EMCON
1921 Ringwood Avenue • San Jose, California 95131 • (408)453-7300 • Fax (408)437-9526

TRANSMITTAL

Project/Task No.: 20805-131.006

TO: Ms. Juliet Shin DATE: April 16, 1997

Alameda County Health Care Services Agency

1131 Harborbay Parkway

Alameda, CA 94502

RE: Off-site Well Installation Report, ARCO service station 6002, 6235 Seminary Ave., Oakland, CA

WE ARE SENDING:

Quantity	Description
1	Off-site Well Installation Report, ARCO service station 6002

For Your:

- X USE
- _____ APPROVAL
- _____ REVIEW/COMMENTS
- _____ INFORMATION
- _____ OTHER

Sent By:

- _____ REGULAR MAIL
- _____ FEDERAL EXPRESS
- _____ UPS
- _____ COURIER
- X OTHER (certified mail)

COMMENTS: Please call if you have any questions. Thanks.

cc: Russel and Maude Edwards
Kevin Graves - RWQCB
Paul Supple - ARCO Products Company

Rob

BY: Rob Davis

92 APR 17 PM 1:59

ENVIRONMENTAL PROTECTION

ESJ\H:\ARCO\6002\SHIN_XM.DOC -96\rkd:1

EMCON
1921 Ringwood Avenue • San Jose, California 95131-1721 • (408) 453-7300 • Fax (408) 437-9526

April 15, 1997
Project 20805-131.006

Ms. Juliet Shin
Alameda County Health Care Services Agency
1131 Harborbay Parkway
Alameda, California 94502

Re: Results of off-site groundwater monitoring well installation at former ARCO service station 6002, 6235 Seminary Ave., Oakland, California

Dear Ms. Shin:

EMCON has prepared this letter report to document the results of temporary groundwater monitoring well installation and sampling activities at two properties (6217 Seminary Ave. and 6267 Sunnymere Ave.) adjacent to former ARCO service station 6002 located at 6235 Seminary Avenue, Oakland California (Figure 1). The purpose of the groundwater monitoring well installation and sampling was to assess groundwater conditions to the south and southwest of the former ARCO facility. This work was performed at the request of the Alameda County Health Care Services Agency (ACHCSA) according to the procedures described in EMCON's workplan, "*Workplan for additional off-site groundwater characterization* (EMCON, January 1995), as submitted to the ACHSCA and the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) on January 20, 1995.

FIELD ACTIVITIES

On July 15, 1996, two borings were drilled by EMCON south and southwest of the ARCO site at 6267 Sunnymere Ave and 6217 Seminary Ave. (Figure 1). The boring at 6267 Sunnymere Ave. was converted to groundwater monitoring well, MW-8. The initial boring at 6217 Seminary Ave. encountered a ceramic sewer line at 7 feet below ground surface (BGS) and was backfilled with bentonite. A second boring was drilled at this location on August 6, 1996 and converted to temporary groundwater monitoring well MW-7. The borings were drilled using 4-inch-diameter hand auger drilling equipment and converted to groundwater monitoring wells by installing 2-inch-diameter polyvinyl chloride (PVC) casing and screen in each boring. A graded sand pack was placed in the annular space around the screened interval and topped with bentonite. The wells were completed by installing water-tight, flush mounted well boxes in concrete at the surface. Exploratory boring logs and well construction details for MW-7 and MW-8 are presented in Appendix A. Copies of Zone 7 Water Agency well construction permits and California Department of Water Resources well completion reports for wells MW-7 and MW-8 are presented in Appendix B.

Subsurface Conditions

Materials encountered beneath the surface at each of the drilling locations consisted of unconsolidated alluvium. The boring for well MW-7 contained primarily clayey gravel to sandy gravel with some sandy clay to 14 feet BGS. The boring for well MW-7 could not be advanced past 14.0 feet BGS because of dense cobbles encountered in the bottom of the boring. The boring for well MW-8 contained sandy clay to 8 feet and clayey gravel to 14.5 feet BGS. Groundwater was first encountered in the boring for well MW-8 at 9.5 feet. At well MW-7 groundwater was not encountered during drilling and well construction.

Soil and Groundwater Sampling

Soil samples were collected from the original boring for well MW-7 at 3.0 and 5.0 feet, the second boring at 8.0 and 12.5 feet, and the boring for well MW-8 at 5.0 feet. The samples were transported with appropriate chain-of-custody documentation to Columbia Analytical Services (CAS), a state-certified laboratory. Groundwater sampling field data sheets are presented in Appendix C.

Groundwater grab samples were collected from temporary groundwater monitoring well MW-8 on August 9 and November 8, 1996. Groundwater was not observed in well MW-7 during the August sampling event, but was later observed and sampled on January 27, 1997. The samples were collected with a Teflon® bailer and submitted to a state-certified laboratory with chain-of-custody documentation.

