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1420 Harbor Bay Parkway
Suite 160
Alameda, CA 94502

(510) 748-6700
FAX (510) 748-6799
http://www.ensr.com

August 27, 1997
Project No. 8700-688-000

Mr. Wayne Chun
265 Heron Drive
Pittsburgh, California 94565

Quarterly Ground Water Monitoring Report
Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Dear Mr. Chun:

This report documents results of quarterly groundwater monitoring and sampling conducted on June 25, 1997, at the former Bill Chun Service Station located at 2301 Santa Clara Avenue, Alameda, California (subject property). A site location map is provided as Figure 1, and a site map is provided as Figure 2.

BACKGROUND

In July of 1992, three underground storage tanks (USTs) were removed from the subject property by Parker Environmental Services (Parker): two 550 gallon and one 285 gallon capacity. During removal, it was discovered that the 285 gallon gasoline UST had leaked. Analysis of soil samples indicated total petroleum hydrocarbons as gasoline (TPH-g) and benzene, toluene, ethylbenzene, and total xylenes (BTEX) had impacted the subsurface soil.

Several assessment activities were conducted at the subject property to determine the extent of the hydrocarbon impacted soil and groundwater. These activities consisted of soil and groundwater assessment and free product recovery. Six monitoring wells were installed at the subject property by others in 1993: MW-1, MW-2, and MW-3 in January, and MW-4, MW-5, and MW-6 in September. The purpose of these wells was to determine the lateral extent of petroleum-impacted subsurface soil and groundwater. Concentrations of gasoline-range hydrocarbons were detected in soils at depths of 9.5 to 11 feet below ground surface (bgs).

Monitoring wells MW-1, MW-2, and MW-3 were installed with the top of the screened casing at a depth below the surface of the groundwater. It is suspected that floating product as gasoline could be present in the vicinity of monitoring wells MW-1 and MW-2. If this is the case, accurate assessment of it's extent and quantity may not be possible due to the position of the screens.

Fugro installed off-site monitoring wells MW-8, MW-9, MW-10, and MW-11 in November 1995 to assess the lateral extent and migration of TPH-g and BTEX in the groundwater.

Quarterly groundwater monitoring and sampling has occurred at the subject property since January, 1993. Fugro has conducted quarterly monitoring activities since November, 1994. Since that time, groundwater flow directions ranged from the northwest to the northeast. Free product was detected in monitoring well MW-5 since November, 1993 and in MW-7 since February, 1994.

CURRENT GROUNDWATER MONITORING AND SAMPLING

On June 25, 1997, groundwater monitoring wells MW-1 through MW-11 were monitored for groundwater depth and the presence of free-phase floating product. Groundwater samples were collected from monitoring wells MW-2, MW-3, MW-4, MW-8, MW-9, MW-10, and MW-11 and submitted to a California state certified laboratory for analysis of TPH-g, BTEX, and methyl tertiary-butyl ether (MTBE) . Monitoring wells MW-1, MW-5, MW-6, and MW-7 were not sampled because a visible product sheen was observed on the groundwater within these monitoring wells.

Quarterly groundwater samples were analyzed for MTBE for the first time during this quarterly event. MTBE is found in most gasoline as an octane enhancer and oxygenating compound and has been used since the late 1970s. MTBE is readily water soluble and degrades at a relatively slower rate than other volatile constituents of gasoline.

Quarterly groundwater samples have been analyzed for volatile organic compounds (VOCs) since May 1996. As of June 1997, sampling frequency for VOC analysis was reduced to semi-annual, as discussed with the Alameda County Environmental Health Division (ACHD) on June 5, 1997. Analysis of VOCs from monitoring wells MW-3 and MW-4 was discontinued. The reduction of sampling frequency for VOCs was based on the consistent detection of 1,2 dichloroethene (1,2 DCE) (ethylene dichloride), a gasoline additive. ENSR expects that the source of 1,2 DCE is the gasoline present in the soil and groundwater at the subject property. Because the only VOCs detected were gasoline constituents, it was deemed unnecessary and too costly to continue monitoring on a quarterly basis for VOCs by EPA Method 8260. Semi-annual sampling for VOCs will take place in September 1997.

Groundwater samples collected since November of 1995 have not contained detectable levels of total petroleum hydrocarbons as diesel (TPH-d); thus, diesel analyses were not performed. Historically, diesel fuel was not dispensed at the former Bill Chun station. It is expected that the previous diesel detections reflected high boiling point range hydrocarbons from the gasoline previously released to the subsurface.

The general flow direction of the water table beneath the subject property is in the northerly direction at a gradient of approximately 0.005 foot per foot (Figure 3). Groundwater elevations have decreased an average of 0.55 feet since the last monitoring event in March of 1997

The results of groundwater elevation data and concentrations of TPH-g, BTEX, and MTBE are summarized in Table 1. Laboratory data reports and chain of custody forms are included in

Attachment A. ENSR's Standard Operating Procedures for groundwater monitoring and sampling is provided in Attachment B.

Table 1. Groundwater Elevations and Analytical Results
Former Bill Chun Service Station
June 26, 1997.

Well Number	Groundwater Elevation (feet amsl)	TPH-g (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)
MW-1	18.88	--	--	--	--	--	--
MW-2	18.98	160,000	37,000	63,000	3,500	19,000	ND
MW-3	19.16	600	ND	1.1	ND	3.0	ND
MW-4	19.10	200	ND	ND	0.5	ND	ND
MW-5	18.99	--	--	--	--	--	--
MW-6	18.83	--	--	--	--	--	--
MW-7	18.97	--	--	--	--	--	--
MW-8	19.45	700	36	5.1	8.0	8.0	10
MW-9	18.49	8,000	4,600	190	100	30	220
MW-10	18.81	ND	ND	ND	ND	ND	ND
MW-11	18.91	300	3.5	0.9	2.7	5.0	ND
MCL	NA	NA	1.0	1,000	680	1,750	NA

NOTES:
amsl = above mean sea level
ppb = parts per billion = micrograms per liter = µg/L
NA = Not Applicable - no MCL has been established for these constituents.
ND = Not Detected
--= Not Sampled due to the presence of free product
MCL = Maximum Contaminant Level. Numbers reported for California primary MCLs. Maximum contaminant levels (MCLs) mandated by the state of California Regional Water Quality Control Board. The MCLs are established based on either identified health risks or aesthetics and apply to drinking water.

Following is a comparison of current data with that obtained in the March 1997 monitoring event. Historical data, including those from the March monitoring event, are provided in Tables 3 at the end of this report.

- TPH-g and BTEX concentrations in monitoring wells MW-2, MW-7, MW-8, MW-10, and MW-11, remained generally consistent with those detected in March 1997.
- Free-phase floating product sheen was observed in MW-1 and MW-6 during the current sampling event. Evidence of a product sheen was not observed in these wells during March 1997 event.

- Samples collected from monitoring well MW-9 indicated an increase in concentrations of TPH-g and BTEX since the March 1997 monitoring event. Most significantly, the benzene concentration increased from 940 micrograms per liter (µg/L) (parts per billion) in March to 4,600 µg/L in June.
- The sample collected from monitoring well MW-3 indicate a decrease in concentrations of TPH-g and BTEX. Most significant was the decrease of TPH-g from 9,060 µg/L in March to 600 µg/L in June.
- MTBE was detected in samples collected from monitoring wells MW-8, MW-9 and MW-10 at 10, 220, and 5 µg/L, respectively.

