



MAR 16 PM 2:26

March 8, 1999

Project 20805-127.006

Mr. Paul Supple  
ARCO Products Company  
P.O. Box 6549  
Moraga, California 94570

Re: Quarterly Groundwater Monitoring Report, Fourth Quarter 1998, for ARCO Service Station No. 2111, located at 1156 Davis Street, San Leandro, California

Dear Mr. Supple:

Pinnacle Environmental Solutions, a division of EMCON (Pinnacle), is submitting the attached report which presents the results of the fourth quarter 1998 groundwater monitoring program at ARCO Products Company (ARCO) Service Station No. 2111, located at 1156 Davis Street, San Leandro, California. The monitoring program complies with Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

### LIMITATIONS

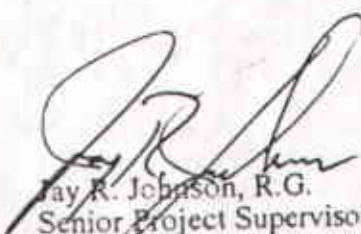
No monitoring event is thorough enough to describe all geologic and hydrogeologic conditions of interest at a given site. If conditions have not been identified during the monitoring event, results should not be construed as a guarantee of the absence of such conditions at the site, but rather as the product of the scope and limitations of work performed during the monitoring event.

Please call if you have questions.

Sincerely,

Pinnacle

  
Glen VanderVeen  
Project Manager

  
Jay R. Johnson, R.G.  
Senior Project Supervisor

Attachment: Quarterly Groundwater Monitoring Report, Fourth Quarter 1998

cc: Kevin Tinsley, ACHCSA  
Mike Bakaldin, San Leandro Hazardous Materials Program



March 8, 1999

## ARCO QUARTERLY GROUNDWATER MONITORING REPORT

Station No.: 2111 Address: 1156 Davis Street, San Leandro, California  
Pinnacle Project No. 20805-127.006  
ARCO Environmental Engineer/Phone No.: Paul Supple / (925) 299-8891  
Pinnacle Project Manager/Phone No.: Glen VanderVeen / (925) 977-9020  
Primary Agency/Regulatory ID No.: ACHCSA

### WORK PERFORMED THIS QUARTER (FOURTH - 1998):

1. Prepared and submitted quarterly groundwater monitoring report for third quarter 1998.
2. Performed quarterly groundwater monitoring and sampling for fourth quarter 1998.

### WORK PROPOSED FOR NEXT QUARTER (FIRST - 1999):

1. Prepare and submit quarterly groundwater monitoring report for fourth quarter 1998.
2. Perform quarterly groundwater monitoring and sampling for first quarter 1999.

### QUARTERLY MONITORING:

Current Phase of Project: Quarterly Groundwater Monitoring  
Frequency of Sampling: Quarterly: MW-1 through MW-7  
Frequency of Monitoring: Quarterly (groundwater)  
Is Floating Product (FP) Present On-site:  Yes  No  
Bulk Soil Removed to Date : Unknown  
Bulk Soil Removed This Quarter : None  
Water Wells or Surface Waters,  
within 2000 ft., impacted by site: None  
Current Remediation Techniques: None  
Average Depth to Groundwater: 16.6 feet  
Groundwater Flow Direction and Gradient  
(Average): 0.008 ft/ft toward west

### DISCUSSION:

- ACHCSA has requested that groundwater samples be analyzed for fuel oxygenates. This request came after the first quarter sampling event. Selected samples will be analyzed for fuel oxygenates during the second quarter 1999.

### ATTACHMENTS:

- Table 1 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Figure 1 - Groundwater Analytical Summary Map
- Figure 2 - Groundwater Elevation Contour Map
- Appendix A - Sampling and Analysis Procedures
- Appendix B - Certified Analytical Reports and Chain-of-Custody Documentation
- Appendix C - Field Data Sheets

**Table 1**  
**Historical Groundwater Elevation and Analytical Data**  
**Petroleum Hydrocarbons and Their Constituents**

**ARCO Service Station 2111**  
**1156 Davis Street, San Leandro, California**

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	TRPH EPA 418.1 µg/L	TPHD LUFT Method µg/L
MW-1	08-01-95	39.60	17.45	22.15	ND	NR	NR	08-01-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
MW-1	12-14-95	39.60	17.09	22.51	ND	W	0.002	12-14-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	03-21-96	39.60	14.72	24.88	ND	WSW	0.005	03-21-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	05-24-96	39.60	15.94	23.66	ND	W	0.003	05-24-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	08-09-96	39.60	17.89	21.71	ND	WNW	0.01	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	11-06-96	39.60	18.66	20.94	ND	WNW	0.007	11-06-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	03-24-97	39.60	16.13	23.47	ND	W	0.005	03-24-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	05-27-97	39.60	17.23	22.37	ND	NNW	0.006	05-28-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	08-07-97	39.60	18.68	20.92	ND	W	0.009	08-07-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	11-10-97	39.60	19.19	20.41	ND	W	0.002	11-10-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	02-16-98	39.60	12.61	26.99	ND	SSW	0.013	02-16-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	04-15-98	39.60	14.30	25.30	ND	WSW	0.014	04-15-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	07-24-98	39.60	16.40	23.20	ND	NW	0.01	07-24-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	10-19-98	39.60	17.90	21.70	ND	W	0.008	10-19-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-2	08-01-95	37.99	15.67	22.32	ND	NR	NR	08-01-95	23000	1300	310	500	3500	--	--	--
MW-2	12-14-95	37.99	15.36	22.63	ND	W	0.002	12-14-95	7300	900	25	180	1000	<200	--	--
MW-2	03-21-96	37.99	12.84	25.15	ND	WSW	0.005	03-21-96	9600	850	30	280	1400	250	--	--
MW-2	05-24-96	37.99	14.03	23.96	ND	W	0.003	05-24-96	2300	300	<5	73	310	<25	--	--
MW-2	08-09-96	37.99	16.10	21.89	ND	WNW	0.01	08-09-96	2800	290	6	75	320	50	--	--
MW-2	11-06-96	37.99	16.98	21.01	ND	WNW	0.007	11-06-96	750	76	<1	15	51	110	--	--
MW-2	03-24-97	37.99	14.22	23.77	ND	W	0.005	03-24-97	790	18	<1	2	6	280	--	--
MW-2	05-27-97	37.99	15.42	22.57	ND	NNW	0.006	05-28-97	750	14	<1	<1	10	150	--	--
MW-2	08-07-97	37.99	16.92	21.07	ND	W	0.009	08-07-97	360	31	<2.5	<2.5	15	260	--	--
MW-2	11-10-97	37.99	17.52	20.47	ND	W	0.002	11-10-97	1300	82	<5	14	49	550	--	--
MW-2	02-16-98	37.99	12.04	25.95	ND	SSW	0.013	02-16-98	<2500	<25	<25	<25	<25	4200	--	--
MW-2	04-15-98	37.99	12.34	25.65	ND	WSW	0.014	04-15-98	<10000	<100	<100	<100	<100	7300	--	--
MW-2	07-24-98	37.99	14.45	23.54	ND	NW	0.01	07-24-98	<2500	<25	<25	<25	<25	1500	--	--
MW-2	10-19-98	37.99	16.08	21.91	ND	W	0.008	10-19-98	<1000	18	<10	<10	<10	1100	--	--



**Table 1**  
**Historical Groundwater Elevation and Analytical Data**  
**Petroleum Hydrocarbons and Their Constituents**

**ARCO Service Station 2111**  
**1156 Davis Street, San Leandro, California**

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHC LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBS EPA 8020 µg/L	TRPH EPA 418.1 µg/L	TPHD LUFT Method µg/L
MW-3	08-01-95	39.32	17.00	22.32	ND	NR	NR	08-01-95	<50	<0.5	<0.5	<0.5	<0.5	∅	600	76*
MW-3	12-14-95	39.32	16.70	22.62	ND	W	0.002	12-14-95	<50	<0.5	<0.5	<0.5	<0.5	∅	<500	<50
MW-3	03-21-96	39.32	14.17	25.15	ND	WSW	0.005	03-21-96	<50	<0.5	<0.5	<0.5	<0.5	∅	<500	<50
MW-3	05-24-96	39.32	15.30	24.02	ND	W	0.003	05-24-96	<50	<0.5	<0.5	<0.5	<0.5	∅	<500	<50
MW-3	08-09-96	39.32	17.58	21.74	ND	WNW	0.01	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	∅	<500	∅
MW-3	11-06-96	39.32	18.33	20.99	ND	WNW	0.007	11-06-96	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-3	03-24-97	39.32	15.44	23.88	ND	W	0.005	03-24-97	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-3	05-27-97	39.32	16.75	22.57	ND	NNW	0.006	05-28-97	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-3	08-07-97	39.32	18.35	20.97	ND	W	0.009	08-07-97	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-3	11-10-97	39.32	18.83	20.49	ND	W	0.002	11-10-97	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-3	02-16-98	39.32	11.99	27.33	ND	SSW	0.013	02-16-98	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-3	04-15-98	39.32	13.75	25.57	ND	WSW	0.014	04-15-98	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-3	07-24-98	39.32	15.90	23.42	ND	NW	0.01	07-24-98	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-3	10-19-98	39.32	17.45	21.87	ND	W	0.008	10-19-98	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	08-01-95	38.10	15.65	22.45	ND	NR	NR	08-01-95	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	12-14-95	38.10	15.35	22.75	ND	W	0.002	12-14-95	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	03-21-96	38.10	12.74	25.36	ND	WSW	0.005	03-21-96	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	05-24-96	38.10	14.03	24.07	ND	W	0.003	05-24-96	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	08-09-96	38.10	16.10	22.00	ND	WNW	0.01	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	11-06-96	38.10	17.00	21.10	ND	WNW	0.007	11-06-96	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	03-24-97	38.10	14.21	23.89	ND	W	0.005	03-24-97	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	05-27-97	38.10	15.38	22.72	ND	NNW	0.006	05-28-97	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	08-07-97	38.10	16.95	21.15	ND	W	0.009	08-07-97	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	11-10-97	38.10	17.53	20.57	ND	W	0.002	11-10-97	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	02-16-98	38.10	10.65	27.45	ND	SSW	0.013	02-16-98	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	04-15-98	38.10	12.20	25.90	ND	WSW	0.014	04-15-98	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	07-24-98	38.10	14.47	23.63	ND	NW	0.01	07-24-98	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅
MW-4	10-19-98	38.10	16.20	21.90	ND	W	0.008	10-19-98	<50	<0.5	<0.5	<0.5	<0.5	∅	∅	∅