LABORATORY PROCEDURES

Soil and groundwater samples were analyzed for total petroleum hydrocarbons as gasoline (TPHG), benzene, toluene, ethylbenzene, and total xylenes (BTEX). Additionally, groundwater samples were analyzed for methl-tert-butyl-ether (MTBE) by US EPA method 8020. Soil and groundwater samples were prepared for analysis by U.S. Environmental Protection Agency (USEPA) method 5030 (purge and trap). Soil was analyzed for TPHG by the methods accepted by the Department of Toxic Substances Control (DTSC) and referenced in *Leaking Underground Fuel Tank* (LUFT) *Field Manual* (State Water Resources Control Board, October 1989). Samples were analyzed for BTEX by USEPA method 8020, described in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (EPA SW-846, November 1986, third edition). These methods are recommended for use at petroleum-hydrocarbon-impacted sites in the *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites* (August 10, 1990).

Additionally, soil samples collected from MW-7 between 3.0 and 3.5 feet were analyzed for Total Organic Carbon (TOC) by the Walkley-Black Method, and geotechnical analysis for moisture content and grain size analysis by ASTM methods D2216 and D422, respectively. The soil sample from MW-7 at 3.0 feet contained 1600 mg/kg of organic carbon. The TOC result will be used along with the geotechnical results in a risk based corrective action (RBCA) evaluation currently being performed for the ARCO facility. Results of the geotechnical analyses are presented in Appendix D.

LABORATORY RESULTS

TPHG and BTEX were not detected in the soil samples from wells MW-7 and MW-8. The groundwater sample collected from monitoring well MW-8 did not contain TPHG, BTEX, and MTBE. The groundwater sample collected from well MW-7 contained 5,900 µg/L TPHG, 29 µg/L benzene, and 220 µg/L MTBE. Soil and groundwater analytical data are presented in Tables 1 and 2, respectively. Certified analytical reports and chain-of-custody documentation for the soil and groundwater samples are presented in Appendix E.

SUMMARY

Petroleum hydrocarbons were not detected in soil samples collected from the borings for groundwater monitoring wells MW-7 and MW-8 and the groundwater samples collected from well MW-8. The groundwater sample collected from well MW-7 contained petroleum hydrocarbon constituents.

As part of the ongoing groundwater investigation at the ARCO site, EMCON will continue with quarterly sampling of wells MW-7 and MW-8. Once the ACHCSA determines that the wells are no longer a necessary part of the investigation, the wells will be decommissioned according to Zone 7 Water Agency specifications.

Please call if you have questions.

Sincerely,

EMCON

Robert K. Davis
Rob Davis
Staff Geologist

John C. Young, R.G., 6407
Project Manager

REGISTERED GEOLOGIST
JOHN CHARLES YOUNG
7/99
NO. 6407
STATE OF CALIFORNIA

Attachments: Table 1 - Soil and Groundwater Analytical Results
Figure 1 - Site Plan
Appendix A - Exploratory Boring Logs and Well Construction Details

Appendix B - California Department of Water Resources Well Completion Reports and Zone 7 Water Agency Well Installation Permit
Appendix C - Groundwater Sampling Field Data Sheets
Appendix D - Geotechnical Analysis Results
Appendix E - Certified Analytical Reports and Chain-of-Custody Documentation

cc: Paul Supple - ARCO Products Company
Russell and Maude Edwards
Kevin Graves - Regional Water Quality Control Board

Table 1

ARCO 6002 Offsite Well Installation
Soil Analytical Data

Sample Identification	Date Sampled	Depth (feet BGS)	TPHG[2] (mg/kg[1])	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)
MW-7	7/16/96	3.0	<1	<0.005	<0.005	<0.005	<0.005
MW-7	7/16/96	5.0	<1	<0.005	<0.005	<0.005	<0.005
MW-7	8/6/96	8.0	<1	<0.005	<0.005	<0.005	<0.005
MW-7	8/6/96	12.5	<1	<0.005	<0.005	<0.005	<0.005
MW-8	7/15/96	5.0	<1	<0.005	<0.005	<0.005	<0.005

1 mg/kg = miligrams per kiilogram

2 TPHG = total petroleum hydrocarbons as gasoline

< indicates laboratory minimum reporting limit

Table 2

ARCO 6002 Offsite Well Installation
Groundwater Analytical Data

Sample Identification	Date Sampled	TPHG[2] (µg/L)[1]	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE[3] (µg/L)
MW-7	1/27/97	5,900	29	<5	<5	580	220
MW-8	8/9/96	<50	<0.5	<0.5	<0.5	<0.5	<3
MW-8	11/8/96	<50	<0.5	<0.5	<0.5	<0.5	<3

1 µg/L = micrograms per liter
2 TPHG = total petroleum hydrocarbons as gasoline
3 MTBE = Methyl tert-Butyl Ether
< indicates laboratory minimum reporting limit

SEMINARY AVENUE

OVERDALE AVENUE

SUNNYMERE AVENUE

N

SIDEWALK

DRIVEWAY

SIDEWALK

DRIVEWAY

MW-4

MW-2

PLANTER

Gate

Gate

PLANTER

4' block wall (Typ.)

6150

6152

6154

6209 (APTS.)

6217 (APTS.)

STAIRS

VW-3

SERVICE ISLAND

AS-1

MW-1

Concrete pad

VW-4

VW-2

DRIVEWAY

ARCO SERVICE STATION BUILDING

VW-1

GRAVEL

GARAGE

CONCRETE

CONCRETE

MW-5

MW-3

PLANTER

PLANTER

MW-7

PLANTER

X

Elevation 8' lower than ARCO property

TREE

TREE

8" block wall

6166

6267

MW-8

Garage

Gate

Approximate property line (Typ.)