Significant changes in petroleum hydrocarbon concentrations in groundwater may be due to seasonal groundwater fluctuations and the resulting contact of groundwater to petroleum-impacted soils. Groundwater flow direction and gradient is also a contributing factor.

MTBE detected in monitoring well MW-9 is expected to have originated from the subject property, although it was not detected in on site monitoring wells MW-2, MW-3, and MW-4. MTBE concentrations in MW-8 is likely related groundwater contamination associated with the former Shell Station, located south, across Santa Clara Avenue from the subject property. Considering this is the initial analysis for MTBE, additional samples, collected on a quarterly basis, will be necessary to further evaluate the source and lateral migration of this compound in the shallow groundwater.

REMARKS

This report has been prepared solely for the use of Mr. Wayne Chun. Any reliance on this report by third parties shall be at the parties sole risk.

We appreciate the opportunity to provide environmental consulting services to Mr. Wayne Chun. If there are any questions or comments regarding this report, or if we can assist you in any other matter, please contact us at (510) 748-6700.

Sincerely,

ENSR Consulting, Engineering and Remediation,

Cassi Stagg FOR
Robyn K. Simonsen, EIT
Staff Engineer

Peter B. Hudson
Project Geologist

cc: Juliet Shin, Alameda County Division of Environmental Health

Attachments

TABLES

TABLE 2
GROUNDWATER ELEVATION DATA
Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-1	01/07/93	28.53	8.87	--	0.00	19.66
	09/07/93		9.63	--	0.00	18.90
	11/16/93		9.89	--	0.00	18.64
	12/07/93		9.66	--	0.00	18.87
	01/06/94		9.67	--	0.00	18.86
	02/03/94		9.50	--	0.00	19.03
	03/04/94		9.18	--	0.00	19.35
	06/06/94		9.55	--	0.00	18.98
	11/09/94		8.83	--	0.00	19.70
	12/20/94		9.00	--	0.00	19.53
	03/29/95		8.44	--	0.00	20.09
	05/24/95		9.01	--	0.00	19.52
	08/30/95		9.52	--	0.00	19.01
	11/29/95	28.49 (2)	9.96	--	0.00	18.53
	05/01/96		9.19	--	0.00	19.30
	08/05/96		9.63	--	0.00	18.86
	12/10/96		9.31	--	0.00	19.18
	03/05/97		9.01	--	0.00	19.48
	06/25/97		**9.61**	**--**	**0.00**	**18.88**
MW-2	01/07/93	28.51	8.78	--	0.00	19.73
	09/07/93		9.52	--	0.00	18.99
	11/16/93		9.73	--	0.00	18.78
	12/07/93		9.54	--	0.00	18.97
	01/06/94		9.54	--	0.00	18.97
	02/03/94		9.37	--	0.00	19.14
	03/04/94		9.02	--	0.00	19.49
	06/06/94		9.40	--	0.00	19.11
	11/09/94		NM(1)	NM	NM	NM

TABLE 2, Continued
GROUNDWATER ELEVATION DATA
Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-2	12/20/94		NM(1)	NM	NM	NM
continued	03/29/95		8.26	--	0.00	20.25
	05/24/95		8.89	--	0.00	19.62
	08/30/95		9.41	--	0.00	19.10
	11/29/96	28.47 (2)	9.96	--	0.00	18.53
	05/01/96		9.19	--	0.00	19.30
	08/05/96		9.49	--	0.00	18.98
	12/10/96		9.13	--	0.00	19.34
	03/05/97		8.90	--	0.00	19.57
	06/25/97		**9.49**	**--**	**0.00**	**18.98**
MW-3	01/07/93	28.82	8.86	--	0.00	19.96
	09/07/93		9.62	--	0.00	19.20
	11/16/93		9.82	--	0.00	19.00
	12/07/93		9.60	--	0.00	19.22
	01/06/94		9.62	--	0.00	19.20
	02/03/94		9.45	--	0.00	19.37
	03/04/94		9.11	--	0.00	19.71
	06/06/94		9.50	--	0.00	19.32
	11/09/94		8.82	--	0.00	20.00
	12/20/94		9.00	--	0.00	19.82
	03/29/95		8.45	--	0.00	20.37
	05/24/95		8.99	--	0.00	19.83
	08/30/95		9.54	--	0.00	19.28
	11/29/95	28.78 (2)	9.90	--	0.00	18.88
	05/01/96		9.25	--	0.00	19.53
	08/05/96		9.61	--	0.00	19.17
	12/10/96		9.27	--	0.00	19.51
	03/05/97		9.09	--	0.00	19.69
	06/25/97		**9.62**	**--**	**0.00**	**19.16**

TABLE 2, Continued
GROUNDWATER ELEVATION DATA
Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-4	09/07/93	28.57	9.39	--	0.00	19.18
	11/16/93		9.60	--	0.00	18.97
	12/07/93		9.42	--	0.00	19.15
	01/06/94		9.44	--	0.00	19.13
	02/03/94		9.31	--	0.00	19.26
	03/04/94		9.05	--	0.00	19.52
	06/06/94		9.31	--	0.00	19.26
	11/09/94		8.68	--	0.00	19.89
	12/20/94		8.97	--	0.00	19.60
	03/29/95		8.46	--	0.00	20.11
	05/24/95		8.86	--	0.00	19.71
	08/30/95		9.41	--	0.00	19.16
	11/29/95	28.53 (2)	9.72	--	0.00	18.81
	05/01/96		9.17	--	0.00	19.36
	08/05/96		9.44	--	0.00	19.09
	12/10/96		9.18	--	0.00	19.35
	03/05/97		8.99	--	0.00	19.54
	06/25/97		**9.43**	**--**	**0.00**	**19.10**
MW-5	09/07/93	28.37	9.31	0.00	--	19.06
	11/16/93		9.99	9.45	0.54	18.81
	12/07/93		9.88	9.27	0.61	18.98
	01/06/94		9.85	9.27	0.58	18.98
	02/03/94		9.51	9.19	0.32	19.12
	03/04/94		8.99	8.96	0.03	19.40
	06/06/94		9.72	9.14	0.58	19.11
	11/09/94		8.58	8.56	0.02	19.81
	12/20/94		8.77	8.76	0.01	19.61
	03/29/95		8.31	--	0.00	20.06
	05/24/95		8.77	8.76	0.01	19.61
	08/30/95		9.50	9.19	0.31	19.12

TABLE 2, Continued
GROUNDWATER ELEVATION DATA
Former Bill Chun Service Station
2301 Santa Clara Avenue-
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-5	11/29/95	28.33 (2)	9.84	9.60	0.24	18.68
continued	05/01/96		8.87	8.86	0.01	19.47
	08/05/96		9.37	9.36	0.01	18.97
	12/10/96		8.15	8.14	0.01	19.39
	03/05/97		8.75	--	0.00	19.58
	06/25/97		**9.34**	**--**	**0.00**	**18.99**
MW-6	09/07/93	28.41	9.53	--	0.00	18.88
	11/16/93		9.74	--	0.00	18.67
	12/07/93		9.58	--	0.00	18.83
	01/06/94		9.60	--	0.00	18.81
	02/03/94		9.47	--	0.00	18.94
	03/04/94		9.18	--	0.00	19.23
	06/06/94		9.46	--	0.00	18.95
	11/09/94		8.72	--	0.00	19.69
	12/20/94		9.00	--	0.00	19.41
	03/29/95		8.44	--	0.00	19.97
	05/24/95		8.94	--	0.00	19.47
	08/30/95		9.43	--	0.00	18.98
	11/29/95	28.36 (2)	9.83	--	0.00	18.53
	05/01/96		9.00	--	0.00	19.36
	08/05/96		9.55	--	0.00	18.81
	12/10/96		9.18	--	0.00	19.18
	03/05/97		8.97	--	0.00	19.39
	06/25/97		**9.53**	**--**	**0.00**	**18.83**