**Table 1**  
**Historical Groundwater Elevation and Analytical Data**  
**Petroleum Hydrocarbons and Their Constituents**

**ARCO Service Station 2111**  
**1156 Davis Street, San Leandro, California**

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHC LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTHH EPA 8020 µg/L	TRPH EPA 418.1 µg/L	TPHD LUFT Method µg/L
MW-5	03-21-96	37.21	12.60	24.61	ND	WSW	0.005	03-22-96	<50	<0.5	<0.5	<0.5	<0.5	82	..	..
MW-5	05-24-96	37.21	13.71	23.50	ND	W	0.003	05-24-96	<50	<0.5	<0.5	<0.5	<0.5	7	..	..
MW-5	08-09-96	37.21	15.60	21.61	ND	WNW	0.01	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	8	..	..
MW-5	11-06-96	37.21	16.36	20.85	ND	WNW	0.007	11-06-96	<50	<0.5	<0.5	<0.5	<0.5	100	..	..
MW-5	03-24-97	37.21	13.87	23.34	ND	W	0.005	03-24-97	<50	<0.5	<0.5	<0.5	<0.5	460	..	..
MW-5	05-27-97	37.21	14.71	22.50	ND	NNW	0.006	05-28-97	<100	<1	<1	<1	<1	120	..	..
MW-5	08-07-97	37.21	16.90	20.31	ND	W	0.009	08-07-97	<250	<2.5	<2.5	<2.5	<2.5	250	..	..
MW-5	11-10-97	37.21	16.88	20.33	ND	W	0.002	11-10-97	<1000	<10	<10	<10	<10	770	..	..
MW-5	02-16-98	37.21	10.56	26.65	ND	SSW	0.013	02-16-98	<200	<2	<2	<2	<2	230	..	..
MW-5	04-15-98	37.21	12.20	25.01	ND	WSW	0.014	04-15-98	<500	<5	<5	<5	<5	900	..	..
MW-5	07-24-98	37.21	14.20	23.01	ND	NW	0.01	07-24-98	<500	<5	<5	<5	<5	570	..	..
MW-5	10-19-98	37.21	15.74	21.47	ND	W	0.008	10-19-98	<250	<2.5	<2.5	<2.5	<2.5	300	..	..
MW-6	03-21-96	37.11	11.55	25.56	ND	WSW	0.005	03-22-96	<50	<0.5	1.9	<0.5	<0.5	<3	..	..
MW-6	05-24-96	37.11	12.80	24.31	ND	W	0.003	05-24-96	<50	<0.5	<0.5	<0.5	<0.5	6	..	..
MW-6	08-09-96	37.11	Not surveyed: Car parked on well			NR	NR	08-09-96	Not sampled: Car parked on well							
MW-6	11-06-96	37.11	Not surveyed: Car parked on well			NR	NR	11-06-96	Not sampled: Car parked on well							
MW-6	03-24-97	37.11	13.06	24.05	ND	W	0.005	03-24-97	<50	<0.5	<0.5	<0.5	<0.5	<3	..	..
MW-6	05-27-97	37.11	14.30	22.81	ND	NNW	0.006	05-28-97	<50	<0.5	<0.5	<0.5	<0.5	<3	..	..
MW-6	08-07-97	37.11	16.40	20.71	ND	W	0.009	08-07-97	<50	<0.5	<0.5	<0.5	<0.5	<3	..	..
MW-6	11-10-97	37.11	16.53	20.58	ND	W	0.002	11-10-97	<50	<0.5	<0.5	<0.5	<0.5	<3	..	..
MW-6	02-16-98	37.11	Not surveyed: Car parked on well			SSW	0.013	02-16-98	Not sampled: Car parked on well							
MW-6	04-15-98	37.11	10.95	26.16	ND	WSW	0.014	04-15-98	<50	<0.5	<0.5	<0.5	<0.5	<3	..	..
MW-6	07-24-98	37.11	13.30	23.81	ND	NW	0.01	07-24-98	<50	<0.5	<0.5	<0.5	<0.5	<3	..	..
MW-6	10-19-98	37.11	Not surveyed: Car parked on well			W	0.008	10-19-98	Not sampled: Car parked on well							

**Table 1**  
**Historical Groundwater Elevation and Analytical Data**  
**Petroleum Hydrocarbons and Their Constituents**

**ARCO Service Station 2111**  
**1156 Davis Street, San Leandro, California**

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	TRPH EPA 418.1 µg/L	TPHD LUFT Method µg/L
MW-7	03-21-96	38.68	13.32	25.36	ND	WSW	0.005	03-22-96	32000	870	450	970	4900	280	--	--
MW-7	05-24-96	38.68	14.58	24.10	ND	W	0.003	05-24-96	22000	570	40	42	1900	<200*	--	--
MW-7	08-09-96	38.68	15.33	23.35	ND	WNW	0.01	08-09-96	14000	390	<10	180	470	<200*	--	--
MW-7	11-06-96	38.68	16.95	21.73	ND	WNW	0.007	11-06-96	9500	440	<10	210	150	<100*	--	--
MW-7	03-24-97	38.68	14.65	24.03	ND	W	0.005	03-24-97	6400	420	<10	260	13	480	--	--
MW-7	05-27-97	38.68	15.58	23.10	ND	NNW	0.006	05-28-97	5000	420	<5	230	10	460	--	--
MW-7	08-07-97	38.68	17.10	21.58	ND	W	0.009	08-07-97	3900	350	<5	200	10	330	--	--
MW-7	11-10-97	38.68	18.05	20.63	ND	W	0.002	11-10-97	5600	590	10	370	43	540	--	--
MW-7	02-16-98	38.68	12.03	26.65	ND	SSW	0.013	02-16-98	<5000	390	<50	<50	61	4300	--	--
MW-7	04-15-98	38.68	13.02	25.66	ND	WSW	0.014	04-15-98	<10000	<100	<100	<100	<100	8900	--	--
MW-7	07-24-98	38.68	14.18	24.50	ND	NW	0.01	07-24-98	5800	180	<50	74	<50	4200	--	--
MW-7	10-19-98	38.68	15.99	22.69	ND	W	0.008	10-19-98	<2500	54	<25	72	<25	3000	--	--

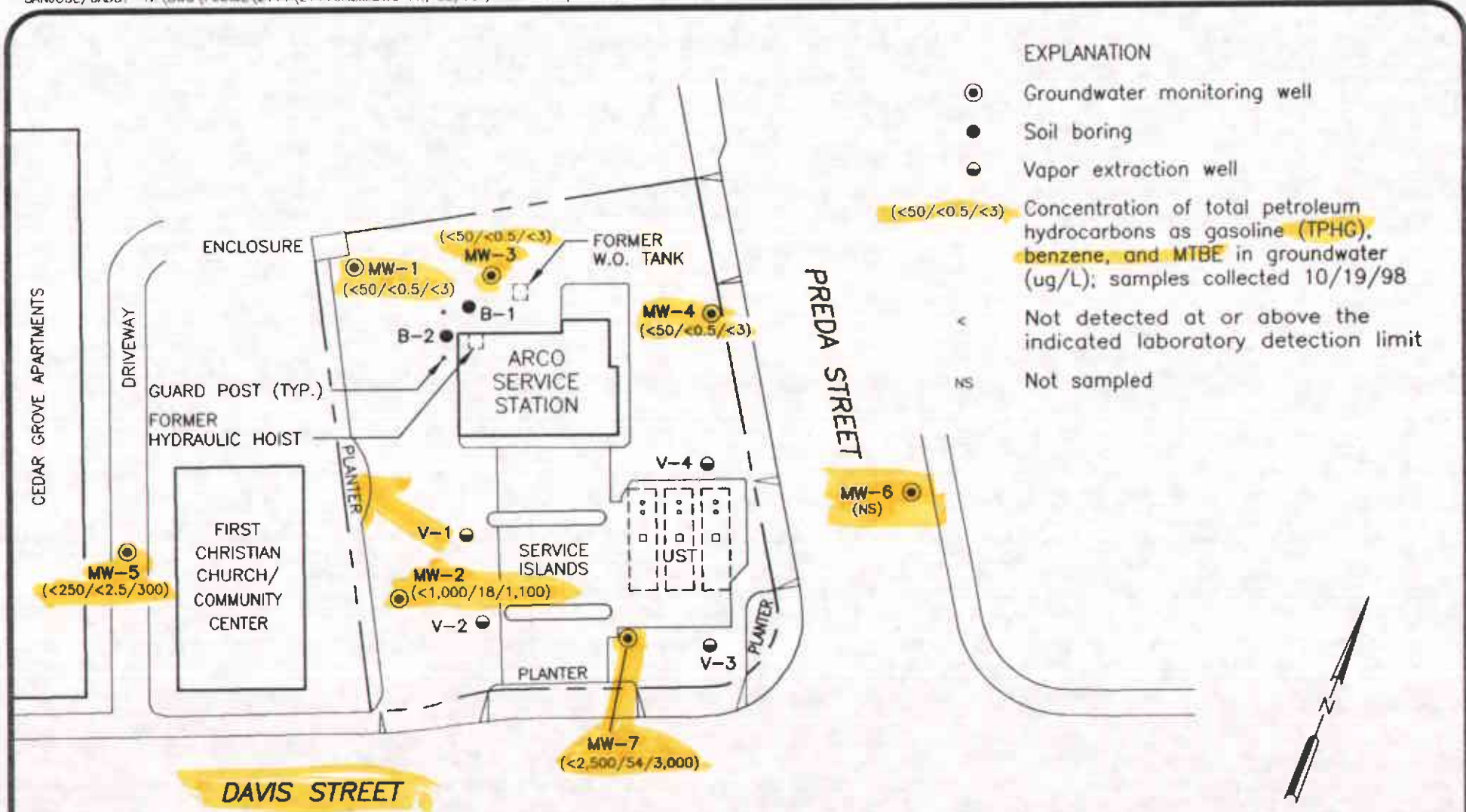


ft-MSL: elevation in feet, relative to mean sea level  
MWN: ground-water flow direction and gradient apply to the entire monitoring well network  
ft/ft: foot per foot  
TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method  
MTBE: Methyl tert-butyl ether  
TRPH: total recoverable petroleum hydrocarbons  
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method  
EPA: United States Environmental Protection Agency  
µg/L: micrograms per liter  
NR: not reported; data not available or not measurable  
ND: none detected  
W: West  
\*: chromatogram fingerprint is not characteristic of diesel  
--: not available or not analyzed