6174

580 ON RAMP

MW-6

580 ON RAMP

EXPLANATION

- ◉ Groundwater monitoring well
- ⊗ Vapor extraction well
- ◒ Air sparge well
- ⌀ Decommissioned well

Base map modified from GSI, 1994.

EMCON

SCALE: 0 30 60 FEET

ARCO PRODUCTS COMPANY
SERVICE STATION 6002, 6235 SEMINARY AVE.
OAKLAND, CALIFORNIA

SITE PLAN

FIGURE NO. 1

PROJECT NO. 805-131.008

C:\805-131\SP-NEW REV 0 04/14/97 12:51:12 klt DJ

APPENDIX A

EXPLORATORY BORING LOGS AND WELL CONSTRUCTION DETAILS

LOG OF EXPLORATORY BORING

PROJECT NUMBER: **20805-131.002**

BORING NO.: **MW-7**

PROJECT NAME: **ARCO Service Station 6002**

PAGE: 1 of 1

BY: **R. Davis**

DATE: **8/06/98**

SURFACE ELEVATION: **NA**

RECOVERY (ft/ft)		PENETRATION (blws/6")	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5			FILL, CLAYEY GRAVEL (GC), dark grayish brown; nails, copper wire, and plastic fragments in soil.	
							CLAYEY SAND to CLAYEY GRAVEL (SC-GC), yellowish brown; 20% medium- plasticity fines; 40% fine to coarse sand, (1:1:1); 40% fine to coarse gravel, (2:1); damp; no odor.	
100%				10			@9.0-10.5': very tough drilling; coarse gravel and cobbles.	
							SANDY CLAY (CL), yellowish brown; 60% medium-plasticity fines; 25% fine to coarse sand; 15% fine to coarse gravel; damp; no odor.	
100%							CLAYEY SAND to CLAYEY GRAVEL (SC-GC), yellowish brown; 20% medium- plasticity fines; 40% fine to coarse sand, (1:1:1); 40% fine to coarse gravel, (1:3); damp to moist; no odor.	
				15			@11.0-14.0': very tough drilling.	
							BORING TERMINATED AT 14.0 FEET, AUGER REFUSAL.	
				20				

EMCON

REMARKS

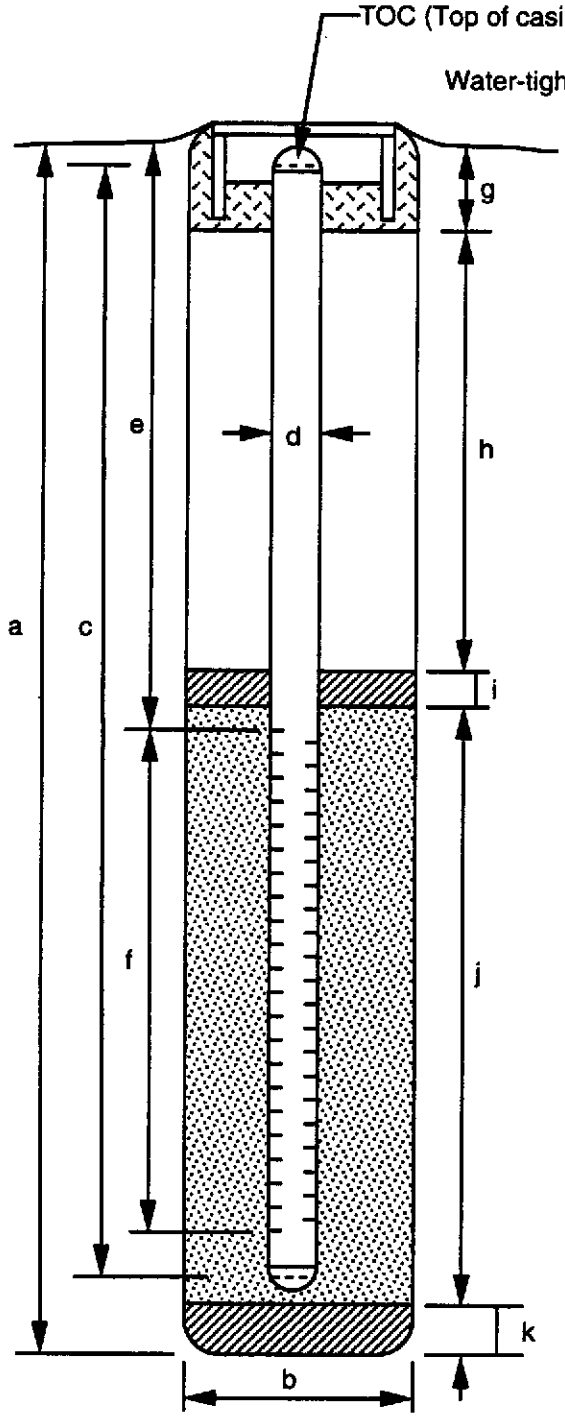
Boring completed to 14.0' using 4" diameter hand auger drilling equipment. Samples were collected by driving 2" diameter by 4" long stainless steel liners into undisturbed soil. Boring converted into a 2" diameter polyvinyl chloride (PVC) groundwater monitoring well. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

