



PROTECTION
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March 8, 1999
Project 20805-123.005

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

Re: Quarterly Groundwater Monitoring Results and Remediation System Performance
Evaluation Report, Fourth Quarter 1998, for ARCO Service Station No. 2035, located at
1001 San Pablo Avenue, Albany, 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. 2035, located at 1001 San Pablo Avenue, Albany, California. Operation and performance data for the site's soil-vapor extraction system (SVE) and groundwater extraction remediation systems are also presented. The monitoring program complies with the Alameda County Health Care Services Agency 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


Valli Voruganti, P.E.
Project Engineer

Attachment: Quarterly Groundwater Monitoring Report, Fourth Quarter 1998

cc: Barney Chan, ACHCSA



Date: March 8, 1999**ARCO QUARTERLY GROUNDWATER MONITORING REPORT**

Station No.: 2035 Address: 1001 San Pablo Avenue, Albany, California
 Pinnacle Project No.: 20805-123.005
 ARCO Environmental Engineer/Phone No.: Paul Supple / (925) 299-8891
 Pinnacle Project Manager/Phone No.: Glen VanderVeen / (925) 977-9020- 510-740-5800
 Primary Agency/Regulatory ID No.: ACHCSA / Barney Chan

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.
3. Continued bubbling air into well RW-1 to introduce dissolved oxygen into the groundwater, thereby enhancing biodegradation of petroleum hydrocarbon in groundwater in the vicinity of the well.
4. Operated soil vapor extraction system (SVE) through November 10, 1998, when it was shut down due to low influent concentrations. *Is this correct? I thought SVE was shut down in 1996*

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.
3. Operate SVE system if hydrocarbon concentrations in extracted vapor warrant.
4. Continue bubbling air into well RW-1.

QUARTERLY MONITORING:

Current Phase of Project: Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems
SVE and Enhanced Bioremediation

Frequency of Sampling: Annual (First Quarter): MW-5
Quarterly: MW-1 through MW-4, MW-6, RW-1

Frequency of Monitoring: Quarterly (groundwater), Monthly (SVE)

Is Floating Product (FP) Present On-site: Yes No

Cumulative FP Recovered to Date: 27.9 gallons, Wells AS-1, AS-2, RW-1, VW-1, VW-2, and VW-7

FP Recovered This Quarter: None

Bulk Soil Removed to Date: 605 cubic yards of TPH impacted soil

Bulk Soil Removed This Quarter: None

Water Wells or Surface Waters, within 2000 ft., impacted by site: None

Current Remediation Techniques: SVE, and Bubbling air in RW-1

Average Depth to Groundwater: 11.2 feet

Groundwater Flow Direction and Gradient (Average): 0.02 ft/ft toward west

SVE QUARTERLY OPERATION AND PERFORMANCE:

| | |
|--|---|
| Equipment Inventory: | Therm Tech Model VAC-10 Thermal/Catalytic Oxidizer |
| Operating Mode: | Catalytic Oxidation |
| BAAQMD Permit #: | 10931 |
| TPH Conc. End of Period (lab): | 32 mg/m ³ on 11/10/98 |
| Benzene Conc. End of Period (lab): | <0.4 mg/m ³ |
| SVE Flowrate End of Period: | 99.6 cfm |
| Total HC Recovered This Period: | 82.39 pounds |
| Total HC Recovered to Date: | 3099.1 pounds |
| Utility Usage | |
| Electric (KWH): | 2529 KWH |
| Gas (Therms): | 451 Therms |
| Operating Hours This Period (SVE): | 1324.67 hours |
| Operating Hours to Date (SVE): | 8536.00 hours |
| Percent Operational (SVE): | 66% until 11/10/98 |
| Operating Hours This Period (GWE): | 0.0 hours |
| Percent Operational (GWE): | 0.0% |
| Unit Maintenance: | Routine monthly maintenance |
| Number of Auto Shut Downs: | 0 |
| Destruction Efficiency Permit Requirement: | 90% - 97% |
| Percent TPH Conversion: | 92.3% in Oct. 1998 and 37.5% in Nov. 1998, respectively |
| Average Stack Temperature: | 724 F |
| Average SVE Source Flow: | 99.4 scfm |
| Average SVE Process Flow: | 99.4 scfm |
| Average Source Vacuum: | 20" wc |

DISCUSSION:

Table 4 presents the extraction rate from the wellfield, the emission rate to the atmosphere, the destruction efficiency, and the cumulative TPHG mass removal. In calculating the emission rate to the atmosphere, the effluent concentration is assumed to be the method reporting limit if the analytical result was reported as non-detect (ND). Due to this assumption and the low influent concentrations, the destruction efficiency for November 1998 was calculated to be less than the permit requirement of 90%, and is not considered accurate. The emission rate to the atmosphere remains below the permit requirement of 0.05 lbs of Benzene per day.

ATTACHMENTS:

- Table 1 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Table 2 - Operational Uptime Information for the SVE System
- Table 3 - Flow Rates and Analytical Results of Air Sample Analyses
- Table 4 - Extraction and Emission Rates
- 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
- Appendix D - Certified Analytical Reports and Chain-of-Custody Documentation for Soil-Vapor Extraction System

**Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

**ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, California**

| Well Designation | Water Level Field Date | Top of Casing Elevation | Depth to Water | Groundwater Elevation | Floating Product Thickness | Groundwater Flow Direction | Hydraulic Gradient | Water Sample Field Date | TPHG LUFT Method | Benzene EPA 8020 | Toluene EPA 8020 | Ethylbenzene EPA 8020 | Total Xylenes EPA 8020 | MTBE EPA 8020 | MTBE EPA 8240 | Oil and Grease SM 5520B&F | Oil and Grease SM 5520C | Oil and Grease SM 5520F | TPPH EPA 418.1 | TPPH LUFT Method |
|------------------|------------------------|-------------------------|----------------|-----------------------|----------------------------|----------------------------|--------------------|-------------------------|--|------------------|------------------|-----------------------|------------------------|---------------|---------------|---------------------------|-------------------------|-------------------------|----------------|------------------|
| | | ft-MSL | feet | ft-MSL | feet | MWN | ft/ft | | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| MW-1 | 03-24-95 | 41.41 | 6.21 | 35.20 | ND | NW | 0.037 | 03-24-95 | 8800 | 3600 | <50 | 62 | 99 | -- | -- | -- | -- | -- | -- | -- |
| MW-1 | 05-24-95 | 41.41 | 9.37 | 32.04 | ND | WNW | 0.013 | 05-24-95 | 4800 | 2000 | <20 | 52 | <20 | -- | -- | -- | -- | -- | -- | -- |
| MW-1 | 08-22-95 | 41.41 | 10.30 | 31.11 | ND | SW | 0.012 | 08-22-95 | 780 | 310 | <2.5 | 12 | <2.5 | 14 | -- | -- | -- | -- | -- | -- |
| MW-1 | 11-09-95 | 41.41 | 12.25 | 29.16 | ND | WSW | 0.01 | 11-09-95 | 58 | 14 | <0.5 | <0.5 | <0.5 | -- | -- | -- | -- | -- | -- | -- |
| MW-1 | 02-27-96 | 41.41 | 9.08 | 32.33 | ND | SW | 0.009 | 02-27-96 | 2700 | 930 | 12 | 18 | 32 | 51 | -- | -- | -- | -- | -- | -- |
| MW-1 | 04-22-96 | 41.41 | 9.11 | 32.30 | ND | WSW | 0.014 | 04-22-96 | 2700 | 1000 | <10 | 22 | <10 | <60 | -- | -- | -- | -- | -- | -- |
| MW-1 | 08-15-96 | 41.41 | 10.37 | 31.04 | ND | SW | 0.011 | 08-15-96 | 300 | 52 | <0.5 | 0.9 | <0.5 | 22 | -- | -- | -- | -- | -- | -- |
| MW-1 | 12-10-96 | 41.41 | 8.79 | 32.62 | ND | WSW | 0.023 | 12-10-96 | 270 | 63 | 0.7 | <0.5 | 1 | 25 | -- | -- | -- | -- | -- | -- |
| MW-1 | 03-27-97 | 41.41 | 9.80 | 31.61 | ND | WSW | 0.026 | 03-27-97 | 1500 | 610 | <5 | 15 | 7 | 56 | -- | -- | -- | -- | -- | -- |
| MW-1 | 05-22-97 | 41.41 | 9.65 | 31.76 | ND | WSW | 0.024 | 05-22-97 | 110 | 5.5 | <0.5 | <0.5 | 0.7 | 10 | -- | -- | -- | -- | -- | -- |
| MW-1 | 09-04-97 | 41.41 | 10.22 | 31.19 | ND | W | 0.019 | 09-04-97 | 180 | 40 | <0.5 | 1.2 | 0.5 | 26 | -- | -- | -- | -- | -- | -- |
| MW-1 | 11-03-97 | 41.41 | 10.68 | 30.73 | ND | SW | 0.038 | 11-03-97 | 83 | 8 | <0.5 | <0.5 | <0.5 | 13 | -- | -- | -- | -- | -- | -- |
| MW-1 | 02-20-98 | 41.41 | 6.92 | 34.49 | ND | W | 0.031 | 02-20-98 | 1800 | 540 | 7 | 27 | 31 | 46 | -- | -- | -- | -- | -- | -- |
| MW-1 | 05-18-98 | 41.41 | 9.28 | 32.13 | ND | W | 0.02 | 05-18-98 | 4500 | 1300 | 20 | 57 | 20 | <60 | -- | -- | -- | -- | -- | -- |
| MW-1 | 08-20-98 | 41.41 | 10.05 | 31.36 | ND | W | 0.02 | 08-21-98 | 530 | 110 | <5 | <5 | <5 | 400 | -- | -- | -- | -- | -- | -- |
| MW-1 | 10-20-98 | 41.41 | 10.42 | 30.99 | ND | W | 0.02 | 10-20-98 | 66 | 9.1 | <0.5 | <0.5 | <0.5 | 8 | -- | -- | -- | -- | -- | -- |
| MW-2 | 03-24-95 | 40.38 | 6.96 | 33.42 | ND | NW | 0.037 | 03-24-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | -- | -- | -- | -- | -- | -- | -- |
| MW-2 | 05-24-95 | 40.38 | 10.02 | 30.36 | ND | WNW | 0.013 | 05-24-95 | Not sampled: well sampled semi-annually, during the first and third quarters | | | | | | | | | | | |
| MW-2 | 08-22-95 | 40.38 | 10.87 | 29.51 | ND | SW | 0.012 | 08-22-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <3 | -- | -- | -- | -- | -- | -- |
| MW-2 | 11-09-95 | 40.38 | 13.12 | 27.26 | ND | WSW | 0.01 | 11-09-95 | Not sampled: well sampled semi-annually, during the first and third quarters | | | | | | | | | | | |
| MW-2 | 02-27-96 | 40.38 | 10.25 | 30.13 | ND | SW | 0.009 | 02-27-96 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <3 | -- | -- | -- | -- | -- | -- |
| MW-2 | 04-22-96 | 40.38 | 9.98 | 30.40 | ND | WSW | 0.014 | 04-22-96 | Not sampled: well sampled semi-annually, during the first and third quarters | | | | | | | | | | | |
| MW-2 | 08-15-96 | 40.38 | 11.10 | 29.28 | ND | SW | 0.011 | 08-15-96 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 4 | -- | -- | -- | -- | -- | -- |
| MW-2 | 12-10-96 | 40.38 | 10.00 | 30.38 | ND | WSW | 0.023 | 12-10-96 | Not sampled: well sampled semi-annually, during the first and third quarters | | | | | | | | | | | |
| MW-2 | 03-27-97 | 40.38 | 10.38 | 30.00 | ND | WSW | 0.026 | 03-27-97 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 12 | -- | -- | -- | -- | -- | -- |
| MW-2 | 05-22-97 | 40.38 | 10.65 | 29.73 | ND | WSW | 0.024 | 05-22-97 | Not sampled: well sampled semi-annually, during the first and third quarters | | | | | | | | | | | |
| MW-2 | 09-04-97 | 40.38 | 10.87 | 29.51 | ND | W | 0.019 | 09-04-97 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 19 | -- | -- | -- | -- | -- | -- |
| MW-2 | 11-03-97 | 40.38 | 11.25 | 29.13 | ND | SW | 0.038 | 11-03-97 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 18 | -- | -- | -- | -- | -- | -- |
| MW-2 | 02-20-98 | 40.38 | 7.69 | 32.69 | ND | W | 0.031 | 02-20-98 | <50 | 0.5 | <0.5 | <0.5 | <0.5 | 12 | -- | -- | -- | -- | -- | -- |
| MW-2 | 05-18-98 | 40.38 | 9.88 | 30.50 | ND | W | 0.02 | 05-18-98 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 10 | -- | -- | -- | -- | -- | -- |
| MW-2 | 08-20-98 | 40.38 | 10.62 | 29.76 | ND | W | 0.02 | 08-21-98 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 3 | -- | -- | -- | -- | -- | -- |
| MW-2 | 10-20-98 | 40.38 | 11.00 | 29.38 | ND | W | 0.02 | 10-20-98 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 31 | -- | -- | -- | -- | -- | -- |