TABLE 2, Continued
GROUNDWATER ELEVATION DATA
Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-7	09/07/93	28.56	9.61	--	0.00	18.95
	11/16/93		9.86	--	0.00	18.70
	12/07/93		9.58	--	0.00	18.98
	01/06/94		9.59	--	0.00	18.97
	02/03/94		9.56	9.39	0.17	19.14
	03/04/94		9.04	9.01	0.03	19.54
	06/06/94		9.67	9.37	0.30	19.13
	11/09/94		8.57	8.52	0.05	20.03
	12/20/94		9.08	8.67	0.41	19.81
	03/29/95		8.51	7.96	0.55	20.49
	05/24/95		8.98	8.81	0.17	19.72
	08/30/95		9.71	9.40	0.31	19.10
	11/29/95	28.44 (2)	9.86	9.84	0.02	18.60
	05/01/96		8.94	8.85	0.09	19.57
	08/05/96		9.48	9.45	0.03	19.03
	12/10/96		8.96	8.95	0.01	19.49
	03/05/97		8.77	--	0.00	19.67
	06/25/97		**9.47**	**--**	**0.00**	**18.97**
MW-8	11/29/95	28.17 (2)	8.92	--	0.00	19.25
	05/01/95		8.42	--	0.00	19.75
	08/05/96		8.75	--	0.00	19.42
	12/10/96		8.53	--	0.00	19.64
	03/05/97		8.77	--	0.00	19.76
	06/25/97		**8.72**	**--**	**0.00**	**19.45**
MW-9	11/29/95	27.45 (2)	9.23	--	0.00	18.22
	05/01/96		8.66	--	0.00	18.79
	08/05/96		8.94	--	0.00	18.51
	12/10/96		8.60	--	0.00	18.85
	03/05/97		8.40	--	0.00	19.05
	06/25/97		**8.96**	**--**	**0.00**	**18.49**

TABLE 2, Continued
GROUNDWATER ELEVATION DATA
Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-10	11/29/95	27.32 (2)	8.73	--	0.00	18.59
	05/01/96		NM (3)	NM	NM	NM
	08/05/96		8.50	--	0.00	18.82
	12/10/96		8.17	-	0.00	19.15
	03/05/97		8.06	--	0.00	19.26
	06/25/97		**8.51**	**--**	**0.00**	**18.81**
MW-11	11/29/95	28.56 (2)	10.16	--	0.00	18.40
	05/01/96		9.12	--	0.00	1944
	08/05/96		9.62	--	0.00	18.94
	12/10/96		9.18	--	0.00	19.38
	03/05/97		8.93	--	0.00	19.63
	06/25/97		**9.65**	**--**	**0.00**	**18.91**

Table Notes on Following Page

NOTES:

(1) MW-2 could not be located; well box was temporarily buried during tank excavation activities

(2) Top of casing reference elevations of all well were resurveyed on Nov. 29, 1995, following installation of MW-8, MW-9, and MW-11. Elevations relative to a found "cut-cross" in the top of the depressed curb at the mid return of the northwest corner of the intersection of Santa Clara Avenue and oak Street. Benchmark elevation taken as 28.455 feet above MSL

(3) MW-10 inaccessible due to parked car

MSL = Mean Sea Level

NM = Not Measured

Ground water elevations (GWE) are corrected for free product thickness (FPT) using the following equation: Corrected GWE = Top of Casing Elevation - (Measured Depth to Water - (0.8 x FPT))

Data prior to 11/09/94 from Environmental Science and Engineering, Inc.

TABLE 3
GROUNDWATER ANALYTICAL RESULTS
Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Well Number	Date Sampled	TPH as Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)	Xylene (Total) (µg/L)	TPH as Diesel (µg/L)	HVOCs (µg/L)	MTBE (µg/L)
MW-1	01/07/93	110,000	14,000	17,000	2,500	8,800	ND (3,000)	1,2-DCE-470	NA
	09/07/93	28,000	11,000	2,100	380	1,200	1,000 (2)	NA	NA
	12/07/93	17,000	10,000	3,000	610	2,000	1,800 (1)	NA	NA
	03/04/94	6,600	4,400	870	150	590	920 (4)	NA	NA
	06/06/94	12,000	6,300	230	ND (0.5)	ND (0.5)	710 (4)	NA	NA
	11/09/94	28,000	9,500	3,000	810	2,300	250	NA	NA
	12/20/94	5,600	3,000	92	86	76	ND (50)	NA	NA
	03/29/95	24,000	5,800	3,100	390	1,300	ND (50)	NA	NA
	05/24/95	2,500	800	280	31	130	ND (50)	NA	NA
	08/30/95	48,000	14,000	3,500	620	1,600	800	NA	NA
	11/29/95	120,000	42,000	22,000	2,300	9,900	ND (1000)	NA	NA
	05/01/96	49,800	11,800	5,720	121	3,160	ND (50)	1,2-DCE-5.6	NA
	08/05/96	54,600	17,400	7,440	1,130	3,880	ND (50)	1,2-DCE-50.7	NA
	12/10/96	27,500	7,680	2,020	720	720	ND (50)	ND	NA
	03/06/97	86,900	18,900	7,730	1,470	3,320	ND (50)	ND	NA
	06/25/97	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**
MW-2	01/07/93	85,000	20,000	8,500	1,500	4,300	ND (3,000)	1,2-DCE-550	NA
	09/07/93	140,000	46,000	28,000	3,300	15,000	8,200 (2)	NA	NA
	12/07/93	86,000	28,000	17,000	35,000	16,000	8,200 (2)	NA	NA
	03/04/94	130,000	22,000	22,000	3,500	16,000	18,000 (4)	NA	NA
	06/06/94	100,000	27,000	22,000	2,300	10,000	9,600 (5)	NA	NA
	11/09/94	NSL	NSL	NSL	NSL	NSL	NSL	NA	NA
	12/20/94	NSL	NSL	NSL	NSL	NSL	NSL	NA	NA
	03/29/95	240,000	56,000	30,000	3,100	7,000	3,800	NA	NA
	05/24/95	330,000	54,000	51,000	4,700	22,000	28,000	NA	NA
	08/30/95	200,000	48,000	52,000	3,900	16,000	8,000	NA	NA
	11/29/95	170,000	42,000	40,000	3,400	17,000	ND (1000)	NA	NA
	05/01/96	481,000	59,000	69,000	27,200	89,600	ND (50)	1,2-DCE-61.8	NA
	08/05/96	193,000	41,800	56,000	3,590	18,000	ND (50)	1,2-DCE-83.2	NA
	12/10/96	166,000	26,400	38,600	3,180	14,700	ND (50)	ND	NA
	03/06/97	316,000	36,600	55,900	4,160	16,100	ND (50)	ND	NA
	06/25/97	**160,000**	**37,000**	**63,000**	**3,500**	**19,000**	**NA**	**ND**	**ND**
MW-3	01/07/93	8,500 (3)	170	70	ND (30)	ND (30)	ND (3,000)	NA	NA
	09/07/93	2,800	19	46	7.7	23	2,500 (1)	NA	NA
	12/07/93	3,000	17	43	13	28	520 (2)	NA	NA
	03/04/94	2,300	22	46	9.0	27	1,300 (5)	NA	NA
	06/06/94	1,900	3.9	ND (0.5)	9.0	27	1,600 (5)	NA	NA
	11/09/94	2,800	2.6	17	17	32	ND (50)	NA	NA
	12/20/94	2,700	10	62	24	59	ND (50)	NA	NA
	03/29/95	1,200	230	230	13	37	500	NA	NA
	05/24/95	5,700	ND (5)	73	20	57	ND (50)	NA	NA
	08/30/95	3,100	ND (1.0)	29	13	28	ND (50)	NA	NA
	11/29/95	13,000	39	59	7	33	ND (80)	NA	NA
	05/01/96	3,020	ND (1.0)	39.9	9.86	30.8	ND (50)	ND	NA
	08/05/96	2,340	4.1	5.3	4.9	25.3	ND (50)	ND	NA
	12/10/96	694,000	920	5,980	1,060	2,960	ND (50)	ND	NA
	03/06/97	9,060	136	244	34	126	ND (50)	ND	NA
	06/25/97	**600**	**ND**	**1.1**	**ND**	**3.0**	**NA**	**ND**	**ND**

