sample(s): 905-1629
Sample I.D.(s): 9920EP10

The Ferrous Iron result is not provided because the appropriate sample container could not be located.

SEQUOIA ANALYTICAL, #1271

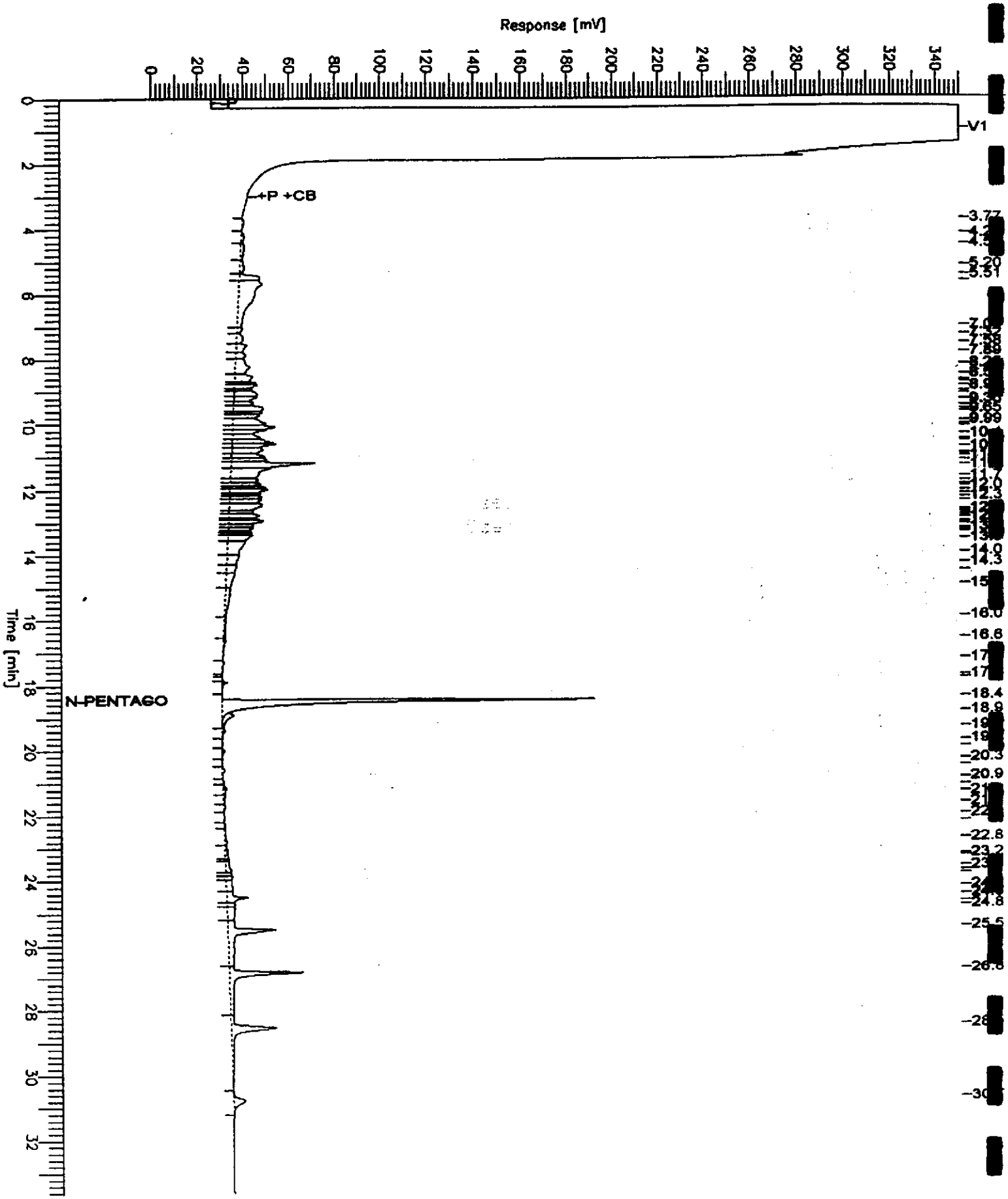
Melissa A. Brewer

Melissa A. Brewer
Project Manager

Chromatogram

Sample Name : HLA
FileName : J:\HP3DATA\3AJU013.raw
Method : TPH03A
Start Time : 0.00 min End Time : 33.65 min
Scale Factor: 0.0 Plot Offset: 0 mV

