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A RESNA Company

RESNA
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TRANSMITTAL

TO: Ms. Susan Hugo
Alameda County Health Care Services
80 Swan Way Room 200
Oakland, California 94621

DATE: September 28, 1992
PROJECT NUMBER: 60000.13
SUBJECT: Final - Second Quarter 1992 Quarterly Groundwater Monitoring at ARCO Station 771, 899 Rincon Avenue, Livermore, California.

FROM: Erin McLucas
TITLE: Staff Geologist

WE ARE SENDING YOU:

COPIES	DATED	DESCRIPTION
1	9/28/92	Final - Second Quarter 1992, Groundwater Monitoring at the above subject site.

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REMARKS: cc: Mr. H.C. Winsor, ARCO Products Company
Mr. Michael Whelan, ARCO Products Company
Mr. Eddy So, CRWQCB, San Francisco Bay Region
Ms. Danielle Stefani, Livermore Fire Department
Mr. Joel Coffman, RESNA Industries Inc.

Copies: 1 to RESNA project file no. 60000.13

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LETTER REPORT
QUARTERLY GROUNDWATER MONITORING
Second Quarter 1992
at
ARCO Station 771
899 Rincon Avenue
Livermore, California

60000.13

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[redacted]
0630MWHE
60000.13

Mr. Michael Whelan
ARCO Products Company
P.O. Box 5811
San Mateo, California 94402

Subject: Second Quarter 1992 Groundwater Monitoring Report for ARCO Station 771, 899 Rincon Avenue, Livermore, California.

Mr. Whelan:

As requested by ARCO Products Company (ARCO), this letter report summarizes the results of second quarter 1992 groundwater monitoring performed by ARCO's contractor, EMCON Associates (EMCON) of San Jose, California, at the above-referenced site. The objectives of this quarterly groundwater monitoring are to evaluate changes in the groundwater flow direction and gradient, and changes in concentrations of petroleum hydrocarbons in the local groundwater associated with the former gasoline-storage tanks and former waste-oil tank at the site. The field work and laboratory analyses of groundwater samples during this quarter were performed under the direction of EMCON and included measuring depths to groundwater, subjectively analyzing groundwater for the presence of petroleum product, collecting groundwater samples from the wells for laboratory analyses, and directing a State-certified laboratory to analyze the groundwater samples. Field procedures and acquisition of field data were performed under the direction of EMCON; evaluation and warrant of their field data and field protocols is beyond RESNA Industries Inc.'s (RESNA's) scope of work. RESNA's scope of work was limited to interpretation of field and laboratory analytical data, which included evaluating trends in reported hydrocarbon concentrations in the local groundwater, the groundwater gradient, and direction of groundwater flow beneath the site.

The operating ARCO Station 771 is located on the southwestern corner of the intersection of Rincon Avenue and Pine Street in Livermore, California, as shown on the Site Vicinity Map, Plate 1.

Prior to this quarterly monitoring period, RESNA (formerly Applied GeoSystems [AGS]) and Roux Associates of Concord, California, performed environmental assessments and investigations related to the removal and replacement of four underground gasoline-storage tanks (USTs) at the site. In February 1990, RESNA performed an environmental site assessment (AGS, June 1990), which included the drilling of three borings (B-1 through B-3). In December 1990, RESNA performed a supplemental subsurface investigation which included the drilling of three soil borings (B-4 through B-6) and installation of three monitoring wells, MW-1, MW-2, and MW-3 (AGS, April 1991). In January 1991, RESNA began quarterly monitoring of the onsite monitoring wells. In July 1991, RESNA performed an additional subsurface investigation which included the drilling of five soil borings (B-7 through B-11) and installation of four monitoring wells MW-4 through MW-7 (RESNA, October 1991). The results of these environmental assessments and investigations are presented in the reports listed in the References Cited section located at the end of this letter report. UST removal and replacement began in December 1991. In April 1992, RESNA installed groundwater recovery well **RW-1, vapor extraction well VW-1, and** one offsite groundwater monitoring **well MW-11,** as a part of an additional onsite and initial offsite subsurface investigation. Additional offsite groundwater monitoring wells **(MW-8 through MW-10)** will be installed upon gaining offsite access. Results of this investigation will be discussed in a forthcoming report. RESNA is proceeding with design and permitting of a remediation system to be installed at the site. The locations of soil borings, groundwater monitoring wells, and other pertinent site features are shown on the Generalized Site Plan, Plate 2.

Groundwater Sampling and Gradient Evaluation

Depth to water measurements (DTW) were performed by EMCON field personnel on April 24, May 20, and June 12, 1992. Quarterly sampling was performed by EMCON field personnel on June 12, 1992. The results of EMCON's field work on the site, including DTW measurements and subjective analysis for the presence of product in the groundwater in MW-1 through MW-7, MW-11 and RW-1 are presented on EMCON's field report sheets and EMCON's Summary of Groundwater Monitoring Data. These data are included in Appendix A.

The DTW levels, wellhead elevations, groundwater elevations, and subjective observations of product in the groundwater from MW-1 through MW-7, and MW-11 for this quarter and previous quarterly groundwater monitorings at the site are summarized in Table 1, Cumulative Groundwater Monitoring Data. Groundwater monitoring well MW-1 was not accessible during the April monitoring because it was covered by plastic and the pile of soil cuttings generated during drilling activities. **Wellhead elevations were resurveyed on May 8, 1992 due to changes in well casing elevations caused by the previous construction on the**

site. Groundwater elevations in monitoring wells MW-1 through MW-7 decreased between 0.03 and 1.68 feet between April 24, and June 12, 1992. Groundwater elevations in monitoring well MW-11 and recovery well RW-1 increased 0.58 feet and 0.13 feet respectively in the same time period. The groundwater gradients interpreted from the April, May and June 1992 monitorings ranged from 0.05 to 0.08 with flow directions to the north-northwest. The groundwater gradients and flow directions are shown on Plates 3 through 5, Groundwater Gradient Maps. EMCON reported floating product in well MW-1 in June; no evidence of product or sheen was observed in the other wells by EMCON's field personnel during this quarter (EMCON field report sheets, Appendix A).

Groundwater monitoring wells MW-2 through MW-7 were purged and sampled by EMCON field personnel on June 12, 1992; well MW-1 was not sampled because it contained floating product. The purge water was removed from the site by a licensed hazardous waste hauler.

Laboratory Methods and Results

Under the direction of EMCON, water samples collected from the wells were analyzed by Columbia Analytical Services, Inc., located in San Jose, California (Hazardous Waste Testing Laboratory Certification No. 1426). The water samples from MW-2 through MW-7 were analyzed for total petroleum hydrocarbons as gasoline (TPHg) and benzene, toluene, ethylbenzene, and total xylenes (BTEX) using modified Environmental Protection Agency (EPA) Methods 5030/8020. Concentrations of TPHg and benzene in the groundwater are shown on Plate 6, TPHg Concentrations in Groundwater and Plate 7, Benzene Concentrations in Groundwater. Well MW-6, nearest downgradient well from the former waste-oil tank, was also analyzed for total petroleum hydrocarbons as diesel (TPHd) and total oil and grease (TOG) using EPA Methods 3510 and 5520C/5520F-IR, respectively. The Chain of Custody Records and Laboratory Analysis Reports are attached in Appendix A. Results of these and previous water analyses are summarized in Table 2, Cumulative Results of Laboratory Analyses of Groundwater--TPHg, TPHd, BTEX, and TOG.

Results of this quarter's groundwater monitoring indicate:

- TPHg was detected in groundwater samples from MW-2 through MW-7 and RW-1 at concentrations ranging from 280 parts per billion (ppb) to 110,000 ppb. The concentration of TPHg in MW-11 was nondetectable (less that 50 ppb);

- Benzene was detected in groundwater samples from MW-2, MW-4 through MW-7, and RW-1 at concentrations ranging from 480 ppb to 8,900 ppb. Concentrations of benzene were nondetectable (<0.5 ppb) in MW-3 and MW-11; Benzene

concentrations exceeded the State Maximum Contaminant Level (MCL) in all wells except MW-3 and MW-11.

- Toluene, ethylbenzene, and total xylenes (TEX) were detected in groundwater samples from MW-2, MW-4 through MW-7, and RW-1 at concentrations ranging from 17 ppb to 16,000 ppb; TEX were nondetectable (<0.5 ppb) in MW-11 and near nondetectable (less than 2.1 ppb) in MW-3.

- Lower boiling point fuel mixture quantified as TPHd (chromatograms included in Appendix A) was detected in the groundwater sample from MW-6 at a concentration of 1,100 ppb. These results appear to actually be within the weathered gasoline range. According to ARCO, diesel has never been stored at this site.

- TOG was detected in the groundwater sample from MW-6 at a concentration of 1.2 parts per million (ppm).

The following is a general summary of changes in the concentrations of hydrocarbon constituents in the groundwater from wells MW-2 through MW-7 since the last quarterly monitoring. Because RW-1 and MW-11 were constructed in April 1992, trends have not been established for the groundwater in these wells. Concentrations of TPHg and total xylenes decreased in monitoring wells MW-2 through MW-7 since the last quarterly monitoring. Benzene and toluene decreased in wells MW-3 through MW-7; ethylbenzene decreased in wells MW-2 through MW-4 and MW-6. Generally, the petroleum hydrocarbon concentrations decreased this quarter. This may be a seasonal effect due to an overall drop in groundwater elevations, or an effect caused by the use of free product skimmers.

Product Recovery

Floating product was measured and removed on a monthly basis, as summarized in Table 3, Approximate Cumulative Product Recovered. In January 1992, Horner EZY Skimmers were installed in wells MW-1, MW-2, and MW-5, as a method of an interim remediation at the site. The total 1992 year-to-date product recovered is 0.29 gallons, of which 93 percent was removed from well MW-1 and the remaining 7 percent from wells MW-2 and MW-5. The total product recovered at the site is 3.06 gallons for 1991 and 1992 combined.

Conclusions

The groundwater at the site has been impacted by petroleum hydrocarbons. The groundwater sample results from recently installed offsite well MW-11 showed levels of TPHg and BTEX to be nondetectable. These constituents have been delineated to the

north. The extent of the petroleum hydrocarbons has not yet been defined to the south, east or west. Attempts to gain access to install wells to delineate in these directions are on-going.

Construction Plans and Specifications for an Interim Vapor Extraction System were issued for Bid on September 11, 1992. The preliminary date for construction startup is November 9, 1992.

RESNA also recommends that copies of this letter report be forwarded to:

Ms. Susan Hugo
Alameda County Health Care Services Agency
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

Mr. Eddy So
Regional Water Quality Control Board
San Francisco Bay Region
2101 Webster Street, Suite 500
Oakland, California 94612

Ms. Danielle Stefani
Livermore Fire Department
4550 East Avenue
Livermore, California 94550

If you have any questions or comments, please call us at (408) 264-7723.

Sincerely,
RESNA Industries Inc.

Erin McLucas
Staff Geologist

Joan E. Tiernan
Registered Civil
Engineer No. 044600

cc: W. C. Winsor, ARCO Product Company

Enclosures: References

Plate 1, Site Vicinity Map
Plate 2, Generalized Site Plan
Plate 3, Groundwater Gradient Map, April 24, 1992
Plate 4, Groundwater Gradient Map, May 20, 1992
Plate 5, Groundwater Gradient Map, June 12, 1992
Plate 6, TPHg Concentrations in Groundwater, June 12, 1992
Plate 7, Benzene Concentrations in Groundwater, June 12, 1992

Table 1, Cumulative Groundwater Monitoring Data
Table 2, Cumulative Results of Laboratory Analyses of Groundwater Samples- TPHg, TPHd, BTEX, and TOG
Table 3, Approximate Cumulative Product Recovered

Appendix A: EMCON's Depth to Water/Floating Product Survey Form (2), Certified Analytical Reports with Chain-of-Custody, Water Sample Field Data Sheets, Monitoring Well Purge Water Disposal Form, and Chromatograms and Maxima 820 Custom Reports for TPHd Analyses

REFERENCES CITED

Applied GeoSystems, June 22, 1990. Limited Subsurface Environmental Assessment, ARCO Station No. 771, Livermore, California. AGS 60000-1.