WELL DETAILS

EMCON ASSOCIATES

PROJECT NUMBER 20805-131.002
PROJECT NAME ARCO 6002
LOCATION Oakland
WELL PERMIT NO. 96485

BORING / WELL NO. MW-7
TOP OF CASING ELEV. NA
GROUND SURFACE ELEV. NA
DATUM M.S.L.
INSTALLATION DATE 8/06/96



EXPLORATORY BORING

a. Total depth 14.0 ft.
b. Diameter 4.0 in.
Drilling method Hand Auger

WELL CONSTRUCTION

c. Total casing length 13.7 ft.
Material Schedule 40 PVC
d. Diameter 2.0 in.
e. Depth to top perforations 5.0 ft.
f. Perforated length 8.5 ft.
Perforated interval from 8.5 to 13.5 ft.
Perforation type Machine Slotted
Perforation size 0.020 inch
g. Surface seal 1.0 ft.
Material Concrete
h. Backfill NA ft.
Material NA
i. Seal 6.0 ft.
Material Bentonite
j. Gravel pack 7.0 ft.
Gravel pack interval from 7.0 to 14.0 ft.
Material 2/12 Sand
k. Bottom seal/fill NA ft.
Material NA

filepath: RKD-welldetails/ARCO/6002

Form prepared by R. Davis

LOG OF EXPLORATORY BORING

PROJECT NUMBER: **805-131.02**

BORING NO.: **MW-8**

PROJECT NAME: **ARCO Service Station 6002**

PAGE: **1 of 1**

BY: **J. Young**

DATE: **7/15/95**

SURFACE ELEVATION: **NA**

RECOVERY (ft/ft)		PENETRATION (blws/6")	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	LITHOGRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
100%				5			SANDY CLAY (CL), brown (10YR,4/3); 60% fines; 35% fine to coarse sand; 5% fine gravel; moist; no odor.	
100%			7/15/95 ▽	10			CLAYEY GRAVEL (GC), light brown; 30% fines; 20-25% fine to coarse sand; 45-50% fine to coarse gravel; very moist; no odor.	
				15			BORING TERMINATED AT 14.5 FEET BGS.	
				20				

EMCON

REMARKS

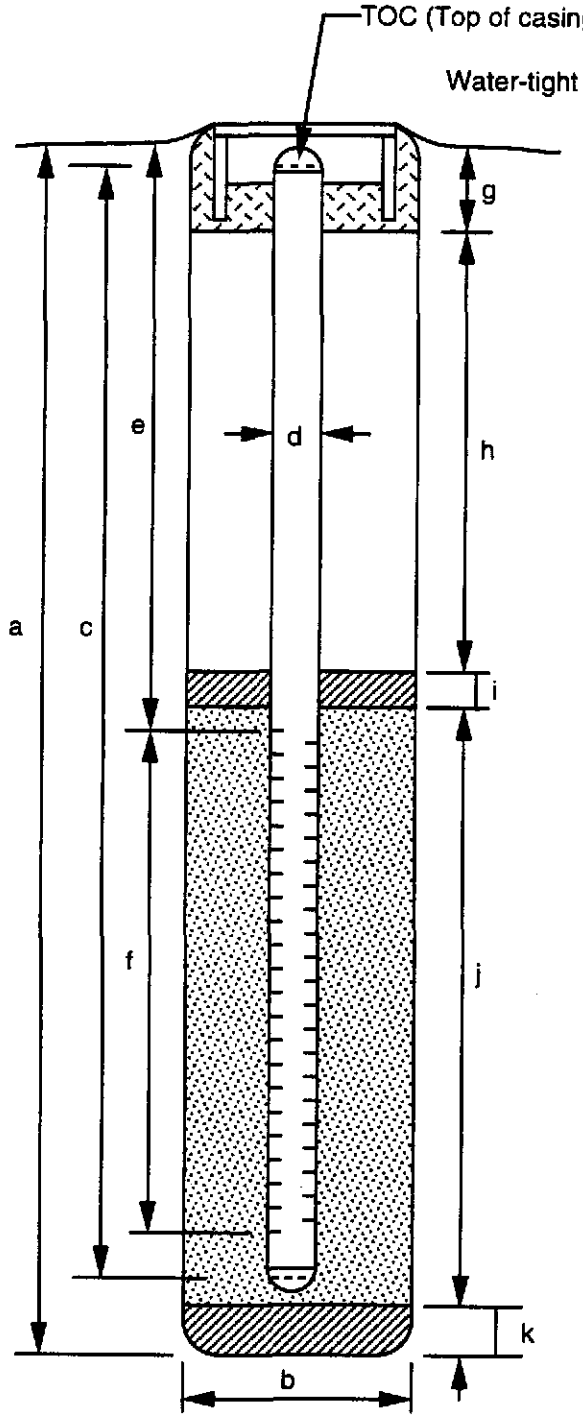
Boring drilled with 8" diameter hollow-stem augers. Samples were taken using a 2" diameter modified-California split spoon sampler. Boring converted into a 2" diameter polyvinyl chloride (PVC) groundwater monitoring well. See explanation sheet for definition of symbols used in well detail and sample columns of this log. See explanation sheet for definition of symbols on this log.