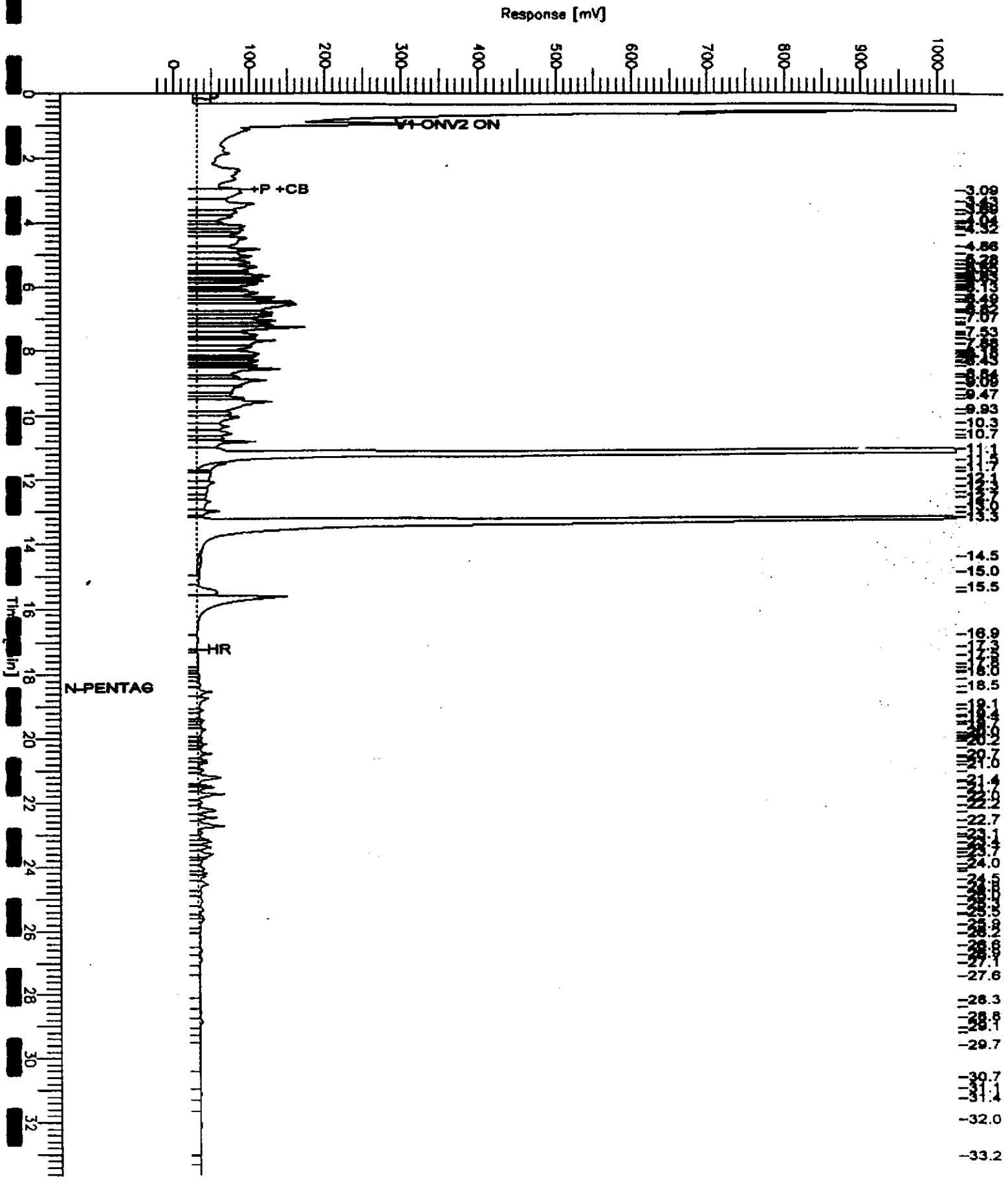
Sample #: 9051621 Page 1 of 1
Date : 6/1/99 6:49 PM
Time of Injection: 6/1/99 6:14 PM
Low Point : 0.00 mV High Point : 350.00 mV
Plot Scale: 350.0 mV



Chromatogram

Sample Name : HLA
File Name : J:\HP3DATA\3AJU035.RAW
Method :
Start Time : 0.00 min End Time : 33.65 min
Scale Factor: 0.0 Plot Offset: -27 mV