California Department of Health Services, Office of Drinking Water, October 24, 1990, Summary of Drinking Water Standards.

RESNA/Applied Geosystems, April 12, 1991. Supplemental Subsurface Investigation at ARCO Station No. 771, Livermore, California. AGS 60000.

RESNA/Applied GeoSystems, July 12, 1991. Letter Report Quarterly Ground-Water Monitoring Second Quarter 1991 at ARCO Station 771, 899 Rincon Avenue, Livermore, California. AGS 60000.05

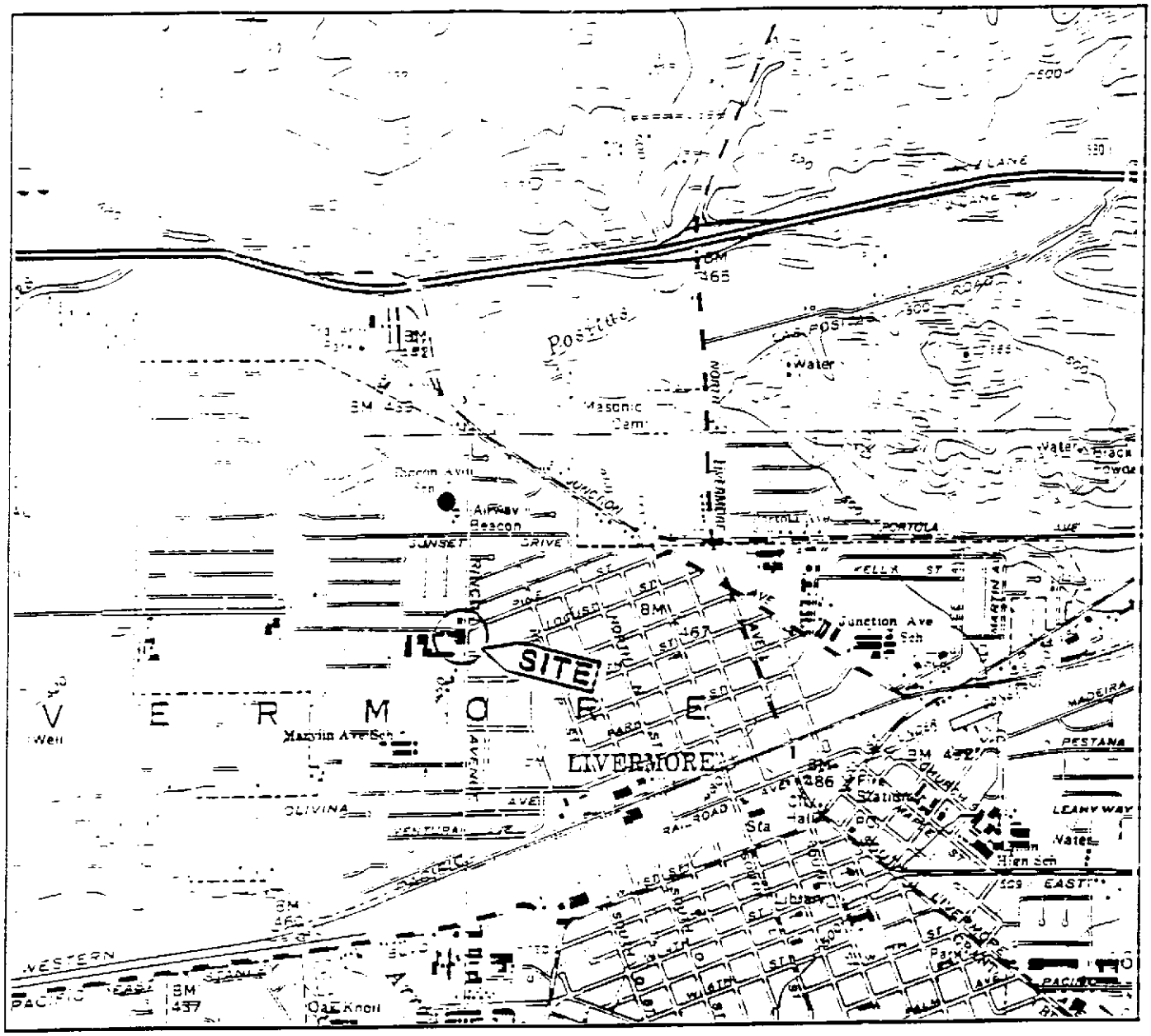
RESNA, October 17, 1991. Report on Additional Subsurface Investigation at ARCO Station 771, 899 Rincon Avenue, Livermore, California. 60000.06

RESNA, November 21, 1991. Letter Report Quarterly Ground-Water Monitoring Third Quarter 1991 at ARCO Station 771, 899 Rincon Avenue, Livermore, California. 60000.05

RESNA, April 7, 1992. Letter Report Quarterly Groundwater Monitoring Fourth Quarter 1991 at ARCO Station 771, 899 Rincon Avenue, Livermore, California. 60000.05

RESNA, May 1, 1992. Letter Report Quarterly Groundwater Monitoring First Quarter 1992 at ARCO Station 771, 899 Rincon Avenue, Livermore, California. 60000.05

Roux, July 10, 1992. Underground Storage Tank Removal and Soil Sampling, ARCO Facility No. 771, 899 Rincon Avenue, Livermore, California. A135W01



Base: U.S. Geological Survey
7.5-Minute Quadrangles
Livermore, California.
Photorevised 1980

LEGEND

= Site Location

Approximate Scale

2000 1000 0 2000 4000

Feet

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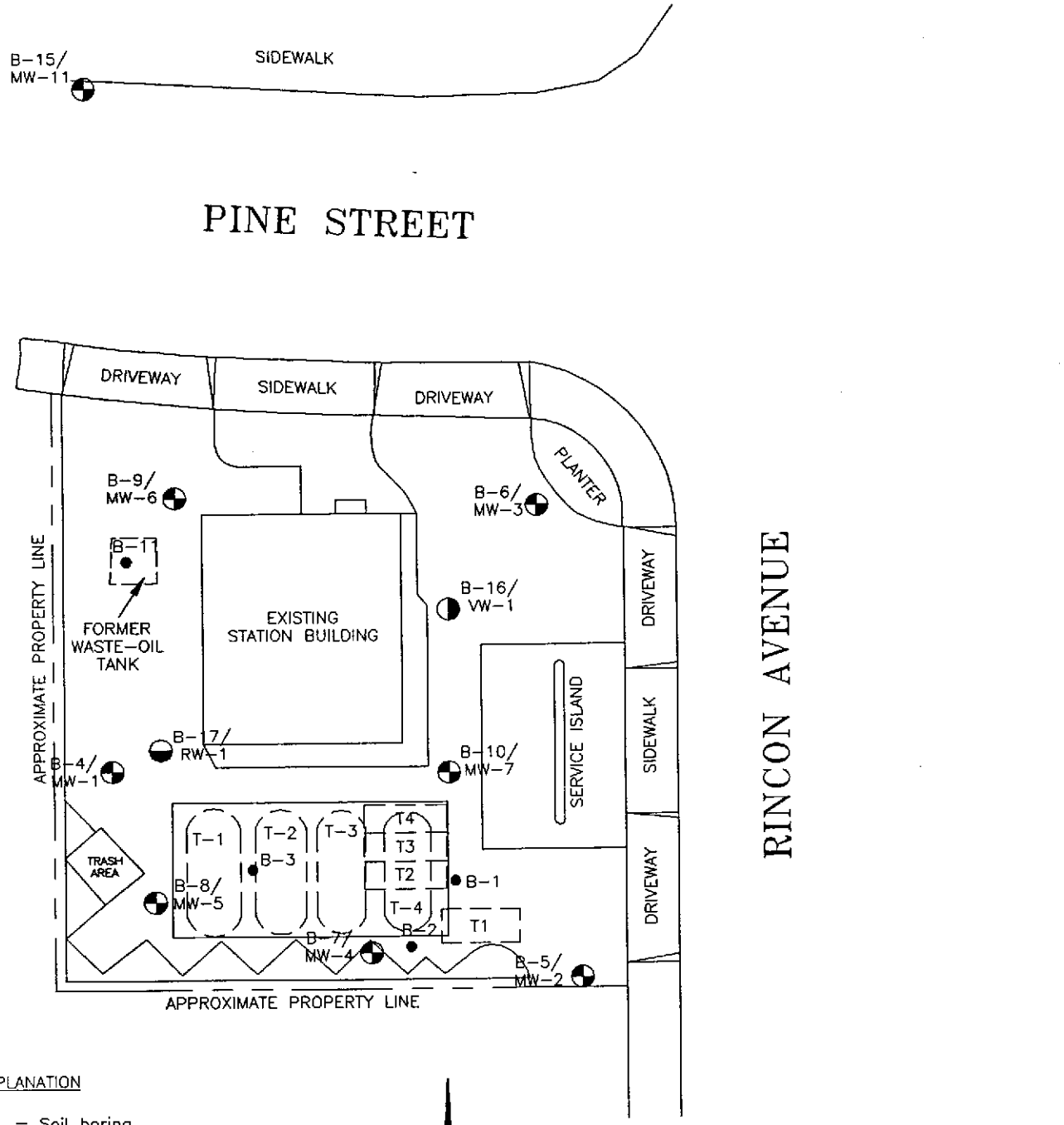
SITE VICINITY MAP
ARCO Station 771
899 Rincon Avenue
Livermore, California

PLATE

1



EXPLANATION

- B-11 = Soil boring (RESNA, February 1990 and July 1991)
- B-15/MW-11 = Monitoring well (RESNA, 1991 and 1992)
- B-17/RW-1 = Recovery well (RESNA, April 1992)
- B-16/VW-1 = Vapor extraction well (RESNA, April 1992)
- T4 = Former underground gasoline-storage tank
- = Existing underground gasoline-storage tank

N

Approximate Scale

30 15 0 30 60

feet

Source: Surveyed by John Koch, Licensed Land Surveyor.

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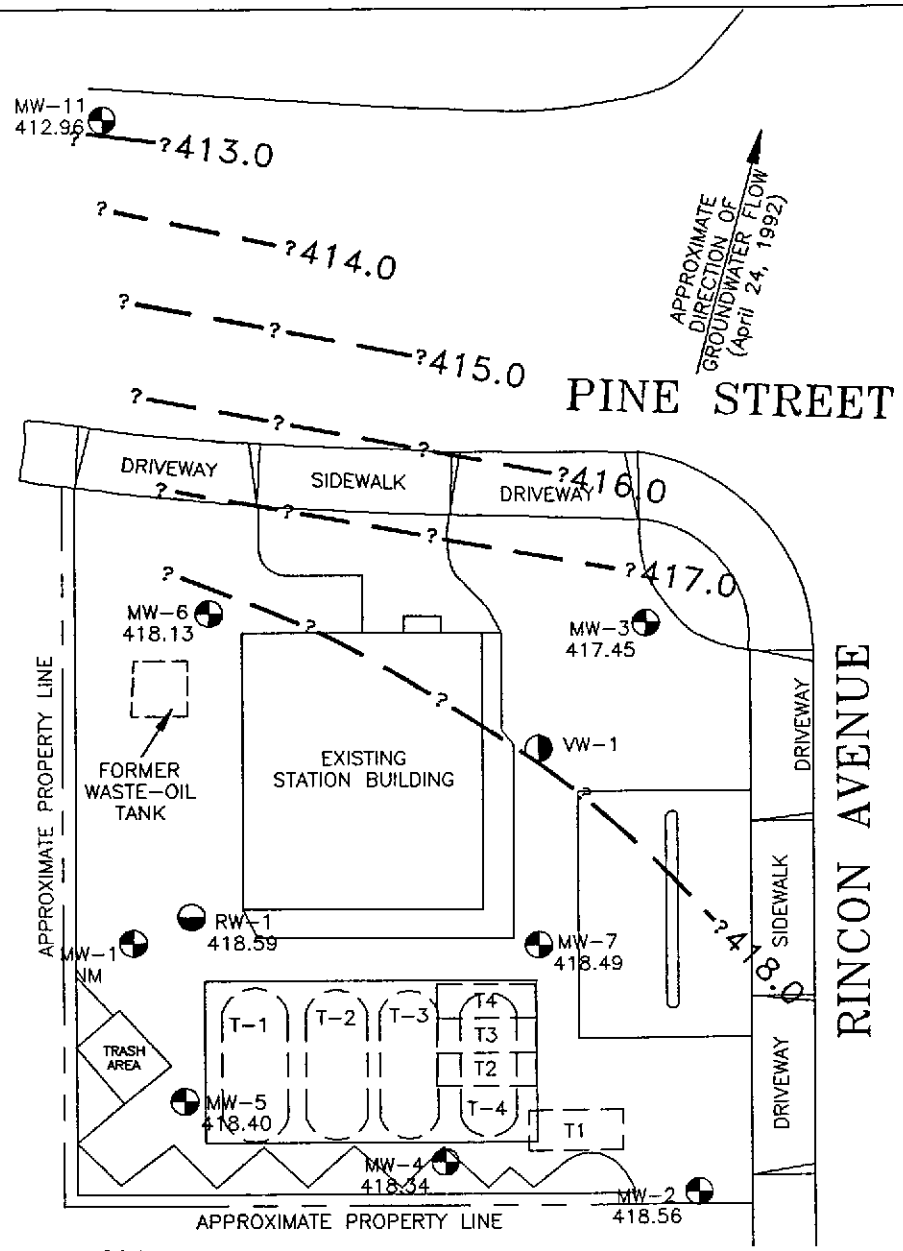
GENERALIZED SITE PLAN
ARCO Station 771
899 Rincon Avenue
Livermore, California