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Petroleum Hydrocarbons and Their Constituents
1995 - Present***

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|------------------|------------------------|-------------------------|----------------|-----------------------|----------------------------|----------------------------|--------------------|-------------------------|--|------------------|------------------|-----------------------|------------------------|---------------|---------------|---------------------------|-------------------------|-------------------------|----------------|------------------|
| | ft-MSL | feet | ft-MSL | feet | MWN | ft/ft | | | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| MW-3 | 03-24-95 | 41.44 | 7.29 | 34.15 | ND | NW | 0.037 | 03-24-95 | 51 | 0.8 | <0.5 | 2.4 | <0.5 | -- | -- | -- | -- | -- | <500 | -- |
| MW-3 | 05-24-95 | 41.44 | 9.53 | 31.91 | ND | WNW | 0.013 | 05-24-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | -- | -- | -- | -- | -- | <500 | -- |
| MW-3 | 08-22-95 | 41.44 | 11.19 | 30.25 | ND | SW | 0.012 | 08-22-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 79 | -- | -- | -- | -- | <500 | -- |
| MW-3 | 11-09-95 | 41.44 | 12.77 | 28.67 | ND | WSW | 0.01 | 11-09-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | -- | -- | -- | -- | -- | 600 | -- |
| MW-3 | 02-27-96 | 41.44 | 9.41 | 32.03 | ND | SW | 0.009 | 02-27-96 | 120 | 3.6 | <0.5 | 2.2 | 3.7 | 90 | -- | -- | -- | -- | <0.5 | -- |
| MW-3 | 04-22-96 | 41.44 | 9.63 | 31.81 | ND | WSW | 0.014 | 04-22-96 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 90 | -- | -- | -- | -- | -- | -- |
| MW-3 | 08-15-96 | 41.44 | 11.12 | 30.32 | ND | SW | 0.011 | 08-15-96 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 54 | -- | -- | -- | -- | -- | -- |
| MW-3 | 12-10-96 | 41.44 | 10.34 | 31.10 | ND | WSW | 0.023 | 12-10-96 | 71 | <0.5 | <0.5 | <0.5 | <0.5 | 130 | -- | -- | -- | -- | -- | -- |
| MW-3 | 03-27-97 | 41.44 | 10.28 | 31.16 | ND | WSW | 0.026 | 03-27-97 | <100 | <1 | <1 | <1 | <1 | 170 | -- | -- | -- | -- | -- | -- |
| MW-3 | 05-22-97 | 41.44 | 10.40 | 31.04 | ND | WSW | 0.024 | 05-22-97 | <100 | <1 | <1 | <1 | <1 | 95 | -- | -- | -- | -- | -- | -- |
| MW-3 | 09-04-97 | 41.44 | 10.75 | 30.69 | ND | W | 0.019 | 09-04-97 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 37 | -- | -- | -- | -- | -- | -- |
| MW-3 | 11-03-97 | 41.44 | 11.44 | 30.00 | ND | SW | 0.038 | 11-03-97 | <200 | <2 | <2 | <2 | <2 | 130 | -- | -- | -- | -- | -- | -- |
| MW-3 | 02-20-98 | 41.44 | 7.48 | 33.96 | ND | W | 0.031 | 02-20-98 | <200 | <2 | 5 | <2 | 8 | 140 | -- | -- | -- | -- | <0.5 | -- |
| MW-3 | 05-18-98 | 41.44 | 9.87 | 31.57 | ND | W | 0.02 | 05-18-98 | <100 | <1 | <1 | <1 | <1 | 150 | -- | -- | -- | -- | <0.5 | -- |
| MW-3 | 08-20-98 | 41.44 | 10.72 | 30.72 | ND | W | 0.02 | 08-21-98 | <200 | <2 | <2 | <2 | <2 | 210 | -- | -- | -- | -- | <0.5 | -- |
| MW-3 | 10-20-98 | 41.44 | 11.30 | 30.14 | ND | W | 0.02 | 10-20-98 | <200 | <2 | <2 | <2 | <2 | 270 | -- | -- | -- | -- | <0.5 | -- |
| MW-4 | 03-24-95 | 40.33 | 5.92 | 34.41 | ND | NW | 0.037 | 03-24-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | -- | -- | -- | -- | -- | -- | -- |
| MW-4 | 05-24-95 | 40.33 | 9.23 | 31.10 | ND | WNW | 0.013 | 05-24-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | -- | -- | -- | -- | -- | -- | -- |
| MW-4 | 08-22-95 | 40.33 | 10.61 | 29.72 | ND | SW | 0.012 | 08-22-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 99 | -- | -- | -- | -- | -- | -- |
| MW-4 | 11-09-95 | 40.33 | 11.97 | 28.36 | ND | WSW | 0.01 | 11-09-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | -- | 89 | -- | -- | -- | -- | -- |
| MW-4 | 02-27-96 | 40.33 | 8.84 | 31.49 | ND | SW | 0.009 | 02-27-96 | <50 | 0.8 | <0.5 | <0.5 | <0.5 | <3 | -- | -- | -- | -- | -- | -- |
| MW-4 | 04-22-96 | 40.33 | 9.15 | 31.18 | ND | WSW | 0.014 | 04-22-96 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-4 | 08-15-96 | 40.33 | 10.35 | 29.98 | ND | SW | 0.011 | 08-15-96 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-4 | 12-10-96 | 40.33 | 8.70 | 31.63 | ND | WSW | 0.023 | 12-10-96 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-4 | 03-27-97 | 40.33 | 9.75 | 30.58 | ND | WSW | 0.026 | 03-27-97 | <5000 | <50 | <50 | <50 | <50 | 4200 | -- | -- | -- | -- | -- | -- |
| MW-4 | 05-22-97 | 40.33 | 9.91 | 30.42 | ND | WSW | 0.024 | 05-22-97 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-4 | 09-04-97 | 40.33 | 10.25 | 30.08 | ND | W | 0.019 | 09-04-97 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-4 | 11-03-97 | 40.33 | 10.79 | 29.54 | ND | SW | 0.038 | 11-03-97 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <3 | -- | -- | -- | -- | -- | -- |
| MW-4 | 02-20-98 | 40.33 | 6.78 | 33.55 | ND | W | 0.031 | 02-20-98 | <2000 | <20 | <20 | <20 | <20 | 3300 | -- | -- | -- | -- | -- | -- |
| MW-4 | 05-18-98 | 40.33 | 9.26 | 31.07 | ND | W | 0.02 | 05-18-98 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <3 | -- | -- | -- | -- | -- | -- |
| MW-4 | 08-20-98 | 40.33 | 10.10 | 30.23 | ND | W | 0.02 | 08-21-98 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 9 | -- | -- | -- | -- | -- | -- |
| MW-4 | 10-20-98 | 40.33 | 10.43 | 29.90 | ND | W | 0.02 | 10-20-98 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 17 | -- | -- | -- | -- | -- | -- |