TABLE 3
GROUNDWATER ANALYTICAL RESULTS
Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Well Number	Date Sampled	TPH as Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)	Xylene (Total) (µg/L)	TPH as Diesel (µg/L)	HVOCs (µg/L)	MTBE (µg/L)
MW-4	09/07/93	440	2.7	1.2	1	1.9	330 (2)	NA	NA
	12/07/93	610	6.6	0.5	0.61	2.5	460 (2)	NA	NA
	03/04/94	110	ND (0.5)	ND (0.5)	ND (0.5)	0.63	56 (5)	NA	NA
	06/06/94	68	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	68 (4)	NA	NA
	11/09/94	90	0.7	1.1	0.5	2.1	ND(50)	NA	NA
	12/20/94	130	2.2	33	4.8	27	ND (50)	NA	NA
	03/29/95	ND (50)	ND (0.5)	0.5	ND (0.5)	ND (0.5)	ND (50)	NA	NA
	05/24/95	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (50)	NA	NA
	08/30/95	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (50)	NA	NA
	11/29/95	100	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (50)	NA	NA
	05/01/96	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (50)	ND	NA
	08/05/96	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (50)	ND	NA
	12/10/96	65	ND (0.5)	ND (0.5)	ND (0.5)	0.6	ND (50)	ND	NA
	03/06/97	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND	NA
	06/25/97	**200**	ND (0.5)	ND (0.5)	**0.5**	ND (0.5)	**NA**	**ND**	**ND**
MW-5	09/07/93	37,000	2,700	1,700	870	4,600	1,700 (2)	NA	NA
	12/07/93	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	03/04/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	06/06/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	11/09/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	12/20/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	03/29/95	54,000	6,800	3,600	1,500	7,600	7,500	NA	NA
	05/24/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	08/30/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	11/29/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	05/01/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	08/05/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	12/10/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	03/06/97	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	06/25/97	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**
MW-6	09/07/93	10,000	1,300	540	370	1,600	1,400 (2)	NA	NA
	12/07/93	17,000	4,300	1,200	600	2,700	2,400 (2)	NA	NA
	03/04/94	21,000	4,600	1,000	460	1,800	1,800 (4)	NA	NA
	06/06/94	12,000	5,400	350	ND (0.5)	1,200	1,600 (4)	NA	NA
	11/09/94	29,000	4,600	1,600	820	3,600	7,500	NA	NA
	12/20/94	66,000	5,800	2,200	1,100	4,600	1,100	NA	NA
	03/29/95	25,000	8,000	780	450	1,300	1,300	NA	NA
	05/24/95	56,000	1,600	1,300	1,200	7,200	40,000	NA	NA
	08/30/95	68,000	16,000	3,400	1,900	6,800	4,900	NA	NA
	11/29/95	57,000	15,000	2,900	2,500	10,000	ND (900)	NA	NA
	05/01/96	39,500	7,400	2,540	1,270	4,470	ND (50)	1,2-DCE-73	NA
	08/05/96	71,200	22,600	4,000	2,100	7,030	ND (50)	1,2-DCE-157	NA
	12/10/96	49,200	10,900	2,180	1,880	6,720	ND (50)	1,2-DCE-210	NA
	03/06/97	65,300	10,300	2,500	1,940	5,770	ND (50)	ND	NA
	06/25/97	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**

TABLE 3
GROUNDWATER ANALYTICAL RESULTS
Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