PLATE
2



EXPLANATION

418.0 = Line of equal elevation of groundwater in feet above mean sea level (MSL)

418.59 = Elevation of groundwater in feet above MSL, April 24, 1992

MW-11 = Monitoring well (RESNA, 1991 and 1992)

RW-1 = Recovery well (RESNA, April 1992)

VW-1 = Vapor extraction well (RESNA, April 1992)

T4 = Underground gasoline-storage tank

NM = Not monitored

T-4 = Existing underground gasoline-storage tank

N

Approximate Scale

30 15 0 30 60

feet

Source: Surveyed by John Koch, Licensed Land Surveyor.

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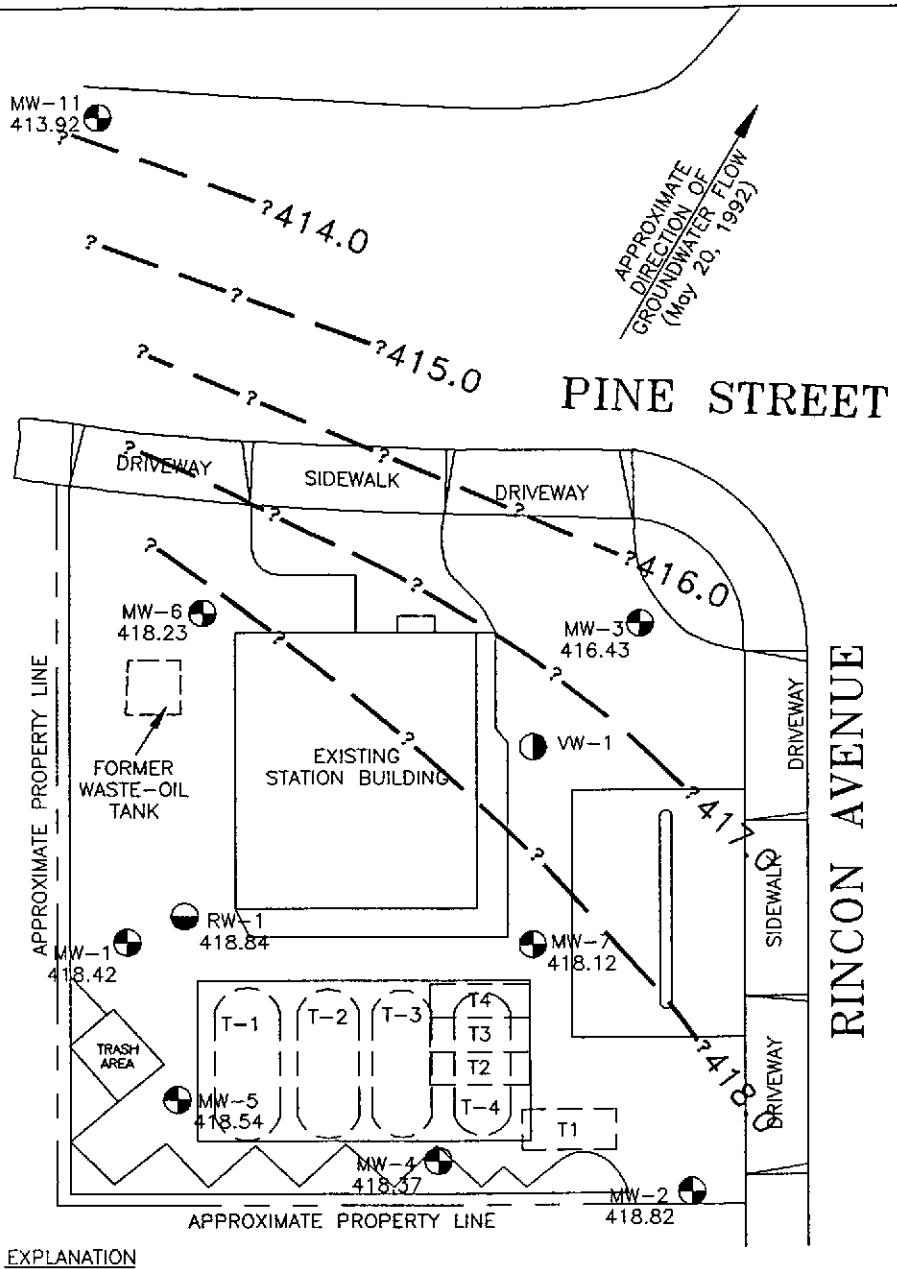
GROUNDWATER GRADIENT MAP
ARCO Station 771
899 Rincon Avenue
Livermore, California

PLATE
3



EXPLANATION

418.0 = Line of equal elevation of groundwater in feet above mean sea level (MSL)

418.84 = Elevation of groundwater in feet above MSL, May 20, 1992

MW-11 = Monitoring well (RESNA, 1991 and 1992)

RW-1 = Recovery well (RESNA, April 1992)

VW-1 = Vapor extraction well (RESNA, April 1992)

T4 = Underground gasoline-storage tank

T-4 = Existing underground gasoline-storage tank

N

Approximate Scale

30 15 0 30 60

feet

Source: Surveyed by John Koch, Licensed Land Surveyor.

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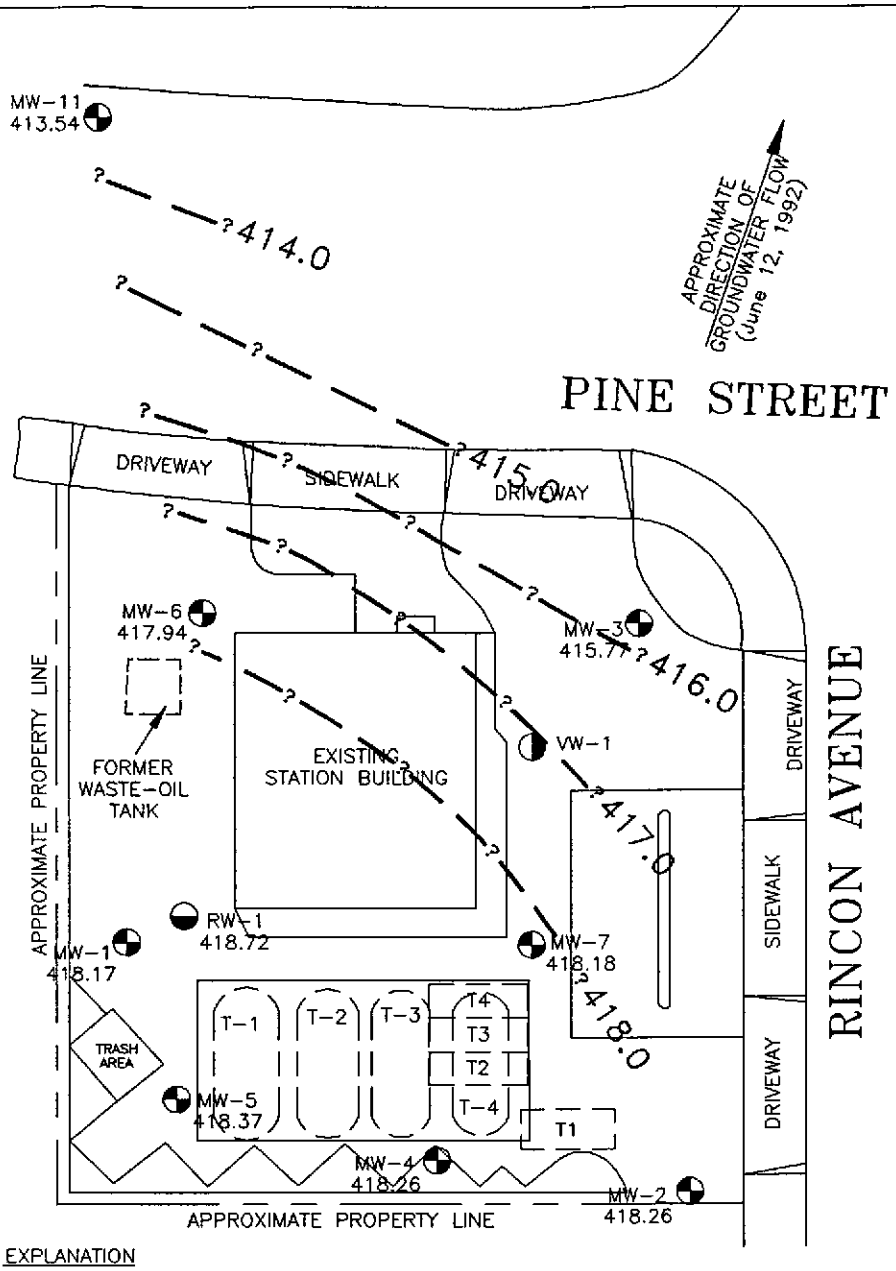
GROUNDWATER GRADIENT MAP
ARCO Station 771
899 Rincon Avenue
Livermore, California

PLATE
4



EXPLANATION

418.0 = Line of equal elevation of groundwater in feet above mean sea level (MSL)

418.72 = Elevation of groundwater in feet above MSL, June 12, 1992

MW-11 = Monitoring well (RESNA, 1991 and 1992)

RW-1 = Recovery well (RESNA, April 1992)

VW-1 = Vapor extraction well (RESNA, April 1992)

T4 = Underground gasoline-storage tank

T-4 = Existing underground gasoline-storage tank

N

Approximate Scale

30 15 0 30 60

feet

Source: Surveyed by John Koch, Licensed Land Surveyor.