WELL DETAILS

EMCON ASSOCIATES

PROJECT NUMBER 20805-131.002
PROJECT NAME ARCO 6002
LOCATION Oakland
WELL PERMIT NO. 96486

BORING / WELL NO. MW-8
TOP OF CASING ELEV. NA
GROUND SURFACE ELEV. NA
DATUM M.S.L.
INSTALLATION DATE 7/15/96



EXPLORATORY BORING

a. Total depth 14.5 ft.
b. Diameter 4.0 in.
Drilling method Hand Auger

WELL CONSTRUCTION

c. Total casing length 14.0 ft.
Material Schedule 40 PVC
d. Diameter 2.0 in.
e. Depth to top perforations 5.0 ft.
f. Perforated length 8.5 ft.
Perforated interval from 5.5 to 14.0 ft.
Perforation type Machine Slotted
Perforation size 0.020 inch
g. Surface seal 1.0 ft.
Material Concrete
h. Backfill 2.5 ft.
Material Cement
i. Seal 1.5 ft.
Material Bentonite
j. Gravel pack 9.5 ft.
Gravel pack interval from 5.0 to 14.5 ft.
Material 2/12 Sand
k. Bottom seal/fill NA ft.
Material NA

filepath: RKD-welldetails/ARCO/6002

Form prepared by R. Davis

APPENDIX B

CALIFORNIA DEPARTMENT OF WATER RESOURCES WELL COMPLETION REPORTS AND ZONE 7 WATER AGENCY WELL INSTALLATION PERMIT

CONFIDENTIAL

STATE OF CALIFORNIA DWR
WELL COMPLETION REPORT
(WELL LOGS)

REMOVED

CONFIDENTIAL

STATE OF CALIFORNIA DWR
WELL COMPLETION REPORT
(WELL LOGS)

REMOVED

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
5997 PARKSIDE DRIVE ♦ PLEASANTON, CALIFORNIA 94588 ♦ (510) 484-2600

TELEFAX TRANSMITTAL

DATE: 16 Jul 96

DELIVER TO: John Young

NAME OF FIRM: Emcon

FAX PHONE #: (408) 437-9526

FROM: Wyman Hong

NUMBER OF PAGES: 3
(Including transmittal)

FOR VOICE CONTACT CALL: (510) 484-2600

FOR RETURN FAX: (510) 462-3914

REMARKS: Drilling permits 96486 & 96491 for monitoring well construction projects at 6267 Johnymeer ave and at 6200 Seminary ave in Oakland for Arco Products Co.

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588 VOICE (510) 484-2600
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 6209 Seminary Ave
Oakland CA

CLIENT
Name MIKE WHELAN / ARCO PRODUCTS COMPANY
Address PO Box 612530 Voice (408) 453-1640
City San Jose CA Zip 95161

APPLICANT
Name John Young Emcon
Fax (408) 437 9526
Address 1921 Rosewood Ave Voice (408) 453-7300
City San Jose CA Zip 95131

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	___	General	___
Water Supply	___	Contamination	___
Monitoring	X	Well Destruction	___

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other ___
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger ___
Cable ___ Other Hand Auger

DRILLER'S LICENSE NO. ___

WELL PROJECTS

Drill Hole Diameter	4	in.	Maximum Depth	18	ft.
Casing Diameter	2	in.	Number	MW-7	
Surface Seal Depth	4	ft.			

GEOTECHNICAL PROJECTS

Number of Borings	___		Maximum Depth	___	ft.
Hole Diameter	___	in.			

ESTIMATED STARTING DATE 7/15/96
ESTIMATED COMPLETION DATE 7/17/96

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [signature] Date 7/11/96

FOR OFFICE USE

PERMIT NUMBER 96491
LOCATION NUMBER ___

PERMIT CONDITIONS

Circled Permit Requirements Apply

(A.) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well Projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

(B.) WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

Approved [signature] Wyman Hong Date 16 Jul 96

91992

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588 VOICE (510) 484-2600
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 6267 Sunnyhere
Oakland CA

CLIENT
Name Mike Wheland / Arco Products Company
Address PO Box 612530 Voice (408) 453-1640
City San Jose CA Zip 95161

APPLICANT
Name John Young Emcon
Fax (408) 437 9526
Address 1921 Ringwood Av Voice (408) 453 7300
City San Jose CA Zip 95131

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	___	General	___
Water Supply	___	Contamination	___
Monitoring	X	Well Destruction	___

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other ___
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger ___
Cable ___ Other Hand Auger

DRILLER'S LICENSE NO. ___

WELL PROJECTS

Drill Hole Diameter	4 in.	Maximum Depth	18 ft.
Casing Diameter	2 in.		
Surface Seal Depth	4 ft.	Number	MW-8

GEOTECHNICAL PROJECTS

Number of Borings	___	Maximum Depth	___ ft.
Hole Diameter	___ in.		