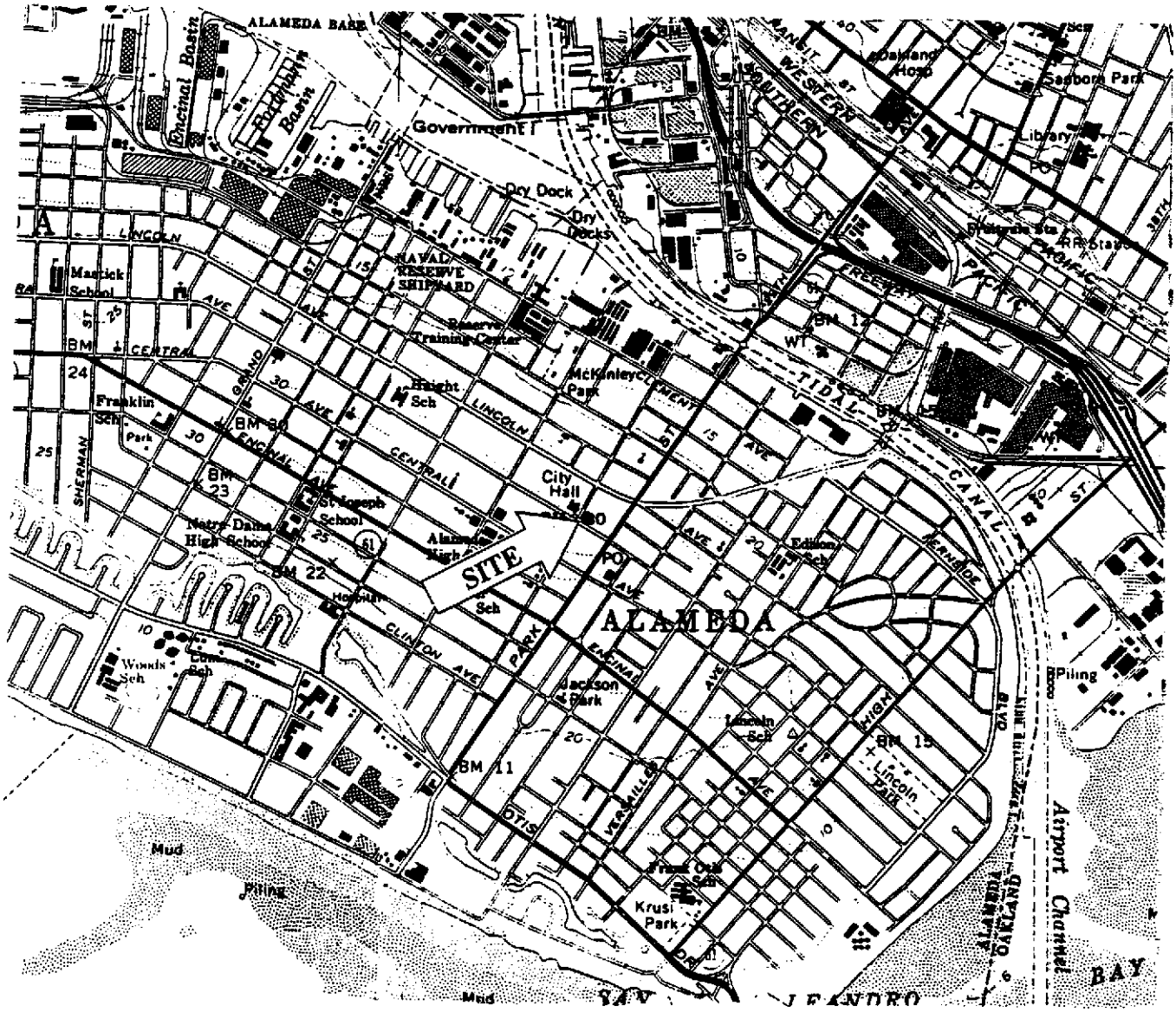
Well Number	Date Sampled	TPH as Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)	Xylene (Total) (µg/L)	TPH as Diesel (µg/L)	HVOCs (µg/L)	MTBE (µg/L)
MW-7	09/07/93	24,000	6,000	4,800	490	2,300	1,300	NA	NA
	12/07/93	95,000	28,000	24,000	1,600	8,700	2,200	NA	NA
	03/04/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	06/06/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	11/09/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	12/20/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	03/29/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	05/24/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	08/30/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	11/29/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	05/01/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	08/05/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	12/10/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	03/05/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP
	06/25/97	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NSFP**	**NA**	**NSFP**
MW-8	11/29/95	7,400	260	40	140	190	ND (80)	NA	NA
	05/01/96	270	1.02	ND	1.10	1.87	ND (50)	ND	NA
	08/05/96	1,100	22.6	3.4	11.2	12.7	ND (50)	TCB-2.5	NA
	12/10/96	442	17.2	2.7	5.9	5.6	ND (50)	ND	NA
	03/05/97	765	33.2	7.2	9.3	11.1	525	ND	NA
	06/25/97	**700**	**36**	**5.1**	**8.0**	**8.0**	**NA**	**NA**	**10**
MW-9	11/29/95	1,500	590	2	3	20	ND (50)	1,2-DCE-46	NA
	05/01/96	230	142	0.78	ND	1.17	ND (50)	ND	NA
	08/05/96	1,80	3.1	0.5	0.5	2.3	ND (50)	ND	NA
	12/10/96	157,000	13.6	320	135	500	ND (50)	1,2-DCE-5.0	NA
	03/05/97	2,710	940	4.6	20.2	12.4	ND (50)	1,2-DCE-19.2	NA
	06/25/97	**8,000**	**4,600**	**190**	**100**	**30.0**	**NA**	**NA**	**220**
MW-10	11/29/95	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (2)	ND (950)	NA	NA
	05/01/96	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NA
	08/05/96	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (50)	Chloroform	NA
	12/10/96	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (50)	1,2-DCE-10.1	NA
	03/05/97	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (50)	ND	NA
	06/25/97	**ND (0.5)**	**ND (0.5)**	**ND (0.5)**	**ND (0.5)**	**ND (0.5)**	**ND (50)**	**NS**	**ND**
MW-11	11/29/95	3,200	14	31	15	570	ND (50)	NA	NA
	05/01/96	79	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	107	ND	NA
	08/05/96	6,660	5,040	ND (0.5)	51.6	ND (0.5)	ND (50)	1,2-DCE-16.0	NA
	12/10/96	68,000	800	260	200	1,160	ND (50)	ND	NA
	03/05/97	340	4.2	0.6	3.1	5.3	ND (50)	ND	NA
	06/25/97	**300**	**3.5**	**0.9**	**2.7**	**5.0**	**NA**	**NS**	**ND**

NOTES:

1,2-DCE = 1,2-Dichloroethane
TCB = 1,1,2,2-Tetrachlorobenzene
TPH-g = Total Petroleum Hydrocarbons as gasoline
TPH-d = Total Petroleum Hydrocarbons as diesel
MTBE = Methyl tertiarybutyl ether reported in µg/L
µg/L = micrograms per liter or parts per billion (ppb)
ND = Not Detected (detection limit in parentheses)
NSFP = Not Sampled - Free Product present
NSL = Not Samples - well could not be located
NSR = Not Sampled - well could not be reached
NA = Not Analyzed

(1) = Results typical of a non-diesel mixture (<C16)
(2) = Results typical of a diesel and non-diesel mixture (<C16)
(3) = Results typical of weathered gasoline
(4) = Results typical of diesel and unidentified hydrocarbons <C14)
(5) = Results typical of unidentified hydrocarbons (<C14)

FIGURES



USGS 7.5 MINUTE
OAKLAND EAST & WEST,
CALIFORNIA QUADRANGLE

NORTH
0 1000 2000
FEET

ENSR

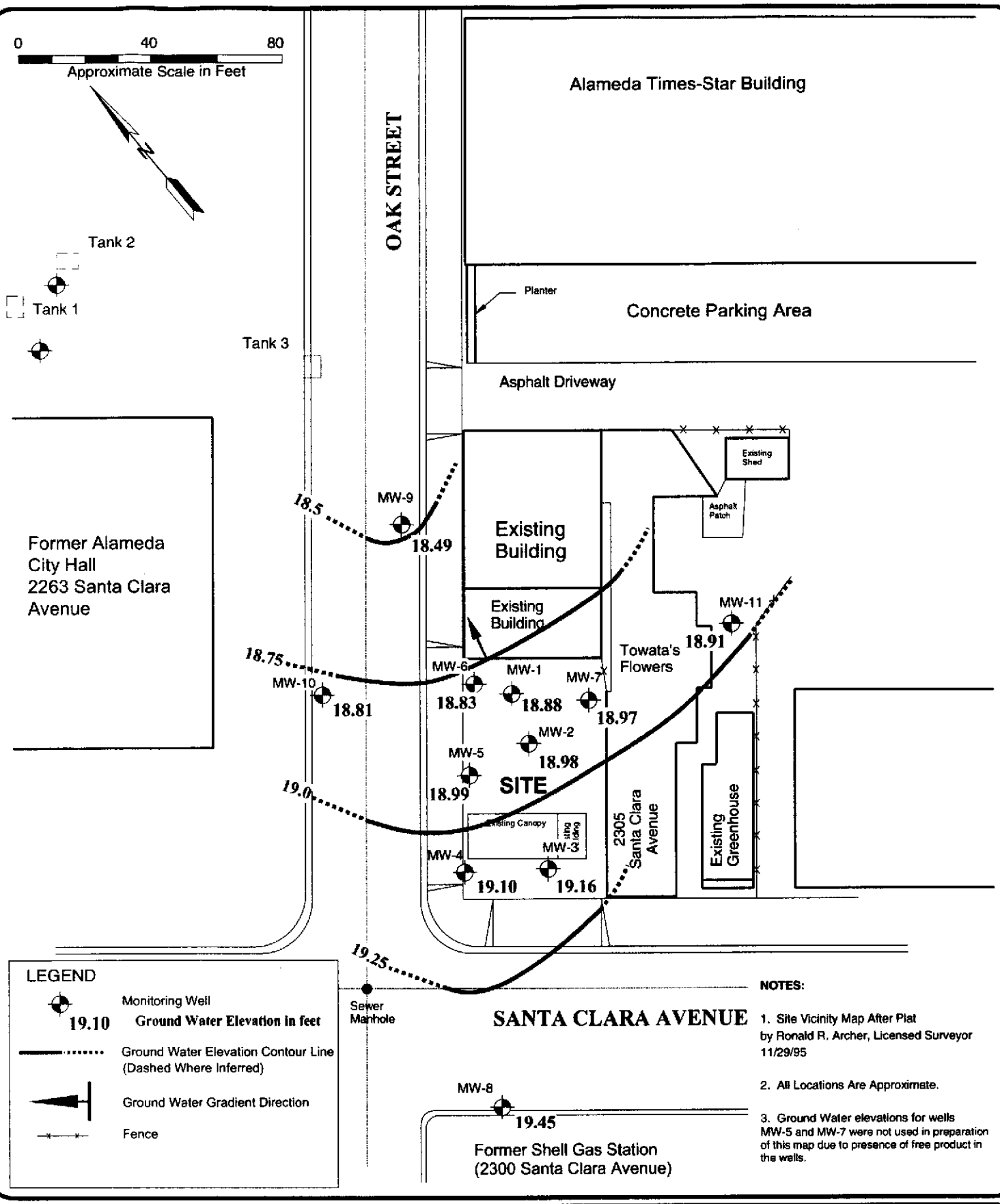
DRAWN BY: J. Paradis	REVISED BY:
DATE: April 4, 1997	DATE:

SITE LOCATION MAP

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

FIGURE
1

PROJECT NUMBER
1475-001



ENSR

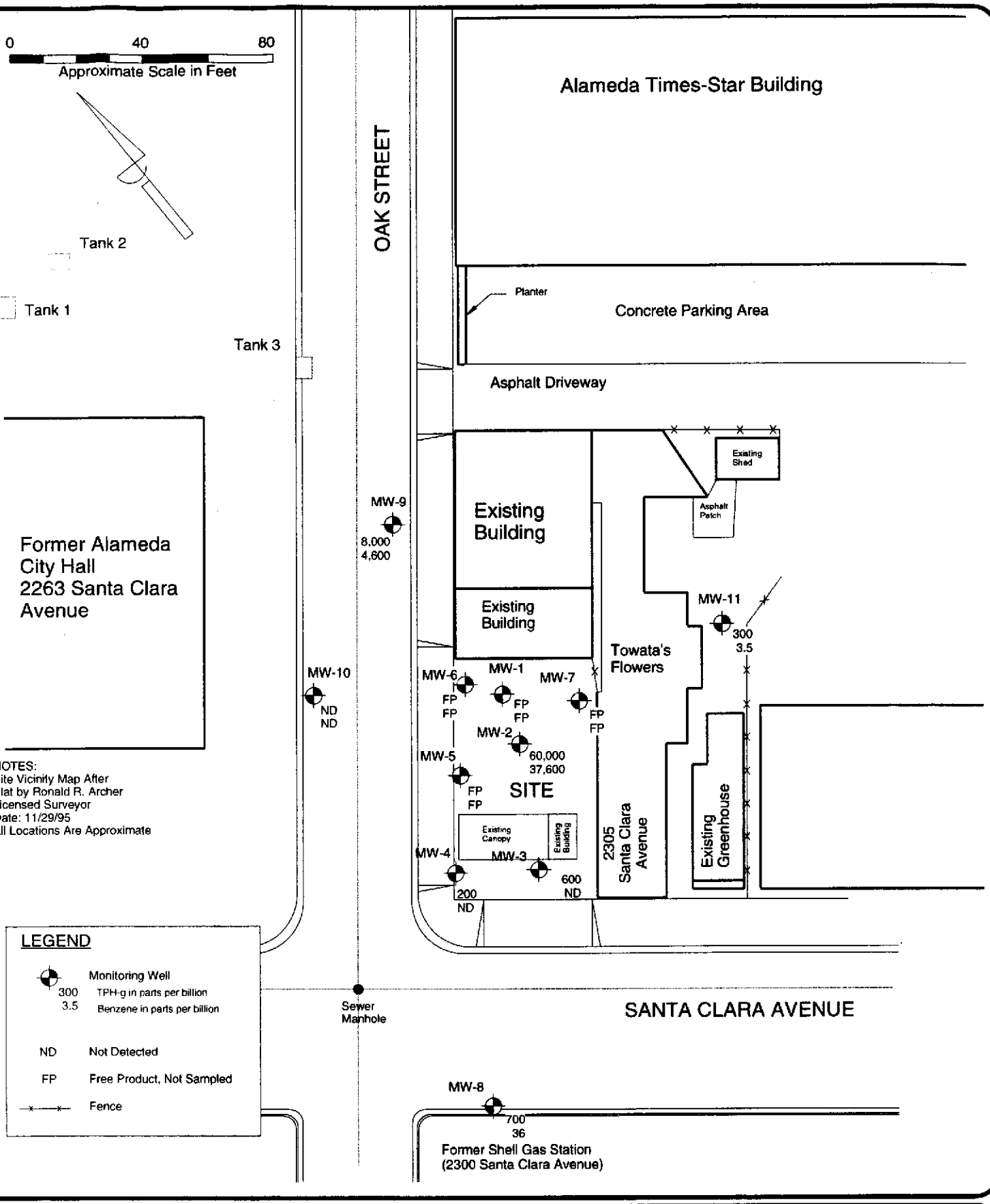
DRAWN BY:	REVISED BY:
J. Paradis	J. Paradis
DATE: October 31, 1996	DATE: July 1,, 1997

POTENTIOMETRIC SURFACE MAP
June 25, 1997

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

FIGURE
2

PROJECT NUMBER
1475-001



ENSR

DRAWN BY:	REVISED BY:
J. Paradis	J. Paradis
DATE: October 31, 1996	DATE: July 23, 1997

DISTRIBUTION MAP OF TPH-g AND BENZENE IN GROUND WATER June 25, 1997

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

FIGURE
3

PROJECT NUMBER:
1475-001

ATTACHMENT A

LABORATORY REPORTS

GROUNDWATER SAMPLE ANALYSIS
JUNE 25, 1997

AMERICAN ENVIRONMENTAL NETWORK
PLEASANT HILL, CALIFORNIA

ENSR

SAMPLE ID: MW-4
AEN LAB NO: 9706390-03
AEN WORK ORDER: 9706390
CLIENT PROJ. ID: 8700688-100

DATE SAMPLED: 06/25/97
DATE RECEIVED: 06/26/97
REPORT DATE: 07/13/97

ANALYTE	METHOD/ CAS#	RESULT		REPORTING LIMIT	UNITS	DATE ANALYZED
BTEX & Gasoline HCs	**EPA 8020**					
Benzene	71-43-2	ND		0.5	ug/L	07/08/97
Toluene	108-88-3	ND		0.5	ug/L	07/08/97
Ethylbenzene	100-41-4	0.5	*	0.5	ug/L	07/08/97
Xylenes, Total	1330-20-7	ND		2	ug/L	07/08/97
Purgeable HCs as Gasoline	5030/GCFID	0.2	*	0.05	mg/L	07/08/97
Methyl t-Butyl Ether	1634-04-4	ND		5	ug/L	07/08/97

ND = Not detected at or above the reporting limit
* = Value at or above reporting limit

ENSR

SAMPLE ID: MW-9
AEN LAB NO: 9706390-05
AEN WORK ORDER: 9706390
CLIENT PROJ. ID: 8700688-100

DATE SAMPLED: 06/25/97
DATE RECEIVED: 06/26/97
REPORT DATE: 07/13/97

ANALYTE	METHOD/ CAS#	RESULT	REPORTING LIMIT	UNITS	DATE ANALYZED
BTEX & Gasoline HCs	**EPA 8020**				
Benzene	71-43-2	4,600 *	5	ug/L	07/09/97
Toluene	108-88-3	190 *	5	ug/L	07/09/97
Ethylbenzene	100-41-4	100 *	5	ug/L	07/09/97
Xylenes, Total	1330-20-7	30 *	20	ug/L	07/09/97
Purgeable HCs as Gasoline	5030/GCFID	8.0 *	0.5	mg/L	07/09/97
Methyl t-Butyl Ether	1634-04-4	220 *	50	ug/L	07/09/97

Reporting limits elevated due to high levels of target compounds. Sample run at dilution. MTBE included in gasoline result.