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Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

**ARCO Service Station No. 2035
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| Well Designation | Water Level Field Date | Top of Casing Elevation | Depth to Water | Groundwater Elevation | Floating Product Thickness | Groundwater Flow Direction | Hydraulic Gradient | Water Sample Field Date | TPHG LUFT Method | Benzene EPA 8020 | Toluene EPA 8020 | Ethylbenzene EPA 8020 | Total Xylenes EPA 8020 | MTBE EPA 8020 | MTBE EPA 8240 | Oil and Grease SM 5520B&F | Oil and Grease SM 5520C | Oil and Grease SM 5520F | TRPH EPA 418.J | TPHD LUFT Method |
|------------------|------------------------|-------------------------|----------------|-----------------------|----------------------------|----------------------------|--------------------|-------------------------|--|------------------|------------------|-----------------------|------------------------|---------------|---------------|---------------------------|-------------------------|-------------------------|----------------|------------------|
| | | ft-MSL | feet | ft-MSL | feet | MWN | ft/ft | | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| MW-5 | 03-24-95 | 41.84 | 6.23 | 35.61 | ND | NW | 0.037 | 03-24-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | -- | -- | -- | -- | -- | -- | -- |
| MW-5 | 05-24-95 | 41.84 | 9.61 | 32.23 | ND | WNW | 0.013 | 05-24-95 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 08-22-95 | 41.84 | 11.12 | 30.72 | ND | SW | 0.012 | 08-22-95 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 11-09-95 | 41.84 | 12.52 | 29.32 | ND | WSW | 0.01 | 11-09-95 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 02-27-96 | 41.84 | 9.52 | 32.32 | ND | SW | 0.009 | 02-27-96 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <3 | -- | -- | -- | -- | -- | -- |
| MW-5 | 04-22-96 | 41.84 | 9.44 | 32.40 | ND | WSW | 0.014 | 04-22-96 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 08-15-96 | 41.84 | 10.83 | 31.01 | ND | SW | 0.011 | 08-15-96 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 12-10-96 | 41.84 | 9.20 | 32.64 | ND | WSW | 0.023 | 12-10-96 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 03-27-97 | 41.84 | 10.10 | 31.74 | ND | WSW | 0.026 | 03-27-97 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <3 | -- | -- | -- | -- | -- | -- |
| MW-5 | 05-22-97 | 41.84 | 10.28 | 31.56 | ND | WSW | 0.024 | 05-22-97 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 09-04-97 | 41.84 | 10.73 | 31.11 | ND | W | 0.019 | 09-04-97 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 11-03-97 | 41.84 | 11.23 | 30.61 | ND | SW | 0.038 | 11-03-97 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 02-20-98 | 41.84 | 6.67 | 35.17 | ND | W | 0.031 | 02-20-98 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <3 | -- | -- | -- | -- | -- | -- |
| MW-5 | 05-18-98 | 41.84 | 9.61 | 32.23 | ND | W | 0.02 | 05-18-98 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 08-20-98 | 41.84 | 10.58 | 31.26 | ND | W | 0.02 | 08-21-98 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-5 | 10-20-98 | 41.84 | 10.66 | 31.18 | ND | W | 0.02 | 10-20-98 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-6 | 03-24-95 | 40.13 | 9.03 | 31.10 | ND | NW | 0.037 | 03-24-95 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | -- | -- | -- | -- | -- | -- | -- |
| MW-6 | 05-24-95 | 40.13 | 12.45 | 27.68 | ND | WNW | 0.013 | 05-24-95 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-6 | 08-22-95 | 40.13 | 13.32 | 26.81 | ND | SW | 0.012 | 08-22-95 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-6 | 11-09-95 | 40.13 | 14.13 | 26.00 | ND | WSW | 0.01 | 11-09-95 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-6 | 02-27-96 | 40.13 | 11.86 | 28.27 | ND | SW | 0.009 | 02-27-96 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <3 | -- | -- | -- | -- | -- | -- |
| MW-6 | 04-22-96 | 40.13 | 12.35 | 27.78 | ND | WSW | 0.014 | 04-22-96 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-6 | 08-15-96 | 40.13 | 13.18 | 26.95 | ND | SW | 0.011 | 08-15-96 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-6 | 12-10-96 | 40.13 | 11.94 | 28.19 | ND | WSW | 0.023 | 12-10-96 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-6 | 03-27-97 | 40.13 | 13.10 | 27.03 | ND | WSW | 0.026 | 03-27-97 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | <3 | -- | -- | -- | -- | -- | -- |
| MW-6 | 05-22-97 | 40.13 | 13.00 | 27.13 | ND | WSW | 0.024 | 05-22-97 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-6 | 09-04-97 | 40.13 | 13.30 | 26.83 | ND | W | 0.019 | 09-04-97 | Not sampled: well sampled annually, during the first quarter | | | | | | | | | | | |
| MW-6 | 11-03-97 | 40.13 | 13.42 | 26.71 | ND | SW | 0.038 | 11-03-97 | <50 | <0.5 | <0.5 | <0.5 | <0.5 | 19 | -- | -- | -- | -- | -- | -- |
| MW-6 | 02-20-98 | 40.13 | 10.57 | 29.56 | ND | W | 0.031 | 02-20-98 | <100 | <1 | <1 | <1 | <1 | 95 | -- | -- | -- | -- | -- | -- |
| MW-6 | 05-18-98 | 40.13 | 12.64 | 27.49 | ND | W | 0.02 | 05-18-98 | <100 | <1 | <1 | <1 | <1 | 180 | -- | -- | -- | -- | -- | -- |
| MW-6 | 08-20-98 | 40.13 | 13.13 | 27.00 | ND | W | 0.02 | 08-21-98 | <100 | <1 | <1 | <1 | <1 | 180 | -- | -- | -- | -- | -- | -- |
| MW-6 | 10-20-98 | 40.13 | 13.48 | 26.65 | ND | W | 0.02 | 10-20-98 | <100 | <1 | <1 | <1 | <1 | 180 | -- | -- | -- | -- | -- | -- |

**Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

**ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, California**

| Well Designation | Water Level Field Date | Top of Casing Elevation | Depth to Water | Groundwater Elevation | Floating Product Thickness | Groundwater Flow Direction | Hydraulic Gradient | Water Sample Field Date | TPHC LUFT Method | Benzene EPA 8020 | Toluene EPA 8020 | Ethylbenzene EPA 8020 | Total Xylenes EPA 8020 | MTBE EPA 8020 | MTBE EPA 8240 | Oil and Grease SM 5520B&F | Oil and Grease SM 5520C | Oil and Grease SM 5520F | TRPH EPA 418.1 | TPHD LUFT Method |
|------------------|------------------------|-------------------------|----------------|-----------------------|----------------------------|----------------------------|--------------------|-------------------------|--|------------------|------------------|-----------------------|------------------------|---------------|---------------|---------------------------|-------------------------|-------------------------|----------------|------------------|
| | | ft-MSL | feet | ft-MSL | feet | MWN | ft/ft | | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| RW-1 | 03-24-95 | 40.33 | 9.32 | 31.02** | 0.01 | NW | 0.037 | 03-24-95 | 11000 | 560 | 660 | 150 | 1700 | -- | -- | -- | -- | -- | -- | -- |
| RW-1 | 05-24-95 | 40.33 | 9.75 | 30.60** | 0.03 | WNW | 0.013 | 05-24-95 | Not sampled: well contained floating product | | | | | | | | | | | |
| RW-1 | 08-22-95 | 40.33 | 10.86 | 29.48** | 0.02 | SW | 0.012 | 08-22-95 | Not sampled: well contained floating product | | | | | | | | | | | |
| RW-1 | 11-09-95 | 40.33 | 20.61 | 19.72 | ND | WSW | 0.01 | 11-09-95 | 1600 | 79 | 46 | 13 | 240 | -- | -- | -- | -- | -- | -- | -- |
| RW-1 | 02-27-96 | 40.33 | 16.56 | 23.77 | ND | SW | 0.009 | 02-27-96 | 210 | 44 | 7.5 | 2.5 | 24 | -- | -- | -- | -- | -- | -- | -- |
| RW-1 | 04-22-96 | 40.33 | 9.65 | 30.68 | ND | WSW | 0.014 | 04-22-96 | 36000 | 7400 | 3700 | 580 | 3400 | <300 | -- | -- | -- | -- | -- | -- |
| RW-1 | 08-15-96 | 40.33 | 10.60 | 29.73 | ND | SW | 0.011 | 08-15-96 | 1800 | 31 | 38 | 15 | 150 | <30 | -- | -- | -- | -- | -- | -- |
| RW-1 | 12-10-96 | 40.33 | 8.72 | 31.61 | ND | WSW | 0.023 | 12-10-96 | 25000 | 1900 | 1000 | 330 | 3200 | <100 | -- | -- | -- | -- | -- | -- |
| RW-1 | 03-27-97 | 40.33 | 10.33 | 30.00 | ND | WSW | 0.026 | 03-27-97 | 7200 | 1900 | 59 | 95 | 240 | 480 | -- | -- | -- | -- | -- | -- |
| RW-1 | 05-22-97 | 40.33 | 10.10 | 30.23 | ND | WSW | 0.024 | 05-22-97 | 3000 | 630 | 84 | 45 | 340 | <60 | -- | -- | -- | -- | -- | -- |
| RW-1 | 09-04-97 | 40.33 | 10.42 | 29.91 | ND | W | 0.019 | 09-04-97 | 7100 | 120 | 55 | 14 | 160 | <60 | -- | -- | -- | -- | -- | -- |
| RW-1 | 11-03-97 | 40.33 | 9.10 | 31.23 | ND | SW | 0.038 | 11-03-97 | <200 | 14 | 19 | 3 | 19 | 140 | -- | -- | -- | -- | -- | -- |
| RW-1 | 02-20-98 | 40.33 | 7.49 | 32.84 | ND | W | 0.031 | 02-20-98 | 3800 | 1000 | 85 | 64 | 220 | 950 | -- | -- | -- | -- | -- | -- |
| RW-1 | 05-18-98 | 40.33 | 8.90 | 31.43 | ND | W | 0.02 | 05-18-98 | <200 | 45 | <2 | 2 | 4 | 220 | -- | -- | -- | -- | -- | -- |
| RW-1 | 08-20-98 | 40.33 | 11.06 | 29.27 | ND | W | 0.02 | 08-21-98 | 480 | 200 | <2 | <2 | 30 | 180 | -- | -- | -- | -- | -- | -- |
| RW-1 | 10-20-98 | 40.33 | 11.12 | 29.21 | ND | W | 0.02 | 10-20-98 | 110 | 36 | 2.9 | <0.5 | 4.1 | 5 | -- | -- | -- | -- | -- | -- |

**Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

**ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, California**

| Well Designation | Water Level Field Date | Top of Casing Elevation | Depth to Water | Groundwater Elevation | Floating Product Thickness | Groundwater Flow Direction | Hydraulic Gradient | Water Sample Field Date | TPHG LUFT Method | Benzene EPA 8020 | Toluene EPA 8020 | Ethylbenzene EPA 8020 | Total Xylenes EPA 8020 | MTBE EPA 8020 | MTBE EPA 8240 | Oil and Grease SM 5520B&F | Oil and Grease SM 5520C | Oil and Grease SM 5520F | TRPH EPA 418.1 | TPHD LUFT Method |
|------------------|---------------------------|----------------------------|----------------|--------------------------|-------------------------------|-------------------------------|-----------------------|----------------------------|---------------------|---------------------|---------------------|--------------------------|---------------------------|------------------|------------------|------------------------------|----------------------------|----------------------------|-------------------|---------------------|
| | ft-MSL | feet | ft-MSL | feet | MWN | ft/ft | | | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |

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

--: not analyzed or not applicable
*: For previous historical groundwater elevation and analytical data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report, ARCO Service Station 2035, Albany, California*, (EMCON, March 25, 1996).
**: [corrected elevation (Z')] = Z + (h * 0.73); where Z = measured elevation, h = floating product thickness, 0.73 = density ratio of oil to water

Table 2
Operational Uptime Information for the
Soil Vapor Extraction System (1997 - 1998)
11/01/97 - 11/10/98
ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, CA

| Date End | Hr-Meter Arrival | Operating Hours To Date | No. of Days Between Sampling Dates | | | Percent Uptime | Cumulative Days (begin 12/93) | |
|-------------|---------------------|----------------------------|------------------------------------|--------|-----------|-------------------|-------------------------------|--------------|
| | | | Total Days | Uptime | Days Down | | Total Days | Total Uptime |
| 11/01/97 | | 6873.20 | | | | | 1425 | 335 |
| 12/01/97 | 11484.46 | 7211.10 | 30 | 14 | 16 | 47% | 1455 | 349 |
| 01/27/98 | 11484.46 | 7211.10 | 57 | 0 | 57 | 0% | 1512 | 349 |
| 08/12/98 | 11484.46 | 7211.10 | 197 | 0 | 197 | 0% | 1709 | 349 |
| 09/02/98 | 11484.69 | 7211.33 | 21 | 0 | 21 | 0% | 1730 | 349 |
| 10/19/98 | 12279.71 | 8006.35 | 47 | 33 | 14 | 70% | 1777 | 382 |
| 11/10/98 | 12809.36 | 8536.00 | 22 | 22 | 0 | 100% | 1799 | 404 |

21 days
 47 days
 last time

S TPHg
 177
 76 #
 6.2 #

374 69 18%

Table 3
Flow Rates and Analytical Results of Air Sample Analyses
(1997 - 1998)

ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, California

| Date End | Vacuum ("WC) | Velocity (fpm) | Flowrate (cfm) | Sample Location | Analyses (mg/m ³) | | | | |
|-------------|-----------------|-------------------|-------------------|--------------------|-------------------------------|---------|---------|--------------|--------|
| | | | | | TPHG | Benzene | Toluene | Ethylbenzene | Xylene |
| 12/01/97 | | | 221.4 | Influent | 640 | 2 | | | |
| | | | | Effluent | 34 | <0.4 | | | |
| 01/27/98 | NA | NA | NA | Influent | NA | NA | | | |
| | | | | Effluent | NA | NA | | | |
| 08/12/98 | NA | NA | NA | Influent | NA | NA | | | |
| | | | | Effluent | NA | NA | | | |
| 09/02/98 | 20 | 1050 | 87.1 | Influent | 2500 | <4 | <4 | 7 | 11 |
| | | | | Effluent | 37 | <0.4 | <0.4 | 0.5 | <0.9 |
| 10/19/98 | 20 | 1200 | 99.6 | Influent | 260 | <0.4 | 2.7 | <0.5 | <0.9 |
| | | | | Effluent | <20 | <0.4 | <0.4 | <0.5 | <0.9 |
| 11/10/98 | 20 | 1200 | 99.6 | Influent | 32 | <0.4 | 0.5 | <0.4 | <0.9 |
| | | | | Effluent | <20 | <0.4 | <0.4 | <0.5 | <0.9 |
| | | | | | | | | | |

WC = inches of water column.
Analytical results in milligrams per cubic meter

Table 4
Extraction and Emission Rates (1997 - 1998)

ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, California

| Date End | Extraction Rate from Wells (lbs/day) | | Emissions Rate to Atmosphere (lbs/day) | | Destruction Removal Efficiency, % | | Cumulative TPHG Removal (lbs) | |
|-------------|---|---------|---|---------|--------------------------------------|---------|----------------------------------|--------|
| | TPHG | Benzene | TPHG | Benzene | TPHG | Benzene | Period | Total |
| 12/01/97 | 12.58 | 0.04 | <0.6685 | <0.0079 | 94.7 | 80.0 | 177.15 | 3016.5 |
| 01/27/98 | NA | NA | NA | NA | NA | NA | 0.00 | 3016.5 |
| 08/12/98 | NA | NA | NA | NA | NA | NA | 0.00 | 3016.5 |
| 09/02/98 | 19.34 | 0.03 | <0.2863 | <0.0031 | 98.5 | 90.0 | 0.19 | 3016.7 |
| 10/19/98 | 2.30 | 0.0035 | <0.1768 | <0.0035 | 92.3 | 0.0 | 76.15 | 3092.8 |
| 11/10/98 | 0.28 | 0.0035 | <0.1768 | <0.0035 | 37.5 | 0.0 | 6.24 | 3099.1 |

Air Permit Limits

DRE shall be at least 98.5% when: influent \geq 2000 ppmV (measured as C6)

DRE shall be at least 97% when: 2000 ppmV > influent \geq 200 ppmV (measured as C6)

DRE shall be at least 90% for influent < 200 ppmV (measured as C6)

Daily benzene emissions shall not exceed 0.05 lbs.

Sample Calculations

$$\begin{aligned} \text{Ext. Rate from} &= \frac{70 \text{ cuft}}{\text{min}} \times \frac{3100 \text{ mg}}{\text{cumeter}} \times 0.028 \frac{\text{cumeter}}{\text{cuft}} \times \frac{\text{lb}}{454000 \text{ mg}} \times 1,440 \frac{\text{min}}{\text{day}} \\ \text{Wells (lbs/day)} & \\ &= 19.27 \text{ lbs/day} \end{aligned}$$

$$\begin{aligned} \text{Dest. Removal} &= \frac{19.27 - (<0.12)}{19.27} \times 100 = 99.35\% \\ \text{Efficiency, \%} & \end{aligned}$$



SHELL STATION

SIDEWALK

MARIN AVENUE

SAN PABLO AVENUE

SIDEWALK

DRIVEWAY

DRIVEWAY

APPROXIMATE PROPERTY LINE

EXPLANATION

- ⊙ Groundwater monitoring well
- Vapor extraction well
- ⊙ Air sparge well

(110/36/5) Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 10/20/98

< Not detected at or above the indicated laboratory detection limit

NS Not sampled

RW-1 (110/36/5)

VW-2

AS-1

VW-3

MW-1 (66/9.1/8)

Former gasoline storage tank pit

AS-2

VW-7

VW-4

VW-8

MW-2 (<50/<0.5/31)

VW-5

VW-6

Remediation compound

STATION BUILDING

MW-3 (<200/<2/270)

Service island (Typ.)