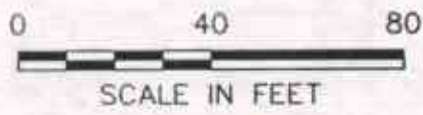
Dimscale: 40 Ltscale: 40 Pltscale: 0  
 IMAGE Files: <No Images>  
 XREF Files: <No Xrefs>  
 SANJOSE/CADD: N:\DWG\PINACL\2111\2111CHEM.DWG Fri, 22/Jan/99 06:02pm kblack



- EXPLANATION**
- ⊙ Groundwater monitoring well
  - Soil boring
  - ⊖ Vapor extraction well
  - (<50/<0.5/<3) Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 10/19/98
  - < Not detected at or above the indicated laboratory detection limit
  - NS Not sampled



**Pinnacle**  
 ENVIRONMENTAL SOLUTIONS  
 A DIVISION OF EMCON

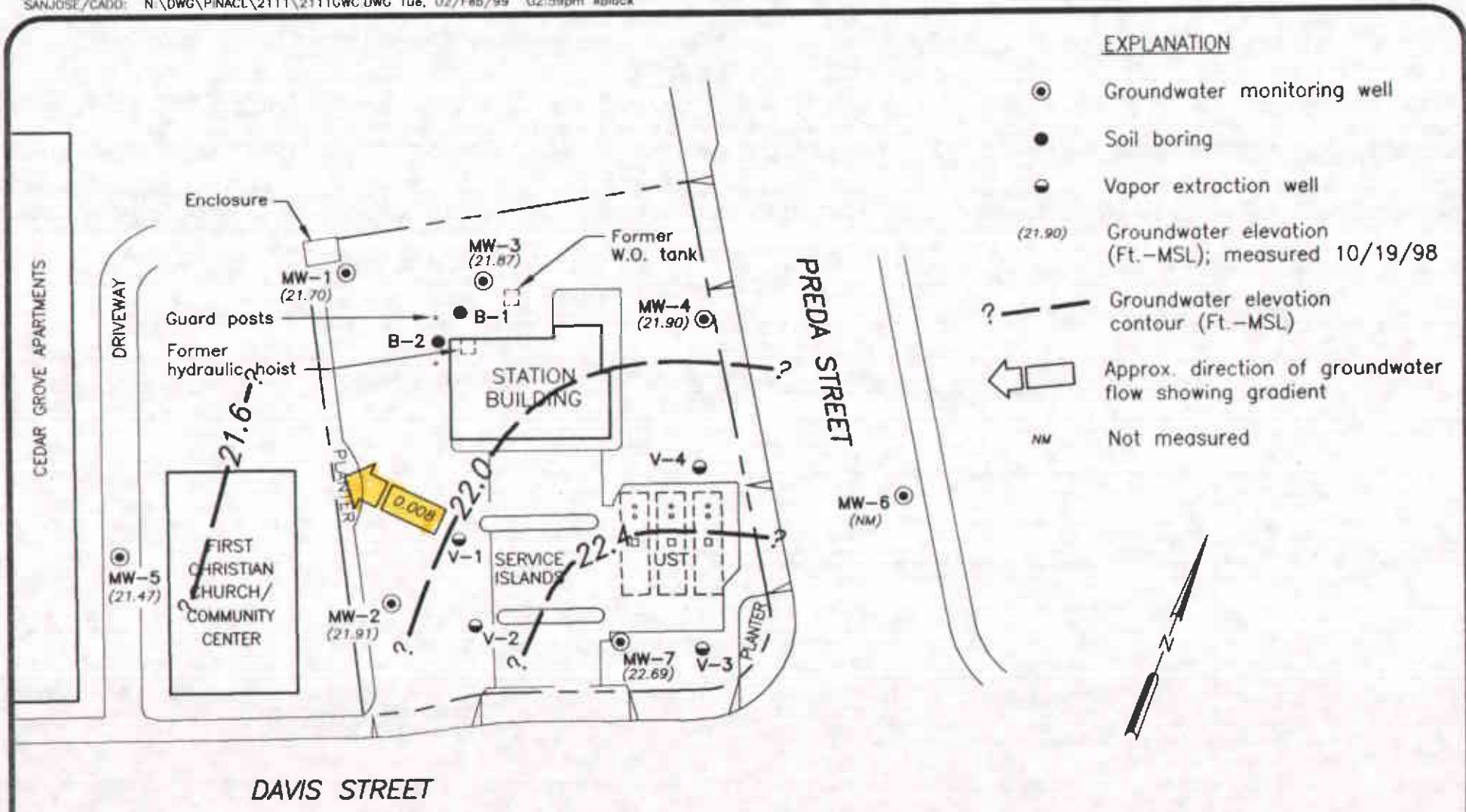


DATE JAN. 1999  
 DWN KAB  
 APP \_\_\_\_\_  
 REV \_\_\_\_\_  
 PROJECT NO. 20805-127.006

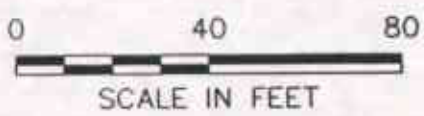
**FIGURE 1**  
 ARCO PRODUCTS COMPANY  
 SERVICE STATION 2111, 1156 DAVIS ST.  
 SAN LEANDRO, CALIFORNIA  
**GROUNDWATER ANALYTICAL SUMMARY**  
 FOURTH QUARTER 1998

1" 1/2" 0" 1"  
 Dimscale: 40 Ltscale: 40 Psitscale: 0  
 SANJOSE/CADD: N:\DWG\PINACL\2111\2111GWC.DWG Tue, 02/Feb/99 02:59pm kblack

IMAGE Files: <No Images>  
 XREF Files: <No Xrefs>



**Pinnacle**  
 ENVIRONMENTAL SOLUTIONS  
 A DIVISION OF EMCON



DATE JAN. 1999  
 DWN KAB  
 APP \_\_\_\_\_  
 REV \_\_\_\_\_  
 PROJECT NO.  
 20805-127.006

**FIGURE 2**  
 ARCO PRODUCTS COMPANY  
 SERVICE STATION 2111, 1156 DAVIS ST.  
 SAN LEANDRO, CALIFORNIA  
**GROUNDWATER ELEVATION CONTOURS**  
**FOURTH QUARTER 1998**



**APPENDIX A**  
**SAMPLING AND ANALYSIS PROCEDURES**

## APPENDIX A

### SAMPLING AND ANALYSIS PROCEDURES

---

The sampling and analysis procedures for water quality monitoring programs are contained in this appendix. The procedures provided for consistent and reproducible sampling methods, proper application of analytical methods, and accurate and precise analytical results. Finally, these procedures provided guidelines so that the overall objectives of the monitoring program were achieved.

The following documents have been used as guidelines for developing these procedures:

- Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities, Environmental Protection Agency (EPA)-530/SW-611, August 1977
- Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document, Office of Solid Waste and Emergency Response (OSWER) 9950.1, September 1986
- Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, 3rd edition, November 1986
- Methods for Organic Chemical Analysis of Municipal and Industrial Waste Water, EPA-600/4-82-057, July 1982
- Methods for Organic Chemical Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983
- Leaking Underground Fuel Tank (LUFT) Field Manual, California State Water Resources Control Board, revised October 1989

### Sample Collection

Sample collection procedures include equipment cleaning, water level and total well depth measurements, and well purging and sampling.

## Equipment Cleaning

Before the sampling event was started, equipment that was used to sample groundwater was disassembled and cleaned with detergent water and then rinsed with deionized water. During field sampling, equipment surfaces that were placed in the well or came into contact with groundwater during field sampling were steam cleaned with deionized water before the next well was purged or sampled.

## Water Level, Floating Hydrocarbon, and Total Well Depth Measurements

Before purging and sampling occurred, the depth to water, floating hydrocarbon thickness, and total well depth were measured using an oil/water interface measuring system. The oil/water interface measuring system consists of a probe that emits a continuous audible tone when immersed in a nonconductive fluid, such as oil or gasoline, and an intermittent tone when immersed in a conductive fluid, such as water. The floating hydrocarbon thickness and water level were measured by lowering the probe into the well. Liquid levels were recorded relative to the tone emitted at the groundwater surface. The sonic probe was decontaminated by being rinsed with deionized water or steam cleaned after each use. A bottom-filling, clear Teflon<sup>®</sup> bailer was used to verify floating hydrocarbon thickness measurements of less than 0.02 foot. Alternatively, an electric sounder and a bottom-filling Teflon bailer may have been used to record floating hydrocarbon thickness and depth to water.

The electric sounder is a transistorized instrument that uses a reel-mounted, two-conductor, coaxial cable that connects the control panel to the sensor. Cable markings are stamped at 1-foot intervals. The water level was measured by lowering the sensor into the monitoring well. A low-current circuit was completed when the sensor contacted the water, which served as an electrolyte. The current was amplified and fed into an indicator light and audible buzzer, signaling when water had been contacted. A sensitivity control compensated for highly saline or conductive water. The electric sounder was decontaminated by being rinsed with deionized water after each use. The bailer was lowered to a point just below the liquid level, retrieved, and observed for floating hydrocarbon.

Liquid measurements were recorded to the nearest 0.01 foot on the depth to water/floating product survey form. The groundwater elevation at each monitoring well was calculated by subtracting the measured depth to water from the surveyed elevation of the top of the well casing. (Every attempt was made to measure depth to water for all wells on the same day.) Total well depth was then measured by lowering the sensor to the bottom of the well. Total well depth, used to calculate purge volumes and to determine whether the well screen was partially obstructed by silt, was recorded to the nearest 0.1 foot on the depth to water/floating product survey form.