ND = Not detected at or above the reporting limit
* = Value at or above reporting limit

ENSR

SAMPLE ID: MW-10
AEN LAB NO: 9706390-06
AEN WORK ORDER: 9706390
CLIENT PROJ. ID: 8700688-100

DATE SAMPLED: 06/25/97
DATE RECEIVED: 06/26/97
REPORT DATE: 07/13/97

ANALYTE	METHOD/ CAS#	RESULT	REPORTING LIMIT	UNITS	DATE ANALYZED
BTEX & Gasoline HCs	**EPA 8020**				
Benzene	71-43-2	ND	0.5	ug/L	07/08/97
Toluene	108-88-3	ND	0.5	ug/L	07/08/97
Ethylbenzene	100-41-4	ND	0.5	ug/L	07/08/97
Xylenes, Total	1330-20-7	ND	2	ug/L	07/08/97
Purgeable HCs as Gasoline	5030/GCFID	ND	0.05	mg/L	07/08/97
Methyl t-Butyl Ether	1634-04-4	ND	5	ug/L	07/08/97

ND = Not detected at or above the reporting limit
* = Value at or above reporting limit

ENSR

SAMPLE ID: MW-11
AEN LAB NO: 9706390-07
AEN WORK ORDER: 9706390
CLIENT PROJ. ID: 8700688-100

DATE SAMPLED: 06/25/97
DATE RECEIVED: 06/26/97
REPORT DATE: 07/13/97

ANALYTE	METHOD/ CAS#	RESULT	REPORTING LIMIT	UNITS	DATE ANALYZED
BTEX & Gasoline HCs	**EPA 8020**				
Benzene	71-43-2	3.5 *	0.5	ug/L	07/09/97
Toluene	108-88-3	0.9 *	0.5	ug/L	07/09/97
Ethylbenzene	100-41-4	2.7 *	0.5	ug/L	07/09/97
Xylenes, Total	1330-20-7	5 *	2	ug/L	07/09/97
Purgeable HCs as Gasoline	5030/GCFID	0.3 *	0.05	mg/L	07/09/97
Methyl t-Butyl Ether	1634-04-4	ND	5	ug/L	07/09/97

ND = Not detected at or above the reporting limit
* = Value at or above reporting limit

AEN (CALIFORNIA)
QUALITY CONTROL REPORT

AEN JOB NUMBER: 9706390

CLIENT PROJECT ID: 8700688-100

Quality Control Summary

All laboratory quality control parameters were found to be within established limits.

Definitions

Laboratory Control Sample (LCS)/Method Spike(s): Control samples of known composition. LCS and Method Spike data are used to validate batch analytical results.

Matrix Spike(s): Aliquot of a sample (aqueous or solid) with added quantities of specific compounds and subjected to the entire analytical procedure. Matrix spike and matrix spike duplicate QC data are advisory.

Method Blank: An analytical control consisting of all reagents, internal standards, and surrogate standards carried through the entire analytical process. Used to monitor laboratory background and reagent contamination.

Not Detected (ND): Not detected at or above the reporting limit.

Relative Percent Difference (RPD): An indication of method precision based on duplicate analysis.

Reporting Limit (RL): The lowest concentration routinely determined during laboratory operations. The RL is generally 1 to 10 times the Method Detection Limit (MDL). Reporting limits are matrix, method, and analyte dependent and take into account any dilutions performed as part of the analysis.

Surrogates: Organic compounds which are similar to analytes of interest in chemical behavior, but are not found in environmental samples. Surrogates are added to all blanks, calibration and check standards, samples, and spiked samples. Surrogate recovery is monitored as an indication of acceptable sample preparation and instrumental performance.

D: Surrogates diluted out.

#: Indicates result outside of established laboratory QC limits.

QUALITY CONTROL DATA

METHOD: EPA 8020, 5030 GCFID

AEN JOB NO: 9706390
INSTRUMENT: E, H
MATRIX: WATER

Surrogate Standard Recovery Summary

Date Analyzed	Client Id.	Lab Id.	Percent Recovery Fluorobenzene
07/09/97	MW-2	01	98
07/09/97	MW-3	02	101
07/08/97	MW-4	03	107
07/09/97	MW-8	04	97
07/09/97	MW-9	05	115
07/08/97	MW-10	06	104
07/09/97	MW-11	07	105
QC Limits:			70-130

DATE ANALYZED: 07/09/97
SAMPLE SPIKED: LCS
INSTRUMENT: E

Laboratory Control Sample Recovery

Analyte	Spike Added (ug/L)	Percent Recovery	RPD	QC Limits Percent Recovery	QC Limits RPD
Benzene	18.5	119	9	85-120	20
Toluene	64.7	102	<1	85-120	20
Hydrocarbons as Gasoline	500	108	4	85-120	20

Daily method blanks for all associated analytical runs showed no contamination at or above the reporting limit.

*** END OF REPORT ***

[redacted]ing In[redacted]tion: [redacted]

1. Client: ENSR
Address: 1420 Harbor Bay Pkwy
Suite 160 Alameda
Contact: Rosyn Simonsen
Alt. Contact: Peter Hudson

American Environmental Network
3440 Vincent Road, Pleasant Hill, CA 94523
Phone (510) 930-9090
FAX (510) 930-0256

R45D
R351

AEN

Page [redacted]

REQUEST FOR ANALYSIS / CHAIN OF CUSTODY

Lab Job Number: 9707290
Lab Destination:
Date Samples Shipped:
Lab Contact:
Date Results Required:
Date Repor. Required:
Client Phone No.:
Client FAX No.:

Address Report To:

2. ENSR

Send Invoice To:

3. ENSR

Send Report To: 1 or 2 (Circle one)

Client P.O. No.: 8700752400 Client Project I.D. No.:

Sample Team Member (s) RK Simonsen

Lab Number	Client Sample Identification	Air Volume	Date/ Time Collected	Sample Type*	Pres.	No. of Cont.	Type of Cont.	TPH-g	BTEX	MTBE	Comments / Hazards
[redacted]01A	TWP-1	01A-C	7/21	H2O	HCl	3	40ml	X	X	X	
[redacted]02A	TWP-2	02A-C		H2O		3	VOA				
[redacted]03	TWP-3	03A-C		H2O		3					
	TWP-4	04A-C		H2O		3					
	TWP-5	05A-C		H2O		3					
	TWP-6	06A-C		H2O		3					
	TWP-7	07A-C		H2O	V	3					
	TWP-8	08A-C		H2O		3					
	TWP-3 @ 11'	09A		Soil	None	1					
	TWP-4 @ 11'	10A		Soil		1					
	TWP-5 @ 11'	11A	V	Soil		1		V	V	V	