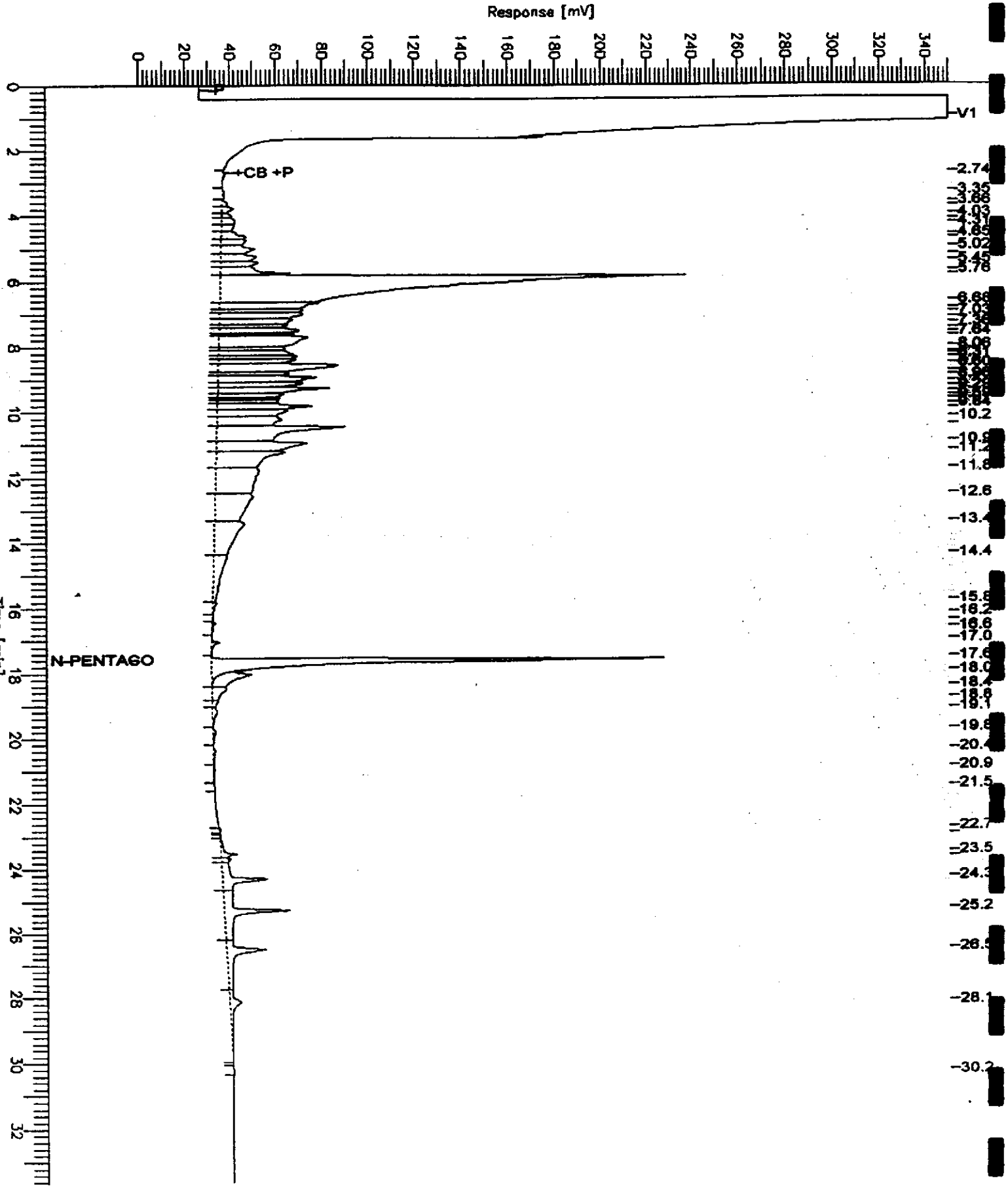
Sample #: 9051625DIL Page 1 of 1
Date : 6/2/99 11:03 AM
Time of Injection: 6/2/99 9:22 AM
Low Point : -26.86 mV High Point : 1024.00 mV
Plot Scale: 1050.9 mV



Chromatogram

Sample Name : HLA
FileName : J:\HP3DATA\3BJU011.raw
Method : TPH03A
Start Time : 0.00 min End Time : 33.65 min
Scale Factor: 0.0 Plot Offset: 0 mV