## Well Purging

If the depth to groundwater was above the top of screens of the monitoring wells, then the wells were purged. Before sampling occurred, a polyvinyl chloride (PVC) bailer, centrifugal pump, low-flow submersible pump, or Teflon bailer was used to purge standing water in the casing and gravel pack from the monitoring well. Monitoring wells were purged according to the protocol presented in Figure A-1. In most monitoring wells, the amount of water purged before sampling was greater than or equal to three casing volumes. Some monitoring wells were expected to be evacuated to dryness after removing fewer than three casing volumes. These low-yield monitoring wells were allowed to recharge for up to 24 hours. Samples were obtained as soon as the monitoring wells recharged to a level sufficient for sample collection. If insufficient water recharged after 24 hours, the monitoring well was recorded as dry for the sampling event.

Groundwater purged from the monitoring wells was transported in a 500-gallon water trailer, 55-gallon drum, or a 325-gallon truck-mounted tank to EMCON's San Jose or Sacramento office location for temporary storage. EMCON arranged for transport and disposal of the purged groundwater through Integrated Waste Stream Management, Inc.

Field measurements of pH, specific conductance, and temperature were recorded in a waterproof field logbook. Figure A-2 shows an example of the water sample field data sheet on which field data are recorded. Field data sheets were reviewed for completeness by the sampling coordinator after the sampling event was completed.

The pH, specific conductance, and temperature meter were calibrated each day before field activities were begun. The calibration was checked once each day to verify meter performance. Field meter calibrations were recorded on the water sample field data sheet.

## Well Sampling

A Teflon bailer was the only equipment acceptable for well sampling. When samples for volatile organic analysis were being collected, the flow of groundwater from the bailer was regulated to minimize turbulence and aeration. Glass bottles of at least 40-milliliters volume and fitted with Teflon-lined septa were used in sampling for volatile organics. These bottles were filled completely to prevent air from remaining in the bottle. A positive meniscus formed when the bottle was completely full. A convex Teflon septum was placed over the positive meniscus to eliminate air. After the bottle was capped, it was inverted and tapped to verify that it contained no air bubbles. The sample containers for other parameters were filled, filtered as required, and capped.

When required, dissolved concentrations of metals were determined using appropriate field filtration techniques. The sample was filtered by emptying the contents of the Teflon bailer into a pressure transfer vessel. A disposable 0.45-micron acrylic copolymer filter was threaded onto the transfer vessel at the discharge point, and the vessel was sealed. Pressure was applied to the vessel with a hand pump and the filtrate directed into the appropriate containers. Each filter was used once and discarded.

## **Sample Preservation and Handling**

The following section specifies sample containers, preservation methods, and sample handling procedures.

### **Sample Containers and Preservation**

Sample containers vary with each type of analytical parameter. Container types and materials were selected to be nonreactive with the particular analytical parameter tested.

### **Sample Handling**

Sample containers were labeled immediately prior to sample collection. Samples were kept cool with cold packs until received by the laboratory. At the time of sampling, each sample was logged on an ARCO chain-of-custody record that accompanied the sample to the laboratory.

Samples that required overnight storage prior to shipping to the laboratory were kept cool (4° C) in a refrigerator. The refrigerator was kept in a warehouse, which was locked when not occupied by an EMCON employee. A sample/refrigerator log was kept to record the date and time that samples were placed into and removed from the refrigerator.

Samples were transferred from EMCON to an ARCO-approved laboratory by courier or taken directly to the laboratory by the environmental sampler. Sample shipments from EMCON to laboratories performing the selected analyses routinely occurred within 24 hours of sample collection.

### **Sample Documentation**

The following procedures were used during sampling and analysis to provide chain-of-custody control during sample handling from collection through storage. Sample documentation included the use of the following:

- Water sample field data sheets to document sampling activities in the field
- Labels to identify individual samples
- Chain-of-custody record sheets for documenting possession and transfer of samples
- Laboratory analysis request sheets for documenting analyses to be performed

## Field Logbook

In the field, the sampler recorded the following information on the water sample field data sheet (see Figure A-2) for each sample collected:

- Project number
- Client's name
- Location
- Name of sampler
- Date and time
- Well accessibility and integrity
- Pertinent well data (e.g., casing diameter, depth to water, well depth)
- Calculated and actual purge volumes
- Purging equipment used
- Sampling equipment used
- Appearance of each sample (e.g., color, turbidity, sediment)
- Results of field analyses (temperature, pH, specific conductance)
- General comments

The water sample field data sheet was signed by the sampler and reviewed by the sampling coordinator.

## Labels

Sample labels contained the following information:

- Project number
- Sample number (i.e., well designation)
- Sample depth
- Sampler's initials
- Date and time of collection
- Type of preservation used (if any)

## Sampling and Analysis Chain-of-Custody Record

The ARCO chain-of-custody record initiated at the time of sampling contained, at a minimum, the sample designation (including the depth at which the sample was collected), sample type, analytical request, date of sampling, and the name of the sampler. The record sheet was signed, timed, and dated by the sampler when transferring the samples. The number of custodians in the chain of possession was minimized. A copy of the ARCO chain-of-custody record was returned to EMCON with the analytical results.



## Groundwater Sampling and Analysis Request Form

A groundwater sampling and analysis request form (see Figure A-3) was used to communicate to the environmental sampler the requirements of the monitoring event. At a minimum, the groundwater sampling and analysis request form included the following information:

- Date scheduled
- Site-specific instructions
- Specific analytical parameters
- Well number
- Well specifications (expected total depth, depth of water, and product thickness)



OWT

# MONITORING WELL PURGING PROTOCOL

MEASURE AND RECORD DEPTH TO WATER AND WELL TOTAL DEPTH

CHECK FOR FLOATING PRODUCT

YES

MEASURE AND DOCUMENT FLOATING PRODUCT THICKNESS. DO NOT SAMPLE WELL FOR DISSOLVED CONSTITUENTS.

NO

CALCULATE PURGE VOLUME BY USING THE FOLLOWING EQUATION:

$$P = \pi r^2 \times 7.48 \times h$$

where:

P = calculated purge volume (gallons)

$\pi$  = 3.14

r = radius of well casing in feet

h = height of water column in feet

WELL EVACUATED TO PRACTICAL LIMITS OF DRYNESS BEFORE REMOVING CALCULATED PURGE VOLUME

EVACUATE WATER FROM WELL EQUAL TO THE CALCULATED PURGE VOLUME WHILE MONITORING GROUNDWATER STABILIZATION INDICATOR PARAMETERS (pH, CONDUCTIVITY, TEMPERATURE) AT INTERVALS OF ONE CASING VOLUME.

NO

YES

FINAL TWO SETS OF GROUNDWATER STABILIZATION INDICATOR PARAMETER MEASUREMENTS MEET THE FOLLOWING CRITERIA:

pH =  $\pm$  0.1 pH units

COND. =  $\pm$  10 %

TEMP. =  $\pm$  1.0 °F

WELL RECHARGES TO A LEVEL SUFFICIENT FOR SAMPLE COLLECTION WITHIN 24 HOURS OF EVACUATION TO DRYNESS.

YES

NO

YES

NO

WELL PURGING CRITERIA MET; PROCEED TO WELL SAMPLING.

CONTINUE PURGING: EVACUATE ADDITIONAL CASING VOLUME OF WATER. MONITOR INDICATOR PARAMETERS FOR STABILITY.

FIELD TEST FIRST RECHARGE WATER FOR INDICATOR PARAMETERS, THEN PROCEED TO WELL SAMPLING.

RECORD WELL AS DRY FOR PURPOSES OF SAMPLING.



EMCON

MONITORING WELL PURGING PROTOCOL

FIGURE

A-1

# WATER SAMPLE FIELD DATA SHEET

Rev. 5/98



**OWT**

PROJECT NO: \_\_\_\_\_  
 PURGED BY: \_\_\_\_\_  
 SAMPLED BY: \_\_\_\_\_

SAMPLE ID: \_\_\_\_\_  
 CLIENT NAME: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

TYPE: Groundwater \_\_\_\_\_ Surface Water \_\_\_\_\_ Leachate \_\_\_\_\_ Other \_\_\_\_\_

CASING DIAMETER (inches): 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 4.5 \_\_\_\_\_ 6 \_\_\_\_\_ Other \_\_\_\_\_

CASING ELEVATION (feet/MSL): \_\_\_\_\_ VOLUME IN CASING (gal.): \_\_\_\_\_  
 DEPTH OF WELL (feet): \_\_\_\_\_ CALCULATED PURGE (gal.): \_\_\_\_\_  
 DEPTH OF WATER (feet): \_\_\_\_\_ ACTUAL PURGE VOL. (gal.): \_\_\_\_\_

DATE PURGED: \_\_\_\_\_ END PURGE: \_\_\_\_\_  
 DATE SAMPLED: \_\_\_\_\_ SAMPLING TIME: \_\_\_\_\_

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	TURBIDITY (visual/NTU)	TIME (2400 HR)
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

OTHER: \_\_\_\_\_ ODOR: \_\_\_\_\_  
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): \_\_\_\_\_

**PURGING EQUIPMENT**

**SAMPLING EQUIPMENT**

\_\_\_\_\_ 2" Bladder Pump      \_\_\_\_\_ Bailer (Teflon)  
 \_\_\_\_\_ Centrifugal Pump      \_\_\_\_\_ Bailer (PVC)  
 \_\_\_\_\_ Submersible Pump      \_\_\_\_\_ Bailer (Stainless Steel)  
 \_\_\_\_\_ Well Wizard™      \_\_\_\_\_ Dedicated  
 Other: \_\_\_\_\_

\_\_\_\_\_ 2" Bladder Pump      \_\_\_\_\_ Bailer (Teflon)  
 \_\_\_\_\_ Bomb Sampler      \_\_\_\_\_ Bailer (Stainless Steel)  
 \_\_\_\_\_ Dipper      \_\_\_\_\_ Submersible Pump  
 \_\_\_\_\_ Well Wizard™      \_\_\_\_\_ Dedicated  
 Other: \_\_\_\_\_

WELL INTEGRITY: \_\_\_\_\_ LOCK: \_\_\_\_\_

REMARKS: \_\_\_\_\_

pH, E.C., Temp. Meter Calibration Date: \_\_\_\_\_ Time: \_\_\_\_\_ Meter Serial No.: \_\_\_\_\_