Relinquished by: (Signature) RK Simonsen	DATE 7/22/97	TIME 11:45	Received by: (Signature) Rich Silvano
Relinquished by: (Signature) Rich Silvano	DATE 7-22-97	TIME 12:25	Received by: (Signature) Jami Gillespie
Relinquished by: (Signature)	DATE	TIME	Received by: (Signature)
Method of Shipment			Lab Comments

DATE 7-22-97 TIME 11:45
DATE 7-22-97 TIME 1225
DATE TIME

*Sample type (Specify): 1) 37mm 0.8 µm MCEF 2) 25mm 0.8 µm MCEF 3) 25mm 0.4 µm polycarb. filter
4) PVC filter, diam. ____ pore size ____ 5) Charcoal tube 6) Silica gel tube 7) Water 8) Soil 9) Bulk Sample
10) Other ____ 11) Other ____

COPIES: WHITE - JOB FILE YELLOW - PROJECT FILE PINK - CLIENT

ATTACHMENT B

STANDARD OPERATING PROCEDURES
GROUNDWATER MONITORING AND SAMPLING

ENSR

SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY PROCEDURES SOP-4

Sample identification and chain-of-custody procedures ensure sample integrity, and document sample possession from the time of collection to its ultimate disposal. Each sample container submitted for analysis is labeled to identify the job number, date, time of sample collection, a sample number unique to the sample, any name(s) of on-site personnel and any other pertinent field observations also recorded on the field excavation or boring log.

Chain-of-custody forms are used to record possession of the sample from time of collection to its arrival at the laboratory. During shipment, the person with custody of the samples will relinquish them to the next person by signing the chain-of-custody form(s) and noting the date and time. The sample-control officer at the laboratory will verify sample integrity, correct preservation, confirm collection in the proper container(s), and ensure adequate volume for analysis.

If these conditions are met, the samples will be assigned unique laboratory log numbers for identification throughout analysis and reporting. The log numbers will be recorded on the chain-of-custody forms and in the legally-required log book maintained in the laboratory. The sample description, date received, client's name, and any other relevant information will also be recorded.

LABORATORY ANALYTICAL QUALITY ASSURANCE AND CONTROL SOP-5

In addition to routine instrument calibration, replicates, spikes, blanks, spiked blanks, and certified reference materials are routinely analyzed at method-specific frequencies to monitor precision and bias. Additional components of the laboratory Quality Assurance/Quality Control program include:

1. Participation in state and federal laboratory accreditation/certification programs;
2. Participation in both U.S. EPA Performance Evaluation studies (WS and WP studies) and inter-laboratory performance evaluation programs;
3. Standard operating procedures describing routine and periodic instrument maintenance;
4. "Out-of-Control"/Corrective Action documentation procedures; and,
5. Multi-level review of raw data and client reports.

GROUNDWATER PURGING AND SAMPLING SOP-7

Prior to water sampling, each well is purged by evacuating a minimum of three wetted well-casing volumes of groundwater. When required, purging will continue until either the discharge water temperature, conductivity, or pH stabilize to within 10% of previously measured values; and a maximum of ten wetted casing volumes of groundwater have been recovered, or the well is bailed dry. When practical, the groundwater sample should be collected when the water level in the well recovers to at least 80 percent of its static level. Field measurements, observations and procedures are noted.

The sampling equipment consists of a clean bailer, or stainless steel bladder pump with a "Teflon" bladder. If the sampling system is dedicated to the well, then the bailer is usually "Teflon," but the bladder pump may be PVC with a polypropylene bladder. Sample container type, preservation, and volume depends on the intended analyses.

The groundwater sample is decanted into each VOA vial in such a manner that there is no meniscus at the top of the vial. A cap is quickly secured to the top of the vial. The vial is then inverted and gently tapped to see if air bubbles are present. If none are present, the vial is labeled and refrigerated for delivery, under strict chain-of-custody, to the analytical laboratory. Label information should include a unique sample identification number, job identification number, date, time, and the sampler's initials.

For quality control purposes, a duplicate water sample may be collected from a well. When required, a trip blank is prepared at the laboratory and placed in the transport cooler. It is labeled similar to the well samples, remains in the cooler during transport, and is analyzed by the laboratory along with the groundwater samples. In addition, a field blank may be prepared in the field when sampling equipment is not dedicated. The field blank is prepared after a pump or bailer has been either steam cleaned or properly washed, prior to use in the next well, and is analyzed along with the other samples. The field blank analysis demonstrates the effectiveness of in-field cleaning procedures to prevent cross-contamination.

To minimize the potential for cross-contamination between wells, all well development and water sampling equipment not dedicated to a well is either steam cleaned or properly washed between use. As a second precautionary measure, wells are sampled in order of lowest to highest concentrations as established by available previous analytical data.

In the event the water samples cannot be submitted to the analytical laboratory on the same day they are collected (e.g., due to weekends or holidays), the samples are temporarily stored until the first opportunity for submittal either on ice in a cooler, such as when in the field, or in a refrigerator.

MEASURING LIQUID LEVELS USING A WATER LEVEL INDICATOR OR INTERFACE PROBE SOP-12

Field equipment used for liquid-level gauging typically includes the measuring probe (water level or interface) and a clean product bailer(s). The field kit also includes cleaning supplies (buckets, TSP, spray bottles, and deionized water) to be used in cleaning the equipment between wells.

Prior to measurement, the probe tip is lowered into the well until it touches bottom. Using the previously established top-of-casing or top-of-box (i.e., wellhead vault) point, the probe cord (or halyard) is marked and a measuring tape (graduated in hundredths of a foot) is used to determine the distance between the probe end and the marking on the cord. This measurement is then recorded on the liquid-level data sheet as the "Measured Total Depth" of the well.

When necessary in using the interface probe to measure liquid levels, the probe is first electrically grounded to either the metal stove pipe or another metal object nearby. When no ground is available, reproducible measurements can be obtained by clipping the ground lead to the handle of the interface probe case.

The probe tip is then lowered into the well and submerged in the groundwater. An oscillating (beeping) tone indicates the probe is in water. The probe is slowly raised until either the oscillating tone ceases or becomes a steady tone. In either case, this is the depth-to-water (DTW) indicator and the DTW measurement is made accordingly. The steady tone indicates floating hydrocarbons. In this case, the probe is slowly raised until the steady tone ceases. This is the depth-to-product (DTP) indicator and the measurement of DTP is recorded. A corrected depth to groundwater to account for floating hydrocarbons can be calculated by using the following formula:

CDTW = DTW - (SP.G x LHT).
CDTW = Corrected depth to groundwater.
DTW = Measured depth to groundwater.
SP.G = Specific gravity: unweathered gasoline = 0.75; diesel = 0.80
LHT = Measured liquid hydrocarbon thickness.

The corresponding groundwater elevation is the difference between a previously determined well reference elevation and either the depth to groundwater or the corrected depth to groundwater.

The process of lowering and raising the probe must be repeated several times to ensure accurate measurements. The DTW and DTP measurements are recorded on the liquid-level data sheet. When floating product is indicated by the probe's response, a product bailer is lowered partially through the product-water interface to confirm the product on the water surface, and as further indication of product thickness, particularly in cases where the product layer is quite thin. Either this measurement or the difference between DTW and DTP is recorded on the data sheet as "product thickness."

In order to avoid cross-contamination of wells during the liquid-level measurement process, wells are measured in the order of "clean" to "dirty" (where such information is available). In addition, all measurement equipment is cleaned with TSP or similar solution and thoroughly rinsed with deionized water before use, between measurements in respective wells, and at the completion of the day's activities.