ESTIMATED STARTING DATE 7/15/96
ESTIMATED COMPLETION DATE 7/17/96

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [signature] Date 7/11/96

FOR OFFICE USE

PERMIT NUMBER 96486
LOCATION NUMBER ___

PERMIT CONDITIONS

Circled Permit Requirements Apply

(A.) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well Projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

(B.) WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 12 Jul 96
Wyman Hong

91992

APPENDIX C

GROUNDWATER SAMPLING FIELD DATA SHEETS

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 27775-241-002 SAMPLE ID: MW-7

PURGED BY: Scuillin CLIENT NAME: ARCO #7002

SAMPLED BY: _____ LOCATION: Oakland CA

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

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

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

DEPTH TO WATER (feet): DRY CALCULATED PURGE (gal.): NA

DEPTH OF WELL (feet): 13.3 ACTUAL PURGE VOL. (gal.): N

DATE PURGED: 08-09-96 Start (2400 Hr) _____ End (2400 Hr) _____

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)
		DRY				

D. O. (ppm): _____ ODOR: _____

(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: _____

Parameters field filtered at this well: _____

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

WELL INTEGRITY: _____ LOCK #: _____

REMARKS: _____

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

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

Location of previous calibration: _____

Signature: _____ Reviewed By: _____ Page 3 of 6

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 21775-241-002 SAMPLE ID: MW-8

PURGED BY: SW / MC CLIENT NAME: ARCO 6002

SAMPLED BY: SW LOCATION: Oakland CA

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

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

CASING ELEVATION (feet/MSL): NA VOLUME IN CASING (gal.): .74

DEPTH TO WATER (feet): 9.41 CALCULATED PURGE (gal.): 2.24

DEPTH OF WELL (feet): 14.0 ACTUAL PURGE VOL. (gal.): 1.5

DATE PURGED: 08-09-96 Start (2400 Hr) 1204 End (2400 Hr) 1207

DATE SAMPLED: SW Start (2400 Hr) ___ End (2400 Hr) 1212

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1207	1	6.87	822	85.4	BROWN	HEAVY
	DRIED 1.5 GALLON 1207					
1215	DRY LAMP	6.75	609	74.1	BROWN	HEAVY

D. O. (ppm): NA ODOR: NONE

COLOR (COBALT 0 - 500): NA

TURBIDITY (NTU 0 - 200 or 0 - 1000): NA

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	W Bailer (Teflon®)	___ 2" Bladder Pump	W 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 #: ARCO

REMARKS: ___

Meter Calibration: Date: 8-9-96 Time: 1150 Meter Serial #: ___ Temperature °F: 85.9

(EC 1000 974 / 1000) (DI ___) (pH 7 6.95 / 7.00) (pH 10 9.95 / 10.00) (pH 4 3.96 / ___)

Location of previous calibration: ___

Signature: [signature] Reviewed By: [signature] Page 4 of 6

APPENDIX D

GEOTECHNICAL ANALYSIS RESULTS

GRAIN SIZE DISTRIBUTION

ASTM D422

EMCON

PROJ. NAME: ARCO #6002 **PROJECT NO.:** 20805-131.002 **LAB #:** 96-097

SAMPLE NO.: MW-7/3.5, #2 **DEPTH, FT.:** 3.5' **TESTED BY:** RMM / KVC

DESCRIPTION: SANDY CLAY, BROWN. **DATE:** 7/17/96

CHECKED BY: DGC

MOISTURE CONTENT DETERMINATION:

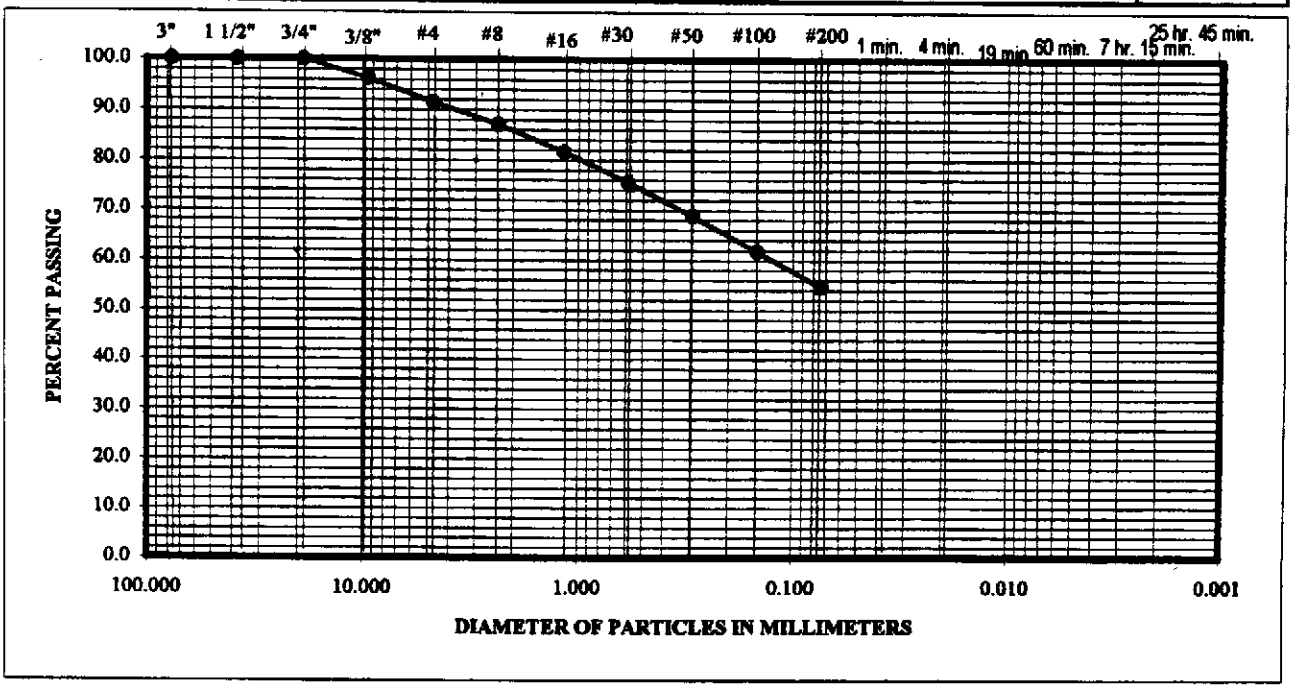
PAN ID	#101	(gm)
PAN+WET SOIL	513.30	(gm)
PAN+DRY SOIL	448.80	(gm)
PAN WEIGHT	126.46	(gm)
DRY SOIL	322.34	(gm)
% MOISTURE	20.0	(%)