E.C. 1000 / \_\_\_\_\_ pH 7 / \_\_\_\_\_ pH 10 / \_\_\_\_\_ pH 4 / \_\_\_\_\_

Temperature °F \_\_\_\_\_

SIGNATURE: \_\_\_\_\_ REVIEWED BY: \_\_\_\_\_ PAGE \_\_\_\_\_ OF \_\_\_\_\_



WATER SAMPLE FIELD DATA SHEET

FIGURE  
**A-2**





**OWT**

**EMCON - SACRAMENTO  
GROUNDWATER SAMPLING AND ANALYSIS REQUEST FORM**

PROJECT NAME :

SCHEDULED DATE :

SPECIAL INSTRUCTIONS / CONSIDERATIONS :

Project Authorization: \_\_\_\_\_  
EMCON Project No.: \_\_\_\_\_  
OWT Project No.: \_\_\_\_\_  
Task Code: \_\_\_\_\_  
Originals To: \_\_\_\_\_  
cc: \_\_\_\_\_

Well Lock Number (s)

CHECK BOX TO AUTHORIZE DATA ENTRY

Site Contact: \_\_\_\_\_  
Name Phone #

Well Number or Source	Casing Diameter (inches)	Casing Length (feet)	Depth to Water (feet)	ANAYSES REQUESTED

Laboratory and Lab QC Istructions:



**EMCON**

**SAMPLING AND ANALYSIS REQUEST FORM**

**FIGURE**

**A-3**

**APPENDIX B**  
**CERTIFIED ANALYTICAL REPORTS,  
AND CHAIN-OF-CUSTODY DOCUMENTATION**



October 30, 1998

Service Request No.: S9802776

Glen Vanderveen  
PINNACLE  
144 A Mayhew Wy.  
Walnut Creek, CA 94596

RE: 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO

Dear Mr. Vanderveen:

The following pages contain analytical results for sample(s) received by the laboratory on October 19, 1998. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned the Service Request No. listed above. To help expedite our service, please refer to this number when contacting the laboratory.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 13, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

Please feel welcome to contact me should you have questions or further needs.

Sincerely,

Steven L. Green  
Project Chemist

Greg Anderson  
Regional QA Coordinator



**COLUMBIA ANALYTICAL SERVICES, Inc.****Acronyms**

<b>A2LA</b>	American Association for Laboratory Accreditation
<b>ASTM</b>	American Society for Testing and Materials
<b>BOD</b>	Biochemical Oxygen Demand
<b>BTEX</b>	Benzene, Toluene, Ethylbenzene, Xylenes
<b>CAM</b>	California Assessment Metals
<b>CARB</b>	California Air Resources Board
<b>CAS Number</b>	Chemical Abstract Service registry Number
<b>CFC</b>	Chlorofluorocarbon
<b>CFU</b>	Colony-Forming Unit
<b>COD</b>	Chemical Oxygen Demand
<b>DEC</b>	Department of Environmental Conservation
<b>DEQ</b>	Department of Environmental Quality
<b>DHS</b>	Department of Health Services
<b>DLCS</b>	Duplicate Laboratory Control Sample
<b>DMS</b>	Duplicate Matrix Spike
<b>DOE</b>	Department of Ecology
<b>DOH</b>	Department of Health
<b>EPA</b>	U. S. Environmental Protection Agency
<b>ELAP</b>	Environmental Laboratory Accreditation Program
<b>GC</b>	Gas Chromatography
<b>GC/MS</b>	Gas Chromatography/Mass Spectrometry
<b>IC</b>	Ion Chromatography
<b>ICB</b>	Initial Calibration Blank sample
<b>ICP</b>	Inductively Coupled Plasma atomic emission spectrometry
<b>ICV</b>	Initial Calibration Verification sample
<b>J</b>	Estimated concentration. The value is less than the MRL, but greater than or equal to the MDL. If the value is equal to the MRL, the result is actually <MRL before rounding.
<b>LCS</b>	Laboratory Control Sample
<b>LUFT</b>	Leaking Underground Fuel Tank
<b>M</b>	Modified
<b>MBAS</b>	Methylene Blue Active Substances
<b>MCL</b>	Maximum Contaminant Level. The highest permissible concentration of a substance allowed in drinking water as established by the U. S. EPA.
<b>MDL</b>	Method Detection Limit
<b>MPN</b>	Most Probable Number
<b>MRL</b>	Method Reporting Limit
<b>MS</b>	Matrix Spike
<b>MTBE</b>	Methyl tert-Butyl Ether
<b>NA</b>	Not Applicable
<b>NAN</b>	Not Analyzed
<b>NC</b>	Not Calculated
<b>NCASI</b>	National Council of the paper industry for Air and Stream Improvement
<b>ND</b>	Not Detected at or above the method reporting/detection limit (MRL/MDL)
<b>NIOSH</b>	National Institute for Occupational Safety and Health
<b>NTU</b>	Nephelometric Turbidity Units
<b>ppb</b>	Parts Per Billion
<b>ppm</b>	Parts Per Million
<b>PQL</b>	Practical Quantitation Limit
<b>QA/QC</b>	Quality Assurance/Quality Control
<b>RCRA</b>	Resource Conservation and Recovery Act
<b>RPD</b>	Relative Percent Difference
<b>SIM</b>	Selected Ion Monitoring
<b>SM</b>	Standard Methods for the Examination of Water and Wastewater, 18th Ed., 1992
<b>STLC</b>	Solubility Threshold Limit Concentration
<b>SW</b>	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Ed., 1986 and as amended by Updates I, II, IIA, and IIB.
<b>TCLP</b>	Toxicity Characteristic Leaching Procedure
<b>TDS</b>	Total Dissolved Solids
<b>TPH</b>	Total Petroleum Hydrocarbons
<b>tr</b>	Trace level. The concentration of an analyte that is less than the PQL but greater than or equal to the MDL. If the value is equal to the PQL, the result is actually <PQL before rounding.
<b>TRPH</b>	Total Recoverable Petroleum Hydrocarbons
<b>TSS</b>	Total Suspended Solids
<b>TTLC</b>	Total Threshold Limit Concentration
<b>VOA</b>	Volatile Organic Analyte(s)

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** 10/19/98  
**Date Received:** 10/19/98

BTEX, MTBE and TPH as Gasoline

**Sample Name:** MW-1(18)  
**Lab Code:** S9802776-001  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	10/22/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/22/98	ND	

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** 10/19/98  
**Date Received:** 10/19/98

BTEX, MTBE and TPH as Gasoline

**Sample Name:** MW-4(17)  
**Lab Code:** S9802776-002  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	10/22/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/22/98	ND	

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** 10/19/98  
**Date Received:** 10/19/98

BTEX, MTBE and TPH as Gasoline

**Sample Name:** MW-3(18)  
**Lab Code:** S9802776-003  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	10/22/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/22/98	ND	

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** 10/19/98  
**Date Received:** 10/19/98

BTEX, MTBE and TPH as Gasoline

**Sample Name:** MW-2(17)  
**Lab Code:** S9802776-004  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	20	NA	10/29/98	<1000	C1
Benzene	EPA 5030	8020	0.5	20	NA	10/29/98	18	
Toluene	EPA 5030	8020	0.5	20	NA	10/29/98	<10	C1
Ethylbenzene	EPA 5030	8020	0.5	20	NA	10/29/98	<10	C1
Xylenes, Total	EPA 5030	8020	0.5	20	NA	10/29/98	<10	C1
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	20	NA	10/29/98	1100	

C1

The MRL was elevated due to high analyte concentration requiring sample dilution.



**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** 10/19/98  
**Date Received:** 10/19/98

BTEX, MTBE and TPH as Gasoline

**Sample Name:** MW-7(16)  
**Lab Code:** S9802776-005  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	50	NA	10/30/98	<2500	C1
Benzene	EPA 5030	8020	0.5	50	NA	10/30/98	54	
Toluene	EPA 5030	8020	0.5	50	NA	10/30/98	<25	C1
Ethylbenzene	EPA 5030	8020	0.5	50	NA	10/30/98	72	
Xylenes, Total	EPA 5030	8020	0.5	50	NA	10/30/98	<25	C1
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	50	NA	10/30/98	3000	

C1

The MRL was elevated due to high analyte concentration requiring sample dilution.

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** NA  
**Date Received:** NA

BTEX, MTBE and TPH as Gasoline

**Sample Name:** Method Blank  
**Lab Code:** S981022-WB1  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	10/22/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/22/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/22/98	ND	

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** NA  
**Date Received:** NA

BTEX, MTBE and TPH as Gasoline

**Sample Name:** Method Blank  
**Lab Code:** S981029-WB1  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	10/29/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/29/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/29/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/29/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/29/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/29/98	ND	

**COLUMBIA ANALYTICAL SERVICES, INC.**

**QA/QC Report**

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** NA  
**Date Received:** NA  
**Date Extracted:** NA  
**Date Analyzed:** NA

**Surrogate Recovery Summary**  
**BTEX, MTBE and TPH as Gasoline**

**Prep Method:** EPA 5030  
**Analysis Method:** 8020 CA/LUFT

**Units:** PERCENT  
**Basis:** NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
MW-1(18)	S9802776-001		104	93
MW-4(17)	S9802776-002		109	94
MW-3(18)	S9802776-003		103	91
MW-2(17)	S9802776-004		95	87
MW-7(16)	S9802776-005		95	93
BATCH QC	S9802886-006MS		100	92
BATCH QC	S9802886-006DMS		100	96
Method Blank	S981022-WB1		92	96
Method Blank	S981029-WB1		96	90

**CAS Acceptance Limits:** 69-116 69-116

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** NA  
**Date Received:** NA  
**Date Extracted:** NA  
**Date Analyzed:** 10/30/98

Matrix Spike/Duplicate Matrix Spike Summary  
 BTE

**Sample Name:** BATCH QC  
**Lab Code:** S9802886-006MS, S9802886-006DMS  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

Percent Recovery

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		CAS Acceptance Limits	Relative Percent Difference
				MS	DMS		MS	DMS	MS	DMS		
Benzene	EPA 5030	8020	0.5	25	25	ND	25	25	100	100	75-135	<1
Toluene	EPA 5030	8020	0.5	25	25	ND	25	24	100	96	73-136	4
Ethylbenzene	EPA 5030	8020	0.5	25	25	ND	26	23	104	92	69-142	12