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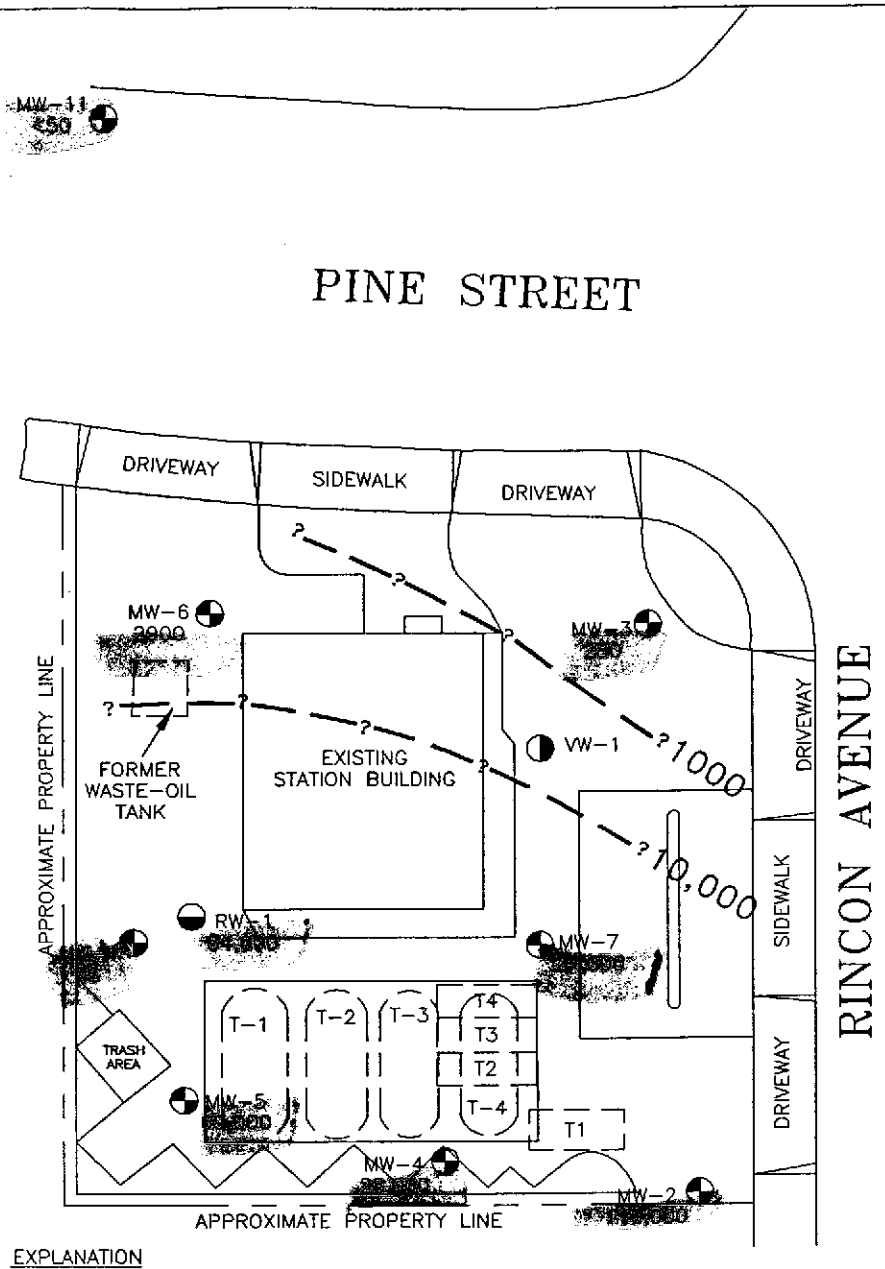
GROUNDWATER GRADIENT MAP
ARCO Station 771
899 Rincon Avenue
Livermore, California

PLATE
5



EXPLANATION

—10,000 = Line of equal concentration of TPHg in groundwater in parts per billion (ppb)

110,000 = Concentration of TPHg in groundwater in ppb, June 12, 1992

MW-11 = Monitoring well (RESNA, 1991 and 1992)

RW-1 = Recovery well (RESNA, April 1992)

VW-1 = Vapor extraction well (RESNA, April 1992)

T4 = Underground gasoline-storage tank

NS = Not sampled, floating product

(T-4) = Existing underground gasoline-storage tank

Approximate Scale

30 15 0 30 60

feet

Source: Surveyed by John Koch, Licensed Land Surveyor.

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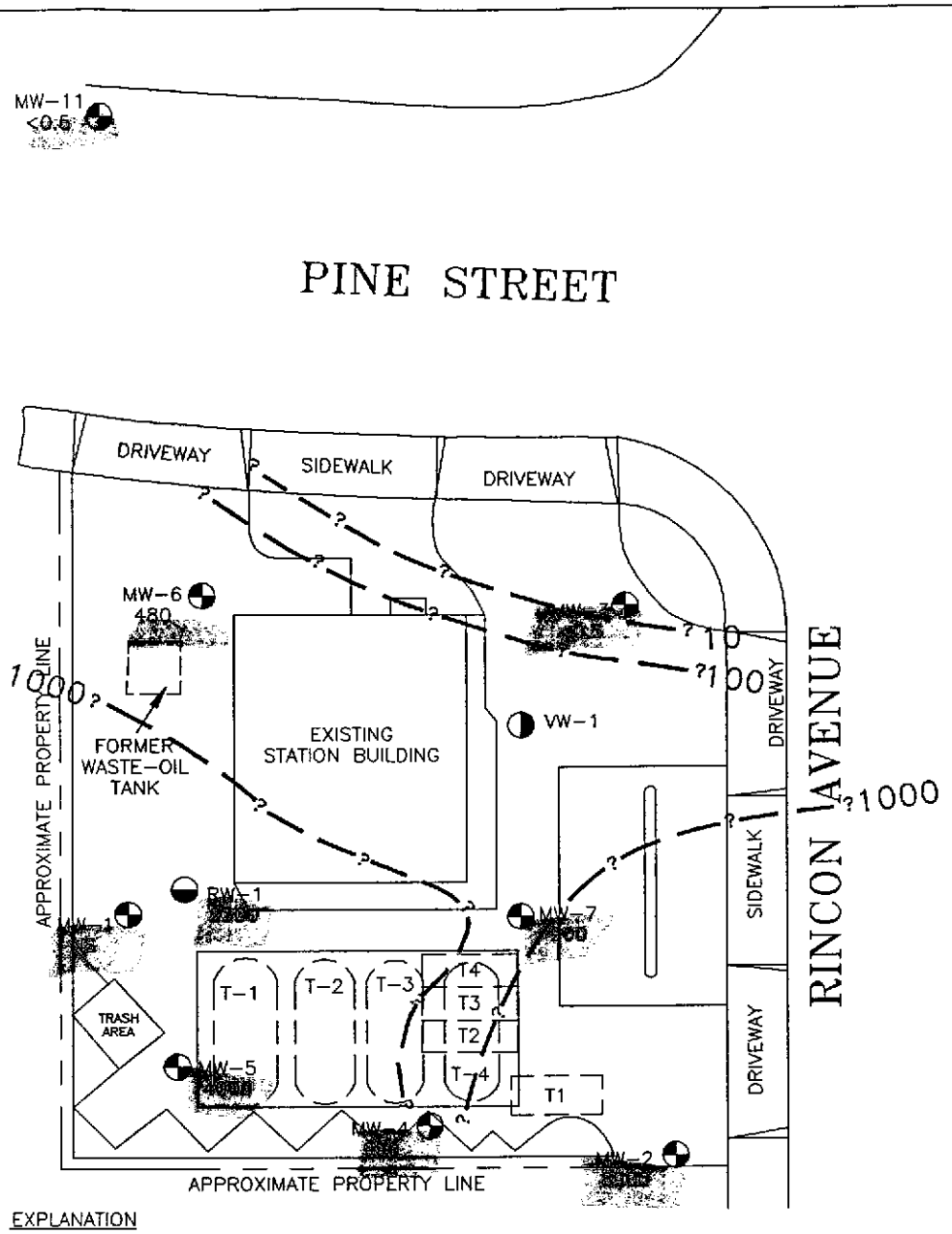
TPHg CONCENTRATIONS IN GROUNDWATER
ARCO Station 771
899 Rincon Avenue
Livermore, California

PLATE 6



EXPLANATION

1000 = Line of equal concentration of benzene in groundwater in parts per billion (ppb)

8900 = Concentration of benzene in groundwater in ppb, June 12, 1992

MW-11 = Monitoring well (RESNA, 1991 and 1992)

RW-1 = Recovery well (RESNA, April 1992)

VW-1 = Vapor extraction well (RESNA, April 1992)

T4 = Underground gasoline-storage tank

NS = Not sampled, floating product

T-4 = Existing underground gasoline-storage tank

N

Approximate Scale

30 15 0 30 60

feet

Source: Surveyed by John Koch, Licensed Land Surveyor.

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BENZENE CONCENTRATIONS IN GROUNDWATER
ARCO Station 771
899 Rincon Avenue
Livermore, California

PLATE 7

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 771
Livermore, California
(Page 1 of 4)

Well Date	Well Elevation	Depth-to- Water	Water Elevation	Floating Product
MW-1				
01-15-91	451.80**	32.77	419.03	Sheen
02-27-91		32.23	419.57	None
03-20-91		27.38	424.42	Sheen
04-10-91		26.49	425.31	None
05-20-91	451.80***	NM	NM	Sheen
06-20-91		33.95	417.85	Sheen
07-25-91		36.59*	415.21*	0.10
08-13-91		37.72*	414.08*	0.20
09-12-91		39.25*	412.55*	0.23
10-30-91		39.14*	412.66*	0.20
11-13-91		Dry	Dry	None
12-26-91		39.30*	412.50	0.01
01-18-92		37.81**	NC	Skimmer
02-21-92		Well inaccessible due to construction		
03-31-92		31.90**	NC	Skimmer
04-24-92	451.42****	Well inaccessible due to construction		
05-20-92		33.00	418.42	Skimmer
06-12-92		33.25	418.17	0.02
MW-2				
01-15-91	449.52**	30.89*	418.63*	0.16
02-27-91		29.11*	420.41*	0.02
03-20-91		24.57*	424.95*	0.02
04-10-91		22.85*	426.67*	0.05
05-20-91	449.51***	NM	NM	NM
06-20-91		31.42*	418.09*	0.15
07-25-91		33.69*	415.82*	0.49
08-13-91		34.80*	414.71*	0.47
09-12-91		36.39*	413.12*	0.45
10-30-91		Dry	Dry	None
11-13-91		Dry	Dry	None
12-26-91		36.45	413.06	Sheen
01-18-92		Well inaccessible due to construction		
02-21-92		26.27**	NC	Skimmer
03-31-92		28.85**	NC	Skimmer
04-24-92	449.51***	30.95	418.56	Skimmer
05-20-92		30.69	418.82	Skimmer
06-12-92		31.25	418.26	None
MW-3				
01-15-91	450.29**	32.34	417.95	None
02-27-91		31.78	418.51	None
03-20-91		27.74	422.55	None

See notes on Page 4 of 4.

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 771
Livermore, California
(Page 2 of 4)

Well Date	Well Elevation	Depth-to-Water	Water Elevation	Floating Product
MW-3				
04-10-91		25.05	425.24	None
05-20-91	450.28***	27.06	423.22	None
06-20-91		32.35	417.93	None
07-25-91		35.02	415.26	None
08-13-91		36.50	413.78	None
09-12-91		38.47	413.81	None
10-30-91		Dry	Dry	None
11-13-91		Dry	Dry	None
12-26-91		38.53	411.75	None
01-18-92		Well inaccessible due to construction		
02-21-92		Well inaccessible due to construction		
03-31-92		30.61	NC	None
04-24-92	450.28****	32.83	417.45	None
05-20-92		33.85	416.43	None
06-12-92		34.51	415.77	None
MW-4				
07-25-91	451.56***	36.07	415.49	None
08-13-91		37.54	414.02	None
09-12-91		38.73	412.83	None
10-10-91		39.90	411.66	None
11-13-91		40.56	411.00	None
12-26-91		38.78	412.78	None
01-18-92		38.71	NC	None
02-21-92		31.91	NC	None
03-31-92		30.36	NC	None
04-24-92	450.99****	32.65	418.34	None
05-20-92		32.62	418.37	None
06-12-92		32.73	418.26	None
MW-5				
07-25-91	451.41***	36.67	414.74	Sheen
08-13-91		37.98*	413.43*	0.01
09-12-91		39.01*	412.40*	0.05
10-30-91		38.28	412.13	Sheen
11-13-91		39.24	412.17	Sheen
12-26-91		39.11	412.30	Sheen
01-18-92		38.15**	NC	Skimmer
02-21-92		30.59**	NC	Skimmer
03-18-92		30.84**	NC	Skimmer
04-24-92	451.40****	33.00	418.40	Skimmer
05-20-92		32.86	418.54	Skimmer
06-12-92		33.03	418.37	None

See notes on Page 4 of 4.