VW-9

Former waste-oil tank

MW-6 (<100/<1/180)

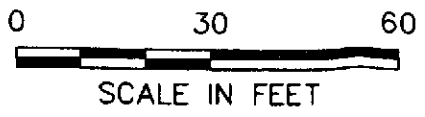
NEW TANK PIT

MW-5 (NS)

MW-4 (<50/<0.5/17)

Pinnacle

ENVIRONMENTAL SOLUTIONS
A DIVISION OF EMCON

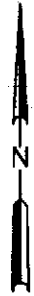


DATE JAN. 1999
DWN KAB
APP _____
REV _____
PROJECT NO.
20805-123.005

FIGURE 1
ARCO PRODUCTS COMPANY
SERVICE STATION 2035, 1001 SAN PABLO AVE.
ALBANY, CALIFORNIA
GROUNDWATER ANALYTICAL SUMMARY
FOURTH QUARTER 1998

IMAGE Files: <No Images>
XREF Files: <No Xrefs>
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SANJOSE/CADD: N:\DWG\PINACL\2035\2035CHEM.DWG Fri, 08/Jan/99 01:51pm kblack

1" 1/2" 0" 1"



SHELL STATION

SIDEWALK

MARIN AVENUE

SAN PABLO AVENUE

SIDEWALK

Service island (Typ.)

RW-1 (29.21)

MW-2 (29.38)

MW-6 (26.65)

MW-4 (29.90)

MW-1 (30.99)

MW-3 (30.14)

MW-5 (31.18)

Former gasoline storage tank pit

Remediation compound

Former waste-oil tank

STATION BUILDING

NEW TANK PIT

APPROXIMATE PROPERTY LINE

DRIVEWAY

0.02

EXPLANATION

- ⊙ Groundwater monitoring well
- (30.99) Groundwater elevation (Ft.-MSL); measured 10/20/98
- ? - - - Groundwater elevation contour (Ft.-MSL)
- ← Approximate direction of groundwater flow showing gradient

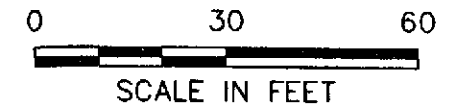


IMAGE Files: <No Images>
 XREF Files: <No Xrefs>
 Dimscale: 30 Ltscale: 30 Pellscale: 0
 SANJOSE/CADD: N:\DWG\PINACL\2035\2035GWC.DWG Wed, 27/Jan/99 03:17pm kblack

Pinnacle

ENVIRONMENTAL SOLUTIONS
A DIVISION OF EMCON

DATE JAN. 1999
 DWN KAB
 APP _____
 REV _____
 PROJECT NO.
 20805-123.005

FIGURE 2
 ARCO PRODUCTS COMPANY
 SERVICE STATION 2035, 1001 SAN PABLO AVE.
 ALBANY, 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[®] 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:

$$P = \pi r^2 h \times 7.48 \times 3$$

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 = ± 0.1 pH units
- COND. = ± 10 %
- TEMP. = ± 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, MONITORING 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. 5/96



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 _____



EMCON

WATER SAMPLE FIELD DATA SHEET

FIGURE

A-2



EMCON - SACRAMENTO
GROUNDWATER SAMPLING AND ANALYSIS REQUEST FORM

PROJECT NAME :

SCHEDULED DATE :

SPECIAL INSTRUCTIONS / CONSIDERATIONS :

[Empty box for special instructions]

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 |
|-----------------------|--------------------------|----------------------|-----------------------|-------------------|
| | | | | |

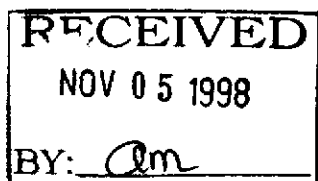
Laboratory and Lab QC Istructions:



SAMPLING AND ANALYSIS REQUEST FORM

FIGURE
A-3

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



November 3, 1998

Service Request No.: S9802801

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

RE: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY

Dear Mr. Vanderveen:

The following pages contain analytical results for sample(s) received by the laboratory on October 20, 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 14, 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

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix: Water

Service Request: S9802801
Date Collected: 10/20/98
Date Received: 10/20/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-4(11)
Lab Code: S9802801-001
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 | 17 | |

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix: Water

Service Request: S9802801
Date Collected: 10/20/98
Date Received: 10/20/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-1(29)
Lab Code: S9802801-002
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 | 66 | D1 |
| Benzene | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/22/98 | 9.1 | |
| 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 | 8 | |

D1 Quantitated as gasoline. The sample contained components that eluted in the gasoline range, but the chromatogram did not match the typical gasoline fingerprint.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix: Water

Service Request: S9802801
Date Collected: 10/20/98
Date Received: 10/20/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-2(28)
Lab Code: S9802801-003
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 | 10/31/98 | ND | |
| Benzene | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/31/98 | ND | |
| Toluene | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/31/98 | ND | |
| Ethylbenzene | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/31/98 | ND | |
| Xylenes, Total | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/31/98 | ND | |
| Methyl <i>tert</i> -Butyl Ether | EPA 5030 | 8020 | 3 | 1 | NA | 10/31/98 | 31 | |

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix: Water

Service Request: S9802801
Date Collected: 10/20/98
Date Received: 10/20/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-6(14)
Lab Code: S9802801-004
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 | 2 | NA | 10/31/98 | <100 | C1 |
| Benzene | EPA 5030 | 8020 | 0.5 | 2 | NA | 10/31/98 | <1 | C1 |
| Toluene | EPA 5030 | 8020 | 0.5 | 2 | NA | 10/31/98 | <1 | C1 |
| Ethylbenzene | EPA 5030 | 8020 | 0.5 | 2 | NA | 10/31/98 | <1 | C1 |
| Xylenes, Total | EPA 5030 | 8020 | 0.5 | 2 | NA | 10/31/98 | <1 | C1 |
| Methyl <i>tert</i> -Butyl Ether | EPA 5030 | 8020 | 3 | 2 | NA | 10/31/98 | 180 | |

C1 The MRL was elevated due to high analyte concentration requiring sample dilution.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix: Water

Service Request: S9802801
Date Collected: 10/20/98
Date Received: 10/20/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-3(33)
Lab Code: S9802801-005
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 | 4 | NA | 10/31/98 | <200 | C1 |
| Benzene | EPA 5030 | 8020 | 0.5 | 4 | NA | 10/31/98 | <2 | C1 |
| Toluene | EPA 5030 | 8020 | 0.5 | 4 | NA | 10/31/98 | <2 | C1 |
| Ethylbenzene | EPA 5030 | 8020 | 0.5 | 4 | NA | 10/31/98 | <2 | C1 |
| Xylenes, Total | EPA 5030 | 8020 | 0.5 | 4 | NA | 10/31/98 | <2 | C1 |
| Methyl <i>tert</i> -Butyl Ether | EPA 5030 | 8020 | 3 | 4 | NA | 10/31/98 | 270 | |

C1 The MRL was elevated due to high analyte concentration requiring sample dilution.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix: Water

Service Request: S9802801
Date Collected: 10/20/98
Date Received: 10/20/98

BTEX, MTBE and TPH as Gasoline

Sample Name: RW-1(12)
Lab Code: S9802801-006
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 | 1 | NA | 10/31/98 | 110 | D1 |
| Benzene | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/31/98 | 36 | |
| Toluene | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/31/98 | 2.9 | |
| Ethylbenzene | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/31/98 | ND | |
| Xylenes, Total | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/31/98 | 4.1 | |
| Methyl <i>tert</i> -Butyl Ether | EPA 5030 | 8020 | 3 | 1 | NA | 10/31/98 | 5 | |

D1 Quantitated as gasoline. The sample contained components that eluted in the gasoline range, but the chromatogram did not match the typical gasoline fingerprint.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix: Water

Service Request: S9802801
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: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix: Water

Service Request: S9802801
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S981030-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 | 10/30/98 | ND | |
| Benzene | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/30/98 | ND | |
| Toluene | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/30/98 | ND | |
| Ethylbenzene | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/30/98 | ND | |
| Xylenes, Total | EPA 5030 | 8020 | 0.5 | 1 | NA | 10/30/98 | ND | |
| Methyl <i>tert</i> -Butyl Ether | EPA 5030 | 8020 | 3 | 1 | NA | 10/30/98 | ND | |

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix: Water

Service Request: S9802801
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-4(11) | S9802801-001 | | 106 | 95 |
| MW-1(29) | S9802801-002 | | 108 | 95 |
| MW-2(28) | S9802801-003 | | 99 | 90 |
| MW-6(14) | S9802801-004 | | 93 | 90 |
| MW-3(33) | S9802801-005 | | 106 | 80 |
| RW-1(12) | S9802801-006 | | 86 | 87 |
| BATCH QC | S9802915-005MS | | 99 | 97 |
| BATCH QC | S9802915-005DMS | | 90 | 104 |
| Method Blank | S981022-WB1 | | 92 | 96 |
| Method Blank | S981030-WB1 | | 99 | 80 |

CAS Acceptance Limits: 69-116 69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix: Water

Service Request: S9802801
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/31/98