**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO

**Service Request:** S9802776  
**Date Analyzed:** 10/29/98

Initial Calibration Verification (ICV) Summary  
 BTEX, MTBE and TPH as Gasoline

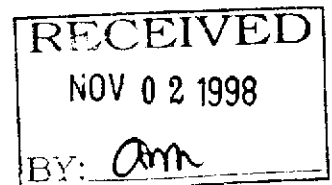
**Sample Name:** ICV  
**Lab Code:** ICV1  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS		Result Notes
					Percent Recovery	Percent Recovery	
TPH as Gasoline	EPA 5030	CA/LUFT	250	260	90-110	104	
Benzene	EPA 5030	8020	25	26	85-115	104	
Toluene	EPA 5030	8020	25	25	85-115	100	
Ethylbenzene	EPA 5030	8020	25	25	85-115	100	
Xylenes, Total	EPA 5030	8020	75	80	85-115	107	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	25	25	85-115	100	





October 30, 1998

Service Request No.: S9802776

Glen Vanderveen  
PINNACLE  
144 A Mayhew Wy.  
Walnut Creek, CA 94596

RE: 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO

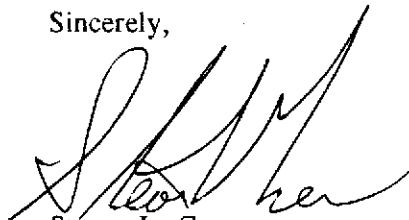
Dear Mr. Vanderveen:


The following pages contain analytical results for sample(s) received by the laboratory on October 19, 1998. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned the Service Request No. listed above. To help expedite our service, please refer to this number when contacting the laboratory.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 8, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

Please feel welcome to contact me should you have questions or further needs.

Sincerely,

  
Steven L. Green  
Project Chemist

  
Greg Anderson  
Regional QA Coordinator

**COLUMBIA ANALYTICAL SERVICES, Inc.****Acronyms**

<b>A2LA</b>	American Association for Laboratory Accreditation
<b>ASTM</b>	American Society for Testing and Materials
<b>BOD</b>	Biochemical Oxygen Demand
<b>BTEX</b>	Benzene, Toluene, Ethylbenzene, Xylenes
<b>CAM</b>	California Assessment Metals
<b>CARB</b>	California Air Resources Board
<b>CAS Number</b>	Chemical Abstract Service registry Number
<b>CFC</b>	Chlorofluorocarbon
<b>CFU</b>	Colony-Forming Unit
<b>COD</b>	Chemical Oxygen Demand
<b>DEC</b>	Department of Environmental Conservation
<b>DEQ</b>	Department of Environmental Quality
<b>DHS</b>	Department of Health Services
<b>DLCS</b>	Duplicate Laboratory Control Sample
<b>DMS</b>	Duplicate Matrix Spike
<b>DOE</b>	Department of Ecology
<b>DOH</b>	Department of Health
<b>EPA</b>	U. S. Environmental Protection Agency
<b>ELAP</b>	Environmental Laboratory Accreditation Program
<b>GC</b>	Gas Chromatography
<b>GC/MS</b>	Gas Chromatography/Mass Spectrometry
<b>IC</b>	Ion Chromatography
<b>ICB</b>	Initial Calibration Blank sample
<b>ICP</b>	Inductively Coupled Plasma atomic emission spectrometry
<b>ICV</b>	Initial Calibration Verification sample
<b>J</b>	Estimated concentration. The value is less than the MRL, but greater than or equal to the MDL. If the value is equal to the MRL, the result is actually <MRL before rounding.
<b>LCS</b>	Laboratory Control Sample
<b>LUFT</b>	Leaking Underground Fuel Tank
<b>M</b>	Modified
<b>MBAS</b>	Methylene Blue Active Substances
<b>MCL</b>	Maximum Contaminant Level. The highest permissible concentration of a substance allowed in drinking water as established by the U. S. EPA.
<b>MDL</b>	Method Detection Limit
<b>MPN</b>	Most Probable Number
<b>MRL</b>	Method Reporting Limit
<b>MS</b>	Matrix Spike
<b>MTBE</b>	Methyl tert-Butyl Ether
<b>NA</b>	Not Applicable
<b>NAN</b>	Not Analyzed
<b>NC</b>	Not Calculated
<b>NCASI</b>	National Council of the paper industry for Air and Stream Improvement
<b>ND</b>	Not Detected at or above the method reporting/detection limit (MRL/MDL)
<b>NIOSH</b>	National Institute for Occupational Safety and Health
<b>NTU</b>	Nephelometric Turbidity Units
<b>ppb</b>	Parts Per Billion
<b>ppm</b>	Parts Per Million
<b>PQL</b>	Practical Quantitation Limit
<b>QA/QC</b>	Quality Assurance/Quality Control
<b>RCRA</b>	Resource Conservation and Recovery Act
<b>RPD</b>	Relative Percent Difference
<b>SIM</b>	Selected Ion Monitoring
<b>SM</b>	Standard Methods for the Examination of Water and Wastewater, 18th Ed., 1992
<b>STLC</b>	Solubility Threshold Limit Concentration
<b>SW</b>	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Ed., 1986 and as amended by Updates I, II, IIA, and IIB.
<b>TCLP</b>	Toxicity Characteristic Leaching Procedure
<b>TDS</b>	Total Dissolved Solids
<b>TPH</b>	Total Petroleum Hydrocarbons
<b>tr</b>	Trace level. The concentration of an analyte that is less than the PQL but greater than or equal to the MDL. If the value is equal to the PQL, the result is actually <PQL before rounding.
<b>TRPH</b>	Total Recoverable Petroleum Hydrocarbons
<b>TSS</b>	Total Suspended Solids
<b>TTLIC</b>	Total Threshold Limit Concentration
<b>VOA</b>	Volatile Organic Analyte(s)

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** 10/19/98  
**Date Received:** 10/19/98

BTEX, MTBE and TPH as Gasoline

**Sample Name:** MW-5(16)  
**Lab Code:** S9802776-006  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	5	NA	10/30/98	<250	C1
Benzene	EPA 5030	8020	0.5	5	NA	10/30/98	<2.5	C1
Toluene	EPA 5030	8020	0.5	5	NA	10/30/98	<2.5	C1
Ethylbenzene	EPA 5030	8020	0.5	5	NA	10/30/98	<2.5	C1
Xylenes, Total	EPA 5030	8020	0.5	5	NA	10/30/98	<2.5	C1
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	5	NA	10/30/98	300	

C1

The MRL was elevated due to high analyte concentration requiring sample dilution.



COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** NA  
**Date Received:** NA

BTEX, MTBE and TPH as Gasoline

**Sample Name:** Method Blank  
**Lab Code:** S981029-WB1  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA:LUFT	50	1	NA	10/29/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/29/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/29/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/29/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/29/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/29/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** NA  
**Date Received:** NA  
**Date Extracted:** NA  
**Date Analyzed:** NA

Surrogate Recovery Summary  
BTEX, MTBE and TPH as Gasoline

**Prep Method:** EPA 5030  
**Analysis Method:** 8020 CA/LUFT

**Units:** PERCENT  
**Basis:** NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
MW-1(18)	S9802776-001		104	93
MW-4(17)	S9802776-002		109	94
MW-3(18)	S9802776-003		103	91
MW-2(17)	S9802776-004		95	87
MW-7(16)	S9802776-005		95	93
MW-5(16)	S9802776-006		99	91
BATCH QC	S9802886-006MS		100	92
BATCH QC	S9802886-006DMS		100	96
Method Blank	S981022-WB1		92	96
Method Blank	S981029-WB1		96	90

CAS Acceptance Limits: 69-116 69-116

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** ARCO Products Company  
**Project:** 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO  
**Sample Matrix:** Water

**Service Request:** S9802776  
**Date Collected:** NA  
**Date Received:** NA  
**Date Extracted:** NA  
**Date Analyzed:** 10/30/98

Matrix Spike/Duplicate Matrix Spike Summary  
 BTE

**Sample Name:** BATCH QC Units: ug/L (ppb)  
**Lab Code:** S9802886-006MS, S9802886-006DMS Basis: NA  
**Test Notes:**

**Percent Recovery**

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result				CAS Acceptance Limits	Relative Percent Difference
				MS	DMS		MS	DMS	MS	DMS		
Benzene	EPA 5030	8020	0.5	25	25	ND	25	25	100	100	75-135	<1
Toluene	EPA 5030	8020	0.5	25	25	ND	25	24	100	96	73-136	4
Ethylbenzene	EPA 5030	8020	0.5	25	25	ND	26	23	104	92	69-142	12

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company  
Project: 20805-127.003/TO#21133.00 RAT#8/2111 SAN LEANDRO

Service Request: S9802776  
Date Analyzed: 10/29/98

Initial Calibration Verification (ICV) Summary  
BTEX, MTBE and TPH as Gasoline

Sample Name: ICV  
Lab Code: ICV1  
Test Notes:

Units: ug/L (ppb)  
Basis: NA

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS	Percent Recovery	Result Notes
					Percent Recovery Acceptance Limits		
TPH as Gasoline	EPA 5030	CA/LUFT	250	260	90-110	104	
Benzene	EPA 5030	8020	25	26	85-115	104	
Toluene	EPA 5030	8020	25	25	85-115	100	
Ethylbenzene	EPA 5030	8020	25	25	85-115	100	
Xylenes, Total	EPA 5030	8020	75	80	85-115	107	
Methyl tert-Butyl Ether	EPA 5030	8020	25	25	85-115	100	

# ARCO Products Company

Division of Atlantic/Richfield Company

Task Order No. **22312.00**

**S9802776 Chain of Custody**

ARCO Facility no. **2111** City (Facility) **San Leandro** Project manager (Consultant) **Glen VanderVeen**  
 ARCO engineer **Paul Supple** Telephone no. (ARCO) Telephone no. (Consultant) **(408) 453-7300** Fax no. (Consultant) **(408) 437-9576**  
 Consultant name **EMCON** Address (Consultant) **144-A Mayhew Way Walnut Creek, CA 94596**