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 771
Livermore, California
(Page 3 of 4)

Well Date	Well Elevation	Depth-to-Water	Water Elevation	Floating Product
MW-6				
07-25-91	451.38***	37.68	413.70	None
08-13-91		39.17	412.21	None
09-12-91		41.14	410.24	None
10-30-91		42.10	409.28	None
11-13-91		41.45	409.93	None
12-26-91		41.23	410.15	None
01-18-92		38.23	NC	None
02-21-92		35.21	NC	None
03-31-92		32.26	NC	None
04-24-92	451.37****	33.24	418.13	None
05-20-92		33.14	418.23	None
06-12-92		33.43	417.94	None
MW-7				
07-25-91	450.65***	34.88	415.77	Sheen
08-13-91		36.17	414.48	None
09-12-91		37.81	412.84	None
10-30-91		38.50	412.15	None
11-13-91		38.31	412.34	None
12-26-91		37.90	412.75	None
01-18-92		Well inaccessible due to construction		
02-21-92		31.50	NC	None
03-31-92		29.40	NC	None
04-24-92	450.63****	32.14	418.49	None
05-20-92		32.51	418.12	None
06-12-92		32.45	418.18	None
MW-11				
04-24-92	448.02****	35.06	412.96	None
05-20-92		34.10	413.92	None
06-12-92		34.48	413.54	None
RW-1				
04-24-92	451.44****	32.85	418.59	None
05-20-92		32.60	418.84	None
06-12-92		32.72	418.72	None

See notes on Page 4 of 4.

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 771
Livermore, California
(Page 4 of 4)

Measurements in feet.

* = Floating product present in well; calculated DTW when floating product is present is calculated using the attached protocol (Appendix A).

** = Surveyed by Ron Archer, Civil Engineer, in January 1991.

*** = Surveyed by John Koch, Licensed Land Surveyor, in July 1991.

NM = Not measured (instrument failure--interface probe).

The static water level in each well that was suspected to contain floating product was measured with an ORS® interface probe; this instrument is accurate to the nearest 0.01 foot. The probe contains two different sensor units, one for detecting the liquid/air interface, and one for distinguishing between water and hydrocarbon. The thickness of the floating product and the groundwater depths were recorded. The recorded thickness of the floating product was then multiplied by 0.80 to obtain an approximate value for the displacement of water by the floating product. This approximate displacement value is then subtracted from the measured depth to water to obtain a calculated depth to water. These calculated groundwater depths were subtracted from wellhead elevations to calculate the differences in groundwater elevations.

NC = Not calculated; wellhead elevations may no longer be correct due to construction activities related to the removal and replacement of underground storage tanks. Wellhead elevations will be resurveyed in April 1992.

**** = Surveyed by John Koch, Licensed Land Surveyor, in May 1992

TABLE 2
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF GROUNDWATER - TPHg, TPHd, BTEX, and TOG
ARCO Station 771
Livermore, California
(Page 1 of 2)

Sample	TPHg	B	T	E	X	TPHd	TOG
MW-1							
01-15-91	Not sampled--sheen						
04-10-91	98,000	11,000	18,000	2,800	20,000	NA	NA
07-25-91	Not sampled--floating product						
10-30-91	Not sampled--floating product						
03-31-92	Not sampled--floating product						
06-12-92	Not sampled--floating product						
MW-2							
01-15-91	Not sampled--floating product						
04-10-91	Not sampled--floating product						
07-25-91	Not sampled--floating product						
10-30-91	Not sampled--sheen						
03-31-92	270,000	7,000	12,000	4,400	40,000	NA	NA
06-12-92	110,000	8,900	13,000	2,800	16,000	NA	NA
MW-3							
01-15-91	230	<0.5	<0.5	2.2	2.1	NA	NA
04-10-91	530	12	8.4	4.0	7.0	NA	NA
07-25-91	110	0.32	0.75	1.2	1.0	NA	NA
10-30-91	Not sampled--dry						
03-31-92	670	12	1.1	7.4	27	NA	NA
06-12-92	280	<0.5	<0.5	2.1	2.0	NA	NA
MW-4							
07-25-91	23,000	590	730	360	3,500	NA	NA
10-30-91	19,000	320	340	230	180	NA	NA
03-31-92	30,000	1,300	740	770	4,800	NA	NA
06-12-92	28,000	990	440	550	3,200	NA	NA
MW-5							
07-25-91	57,000	2,300	4,200	77	14,000	NA	NA
10-30-91	Not sampled--sheen						
03-31-92	80,000	7,100	9,100	2,000	16,000	NA	NA
06-12-92	69,000	4,000	5,300	2,200	12,000	NA	NA
MW-6							
07-25-91	10,000	3,000	200	340	1,000	NA	NA
10-30-91	970	150	4.4	4.9	6.6	NA	NA
03-31-92	16,000	3,600	1,500	660	1,700	2,400*	2.5(4.0)
06-12-92	2,900	480	17	190	170	1,100**	1.2

See notes on Page 2 of 2.

TABLE 2
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF GROUNDWATER - TPHg, TPHd, BTEX, and TOG
ARCO Station 771
Livermore, California
(Page 2 of 2)

Sample	TPHg	B	T	E	X	TPHd	TOG
MW-7							
07-25-91	45,000	1,500	2,700	1,200	9,200	NA	NA
10-30-91	93,000	1,800	770	780	6,700	NA	NA
03-31-92	35,000	960	350	300	5,900	NA	NA
06-12-92	27,000	900	270	340	4,800	NA	NA
MW-11							
06-12-92	<50	<0.5	<0.5	<0.5	<0.5	NA	NA
RW-1							
06-12-92	54,000	2,300	4,400	1,200	12,000	NA	NA
MCLs	—	1	—	680	1,750		
DWAL	—	—	100	—	—		

All results in parts per billion (ppb), except TOG, which is reported in parts per million (ppm).
TPHg: Total petroleum hydrocarbons as gasoline (measured by EPA Method 5030/8015).
B: Benzene T: toluene E: ethylbenzene X: total xylene isomers
BTEX: Measured by EPA Method 5030/8020.
TPHd: Total petroleum hydrocarbons as diesel (measured by EPA Method 3510). May be weathered gasoline.
TOG: Total oil and grease.
NA: Not analyzed.
<: Less than the laboratory detection limit.
*: Laboratory reported sample matrix contains low boiling point fuel mixture calculated as diesel.
**: Sample contains a lower boiling point hydrocarbon mixture quantified as diesel. The chromatogram does not match the typical diesel fingerprint, but appears to be weathered gasoline.
MCL: State Maximum Contaminant Level in ppb (October 1990).
DWAL: State Recommended Drinking Water Action Level in ppb (October 1990).

TABLE 3
APPROXIMATE CUMULATIVE PRODUCT RECOVERED
ARCO Station 771
Livermore, California

Year		Floating Product Removed (gallons)
1991	TOTAL:	2.77 Gallons

Date	Floating Product Removed (gallons)
1992:	
MW-1	
01-15-92	Well inaccessible due to construction
02-28-92	Well inaccessible due to construction
03-26-92	0.25
04-27-92	Well inaccessible due to construction
05-14-92	None present
06-30-92	0.02
MW-2	
01-15-92	Well inaccessible due to construction
02-28-92	None present
03-26-92	0.01
04-27-92	None present
05-14-92	None present
06-30-92	None present
MW-5	
01-15-92	Well inaccessible due to construction
02-28-92	None present
03-26-92	0.01
04-27-92	None present
05-14-92	None present
06-30-92	None present
TOTAL:	0.29 Gallons

APPENDIX A
EMCON'S DEPTH TO WATER/FLOATING PRODUCT SURVEY FORMS (2), CERTIFIED ANALYTICAL REPORTS WITH CHAIN-OF-CUSTODY, AND WATER SAMPLE FIELD DATA SHEETS

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

Date April 27, 1992
Project G70-12.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Almaden Expressway, Suite 34
San Jose, California 95118

We are enclosing:

Copies	Description
1	Depth To Water/Floating Product Survey Results
	April 1992 monthly water level survey, ARCO
	station 771, 899 Rincon Avenue, Livermore, CA

For your: X Information Sent by: X Mail

Comments:
Monthly water level data for the above mentioned site are attached. Please call if you have any questions: (408) 453-2266.

Reviewed by: REGISTERED PROFESSIONAL ENGINEER ROBERT CURTIS PORTER No: 4094 Exp 6/30/92 INDUSTRIAL STATE OF CALIFORNIA

Mark Knuttel MK

Robert Porter, Senior Project Engineer.

1938 Junction Avenue, San Jose, California 95131-2102, (408) 453-0719, Fax (408) 453-0452

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-12.01 STATION ADDRESS : 899 Rincon Avenue, Livermore, CA DATE : 4-24-92

ARCO STATION # : 771 FIELD TECHNICIAN : Mark Knuttel DAY : FRIDAY

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking 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-11	OK	YES	✓	3259	YES	35.06	35.06	ND	ND	38.6	—
2	RW-1	OK	YES	✓	3259	YES	32.85	32.85	ND	ND	39.45	—
3	MW-3	OK	YES	✓	3259	YES	32.83	32.83	ND	ND	39.62	—
4	MW-6	OK	YES	✓	3259	YES	33.24	33.24	ND	ND	43.21	—
5	MW-4	OK	YES	✓	3259	YES	32.65	32.65	ND	ND	40.85	CIRCULAR METAL CASING
6	MW-7	OK	YES	✓	3259	YES	32.14	32.14	ND	ND	39.80	CIRCULAR METAL CASING
7	MW-5	OK	YES	✓	3259	YES	33.0	33.1	ND	ND	40.5	CIRCULAR METAL CASING SKIMMER IN WELL
8	MW-2	OK	YES	✓	3259	YES	30.95	30.95	ND	ND	37.85	CIRCULAR METAL CASING SKIMMER IN WELL
9	MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	SOIL PILE ON TOP OF WELL

EMCON
ASSOCIATES
Consultants in Wastes
Management and
Environmental Control

Date May 21, 1992
Project G70-12.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Almaden Expressway, Suite 34
San Jose, California 95118

We are enclosing:

Copies	Description
1	Depth To Water/Floating Product Survey Results
	May 1992 monthly water level survey, ARCO
	station 771, 899 Rincon Avenue, Livermore, CA

For your: X Information Sent by: X Mail

Comments:
Monthly water level data for the above mentioned site are attached. Please call if you have any questions: (408) 453-2266.

Reviewed by:

Jim Butera

Robert Porter, Senior Project Engineer.

1938 Junction Avenue, San Jose, California 95131-2102, (408) 453-0719, Fax (408) 453-0452

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-12.01 STATION ADDRESS : 899 Rincon Avenue, Livermore, CA DATE : 5-20-92

ARCO STATION # : 771 FIELD TECHNICIAN : M. Knuthal / St. Butera DAY : Wednesday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking 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-11	OK	yes	yes	3259	yes	34.10	34.10	ND	ND	38.60	—
2	RW-1	OK	yes	yes	3259	yes	32.60	32.60	ND	ND	39.45	—
3	MW-3	OK	yes	yes	3259	yes	33.85	33.85	ND	ND	39.60	—
4	MW-6	OK	yes	yes	3259	yes	33.14	33.13	ND	ND	43.20	—
5	MW-4	OK	yes	~~NO~~ yes	3259	yes	32.62	32.62	ND	ND	41.0	3 ft. DIAMETER OUTER CASING 3/4" SOCKET
6	MW-7	OK	yes	~~NO~~ yes	3259	yes	32.51	32.51	ND	ND	39.8	↓
7	MW-5	OK	yes	~~NO~~ yes	3259	yes	32.86	32.86	ND	ND	40.5	SKIMMER IN WELL
8	MW-2	OK	yes	yes	3257	yes	30.69	30.70	ND	ND	37.85	SKIMMER IN WELL
9	MW-1	OK	yes	yes	3259	yes	33.00	33.01	ND	ND	40.15	SKIMMER IN WELL
												ALL SKIMMERS WERE
												EMPTY.

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

RECEIVED
JUL 13 1992
RESNA
SAN JOSE

Date July 9, 1992
Project G70-12.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Almaden Expressway, Suite 34
San Jose, California 95050

We are enclosing:

Copies	Description
1	Depth To Water / Floating Product Survey Results
1	Summary of Groundwater Monitoring Data
2	Certified Analytical Reports with Chain-of-Custody
10	Water Sample Field Data Sheets

For your: X Information Sent by: X Mail

Comments:

Enclosed are the data from the second quarter 1992 monitoring event at ARCO service station 771. Please note that well MW-6 was resampled for diesel analysis on June 30, 1992 due to quality assurance deficiencies associated with the original analysis of this sample. Both the original and resample diesel results are enclosed for your review. Groundwater monitoring is conducted consistent with applicable regulatory guidelines.