Matrix Spike/Duplicate Matrix Spike Summary
 TPH as Gasoline

Sample Name: BATCH QC Units: ug/L (ppb)
Lab Code: S9802915-005MS, S9802915-005DMS Basis: NA
Test Notes:

| Analyte | Prep Method | Analysis Method | Percent Recovery | | | | | | | | | | Result Notes |
|----------|-------------|-----------------|------------------|-----|---------------|--------------|-----|----------------|-----|-----------------------------|--------|--------|--------------|
| | | | Spike Level | | Sample Result | Spike Result | | CAS Acceptance | | Relative Percent Difference | | | |
| | | | MRL | MS | | DMS | MS | DMS | MS | | DMS | Limits | |
| Gasoline | EPA 5030 | CA/LUFT | 50 | 250 | 250 | ND | 250 | 270 | 100 | 108 | 75-135 | 8 | |

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22312.00/RAT8/2035 ALBANY

Service Request: S9802801
Date Analyzed: 10/31/98

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

Sample Name: ICV Units: ug/L (ppb)
Lab Code: ICV1 Basis: NA
Test Notes:

ICV Source:

| Analyte | Prep Method | Analysis Method | True Value | Result | CAS Percent Recovery | | Result Notes |
|---------------------------------|-------------|-----------------|------------|--------|----------------------|------------------|--------------|
| | | | | | Acceptance Limits | 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 | 26 | 85-115 | 104 | |
| Ethylbenzene | EPA 5030 | 8020 | 25 | 27 | 85-115 | 108 | |
| Xylenes, Total | EPA 5030 | 8020 | 75 | 80 | 85-115 | 107 | |
| Methyl <i>tert</i> -Butyl Ether | EPA 5030 | 8020 | 25 | 25 | 85-115 | 100 | |

ICV/032196

APPENDIX C
FIELD DATA SHEETS

**FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY**

PROJECT # : 21775-217.003

STATION ADDRESS : 101 San Pablo Avenue, Albany

DATE : 10/20/98

ARCO STATION # : 2035

FIELD TECHNICIAN : Manuel Gallegos

DAY : Tuesday

| DTW Order | WELL ID | Well Box Seal | Type Of Well Box | Well Box Secure | Lock Number | Type Of Well Cap | FIRST DEPTH TO WATER (feet) | SECOND DEPTH TO WATER (feet) | DEPTH TO FLOATING PRODUCT (feet) | FLOATING PRODUCT THICKNESS (feet) | WELL TOTAL DEPTH (feet) | COMMENTS |
|-----------|---------|---------------|------------------|-----------------|-------------|------------------|-----------------------------|------------------------------|----------------------------------|-----------------------------------|-------------------------|----------|
| 1 | MW-5 | OK | 15/16 | OK | ARCO | LWC | 10.46 | 10.46 | NR | NR | 25.1 | |
| 2 | MW-4 | OK | 15/16 | OK | ARCO | LWC | 10.43 | 10.43 | | | 25.1 | |
| 3 | MW-1 | OK | 15/16 | OK | ARCO | LWC | 10.42 | 10.42 | | | 29.7 | |
| 4 | MW-2 | OK | 15/16 | OK | ARCO | LWC | 11.00 | 11.00 | | | 28.8 | |
| 5 | MW-6 | OK | 15/16 | OK | ARCO | LWC | 13.48 | 13.48 | | | 24.2 | |
| 6 | MW-3 | OK | 15/16 | OK | ARCO | LWC | 11.30 | 11.30 | | | 33.0 | |
| 7 | RW-1 | OK | 5/16 | OK | None | LWC | 11.12 | 11.12 | | | 25.5 | |
| | | | | | | | | | | | | |
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SURVEY POINTS ARE TOP OF WELL CASINGS

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-217.003
 PURGED BY M. Gallegos
 SAMPLED BY ✓

SAMPLE ID mw-1 (29')
 CLIENT NAME ARCO # 2035
 LOCATION Albany, 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.) 12.59
 DEPTH OF WELL (feet) 29.7 CALCULATED PURGE (gal.) 37.78
 DEPTH OF WATER (feet) 10.42 ACTUAL PURGE VOL (gal.) 38.0

DATE PURGED: 10-20-98 END PURGE: 1047
 DATE SAMPLED: ✓ SAMPLING TIME: 1055

| TIME (2400 HR) | VOLUME (gal) | pH (units) | E.C. (µmhos/cm@25°C) | TEMPERATURE (°F) | COLOR (visual) | TURBIDITY (visual) |
|-------------------|-----------------|---------------|-------------------------|---------------------|-------------------|-----------------------|
| <u>1042</u> | <u>12.5</u> | <u>5.58</u> | <u>694</u> | <u>68.4</u> | <u>clear</u> | <u>clear</u> |
| <u>1044</u> | <u>25.0</u> | <u>5.81</u> | <u>693</u> | <u>69.1</u> | <u>↓</u> | <u>↓</u> |
| <u>1047</u> | <u>38.0</u> | <u>5.87</u> | <u>703</u> | <u>69.3</u> | <u>↓</u> | <u>↓</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): NR

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: 10/20/98 Time: 1035 Meter Serial No. 87M
 E.C. 1000 1000, 1000 pH 7 6.98 1700 pH 10 9.97 11000 pH 4 1400
 Temperature °F 59.8

SIGNATURE M. Gallegos REVIEWED BY NA PAGE 1 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-217.003
 PURGED BY M. Ballegos
 SAMPLED BY ✓

SAMPLE ID MW-2(28')
 CLIENT NAME ARCO #2035
 LOCATION Albany, CA

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

CASING ELEVATION (feet/MSL) NIR VOLUME IN CASING (gal.) 11.62
 DEPTH OF WELL (feet) 28.8 CALCULATED PURGE (gal.) 34.88
 DEPTH OF WATER (feet) 11.00 ACTUAL PURGE VOL (gal.) 35.0

DATE PURGED: 10-20-98 END PURGE: 1127
 DATE SAMPLED: ✓ SAMPLING TIME: 1125

| TIME (2400 HR) | VOLUME (gal) | pH (units) | E.C. (µmhos/cm@25°C) | TEMPERATURE (°F) | COLOR (visual) | TURBIDITY (visual) |
|-------------------|-----------------|---------------|-------------------------|---------------------|-------------------|-----------------------|
| <u>1124</u> | <u>11.5</u> | <u>6.10</u> | <u>750</u> | <u>69.1</u> | <u>clear</u> | <u>clear</u> |
| <u>1125</u> | <u>23.0</u> | <u>6.18</u> | <u>751</u> | <u>69.3</u> | <u>↓</u> | <u>↓</u> |
| <u>1127</u> | <u>35.0</u> | <u>6.22</u> | <u>750</u> | <u>69.2</u> | <u>↓</u> | <u>↓</u> |
| | | | | | | |
| | | | | | | |

OTHER: DO = 1.0 ODOR: none NIR NIR
(COBALT 0-100) (NTU 0-200)
 FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NIR

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

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date 10/20/98 Time _____ Meter Serial No. 87M
 E.C. 1000 1/000 pH 7 1700 pH 10 1/000 pH 4 1400

Temperature °F _____
 SIGNATURE: Manuel J. [Signature] REVIEWED BY: NA PAGE 2 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



PROJECT NO 21775-217.003
 PURGED BY M. Ballegos
 SAMPLED BY ✓

SAMPLE ID MW-3(33')
 CLIENT NAME ARCO # 2035
 LOCATION Albany, 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.) 14.17
 DEPTH OF WELL (feet) 33.0 CALCULATED PURGE (gal.) 42.53
 DEPTH OF WATER (feet) 11.30 ACTUAL PURGE VOL (gal.) 30.0

DATE PURGED: 10-20-98 END PURGE: 1245
 DATE SAMPLED: ✓ SAMPLING TIME: 1250

| TIME (2400 HR) | VOLUME (gal) | pH (units) | E.C. (µmhos/cm@25°C) | TEMPERATURE (°F) | COLOR (visual) | TURBIDITY (visual) |
|-------------------|--------------------|---------------|-------------------------|---------------------|-------------------|-----------------------|
| <u>1238</u> | <u>14.5</u> | <u>7.20</u> | <u>634</u> | <u>68.3</u> | <u>Cloudy</u> | <u>NR</u> |
| <u>1241</u> | <u>29.0</u> | <u>6.77</u> | <u>626</u> | <u>69.5</u> | <u>11</u> | <u>11</u> |
| | <u>well not at</u> | | <u>at</u> | | | |
| | <u>well not at</u> | | <u>30.0 gallons</u> | | <u>BEH</u> | <u>Hand</u> |
| <u>1250</u> | <u>recharge</u> | <u>6.70</u> | <u>599</u> | <u>68.3</u> | <u>BEH</u> | <u>Hand</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): 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 checked="" 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 10/20/98 Time _____ Meter Serial No. 87M
 E.C. 1000 1/000 pH 7 1700 pH 10 1/000 pH 4 1900

Temperature °F _____
 SIGNATURE [Signature] REVIEWED BY NA PAGE 3 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-217.003
 PURGED BY M. Gallegos
 SAMPLED BY ✓

SAMPLE ID MW-4(11')
 CLIENT NAME ARCO #2035
 LOCATION Albany, 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) 25.1 CALCULATED PURGE (gal.) _____
 DEPTH OF WATER (feet) 10.43 ACTUAL PURGE VOL (gal.) ✓