TOTAL DRY WEIGHT: 322.34

TOTAL DRY WEIGHT USED FOR HYDROM.:

HYDROMETER & TEMP. CORRECTION:

SIEVE SIZE (U.S. STANDARD)	PARTICLE INCHES (inch.)	DIAMETER MILLIMETER (mm)	WEIGHT RETAINED (gm)	ACCUMULATED WGT. RETAINED (gm)	WEIGHT PASSING (gm)	PERCENT PASSING
5"					322.34	100.0
3"	3.0	76.2			322.34	100.0
1 1/2"	1.5	38.1			322.34	100.0
3/4"	0.7	18.9			322.34	100.0
3/8"	0.371	9.42	12.10	12.10	310.24	96.2
#4	0.185	4.70	15.64	27.74	294.60	91.4
#8	0.093	2.36	14.04	41.78	280.56	87.0
#16	0.046	1.17	17.53	59.31	263.03	81.6
#30	0.0232	0.59	19.43	78.74	243.60	75.6
#50	0.0116	0.30	21.69	100.43	221.91	68.8
#100	0.0058	0.15	23.14	123.57	198.77	61.7
#200	0.0029	0.07	22.63	146.20	176.14	54.6
HYDROMETER:		0.037				
		0.019				
		0.009				
		0.005				
		0.002				
		0.001				



8yy93cm.

APPENDIX E

CERTIFIED ANALYTICAL REPORTS AND CHAIN-OF-CUSTODY DOCUMENTATION

FILE COPY

Columbia Analytical Services inc.

November 22, 1996

Service Request No.: S9601886

Mr. John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 6002 Oakland/Project No. 20805-131.008/TO#19350.00

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on November 11, 1996. 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 7, 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

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	**Service Request:**	S9601886
Project:	6002 Oakland / #20805-131.008/TO#19350.00	**Date Collected:**	11/11/96
Sample Matrix:	Water	**Date Received:**	11/11/96
		Date Extracted:	NA

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name:	**MW-4 (23)**	**MW-8 (12)**	**Method Blank**
Lab Code:	S9601886-001	S9601886-002	S961118-WB1
Date Analyzed:	11/18/96	11/19/96	11/18/96

Analyte	**MRL**			
TPH as Gasoline	50	ND	ND	ND
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
Methyl *tert*-Butyl Ether	3	ND	ND	ND

3S22/060194

QA/QC Report

Client: ARCO Products Company
Project: 6002 Oakland / #20805-131.008/TO#19350.00
Sample Matrix: Water

Service Request: S9601886
Date Collected: 11/11/96
Date Received: 11/11/96
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Sample Name	Lab Code	PID Detector Percent Recovery 4-Bromofluorobenzene	FID Detector Percent Recovery α,α,α-Trifluorotoluene
MW-4 (23)	S9601886-001	102	105
MW-8 (12)	S9601886-002	104	96
MW-4 (23) (MS)	S96-1886-001MS	99	106
MW-4 (23) (MS)	S9601886-001DMS	98	110
Method Blank	S961118-WB1	99	91
CAS Acceptance Limits:		69-116	69-116

SUR2/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601886
Project:	6002 Oakland / #20805-131.008/TO#19350.00	**Date Collected:**	11/11/96
Sample Matrix:	Water	**Date Received:**	11/11/96
		Date Extracted:	NA
		Date Analyzed:	11/18/96

Matrix Spike/Duplicate Matrix Spike Summary
TPH as Gasoline
EPA Methods 5030/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name: MW-4 (23)
Lab Code: S9601886-001MS, DMS

	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**
Gasoline	250	250	ND	240	240	96	96	67-121	<1

DMS1S/060194

Client: ARCO Products Company
Project: 6002 Oakland / #20805-131.008/TO#19350.00

Service Request: S9601886
Date Analyzed: 11/18/96

Initial Calibration Verification (ICV) Summary
BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ppb

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	24.2	97	85-115
Toluene	25	24.1	96	85-115
Ethylbenzene	25	26.7	107	85-115
Xylenes, Total	75	71.3	95	85-115
Gasoline	250	228	91	90-110
Methyl *tert*-Butyl Ether	50	47	94	85-115