Reviewed by: Jim Butera

REGISTERED PROFESSIONAL ENGINEER
SHREERANG N. DHARASKER
No. 004704
Exp. 6/30/96
CHEMICAL
STATE OF CALIFORNIA

Shreerang N. Dharasker, Senior Project Engineer.

1938 Junction Avenue, San Jose, California 95131-2102, (408) 453-0719, Fax (408) 453-0452

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-12.01 STATION ADDRESS : 899 Rincon Avenue, Livermore, CA DATE : 6-12-92

ARCO STATION # : 771 FIELD TECHNICIAN : S. Williams DAY : FRI

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking 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-11	✓	✓	✓	3259	✓	34.48	34.47	ND	ND	38.60	—
2	RW-1	✓	✓	✓	✓	✓	32.72	32.72	ND	ND	39.45	—
3	MW-3	✓	✓	✓	✓	✓	34.51	34.50	ND	ND	39.67	—
4	MW-6	✓	✓	✓	✓	✓	33.43	33.43	ND	ND	43.24	—
5	MW-4	✓	✓	✓	✓	✓	32.73	32.73	ND	ND	41.0	—
6	MW-7	✓	✓	✓	✓	✓	32.45	32.45	ND	ND	39.80	—
7	MW-5	✓	✓	✓	✓	✓	33.03	33.03	ND	ND	40.50	—
8	MW-2	✓	✓	✓	✓	✓	31.25	31.25	ND	ND	37.85	—
9	MW-1	✓	✓	✓	✓	✓	33.25	33.25	33.27	.02	40.20	—

Summary of Groundwater Monitoring Data
Second Quarter 1992
ARCO Service Station 771
899 Rincon Avenue, Livermore, California
micrograms per liter (µg/l) and milligrams per liter (mg/l)

Well ID and Sample Depth	Sampling Date	Depth To Water (feet)	Floating Product Thickness (feet)	TPH[1] as Gasoline (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethyl-benzene (µg/l)	Total Xylenes (µg/l)	TPH as Diesel (ug/l)	Total Oil and Grease, 5520C (mg/l
MW-1	06/12/92	33.25	0.02	FP[2].	FP.	FP	FP	FP	FP	FP
MW-2(37)	06/12/92	31.25	ND.[3]	110,000.	8,900.	13,000.	2,800.	16,000.	NR.[4]	NR.
MW-3(38)	06/12/92	34.51	ND.	280.	<0.5	<0.5	2.1	2.0	NR.	NR.
MW-4(40)	06/12/92	32.73	ND.	28,000.	990.	440.	550.	3,200.	NR.	NR.
MW-5(39)	06/12/92	33.03	ND.	69,000.	4,000.	5,300.	2,200.	12,000.	NR.	NR.
MW-6(42)	06/12/92	33.43	ND.	2,900.	480.	17.	190.	170.	1,100*.	1.2*
MW-7(39)	06/12/92	32.45	ND.	27,000.	900.	270.	340.	4,800.	NR.	NR.
MW-11(37)	06/12/92	34.48	ND.	<50	<0.5	<0.5	<0.5	<0.5	NR	NR
RW-1(38)	06/12/92	32.72	ND.	54,000.	2,300.	4,400.	1,200.	12,000.	NR	NR
FB-1.[5]	06/12/92	NA.[6]	NA.	<50	<0.5	<0.5	<0.5	<0.5	NR.	NR.

1. TPH. = Total petroleum hydrocarbons
2. FP. = Not sampled; well was not sampled due to detection of floating product
3. ND. = Not detected
4. NR. = Not reported; sample was not scheduled for analysis of the selected parameter
5. FB. = Field blank
6. NA. = Not applicable
   * = Sampling date was 6/30/92

Columbia Analytical Services inc.

June 29, 1992

Jim Butera
EMCON Associates
1921 Ringwood Avenue
San Jose, CA 95131

Re: **EMCON Project No. G70-12.01**
Arco Facility No. 771

Dear Mr. Butera:

Enclosed are the results of the water samples submitted to our lab on June 15, 1992. For your reference, our service request number for this work is SJ92-0733.

All analyses were performed in accordance with the laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

Keoni A. Murphy
Laboratory Manager

Annelise J. Bazar
Regional QA Coordinator

le/KAM

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/15/92
Work Order #: SJ92-0733
Sample Matrix: Water

Inorganic Parameters[1]
mg/L (ppm)

Sample Name:	MW-6 (42)	Method Blank
Date Sampled:	06/12/92	

Analyte	Method	MRL		
Total Oil and Grease	413.2	0.5	1.2	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
[1] Unless otherwise noted, all analyses were performed within EPA recommended maximum holding times specified in *Test Methods for Evaluating Solid Waste,* (SW-846, 3rd Edition) and *Methods for Chemical Analysis of Water and Waste* (EPA-600/4-79-020, Revised March 1983).

Approved by Keonn A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	06/15/92
Project:	EMCON Project No. G70-12.01	**Date Extracted:**	06/19/92
	Arco Facility No. 771	**Date Analyzed:**	06/22/92
Sample Matrix:	Water	**Work Order #:**	SJ92-0733

Total Petroleum Hydrocarbons as Diesel
EPA Methods 3510/California DHS LUFT Method
µg/L (ppb)

Sample Name	MRL	TPH as Diesel
MW-6 (42)	50	1,200.[1,2]
Method Blank	50	2,100.[1]

MRL Method Reporting Limit
TPH Total Petroleum Hydrocarbons
ND None Detected at or above the method reporting limit
[1] The sample matrix contains a lower boiling point fuel mixture calculated as diesel. The chromatogram does not match typical diesel fingerprint.
[2] Analyte concentration is an estimate because this analyte was found in the Method Blank.

Approved by Kevin A Murphy Date June 29, 1992

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	06/15/92
Project:	EMCON Project No. G70-12.01	**Work Order #:**	SJ92-0733
	Arco Facility No. 771	**Sample Matrix:**	Water

BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
µg/L (ppb)

Sample Name:		MW-2 (37)	MW-3 (38)	MW-4 (40)
Date Analyzed:		06/23/92	06/22/92	06/24/92
Analyte	**MRL**			
Benzene	0.5	8,900.	ND	990.
Toluene	0.5	13,000.	ND	440.
Ethylbenzene	0.5	2,800.	2.1	550.
Total Xylenes	0.5	16,000.	2.0	3,200.
TPH as Gasoline	50	110,000.	280.	28,000.

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Kevin A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/15/92
Work Order #: SJ92-0733
Sample Matrix: Water

BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
µg/L (ppb)

Sample Name:		MW-5 (39)	MW-6 (42)	MW-7 (39)
Date Analyzed:		06/23/92	06/24/92	06/23/92
Analyte	MRL			
Benzene	0.5	4,000.	480.	900.
Toluene	0.5	5,300.	17.	270.
Ethylbenzene	0.5	2,200.	190.	340.
Total Xylenes	0.5	12,000.	170.	4,800.
TPH as Gasoline	50	69,000.	2,900.	27,000.

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit

Approved by Kevin A Murphy Date June 29, 1992

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	06/15/92
Project:	EMCON Project No. G70-12.01	**Work Order #:**	SJ92-0733
	Arco Facility No. 771	**Sample Matrix:**	Water

BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
µg/L (ppb)

Sample Name:		MW-11 (37)	RW-1 (38)	FB-1
Date Analyzed:		06/22/92	06/23/92	06/22/92
Analyte	**MRL**			
Benzene	0.5	ND	2,300.	ND
Toluene	0.5	ND	4,400.	ND
Ethylbenzene	0.5	ND	1,200.	ND
Total Xylenes	0.5	ND	12,000.	ND
TPH as Gasoline	50	ND	54,000.	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Kevin A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	06/15/92
Project:	EMCON Project No. G70-12.01	**Work Order #:**	SJ92-0733
	Arco Facility No. 771	**Sample Matrix:**	Water

BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
µg/L (ppb)

Sample Name:		Method Blank	Method Blank	Method Blank
Date Analyzed:		06/22/92	06/23/92	06/24/92
Analyte	**MRL**			
Benzene	0.5	ND	ND	ND
Toluene	0.5	ND	ND	ND
Ethylbenzene	0.5	ND	ND	ND
Total Xylenes	0.5	ND	ND	ND
TPH as Gasoline	50	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Kevin A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/15/92
Work Order #: SJ92-0733
Sample Matrix: Water

QA/QC Report
Continuing Calibration Summary
Inorganics
EPA Method 413.2
mg/L

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Total Oil & Grease	80.	80.5	101.	53-149

Approved by Karen A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/15/92
Work Order #: SJ92-0733
Sample Matrix: Water

QA/QC Report
Matrix Spike Summary
Inorganic Parameters
mg/L (ppm)

Sample Name: MW-6 (42)
Date Sampled: 06/12/92

Parameter	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	Acceptance Criteria
Total Oil & Grease	6.3	1.2	5.3	5.7	65.	71.	53-149

Approved by Kevin A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/15/92
Work Order #: SJ92-0733
Sample Matrix: Water

QA/QC Report
Continuing Calibration Summary
TPH as Diesel
EPA Methods 3510/DHS LUFT Method
mg/L (ppm)

Date Analyzed: 06/22/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
TPH as Diesel	1,000.	972.	97.	90-110

TPH Total Petroleum Hydrocarbons

Approved by Karen A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/15/92
Work Order #: SJ92-0733
Sample Matrix: Water

QA/QC Report
Surrogate Recovery Summary
TPH as Diesel
EPA Method 3510/DHS LUFT Method

Sample Name	Date Analyzed	Percent Recovery P-Terphenyl
MW-6 (42)	06/22/92	80.
MW-6 (42) MS	06/22/92	63.
MW-6 (42) DMS	06/22/92	88.
Method Blank	06/22/92	103.
	CAS Acceptance Criteria	55-145

TPH Total Petroleum Hydrocarbons

Approved by Kevin A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/15/92
Work Order #: SJ92-0733
Sample Matrix: Water

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
Total Petroleum Hydrocarbons as Diesel
DHS LUFT Method
µg/L (ppb)

Sample Name: MW-6 (42)
Date Analyzed: 06/22/92

Parameter	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	Acceptance Criteria
Diesel	3,640.	1,170.	4,860.	4,460.	101.	90.	55-145

Approved by Robert A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client:	EMCON Associates	**Date Received:**	06/15/92
Project:	EMCON Project No. G70-12.01	**Work Order #:**	SJ92-0733
	Arco Facility No. 771	**Sample Matrix:**	Water

QA/QC Report
Continuing Calibration Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
Nanograms

Date Analyzed: 06/22/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	240.	96.	85-115
Toluene	250.	261.	104.	85-115
Ethylbenzene	250.	251.	100.	85-115
Total Xylenes	750.	725.	97.	85-115
TPH as Gasoline	2,500.	2,556.	102.	90-110

Date Analyzed: 06/23/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	258.	103.	85-115
Toluene	250.	267.	107.	85-115
Ethylbenzene	250.	282.	113.	85-115
Total Xylenes	750.	764.	101.	85-115
TPH as Gasoline	2,500.	2,393.	96.	90-110

TPH Total Petroleum Hydrocarbons

Approved by Kevin A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/15/92
Work Order #: SJ92-0733
Sample Matrix: Water

QA/QC Report
Continuing Calibration Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
Nanograms

Date Analyzed: 06/24/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	259.	104.	85-115
Toluene	250.	273.	109.	85-115
Ethylbenzene	250.	271.	108.	85-115
Total Xylenes	750.	759.	101.	85-115
TPH as Gasoline	2,500.	2,342.	94.	90-110

TPH Total Petroleum Hydrocarbons

Approved by Kevin Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client:	EMCON Associates	**Date Received:**	06/15/92
Project:	EMCON Project No. G70-12.01	**Work Order #:**	SJ92-0733
	Arco Facility No. 771	**Sample Matrix:**	Water