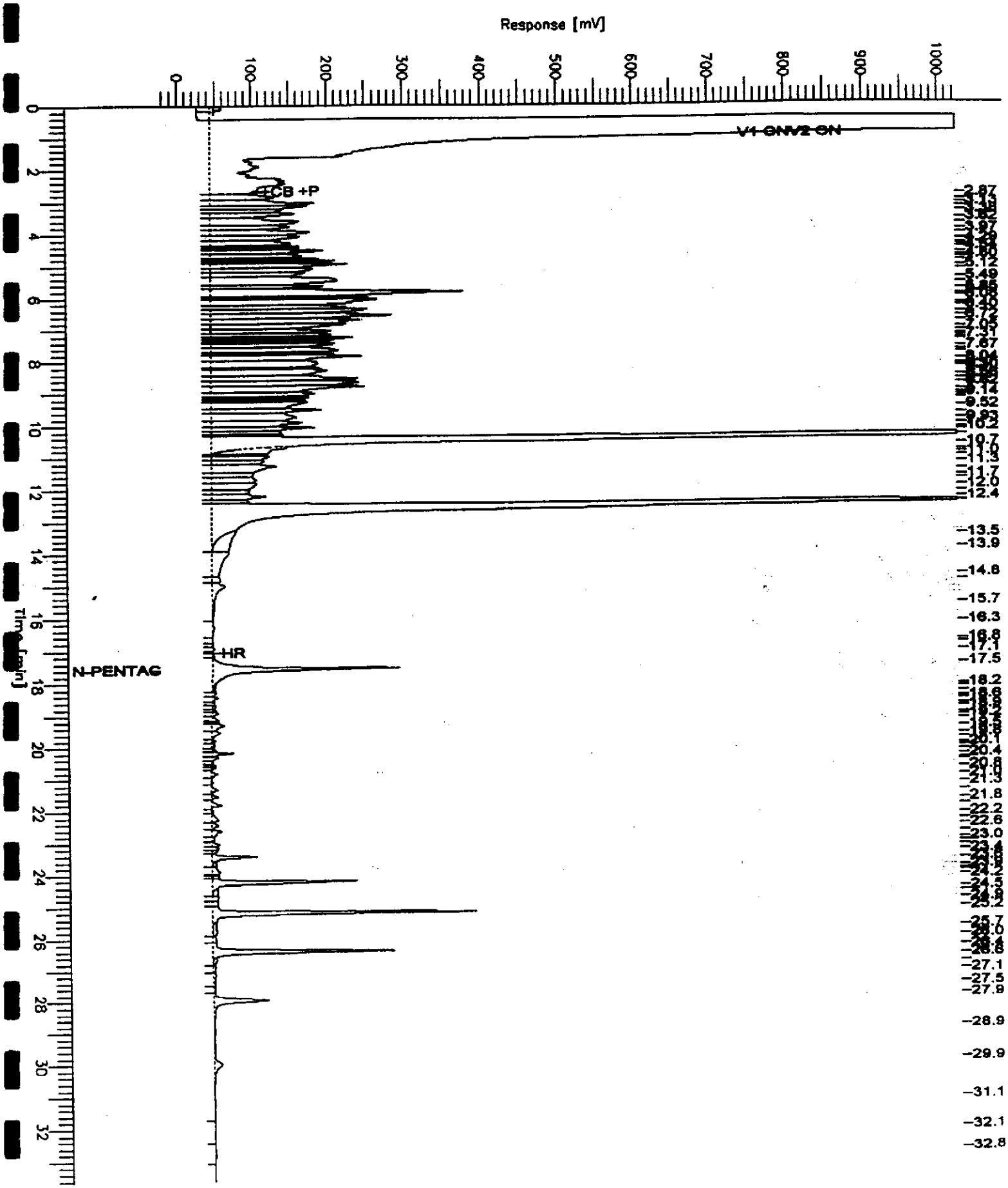
Sample #: 9051626 Page 1 of 1
Date : 6/1/99 5:25 PM
Time of Injection: 6/1/99 4:51 PM
Low Point : 0.00 mV High Point : 350.00 mV
Plot Scale: 350.0 mV



Chromatogram

Name : HLA
File Name : J:\HP3DATA\3BJU012.RAW
Method :
Start Time : 0.00 min End Time : 33.65 min
Scale Factor: 0.0 Plot Offset: -26 mV

Sample #: 9051627 Page 1 of 1
Date : 6/2/99 8:20 AM
Time of Injection: 6/1/99 5:32 PM
Low Point : -25.84 mV High Point : 1024.00 mV
Plot Scale: 1049.8 mV



Chromatogram

Name : HLA
: J:\HP3DATA\3BJU013.RAW
:
rt Time : 0.00 min End Time : 33.65 min
cale Factor: 0.0 Plot Offset: 0 mV

Sample #: 9051628 Page 1 of 1
Date : 6/2/99 8:24 AM
Time of Injection: 6/1/99 6:14 PM
Low Point : 0.00 mV High Point : 350.00 mV
Plot Scale: 350.0 mV