DATE PURGED 10-20-98 END PURGE _____
 DATE SAMPLED ✓ SAMPLING TIME 1110

| TIME (2400 HR) | VOLUME (gal) | pH (units) | E.C. (µmhos/cm@25°C) | TEMPERATURE (°F) | COLOR (visual) | TURBIDITY (visual) |
|-------------------|-----------------|---------------|-------------------------|---------------------|-------------------|-----------------------|
| <u>1110</u> | <u>GRAB</u> | <u>6.38</u> | <u>427</u> | <u>70.2</u> | <u>Clear</u> | <u>Clear</u> |
| | | | | | | |
| | | | | | | |
| | | | | | | |

OTHER: DO = .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"/> Centrifugal Pump <input type="checkbox"/> Submersible Pump <input type="checkbox"/> Well Wizard™ Other: _____ | <input checked="" type="checkbox"/> 2" Bladder Pump <input type="checkbox"/> Bomb Sampler <input type="checkbox"/> Dipper <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"/> Bailer (Teflon) <input type="checkbox"/> Bailer (Stainless Steel) <input type="checkbox"/> Submersible Pump <input type="checkbox"/> Dedicated |

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date 10/20/98 Time _____ Meter Serial No. 87M
 E.C. 1000 1/000 pH 7 1700 pH 10 1/000 pH 4 1400
 Temperature °F _____
 SIGNATURE [Signature] REVIEWED BY [Signature] PAGE 4 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-217.003
 PURGED BY M. Bellegos
 SAMPLED BY ✓

SAMPLE ID MW-6 (14')
 CLIENT NAME ARCO # 2035
 LOCATION Albany, 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) 24.2 CALCULATED PURGE (gal.) NR
 DEPTH OF WATER (feet) 13.48 ACTUAL PURGE VOL (gal.) ✓

DATE PURGED: 10-20-98 END PURGE: ✓
 DATE SAMPLED: ✓ SAMPLING TIME: 1200

| TIME (2400 HR) | VOLUME (gal) | pH (units) | E.C. (µmhos/cm@25°C) | TEMPERATURE (°F) | COLOR (visual) | TURBIDITY (visual) |
|-------------------|-----------------|---------------|-------------------------|---------------------|-------------------|-----------------------|
| <u>1200</u> | <u>GRAB</u> | <u>6.67</u> | <u>723</u> | <u>70.1</u> | <u>BRN</u> | <u>Heavy</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): 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 10/20/98 Time: _____ Meter Serial No. 87M
 E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 1400

Temperature °F _____
 SIGNATURE: M. Bellegos REVIEWED BY: MA PAGE 5 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-217.003
 PURGED BY M. Gallegos
 SAMPLED BY ✓

SAMPLE ID RW-1 (12')
 CLIENT NAME ARCO #2035
 LOCATION Albany, 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) 25.5 CALCULATED PURGE (gal.) _____
 DEPTH OF WATER (feet) 11.12 ACTUAL PURGE VOL (gal.) NR

DATE PURGED: 10-20-98 END PURGE _____
 DATE SAMPLED ✓ SAMPLING TIME 1215

| TIME (2400 HR) | VOLUME (gal) | pH (units) | E.C. (µmhos/cm@25°C) | TEMPERATURE (°F) | COLOR (visual) | TURBIDITY (visual) |
|-------------------|-----------------|---------------|-------------------------|---------------------|-------------------|-----------------------|
| <u>1215</u> | <u>GRAB</u> | <u>6.90</u> | <u>830</u> | <u>72.4</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): NR

| PURGING EQUIPMENT | SAMPLING EQUIPMENT |
|---|---|
| <input checked="" type="checkbox"/> 2" Bladder Pump | <input checked="" type="checkbox"/> 2" Bladder Pump |
| <input type="checkbox"/> Centrifugal Pump | <input type="checkbox"/> Bomb Sampler |
| <input type="checkbox"/> Submersible Pump | <input type="checkbox"/> Dipper |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Well Wizard™ |
| Other: _____ | Other: _____ |

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date: 10/20/98 Time _____ Meter Serial No. 87M
 E.C. 1000 1/000 pH 7 1700 pH 10 1/000 pH 4 1400
 Temperature °F _____
 SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 6 OF 6

ARCO Products Company

Division of Atlantic/Richfield Company

Task Order

Chain of Custody

ARCO Facility no. 2025 City (Facility) Albany Van Vander Veen

ARCO engineer Paul Supple Telephone no. (ARCO) 452-7200 Fax no. (Consultant) (408) 437-9526

Consultant name ELICON Address (Consultant) Way Walnut Creek, CA 94596

Laboratory Name CAS
Contract Number

| Sample I.D. | Lab no. | Container no. | Matrix | | | Preservation | | Sampling date | Sampling time | EPA 418 USM 508 | EPA 6018010 | EPA 6248240 | EPA 6258270 | TCLP Metals VOAD VOAD | Semi Metals VOAD VOAD | CMM Metals EPA 60107000 | TTLCO STLCO | Lead Org/DHSC | Lead EPA 742074210 |
|-------------|---------|---------------|--------|-------|-------|--------------|------|---------------|---------------|-----------------|-------------|-------------|-------------|-----------------------|-----------------------|-------------------------|-------------|---------------|--------------------|
| | | | Soil | Water | Other | Ice | Acid | | | | | | | | | | | | |
| MW-4(11) | 7 | | | X | | X | HCL | 1/20/91 | | | | | | | | | | | |
| MW-1(57) | 7 | | | X | | X | HCL | 1/25/91 | | | | | | | | | | | |
| MW-7(59) | 7 | | | X | | X | HCL | 1/13/91 | | | | | | | | | | | |
| MW-6(49) | 7 | | | X | | X | HCL | 1/20/91 | | | | | | | | | | | |
| MW-3(53) | 7 | | | X | | X | HCL | 1/20/91 | | | | | | | | | | | |
| RW-1(12) | 7 | | | X | | X | HCL | 1/21/91 | | | | | | | | | | | |

Method of analysis Sampler
well
debris

Special Equipment
Limit/report
100
100
100
100
100

Condition of sample:

Relinquished by Paul Supple Date 1/20/91

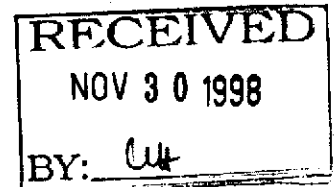
Relinquished by _____ Date _____

Relinquished by _____ Date _____

P.BINS CAS 1/20/91 1430

APPENDIX D

**CERTIFIED ANALYTICAL REPORTS,
AND CHAIN-OF-CUSTODY DOCUMENTATION
FOR SOIL-VAPOR EXTRACTION SYSTEM**



November 25, 1998

Service Request No.: S9803065

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

RE: 20805-123.005/TO#22631.00/RAT8/2035 OAKLAND

Dear Mr. Vanderveen:

The following pages contain analytical results for sample(s) received by the laboratory on November 10, 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 14, 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,

A handwritten signature in cursive that reads 'Bernadette J. Cox for'.

Steven L. Green
Project Chemist

A handwritten signature in cursive that reads 'Greg Anderson for'.

Greg Anderson
Regional QA Coordinator

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22631.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: 89803065
Date Collected: 11/10/98
Date Received: 11/10/98

BTEX and Total Volatile Hydrocarbons

Sample Name: I-1
Lab Code: S9803065-001
Test Notes:

Units: mg/m3
Basis: NA

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|-------------------------------------|-------------|-----------------|-----|-----------------|----------------|---------------|--------|--------------|
| Benzene | 5030 | 8020 | 0.4 | 1 | NA | 11/10/98 | ND | |
| Toluene | 5030 | 8020 | 0.4 | 1 | NA | 11/10/98 | 0.5 | |
| Ethylbenzene | 5030 | 8020 | 0.5 | 1 | NA | 11/10/98 | ND | |
| Xylenes, Total | 5030 | 8020 | 0.9 | 1 | NA | 11/10/98 | ND | |
| Total Volatile Hydrocarbons: | | | | | | | | |
| C1 - C5 | 5030 | 8015M | 12 | 1 | NA | 11/10/98 | 31 | |
| C6 - C12 | 5030 | 8015M | 20 | 1 | NA | 11/10/98 | 32 | |
| TPH as Gasoline* | 5030 | 8015M | 20 | 1 | NA | 11/10/98 | 32 | |

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22631.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9803065
Date Collected: 11/10/98
Date Received: 11/10/98

BTEX and Total Volatile Hydrocarbons

Sample Name: I-1
Lab Code: S9803065-001
Test Notes:

Units: ppmV
Basis: NA

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|-------------------------------------|-------------|-----------------|-----|-----------------|----------------|---------------|--------|--------------|
| Benzene | 5030 | 8020 | 0.1 | 1 | NA | 11/10/98 | ND | |
| Toluene | 5030 | 8020 | 0.1 | 1 | NA | 11/10/98 | 0.1 | |
| Ethylbenzene | 5030 | 8020 | 0.1 | 1 | NA | 11/10/98 | ND | |
| Xylenes, Total | 5030 | 8020 | 0.2 | 1 | NA | 11/10/98 | ND | |
| Total Volatile Hydrocarbons: | | | | | | | | |
| C1 - C5 | 5030 | 8015M | 5 | 1 | NA | 11/10/98 | 13 | |
| C6 - C12 | 5030 | 8015M | 5 | 1 | NA | 11/10/98 | 8 | |
| TPH as Gasoline* | 5030 | 8015M | 5 | 1 | NA | 11/10/98 | 8 | |

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22631.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9803065
Date Collected: 11/10/98
Date Received: 11/10/98