QA/QC Report
Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method

Sample Name	Date Analyzed	Percent Recovery α,α,α-Trifluorotoluene
MW-2 (37)	06/23/92	118.
MW-3 (38)	06/22/92	114.
MW-4 (40)	06/24/92	117.
MW-5 (39)	06/23/92	115.
MW-6 (42)	06/24/92	110.
MW-7 (39)	06/23/92	115.
MW-11 (37)	06/22/92	109.
RW-1 (38)	06/23/92	114.
FB-1	06/22/92	109.
MS	06/22/92	109.
DMS	06/22/92	109.
Method Blank	06/22/92	112.
Method Blank	06/23/92	110.
Method Blank	06/24/92	110.
	CAS Acceptance Criteria	70-130

TPH Total Petroleum Hydrocarbons

Approved by Robert Murphy Date June 29/1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/15/92
Work Order #: SJ92-0733
Sample Matrix: Water

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
BTE
EPA Methods 5030/8020
µg/L (ppb)

Sample Name: MW-11 (37)
Date Analyzed: 06/22/92

Analytes	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	Acceptance Criteria
Benzene	25.	ND	24.3	24.4	97.	98.	39-150
Toluene	25.	ND	25.9	26.0	104.	104.	46-148
Ethylbenzene	25.	ND	26.2	26.4	105.	106.	32-160

ND None Detected at or above the method reporting limit

Approved by Leon A Murphy Date June 29, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

Chain of Custody

ARCO Facility no. 771	City (Facility) LIVERMORE	Project manager (Consultant) JIM BUTERA	Laboratory name CAS
ARCO engineer Kyle Christie	Telephone no. (ARCO) (415) 571-1434	Telephone no. (Consultant) (408) 453-2266	Fax no. (Consultant) (408) 453-0452
Consultant name EMCON ASSOCIATES	Address (Consultant) 1938 JUNCTION AVE		Contract number 67077

Method of shipment: Sampler will deliver

Special detection Limit/reporting: lowest Possible

Special QA/QC: As Normal

Remarks: G70-1201
2 40 ml VOA's per well
~~TPH-d~~ - 2-Liter NP
TOG - 2 Liter HCl (9 bags)

Lab number: SJ92-0733

Turnaround time
- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☒

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH GAS EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☑	Oil and Grease 413.1 ☐ 413.2 ☑	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-1( )		2		X		X	HCl				X		Product in Well per J. Butera 6-15-92									
MW-2(31')	1-2	2		X		X		6-12-92	1737		X											
MW-3(38')	3-4	2		X		X		6-12-92	1524		X											
MW-4(40')	5-6	2		X		X		6-12-92	1515		X											
MW-5(34')	7-8	2		X		X		6-12-92	1735		X											
MW-6(42')	9-10	2		X		X		6-12-92	1625		X											
MW-7(39')	11-12	2		X		X		6-12-92	1630		X											
MW-11(37')	13-14	2		X		X		6-12-92	1242		X											
RW-1(36')	15-16	2		X		X		6-12-92	1214		X											
FB-1	17-18	2		X		X		6-12-92	1424		X											
MW-6(42')	19-20	2		X		X	NP	6-12-92	1625			X										
MW-6(42')	21-22	2		X		X	HCl	6-12-92	1625				X									

Condition of sample: OK

Temperature received: cool

Relinquished by sampler	Date 6-15-92	Time 0848	Received by 6-15-92 0848
Relinquished by	Date 6-15-92	Time 0848	Received by
Relinquished by	Date 6-15-92	Time 0848	Received by laboratory / Date / Time

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

Columbia Analytical Services, Inc.

July 7, 1992

Jim Butera
EMCON Associates
1921 Ringwood Avenue
San Jose, CA 95131

Re: **EMCON Project No. G70-12.01**
Arco Facility No. 771

Dear Mr. Butera:

Enclosed are the results of the water sample submitted to our lab on June 30, 1992. For your reference, our service request number for this work is SJ92-0787.

All analyses were performed in accordance with the laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

Keoni A. Murphy
Laboratory Manager

Annelise J. Bazar
Regional QA Coordinator

le/KAM

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	06/30/92
Project:	EMCON Project No. G70-12.01	**Date Extracted:**	07/01/92
	Arco Facility No. 771	**Date Analyzed:**	07/01/92
Sample Matrix:	Water	**Work Order #:**	SJ92-0787

Total Petroleum Hydrocarbons as Diesel
EPA Method 3510/California DHS LUFT Method
µg/L (ppb)

Sample Name	MRL	TPH as Diesel
MW-6 (42)	50	1,100.*
Method Blank	50	ND

MRL Method Reporting Limit
TPH Total Petroleum Hydrocarbons
ND None Detected at or above the method reporting limit
* The sample matrix contains a lower boiling point fuel mixture calculated as diesel. The chromatogram does not match typical diesel fingerprint.

Approved by Kevin A. Murphy Date July 7, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/30/92
Work Order #: SJ92-0787
Sample Matrix: Water

QA/QC Report
Continuing Calibration Summary
TPH as Diesel
EPA Method 3510/DHS LUFT Method
mg/L (ppm)

Date Analyzed: 07/01/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
TPH as Diesel	1,000.	1,005.	101.	90-110

TPH Total Petroleum Hydrocarbons

Approved by Keon A Murphy Date July 7, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/30/92
Work Order #: SJ92-0787
Sample Matrix: Water

QA/QC Report
Surrogate Recovery Summary
TPH as Diesel
EPA Method 3510/DHS LUFT Method

Sample Name	Date Analyzed	Percent Recovery P-Terphenyl
MW-6 (42)	07/01/92	72.
MW-6 (42) MS	07/01/92	90.
MW-6 (42) DMS	07/01/92	75.
Method Blank	07/01/92	85.
	CAS Acceptance Criteria	55-145

TPH Total Petroleum Hydrocarbons

Approved by Karen A Murphy Date July 7, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Client: EMCON Associates
Project: EMCON Project No. G70-12.01
Arco Facility No. 771

Date Received: 06/30/92
Work Order #: SJ92-0787
Sample Matrix: Water

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
Total Petroleum Hydrocarbons as Diesel
DHS LUFT Method
µg/L (ppb)

Sample Name: MW-6 (42)
Date Analyzed: 07/01/92

Parameter	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	Acceptance Criteria
Diesel	4,000.	1,060.	4,350.	4,230.	82.	79.	55-145

Approved by Robert Murphy Date July 7, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMC GC-92-1

Chain of Custody

ARCO Facility no. 771	City (Facility) Livermore	Project manager (Consultant) Jim Butera	Laboratory name CAS
ARCO engineer Kyle Christie	Telephone no. (ARCO) 408 264 7723	Telephone no. (Consultant) (408) 453 0719	Fax no. (Consultant) 408 453 0452
Consultant name Emcon	Address (Consultant)		Contract number 07077

Method of shipment: Sample will Deliver

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH — Diesel EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-6 (1,2)	V	2		X		X		6-30-92	1310					X								

Special detection Limit/reporting

Special QA/QC

Remarks: Rush
48hr. TAT
per K. Murphy
6-30-92 1HF
G70-1201

Lab number: 5J92-0787

Condition of sample: OK		Temperature received: cool	
Relinquished by sampler	Date 6-30-92 Time 1424	Received by	6-30-92 1424
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date Time

Turnaround time

- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☒
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☐

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 670-1201 SAMPLE ID: RW-1

PURGED BY: M. Gallegos CLIENT NAME: ARCO # 771

SAMPLED BY: J. Williams LOCATION: Livermore

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 ___ 4.5 ___ 6 X Other ___

CASING ELEVATION (feet/MSL): ___ VOLUME IN CASING (gal.): 9.87

DEPTH TO WATER (feet): 32.72 CALCULATED PURGE (gal.): 49.39

DEPTH OF WELL (feet): 39.45 (4.73) ACTUAL PURGE VOL. (gal.): 22.5

DATE PURGED: 6-12-92 Start (2400 Hr) 1132 End (2400 Hr) 1203

DATE SAMPLED: 6-12-92 Start (2400 Hr) 1214 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1145	10	6.79	1497	72.6	BROWN	HEAVY
1200	20	7.35	1430	69.8	↓	↓
	~~30~~ NR4					
1216	~~40~~ Re-Purge	—	1446	[illegible]	BROWN	[illegible]
	~~50~~					

D. O. (ppm): NR ODOR: Strong

NR (COBALT 0 - 100) NR (NTU 0 - 200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	X Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good LOCK #: 3259

REMARKS: DRIED AFTER 22.5 GALLON. Time 1203

Meter Calibration: Date: ___ Time: 1130 Meter Serial #: ___ Temperature °F: 68 781

(EC 1000 977 / 1000) (DI ___) (pH 7 6.93 / 7.00) (pH 10 10.05 / 10.00) (pH 4 4.01 / —)

Location of previous calibration: RW-1

Signature: [signature] Reviewed By: TS Page 1 of 9

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 670-1201 SAMPLE ID: MW-1

PURGED BY: NA CLIENT NAME: ARCO 771

SAMPLED BY: NA LOCATION: LIVERMORE CA

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 X 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): NA

DEPTH TO WATER (feet): 33.25 CALCULATED PURGE (gal.): /

DEPTH OF WELL (feet): 40.2 ACTUAL PURGE VOL. (gal.): ___

DATE PURGED: NA Start (2400 Hr) NA End (2400 Hr) NA

DATE SAMPLED: / Start (2400 Hr) / End (2400 Hr) /

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
		0.02 feet of product in well				
		NO - SAMPLE				

D. O. (ppm): NA ODOR: NA COLOR (COBALT 0 - 100): NA TURBIDITY (NTU 0 - 200): NA

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	___ Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: NA		Other: NA	

WELL INTEGRITY: Fine LOCK #: 3259

REMARKS: ___

Meter Calibration: Date: ___ Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: ___

Signature: Joe Quintana Reviewed By: JB Page 2 of 9

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: G70-12-01 SAMPLE ID: MW-2

PURGED BY: S. Williams CLIENT NAME: ARCO 971

SAMPLED BY: S. Williams LOCATION: Livermore CA

TYPE: Ground Water ✓ Surface Water ____ Treatment Effluent ____ Other ____

CASING DIAMETER (inches): 2 ____ 3 ____ 4 ✓ 4.5 ____ 6 ____ Other ____

CASING ELEVATION (feet/MSL): ✓ VOLUME IN CASING (gal.): 4.32

DEPTH TO WATER (feet): 31.25 CALCULATED PURGE (gal.): 21.64

DEPTH OF WELL (feet): 37.85 ACTUAL PURGE VOL. (gal.): 16.5

DATE PURGED: 06-12-92 Start (2400 Hr) 1705 End (2400 Hr) 1726

DATE SAMPLED: 06-12-92 Start (2400 Hr) ____ End (2400 Hr) 1737

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1710	5	6.95	1353	66.9	GRAY	HEAVY
1715	10	6.95	1331	69.8	"	"
1723	16	7.05	1320	66.5	"	"
~~1730~~	~~15 RV~~					
1740	Recharge	7.65	1319	66.8	"	"

D. O. (ppm): NR ODOR: STRONG N/A (COBALT 0 - 100) 20 (NTU 0 - 200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
____ 2" Bladder Pump	____ Bailer (Teflon®)	____ 2" Bladder Pump	✓ Bailer (Teflon®)
____ Centrifugal Pump	✓ Bailer (PVC)	____ DDL Sampler	____ Bailer (Stainless Steel)
____ Submersible Pump	____ Bailer (Stainless Steel)	____ Dipper	____ Submersible Pump
____ Well Wizard™	____ Dedicated	____ Well Wizard™	____ Dedicated
Other: ____		Other: ____	

WELL INTEGRITY: ____ LOCK #: 3259

REMARKS: DRIED AFTER 16.5 GALLONS Time 1726

Meter Calibration: Date: ____ Time: ____ Meter Serial #: ____ Temperature °F: ____

(EC 1000 ____ / ____) (DI ____) (pH 7 ____ / ____) (pH 10 ____ / ____) (pH 4 ____ / ____)

Location of previous calibration: MW-7

Signature: [signature] Reviewed By: JM Page 3 of 9

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 670-12.01 SAMPLE ID: MW-3

PURGED BY: M Gallegos / J. Williams CLIENT NAME: ARCO 771

SAMPLED BY: J. Williams / M. Gallegos LOCATION: Livermore

TYPE: Ground Water X Surface Water ____ Treatment Effluent ____ Other ____

CASING DIAMETER (inches): 2 ____ 3 ____ 4 X 4.5 ____ 6 ____ Other ____

CASING ELEVATION (feet/MSL): ____ VOLUME IN CASING (gal.): 3.35

DEPTH TO WATER (feet): 34.51 CALCULATED PURGE (gal.): 16.76

DEPTH OF WELL (feet): 39.62 5.11 ACTUAL PURGE VOL. (gal.): 8 gallons

DATE PURGED: 6-12-92 Start (2400 Hr) 1500 End (2400 Hr) 1521

DATE SAMPLED: 6-12-92 Start (2400 Hr) 1526 End (2400 Hr) 1530

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1506	3.5	7.54	875	70.0	~~Brown~~ Gray	Heavy
1521	7.0	7.46	926	67.7	Brown	Heavy
1530	Recharge 10.5 Gal	7.70	945	71.4	"	"
	~~H2O~~					
	~~17.5~~					

D. O. (ppm): NR. ODOR: Light

COLOR (COBALT 0 - 100): NR. TURBIDITY (NTU 0 - 200): NR.