Laboratory Name  
**CAS**  
Contract Number

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602 EPA 8020	BTEX/PH/acid, MTBE EPA Method 8210	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 4132 <input type="checkbox"/>	TPH EPA 418.1/SM 503E	EPA 601/601C	EPA 624/6240	EPA 625/6270	TCUP Metals <input type="checkbox"/> VOAC <input type="checkbox"/> VOAC	Semi Metals <input type="checkbox"/> VOAC <input type="checkbox"/> VOAC	CAM Metals EPA 6010/7000 TLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org (HSE) <input type="checkbox"/>	Lead EPA 7420/7421C <input type="checkbox"/>	
			Soil	Water	Other	Ice	Acid																
<b>MW-5 (16)6</b>		<b>2</b>		<b>X</b>		<b>X</b>	<b>HCL</b>	<b>10/19/88</b>	<b>1240</b>		<b>X</b>												

Method of shipment  
**Sampler will deliver**

Special Detection Limit/reporting  
**Lowest Possible**

Special QA/QC  
**As Normal**

Remarks  
**RAT 8  
2-40ml HCL  
VOAs**

**#20505-127.006**

Lab Number

Turnaround Time:  
 Priority Rush 1 Business Day   
 Rush 2 Business Days   
 Expedited 5 Business Days   
 Standard 10 Business Days

Condition of sample: \_\_\_\_\_ Temperature received: \_\_\_\_\_  
 Relinquished by sample **[Signature]** Date **10/19/88** Time \_\_\_\_\_ Received by **Brian Feller** Date **10-19-88 2:07**  
 Relinquished by \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Received by \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_  
 Relinquished by \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Received by laboratory \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_

**DOE: 11-2 R11 D3**

**APPENDIX C**  
**FIELD DATA SHEETS**





# WATER SAMPLE FIELD DATA SHEET

Rev 1/97



**OWT**

PROJECT NO 21775-226.003  
 PURGED BY M. Gallegos  
 SAMPLED BY ↓

SAMPLE ID MW-1(18')  
 CLIENT NAME ARCOH 2111  
 LOCATION San Leandro, CA

TYPE Groundwater  Surface Water  Leachate  Other   
 CASING DIAMETER (inches) 2  3  4  5  6  Other

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR  
 DEPTH OF WELL (feet) 26.3 CALCULATED PURGE (gal.) NR  
 DEPTH OF WATER (feet) 17.90 ACTUAL PURGE VOL. (gal.) ↓

DATE PURGED: 10-19-98 END PURGE:             
 DATE SAMPLED: ↓ SAMPLING TIME: 1135

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1135</u>	<u>GRAB</u>	<u>6.25</u>	<u>750</u>	<u>69.1</u>	<u>clear</u>	<u>clear</u>

OTHER: DO = .5 ODOR: none NR NR  
(COBALT 0-100) (NTU 0-200)  
NR

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1):           

PURGING EQUIPMENT	SAMPLING EQUIPMENT
<input type="checkbox"/> 2" Bladder Pump <input type="checkbox"/> Centrifugal Pump <input type="checkbox"/> Submersible Pump <input type="checkbox"/> Well Wizard™ Other: <u>          </u>	<input type="checkbox"/> Bailer (Teflon) <input type="checkbox"/> Bailer (PVC) <input type="checkbox"/> Bailer (Stainless Steel) <input type="checkbox"/> Dedicated <input type="checkbox"/> 2" Bladder Pump <input checked="" type="checkbox"/> <input type="checkbox"/> Bomb Sampler <input type="checkbox"/> Dipper <input type="checkbox"/> Well Wizard™ Other: <u>          </u>

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date 10/19/98 Time:            Meter Serial No. 87M  
 E.C. 1000 1000 pH 7 700 pH 10 11000 pH 4 1400  
 Temperature °F             
 SIGNATURE [Signature] REVIEWED BY [Signature] PAGE 1 OF 7

# WATER SAMPLE FIELD DATA SHEET

Rev 1/97



**OWT**

PROJECT NO 21775-226.003  
 PURGED BY M. Gallegos  
 SAMPLED BY ✓

SAMPLE ID MW-2(17')  
 CLIENT NAME ARCO#2111  
 LOCATION San Leandro, CA

TYPE Groundwater  Surface Water \_\_\_\_\_ Leachate \_\_\_\_\_ Other \_\_\_\_\_  
 CASING DIAMETER (inches) 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4  5 \_\_\_\_\_ 6 \_\_\_\_\_ Other \_\_\_\_\_

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR  
 DEPTH OF WELL (feet) 26.7 CALCULATED PURGE (gal.) \_\_\_\_\_  
 DEPTH OF WATER (feet) 16.05 ACTUAL PURGE VOL (gal.) NR

DATE PURGED: 10-19-98 END PURGE: \_\_\_\_\_  
 DATE SAMPLED: ✓ SAMPLING TIME: 1205

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1205</u>	<u>GPAB</u>	<u>6.30</u>	<u>731</u>	<u>70.1</u>	<u>clear</u>	<u>clear</u>

OTHER: DO = 1 ODOR: none NR NR  
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): \_\_\_\_\_

<u>PURGING EQUIPMENT</u>	<u>SAMPLING EQUIPMENT</u>
<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> 2" Bladder Pump
<input type="checkbox"/> Centrifugal Pump	<input checked="" type="checkbox"/> Bailer (Teflon)
<input type="checkbox"/> Submersible Pump	<input type="checkbox"/> Bailer (Stainless Steel)
<input type="checkbox"/> Well Wizard™	<input type="checkbox"/> Dipper
<input type="checkbox"/> Other _____	<input type="checkbox"/> Submersible Pump
	<input type="checkbox"/> Well Wizard™
	<input type="checkbox"/> Dedicated
	<input type="checkbox"/> Other _____

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date 10/19/98 Time: \_\_\_\_\_ Meter Serial No 87M  
 E.C. 1000 11000 pH7 7.00 pH10 11000 pH4 1400  
 Temperature °F \_\_\_\_\_  
 SIGNATURE [Signature] REVIEWED BY MA PAGE 2 OF 7

# WATER SAMPLE FIELD DATA SHEET

Rev 1/97



**OWT**

PROJECT NO 21775-226.003  
 PURGED BY M. Gallegos  
 SAMPLED BY ↓

SAMPLE ID MW-3 (18')  
 CLIENT NAME ARCO# 2111  
 LOCATION San Leandro, CA

TYPE Groundwater  Surface Water \_\_\_\_\_ Leachate \_\_\_\_\_ Other \_\_\_\_\_  
 CASING DIAMETER (inches) 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4  4.5 \_\_\_\_\_ 6 \_\_\_\_\_ Other \_\_\_\_\_

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR  
 DEPTH OF WELL (feet) 26.7 CALCULATED PURGE (gal.) \_\_\_\_\_  
 DEPTH OF WATER (feet) 17.45 ACTUAL PURGE VOL (gal.) ↓

DATE PURGED 10-19-98 END PURGE: \_\_\_\_\_  
 DATE SAMPLED ↓ SAMPLING TIME: 1150

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1150</u>	<u>GRAB</u>	<u>6.39</u>	<u>752</u>	<u>69.2</u>	<u>clear</u>	<u>clear</u>

OTHER: DO = .5 ODOR: none NR NR  
(COBALT 0-100) (NTU 0-200)  
NR

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): \_\_\_\_\_

**PURGING EQUIPMENT**

2" Bladder Pump  Bailer (Teflon)  
 Centrifugal Pump  Bailer (PVC)  
 Submersible Pump  Bailer (Stainless Steel)  
 Well Wizard™  Dedicated  
 Other: \_\_\_\_\_

**SAMPLING EQUIPMENT**

2" Bladder Pump  Bailer (Teflon)  
 Bomb Sampler  Bailer (Stainless Steel)  
 Dipper  Submersible Pump  
 Well Wizard™  Dedicated  
 Other: \_\_\_\_\_

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date 10/19/98 Time: \_\_\_\_\_ Meter Serial No. 8777  
 E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 1400

Temperature °F \_\_\_\_\_  
 SIGNATURE: M. Gallegos REVIEWED BY: MA PAGE 3 OF 7

# WATER SAMPLE FIELD DATA SHEET

Rev 1/97



PROJECT NO 21775-226.003  
 PURGED BY M. Gallegos  
 SAMPLED BY ↓

SAMPLE ID MW-4 (17')  
 CLIENT NAME ARCOH 2111  
 LOCATION San Leandro, CA

TYPE Groundwater  Surface Water \_\_\_\_\_ Leachate \_\_\_\_\_ Other \_\_\_\_\_  
 CASING DIAMETER (inches) 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4  5 \_\_\_\_\_ 6 \_\_\_\_\_ Other \_\_\_\_\_

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR  
 DEPTH OF WELL (feet) 21.7 CALCULATED PURGE (gal.) \_\_\_\_\_  
 DEPTH OF WATER (feet) 16.20 ACTUAL PURGE VOL (gal.) ↓

DATE PURGED: 10-19-98 END PURGE: \_\_\_\_\_  
 DATE SAMPLED ↓ SAMPLING TIME: 1120

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1120	6 PAR	5.41	775	70.4	Clear	Clear

OTHER: DO=0.5 ODOR: none NR NR  
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input checked="" type="checkbox"/> Bailer (Teflon)
<input type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb Sampler	<input type="checkbox"/> Bailer (Stainless Steel)
<input type="checkbox"/> Submersible Pump	<input type="checkbox"/> Bailer (Stainless Steel)	<input type="checkbox"/> Dipper	<input type="checkbox"/> Submersible Pump
<input type="checkbox"/> Well Wizard™	<input type="checkbox"/> Dedicated	<input type="checkbox"/> Well Wizard™	<input type="checkbox"/> Dedicated
Other: _____		Other: _____	

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: all samples taken

pH, E.C., Temp, Meter Calibration Date: 10/19/98 Time: 1112 Meter Serial No: 87M  
 E.C. 1000 1015, 1000 pH 7 708, 700 pH 10 997, 1000 pH 4 402, 400  
 Temperature °F 67.6  
 SIGNATURE: [Signature] REVIEWED BY: WA PAGE 4 OF 7

# WATER SAMPLE FIELD DATA SHEET

Rev 1/97



**OWT**

PROJECT NO 21775-226.003  
 PURGED BY M. Gallegos  
 SAMPLED BY ✓

SAMPLE ID MW-5 (16')  
 CLIENT NAME ARCO#2111  
 LOCATION San Leandro, CA

TYPE Groundwater  Surface Water \_\_\_\_\_ Leachate \_\_\_\_\_ Other \_\_\_\_\_  
 CASING DIAMETER (inches) 2  3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ Other \_\_\_\_\_