BTEX and Total Volatile Hydrocarbons

Sample Name: E-1
Lab Code: S9803065-002
Test Notes:

Units: mg/m3
Basis: NA

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|-------------------------------------|-------------|-----------------|-----|-----------------|----------------|---------------|--------|--------------|
| Benzene | 5030 | 8020 | 0.4 | 1 | NA | 11/10/98 | ND | |
| Toluene | 5030 | 8020 | 0.4 | 1 | NA | 11/10/98 | ND | |
| Ethylbenzene | 5030 | 8020 | 0.5 | 1 | NA | 11/10/98 | ND | |
| Xylenes, Total | 5030 | 8020 | 0.9 | 1 | NA | 11/10/98 | ND | |
| Total Volatile Hydrocarbons: | | | | | | | | |
| C1 - C5 | 5030 | 8015M | 12 | 1 | NA | 11/10/98 | 18 | |
| C6 - C12 | 5030 | 8015M | 20 | 1 | NA | 11/10/98 | ND | |
| TPH as Gasoline* | 5030 | 8015M | 20 | 1 | NA | 11/10/98 | ND | |

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TOW22631.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9803065
Date Collected: 11/10/98
Date Received: 11/10/98

BTEX and Total Volatile Hydrocarbons

Sample Name: E-1
Lab Code: S9803065-002
Test Notes:

Units: ppmV
Basis: NA

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|-------------------------------------|-------------|-----------------|-----|-----------------|----------------|---------------|--------|--------------|
| Benzene | 5030 | 8020 | 0.1 | 1 | NA | 11/10/98 | ND | |
| Toluene | 5030 | 8020 | 0.1 | 1 | NA | 11/10/98 | ND | |
| Ethylbenzene | 5030 | 8020 | 0.1 | 1 | NA | 11/10/98 | ND | |
| Xylenes, Total | 5030 | 8020 | 0.2 | 1 | NA | 11/10/98 | ND | |
| Total Volatile Hydrocarbons: | | | | | | | | |
| C1 - C5 | 5030 | 8015M | 5 | 1 | NA | 11/10/98 | 8 | |
| C6 - C12 | 5030 | 8015M | 5 | 1 | NA | 11/10/98 | ND | |
| TPH as Gasoline* | 5030 | 8015M | 5 | 1 | NA | 11/10/98 | ND | |

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22631.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9803065
Date Collected: NA
Date Received: NA

BTEX and Total Volatile Hydrocarbons

Sample Name: Method Blank
Lab Code: S981110-VB1
Test Notes:

Units: mg/m3
Basis: NA

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|-------------------------------------|-------------|-----------------|-----|-----------------|----------------|---------------|--------|--------------|
| Benzene | 5030 | 8020 | 0.4 | 1 | NA | 11/10/98 | ND | |
| Toluene | 5030 | 8020 | 0.4 | 1 | NA | 11/10/98 | ND | |
| Ethylbenzene | 5030 | 8020 | 0.5 | 1 | NA | 11/10/98 | ND | |
| Xylenes, Total | 5030 | 8020 | 0.9 | 1 | NA | 11/10/98 | ND | |
| Total Volatile Hydrocarbons: | | | | | | | | |
| C1 - C5 | 5030 | 8015M | 12 | 1 | NA | 11/10/98 | ND | |
| C6 - C12 | 5030 | 8015M | 20 | 1 | NA | 11/10/98 | ND | |
| TPH as Gasoline* | 5030 | 8015M | 20 | 1 | NA | 11/10/98 | ND | |

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22631.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9803065
Date Collected: NA
Date Received: NA

BTEX and Total Volatile Hydrocarbons

Sample Name: Method Blank
Lab Code: S981110-VB1
Test Notes:

Units: ppmV
Basis: NA

| Analyte | Prep Method | Analysis Method | MRL | Dilution Factor | Date Extracted | Date Analyzed | Result | Result Notes |
|------------------------------|-------------|-----------------|-----|-----------------|----------------|---------------|--------|--------------|
| Benzene | 5030 | 8020 | 0.1 | 1 | NA | 11/10/98 | ND | |
| Toluene | 5030 | 8020 | 0.1 | 1 | NA | 11/10/98 | ND | |
| Ethylbenzene | 5030 | 8020 | 0.1 | 1 | NA | 11/10/98 | ND | |
| Xylenes, Total | 5030 | 8020 | 0.2 | 1 | NA | 11/10/98 | ND | |
| Total Volatile Hydrocarbons: | | | | | | | | |
| C1 - C5 | 5030 | 8015M | 5 | 1 | NA | 11/10/98 | ND | |
| C6 - C12 | 5030 | 8015M | 5 | 1 | NA | 11/10/98 | ND | |
| TPH as Gasoline* | 5030 | 8015M | 5 | 1 | NA | 11/10/98 | ND | |

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22631.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9803065
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 11/10/98

Duplicate Summary
 BTEX and Total Volatile Hydrocarbons

Sample Name: BATCH QC
Lab Code: S9803038-001DUP
Test Notes:

Units: mg/m3
Basis: NA

| Analyte | Prep Method | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|------------------------------------|-------------|-----------------|-----|---------------|-------------------------|---------|-----------------------------|--------------|
| Benzene | 5030 | 8020 | 0.4 | 2.1 | 2.3 | 2.2 | 4 | |
| Toluene | 5030 | 8020 | 0.4 | 12 | 13 | 13.0 | 8 | |
| Ethylbenzene | 5030 | 8020 | 0.5 | 1.7 | 1.7 | 1.7 | <1 | |
| Xylenes, Total | 5030 | 8020 | 0.9 | 7.1 | 7.5 | 7.3 | 5 | |
| Total Volatile Hydrocarbons | | | | | | | | |
| C1 - C5 | 5030 | 8015M | 12 | 320 | 570 | 450 | 55 | C1 |
| C6 - C12 | 5030 | 8015M | 20 | 290 | 320 | 310 | 10 | |
| TPH as Gasoline* | 5030 | 8015M | 20 | 290 | 320 | 310 | 10 | |

C1 A huge peak is detected in duplicate sample. The result is different in gasoline range.

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22631.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9803065
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 11/10/98

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: BATCH QC
Lab Code: S9803038-001DUP
Test Notes:

Units: ppmV
Basis: NA

| Analyte | Prep Method | Analysis Method | MRL | Sample Result | Duplicate Sample Result | Average | Relative Percent Difference | Result Notes |
|-----------------------------|-------------|-----------------|-----|---------------|-------------------------|---------|-----------------------------|--------------|
| Benzene | 5030 | 8020 | 0.1 | 0.7 | 0.7 | 0.7 | <1 | |
| Toluene | 5030 | 8020 | 0.1 | 3.2 | 3.4 | 3.3 | 3 | |
| Ethylbenzene | 5030 | 8020 | 0.1 | 0.4 | 0.4 | 0.4 | <1 | |
| Xylenes, Total | 5030 | 8020 | 0.2 | 1.6 | 1.7 | 1.7 | 6 | |
| Total Volatile Hydrocarbons | | | | | | | | |
| C1 - C5 | 5030 | 8015M | 5 | 130 | 240 | 190 | 58 | |
| C6 - C12 | 5030 | 8015M | 5 | 71 | 78 | 75 | 9 | |
| TPH as Gasoline* | 5030 | 8015M | 5 | 71 | 78 | 75 | 9 | |

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22631.00/RAT8/2035 OAKLAND
LCS Matrix: Air

Service Request: S9803065
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 11/10/98

Laboratory Control Sample Summary
TPH as Gasoline

Sample Name: Lab Control Sample
Lab Code: S9811110-LCS
Test Notes:

Units: mg/m3
Basis: NA

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Percent Recovery Acceptance Limits | Result Notes |
|----------------|--------------------|------------------------|-------------------|---------------|-------------------------|---|---------------------|
| Gasoline | 5030 | 8015M | 200 | 210 | 105 | 60-140 | |

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.005/TO#22631.00/RAT8/2035 OAKLAND
LCS Matrix: Air

Service Request: S9803065
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 11/10/98

Laboratory Control Sample Summary
TPH as Gasoline

Sample Name: Lab Control Sample
Lab Code: S981110-LCS
Test Notes:

Units: ppmV
Basis: NA

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS | Result Notes |
|----------|-------------|-----------------|------------|--------|------------------|------------------------------------|--------------|
| | | | | | | Percent Recovery Acceptance Limits | |
| Gasoline | 5030 | 8015M | 49 | 51 | 104 | 60-140 | |

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.003/TO#22631.00/RAT8/2035 OAKLAND

Service Request: S9803065
Date Analyzed: 11/10/98

**Initial Calibration Verification (ICV) Summary
BTEX and Total Volatile Hydrocarbons**

Sample Name: ICV
Lab Code: ICV1
Test Notes:

Units: mg/m3
Basis: NA

ICV Source:

| Analyte | Prep Method | Analysis Method | True Value | Result | Percent Recovery | CAS Acceptance Limits |
|----------------|--------------------|------------------------|-------------------|---------------|-------------------------|------------------------------|
| Benzene | 5030 | 8020 | 25 | 25 | 100 | 80-120 |
| Toluene | 5030 | 8020 | 25 | 25 | 100 | 80-120 |
| Ethylbenzene | 5030 | 8020 | 25 | 25 | 100 | 80-120 |
| Xylenes, Total | 5030 | 8020 | 75 | 75 | 100 | 80-120 |
| Gasoline | 5030 | 8015M | 250 | 230 | 92 | 80-120 |