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
____ 2" Bladder Pump	~~X~~ Bailer (Teflon®)	____ 2" Bladder Pump	X Bailer (Teflon®)
____ Centrifugal Pump	X Bailer (PVC)	____ DDL Sampler	____ Bailer (Stainless Steel)
____ Submersible Pump	____ Bailer (Stainless Steel)	____ Dipper	____ Submersible Pump
____ Well Wizard™	____ Dedicated	____ Well Wizard™	____ Dedicated
Other: ____		Other: ____	

WELL INTEGRITY: Good LOCK #: 3259

REMARKS: (well dried at 7.0 gallons) all samples taken

Meter Calibration: Date: 6-12-92 Time: 1435 Meter Serial #: ____ Temperature °F: 72.9

(EC 1000 1054 / 1000) (DI ____) (pH 7 6.8X / 700) (pH 10 1004 / 1006) (pH 4 ____ / ____)

Location of previous calibration: ____

Signature: [signature] Reviewed By: JM Page 4 of 9

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: G70-12-01 SAMPLE ID: MW-4

PURGED BY: J. Williams CLIENT NAME: ARCO 471

SAMPLED BY: J. Williams LOCATION: Livermore Ca

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 ✓ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): ___ VOLUME IN CASING (gal.): 5.42

DEPTH TO WATER (feet): 32.73 CALCULATED PURGE (gal.): 27.12

DEPTH OF WELL (feet): 41.0 ACTUAL PURGE VOL. (gal.): 14.0

DATE PURGED: 6-12-97 Start (2400 Hr) 14:50 End (2400 Hr) 15:08

DATE SAMPLED: 6-12-97 Start (2400 Hr) / End (2400 Hr) 1515

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
14:54	6	7.27	1255	74.3	BROWN	HEAVY
15:02	12	7.12	1263	69.3	"	"
	14 SR4					
15:15	22 Recharge	7.07	1313	68.4	BROWN	HEAVY
	20					

D. O. (ppm): NA ODOR: STRONG N.R. (COBALT 0 - 100) N.R. (NTU 0 - 200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
___ Centrifugal Pump	✓ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: DRIED AFTER 14 GALLON TIME 15:08

Meter Calibration: Date: ___ Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: RW-1

Signature: Jon Williams Reviewed By: JD Page 5 of 9

EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

PROJECT NO: 670-12.01 SAMPLE ID: MW-5

PURGED BY: M. Gallegos CLIENT NAME: ARCO #771

SAMPLED BY: M. Gallegos LOCATION: Livermore

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 X 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): ——— VOLUME IN CASING (gal.): 4.90

DEPTH TO WATER (feet): 33.03 CALCULATED PURGE (gal.): 24.50

DEPTH OF WELL (feet): 40.50 ACTUAL PURGE VOL. (gal.): 12.5

7.47

DATE PURGED: 6-12-92 Start (2400 Hr) 1712 End (2400 Hr) 1729

DATE SAMPLED: 6-12-92 Start (2400 Hr) 1735 End (2400 Hr) 1738

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1716	5	8.09	11.60	66.4	Light Gray	Heavy
1723	10	7.30	11.67	66.2	"	Heavy
1735	Recharge ~~15~~	7.82	1178	65.9	"	Heavy
	~~20~~					
	~~25~~					

D. O. (ppm): NR ODOR: Strong NR (COBALT 0 - 100) NR. (NTU 0 - 200)

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

PURGING EQUIPMENT

- ___ 2" Bladder Pump
- ___ Centrifugal Pump
- ___ Submersible Pump
- ___ Well Wizard™
- ___ Bailer (Teflon®)
- X Bailer (PVC)
- ___ Bailer (Stainless Steel)
- ___ Dedicated

Other: ___

SAMPLING EQUIPMENT

- ___ 2" Bladder Pump
- ___ DDL Sampler
- ___ Dipper
- ___ Well Wizard™
- X Bailer (Teflon®)
- ___ Bailer (Stainless Steel)
- ___ Submersible Pump
- ___ Dedicated

Other: ___

WELL INTEGRITY: Good LOCK #: 3259

REMARKS: Well Dry - 12.5 gallons - All samples Taken

Meter Calibration: Date: 6-12-92 Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-2

Signature: M Gallegos Reviewed By: JB Page 6 of 9

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 620-12.01 SAMPLE ID: MW-6

PURGED BY: M. Gallegos CLIENT NAME: ARCO #771

SAMPLED BY: M. Gallegos LOCATION: Livermore

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 X 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): ___ VOLUME IN CASING (gal.): 6.43

DEPTH TO WATER (feet): 33.43 CALCULATED PURGE (gal.): 32.17

DEPTH OF WELL (feet): 43.24 / 9.81 ACTUAL PURGE VOL. (gal.): 15 gallons

DATE PURGED: 6-12-92 Start (2400 Hr) 1554 End (2400 Hr) 1606

DATE SAMPLED: 6-12-92 Start (2400 Hr) 1625 End (2400 Hr) 1631

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1600	7	8.28	1154	70.8	Grey	Heavy
1606	14	8.04	1109	70.9	Grey	Heavy
1631	~~Recharge~~ Dry	8.51	1138	71.6	Grey	Heavy
	~~28~~					
	~~35~~					

D. O. (ppm): NR ODOR: strong NR. (COBALT 0 - 100) NR. (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®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	X Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: GOOD LOCK #: 3259

REMARKS: Well Dried at 14 gallons All Samples Taken

Meter Calibration: Date: 6-12-92 Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-3

Signature: [signature] Reviewed By: JB Page 7 of 9

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 670-12-01 SAMPLE ID: MW-7

PURGED BY: J. Williams CLIENT NAME: ARCO 771

SAMPLED BY: J. Williams LOCATION: Livermore CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 ✓ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): WR VOLUME IN CASING (gal.): 4.82

DEPTH TO WATER (feet): 32.45 CALCULATED PURGE (gal.): 24.10

DEPTH OF WELL (feet): 39.50 ACTUAL PURGE VOL. (gal.): 12

DATE PURGED: 06-12-92 Start (2400 Hr) 1600 End (2400 Hr) 1622

DATE SAMPLED: 06-12-92 Start (2400 Hr) ✓ End (2400 Hr) 1630

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1606	5	6.60	1284	68.4	GRAY	HEAVY
1613	10	6.98	1235	69.1	L	L
	~~5~~ MPV					
1635	Recharge	7.10	1299	65.4	GRAY	HEAVY
	20					

D. O. (ppm): N/ ODOR: STRONG COLOR (COBALT 0 - 100): LR TURBIDITY (NTU 0 - 200): LR

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
___ Centrifugal Pump	✓ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: GOOD LOCK #: 3259

REMARKS: DRIED AFTER 12 GALLON TIME 1622

Meter Calibration: Date: ___ Time: ___ Meter Serial #: ___ Temperature °F: 76.1

(EC 1000 954 / 1000) (DI ___) (pH 7 6.92 / 7.00) (pH 10 10.00 / 10.00) (pH 4 3.99 / ___)

Location of previous calibration: MW-7

Signature: [signature] Reviewed By: JB Page 8 of 9

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 620-12.01 SAMPLE ID: MW-11

PURGED BY: M. Gilkeson / T. Williams CLIENT NAME: ARCO 771

SAMPLED BY: T. Williams LOCATION: Livermore.

TYPE: Ground Water X. Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 X 3 ___ 4 ___ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): ___ VOLUME IN CASING (gal.): 0.672

DEPTH TO WATER (feet): 34.48 CALCULATED PURGE (gal.): 3.36

DEPTH OF WELL (feet): 38.60 4.12 ACTUAL PURGE VOL. (gal.): 2.4

DATE PURGED: 6-12-92 Start (2400 Hr) 1224 End (2400 Hr) 1231

DATE SAMPLED: 6-12-92 Start (2400 Hr) ___ End (2400 Hr) 1242

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
12:26	.8	7.51	1017	68.2	BROWN	HEAVY
12:28	1.6	7.36	1020	68.1	"	"
12:30	2.4	7.39	1028	67.6	"	"
	3.2 DRY					
12:44	4 Recharge	7.40	1223	67.8	BROWN	HEAVY

D. O. (ppm): NR ODOR: None NR (COBALT 0 - 100) NR (NTU 0 - 200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	X Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good. LOCK #: 3258

REMARKS: DRIED AFTER 2.4 GALLON Time 12:31

Meter Calibration: Date: ___ Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: Rw-1

Signature: [signature] Reviewed By: JB Page 9 of 9

{F1047} 60000.13 TF NUMBER: 1047 GIB-92-056

MONITORING WELL PURGE WATER TRANSPORT FORM

GENERATOR INFORMATION

NAME: ARCO PRODUCTS RECEIVED

ADDRESS: P.O. BOX 5811 JUL 30 1992

CITY,STATE,ZIP: SAN MATEO, CA 94402 RESNA SAN JOSE PHONE #: (415) 571-2434

DESCRIPTION OF WATER: PURGE WATER GENERATED DURING SAMPLING OR DEVELOPMENT OF MONITORING WELLS LOCATED AT VARIOUS SITES. AUGER RINSATE GENERATED DURING THE INSTALLATION OF MONITORING WELLS AT VARIOUS SITES. THE WATER MAY CONTAIN DISSOLVED HYDROCARBONS.

THE GENERATOR CERTIFIES THAT THIS WATER AS DESCRIBED IS NON-HAZARDOUS

Kyle Christie by Don DeFoe 7-2-92
(Typed or printed full name & signature) (Date)

SITE INFORMATION

	STA #	JOB #	ADDRESS	GALS
1	A-697	20598&20665	420W. SHAW AVE., FRESNO, CA	58
2	A-335	20597-PW	4595 E. CLINTON ST., FRESNO, CA	5
3	A-6100	20717-DW	25775 SO. PATTERSON PASS RD., TRACY, CA	102
4	A-771	20656-PW	899 RINCON AVE., LIVERMORE, CA	90
5	A-6041	20657-PW	7249 VILLAGE PARKWAY, DUBLIN, CA	31
6	A-5387	20655-PW	20200 HESPERIAN BLVD., SAN LORENZO, CA	187
7	A-761	20599-PW	1985 BROADWAY AVE., VALLEJO, CA	109
8	A-2035	20659-PW	1001 SAN PABLO AVE., ALBANY, CA	165
9	A-414	20660-PW	5000 SHATTUCK AVE., BERKELEY, CA	80
10	A-6148	20658-PW	5131 SHATTUCK AVE., OAKLAND, CA	54
			TOTAL GALLONS:	881

TRANSPORTER INFORMATION

NAME: BALCH PETROLEUM

ADDRESS: 930 AMES AVE.

CITY,STATE,ZIP: MILPITAS, CA 95035 PHONE #: (408) 942-8686

TRUCK ID #: PETERBILT HURSCHEL WARD Hurschel Ward 7-2-92
(Typed or printed full name & signature) (Date)

TSD FACILITY INFORMATION

NAME: GIBSON OIL & REFINING

ADDRESS: 475 SEAPORT BLVD

CITY,STATE,ZIP: REDWOOD CITY, CA 94063 PHONE #: (415) 368-5511

RELEASE #: 11320 Bill (Edw Bill Lee 7-2-92
(Typed or printed full name & signature) (Date)

GOR1100