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal) NR  
 DEPTH OF WELL (feet) 23.9 CALCULATED PURGE (gal) \_\_\_\_\_  
 DEPTH OF WATER (feet) 15.74 ACTUAL PURGE VOL (gal) ✓

DATE PURGED: 10-19-98 END PURGE: \_\_\_\_\_  
 DATE SAMPLED: ✓ SAMPLING TIME: 1240

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1240	CLAB	6.41	747	73.1	clear	clear

OTHER: DD=1 ODOR: none NR NR  
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): \_\_\_\_\_

PURGING EQUIPMENT	SAMPLING EQUIPMENT
<input type="checkbox"/> 2" Bladder Pump <input type="checkbox"/> Centrifugal Pump <input type="checkbox"/> Submersible Pump <input type="checkbox"/> Well Wizard™ Other _____	<input type="checkbox"/> Bailer (Teflon) <input type="checkbox"/> Bailer (PVC) <input type="checkbox"/> Bailer (Stainless Steel) <input type="checkbox"/> Dedicated <input checked="" type="checkbox"/> 2" Bladder Pump <input type="checkbox"/> Bomb Sampler <input type="checkbox"/> Dipper <input type="checkbox"/> Well Wizard™ Other _____

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date 10/19/98 Time \_\_\_\_\_ Meter Serial No. 87M  
 E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 14100  
 Temperature °F \_\_\_\_\_  
 SIGNATURE: [Signature] REVIEWED BY [Signature] PAGE 5 OF 7

# WATER SAMPLE FIELD DATA SHEET

Rev 1/97



PROJECT NO 21775-226.003  
 PURGED BY M. Ballegas  
 SAMPLED BY                     

SAMPLE ID MW-6  
 CLIENT NAME ARCOH 2111  
 LOCATION San Leandro, CA

TYPE Groundwater  Surface Water  Leachate  Other   
 CASING DIAMETER (inches) 2  3  4  4.5  6  Other

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR  
 DEPTH OF WELL (feet)                      CALCULATED PURGE (gal.)                       
 DEPTH OF WATER (feet)                      ACTUAL PURGE VOL (gal.)                     

DATE PURGED 10-19-98 END PURGE                       
 DATE SAMPLED                      SAMPLING TIME                     

TIME <small>(2400 HR)</small>	VOLUME <small>(gal)</small>	pH <small>(units)</small>	E.C. <small>(µmhos/cm@25°C)</small>	TEMPERATURE <small>(°F)</small>	COLOR <small>(visual)</small>	TURBIDITY <small>(visual)</small>
<u>N/A</u>	<u>Samples taken</u>	<u>                    </u>	<u>Corrupted on top of well</u>	<u>                    </u>	<u>                    </u>	<u>                    </u>

OTHER: DO= ODOR:                      NR NR  
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1):                     

PURGING EQUIPMENT	SAMPLING EQUIPMENT
<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> 2" Bladder Pump
<input type="checkbox"/> Centrifugal Pump	<input checked="" type="checkbox"/> Bailor (Teflon)
<input type="checkbox"/> Submersible Pump	<input type="checkbox"/> Bomb Sampler
<input type="checkbox"/> Well Wizard™	<input type="checkbox"/> Dipper
<input type="checkbox"/> Bailor (Teflon)	<input type="checkbox"/> Submersible Pump
<input type="checkbox"/> Bailor (PVC)	<input type="checkbox"/> Well Wizard™
<input type="checkbox"/> Bailor (Stainless Steel)	<input type="checkbox"/> Dedicated
<input type="checkbox"/> Dedicated	Other: <u>                    </u>

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: all samples taken

pH, E.C., Temp Meter Calibration Date 10/19/98 Time                      Meter Serial No. 87M  
 E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 14100

Temperature °F                       
 SIGNATURE [Signature] REVIEWED BY [Signature] PAGE 6 OF 7

# WATER SAMPLE FIELD DATA SHEET

Rev 1/97



**OWT**

PROJECT NO 21775-226.003  
 PURGED BY M. Gallegos  
 SAMPLED BY ✓

SAMPLE ID MW-7 (16')  
 CLIENT NAME ARCOH 2111  
 LOCATION San Leandro, CA

TYPE Groundwater  Surface Water \_\_\_\_\_ Leachate \_\_\_\_\_ Other \_\_\_\_\_  
 CASING DIAMETER (inches) 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4  4.5 \_\_\_\_\_ 6 \_\_\_\_\_ Other \_\_\_\_\_

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR  
 DEPTH OF WELL (feet) 27.3 CALCULATED PURGE (gal.) NR  
 DEPTH OF WATER (feet) 15.99 ACTUAL PURGE VOL (gal.) NR

DATE PURGED: 10-19-98 END PURGE: \_\_\_\_\_  
 DATE SAMPLED: ✓ SAMPLING TIME: 1220

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1220</u>	<u>GRAB</u>	<u>6.37</u>	<u>958</u>	<u>73.3</u>	<u>Clear</u>	<u>Clear</u>

OTHER: DD=2 ODOR: Strong NR NR  
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): \_\_\_\_\_

PURGING EQUIPMENT

2" Bladder Pump  Bailor (Teflon)  
 Centrifugal Pump  Bailor (PVC)  
 Submersible Pump  Bailor (Stainless Steel)  
 Well Wizard™  Dedicated  
 Other \_\_\_\_\_

SAMPLING EQUIPMENT

2" Bladder Pump  Bailor (Teflon)  
 Bomb Sampler  Bailor (Stainless Steel)  
 Dipper  Submersible Pump  
 Well Wizard™  Dedicated  
 Other \_\_\_\_\_

WELL INTEGRITY: OK LOCK: ARLO

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration: Date 10/19/98 Time \_\_\_\_\_ Meter Serial No. 87M  
 E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 1400

Temperature °F \_\_\_\_\_  
 SIGNATURE: [Signature] REVIEWED BY: SA PAGE 7 OF 7





# ARCO Products Company

Division of Atlantic/Richfield Company

Task Order No. **273700**

# Chain of Custody

ARCO Facility no. <b>7111</b>	City (Facility) <b>San Leandro</b>	Project manager (Consultant) <b>Glen VanderVeer</b>	Laboratory Name <b>CAE</b>
ARCO engineer <b>Paul Supple</b>	Telephone no. (ARCO)	Telephone no. (Consultant) <b>(408) 453-7900</b>	Contract Number
Consultant name <b>EMCON</b>	Address (Consultant) <b>144 A Mayhew Way, Walnut Creek, CA 94596</b>		
		Fax no. (Consultant) <b>(408) 437-9976</b>	

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX MDEPA 9000	BTEX/TPH EPA Method 8141A	TPH Method 8141 Gas O <sub>2</sub> Dissolved Oil and Grease	4131D 4132D	TPH EPA 418 USM 500E	EPA 6010010	EPA 624R240	EPA 625/6270	TCLP Semi Method VOA8 7000	CAM Metals EPA 60107006	TTLCO <sub>2</sub> STECO <sub>2</sub>	Lead Org/CHCl <sub>3</sub>	Lead EPA 74627421D	
			Soil	Water	Other	Ice	Acid																
<b>MW-5 (16)</b>		<b>2</b>		<b>X</b>		<b>X</b>	<b>HCL</b>	<b>12/15/98</b>	<b>1240</b>		<b>X</b>												

Method of shipment  
**Sampler will deliver**

Special Detection Limit/reporting  
**Lowest Possible**

Special QADC  
**As Normal**

Remarks  
**RAT 8  
2-40ml HCL  
VOAS**

#20905-17700

Lab Number

Turnaround Time:  
 Priority Rush 1 Business Day   
 Rush 2 Business Days   
 Expedited 5 Business Days   
 Standard 10 Business Days

Condition of sample:		Temperature received:	
Relinquished by sampler <i>[Signature]</i>	Date <b>12/15/98</b>	Time	Received by <i>[Signature]</i>
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory
			Date
			Time

# ARCO Products Company

Division of Atlantic/Richfield Company

Task Order No. 22317.00

# Chain of Custody

ARCO Facility no. <u>2111</u>	City (Facility) <u>San Leandro</u>	Project manager (Consultant) <u>Glen Vander Veen</u>	Laboratory Name <u>CAS</u>
ARCO engineer <u>Paul Supple</u>	Telephone no. (ARCO)	Telephone no. (Consultant) <u>(408) 453-7000</u>	Contract Number
Consultant name <u>EMCON</u>		Address (Consultant) <u>144-A Mayhew Way, Walnut Creek, CA 94596</u>	Method of shipment <u>Sampler will deliver</u>

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 801	Sulfides EPA 802	TPH EPA 803	Oil and Grease EPA 806	TPH EPA 418.1/SM 506	EPA 601/6010	EPA 624/6340	EPA 825/8270	TOLUENE METHYLBENZENE XYLENE EPA 826/8270	SEM METHYLBENZENE XYLENE EPA 826/8270	CAMP EPA 801/7000	TLC EPA 821/8210	Lead EPA 743/74310	Lead EPA 743/74310		
			Soil	Water	Other	Ice	Acid																		
MW-1(19)		7		X		X	HCL	10/15/98	1155																
MW-4(7)		2		X		X	HCL	10/15/98	1120																
MW-3(19)		7		X		X	HCL	10/15/98	1150																
MW-6(1)		2		X		X	HCL	-	-																
MW-2(17)		7		X		X	HCL	11/15/98	1205																
MW-7(16)		7		X		X	HCL	10/15/98	1220																

Special Detection Limit/reporting <u>Lowest Possible</u>
Special QACC <u>As Normal</u>

Remarks  
RAT 9  
2-40ml HCL  
VOCs  
#20805-117006

Lab Number

Condition of sample:		Temperature received:	
Relinquished by sampler <u>[Signature]</u>	Date <u>10/15/98</u>	Time	Received by <u>[Signature]</u>
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory
	Date	Time	Date
			Time

Turnaround Time:	
Priority Rush 1 Business Day	<input type="checkbox"/>
Rush 2 Business Days	<input type="checkbox"/>
Expedited 5 Business Days	<input type="checkbox"/>
Standard 10 Business Days	<input checked="" type="checkbox"/>