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 9550.00

Chain of Custody

ARCO Facility no. 6002	City (Facility) Oakland	Project manager (Consultant) JohnYoung	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) (408)453-7300	Fax no. (Consultant) (408)453-0452
Consultant name EMCON	Address (Consultant) 1921 Ringwood Ave, San Jose, CA 95131		Contract number

	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 and BTEX) 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 ☐		
(1)	MW-4(GB)		2		X		X	HCL	11/11/96	1515		X											
	MW-7( )		2		X		X	HCL	—			X	Well was dry										
(2)	MW-8(2)		2		X		X	HCL	11/11/96	1515		X											
	MW-5( )		2		X		X	HCL	—			X	Well was buried										

Method of shipment: Sampler will deliver

Special detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: 2-40ml HCL VOAs

* Both sets of VOAs have sediment

#20805-131

Lab number: 9601856

Turnaround time

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

Condition of sample: s.k

Temperature received: Cool

	Date	Time		Date	Time
Relinquished by sampler	11-11-96	1515	Received by		
Relinquished by			Received by		
Relinquished by			Received by laboratory	11-11-96	1515

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

APPC-3292 (2-91)

MS

Columbia Analytical Services inc.

July 30, 1996

Service Request No: S9601143

Mr. John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: 6002 OAKLAND/20805-131.002/TO#13676.00

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on July 17, 1996. 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 10, 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

SLG/ld

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	**Service Request:**	S9601143
Project:	6002 OAKLAND/20805-131.002/TO#13676.00	**Date Collected:**	7/15,16/96
Sample Matrix:	Soil	**Date Received:**	7/17/96
		Date Extracted:	NA
		Date Analyzed:	7/24/96

BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
As Received Basis

Analyte:	**TPH as Gasoline**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Xylenes, Total**
Units:	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)
Method Reporting Limit:	1	0.005	0.005	0.005	0.005
Sample Name	**Lab Code**				
MW-8/5'	S9601143-001	ND	ND	ND	ND	ND
MW-7/5'	S9601143-002	ND	ND	ND	ND	ND
MW-7/3.0'	S9601143-003	ND	ND	ND	ND	ND
Method Blank	S960724-SB1	ND	ND	ND	ND	ND

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.002/TO#13676.00
Sample Matrix: Soil

Service Request: S9601143
Date Collected: 7/15,16/96
Date Received: 7/17/96
Date Extracted: NA

Inorganic Parameters [1]
Units: mg/Kg (ppm)
As Received Basis

		Sample Name:	MW-8/5'	MW-7/5'	MW-7/3.0'
		Lab Code:	S9601143-001	S9601143-002	S9601143-003
		Date Analyzed:	NA	NA	7/29/96
Analyte	**EPA Method**	**MRL**			
Carbon, Total Organic (TOC)	Walkley-Black [2]	10	--	--	1600

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).
2 Method of Soil Analysis, Part 2, 2nd Edition pp. 570-571.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601143
Project:	6002 OAKLAND/20805-131.002/TO#13676.00	**Date Collected:**	7/15,16/96
Sample Matrix:	Soil	**Date Received:**	7/17/96
		Date Extracted:	NA

Inorganic Parameters [1]
Units: mg/Kg (ppm)
As Received Basis

		Sample Name:	**Method Blank**
		Lab Code:	S9601143-SB
		Date Analyzed:	7/29/96
Analyte	**EPA Method**	**MRL**	
Carbon, Total Organic (TOC)	Walkley-Black [2]	10	ND

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).

2 Method of Soil Analysis, Part 2, 2nd Edition pp. 570-571.

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.002/TO#13676.00
Sample Matrix: Soil

Service Request: S9601143
Date Collected: 7/15,16/96
Date Received: 7/17/96
Date Extracted: NA
Date Analyzed: 7/24/96

Surrogate Recovery Summary
TPH as Gasoline/BTEX
EPA Methods 5030/8020/California DHS LUFT Method

Sample Name	Lab Code	PID Detector Percent Recovery 4-Bromofluorobenzene	FID Detector Percent Recovery α,α,α–Trifluorotoluene
MW-8/5'	S9601143-001	80	87
MW-7/5'	S9601143-002	81	81
MW-7/3.0'	S9601143-003	83	79
Batch QC (MS)	S960759-006MS	84	86
Batch QC (DMS)	S960759-006 DMS	84	83
Method Blank	S960724-SB1	84	90
CAS Acceptance Limits:		51-137	51-137

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.002/TO#13676.00
Sample Matrix: Soil

Service Request: S9601143
Date Collected: 7/15,16/96
Date Received: 7/17/96
Date Extracted: NA
Date Analyzed: 7/24/96

Matrix Spike/Duplicate Matrix Spike Summary
BTE
EPA Methods 5030/8020
Units: mg/Kg (ppm)
As Received Basis

Sample Name: Batch QC
Lab Code: S9601159-006

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference
Benzene	0.05	0.05	ND	0.048	0.051	96	102	57-154	6
Toluene	0.05	0.05	ND	0.047	0.051	94	102	60-142	8
Ethylbenzene	0.05	0.05	ND	0.045	0.049	90	98	46-150	9

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.002/TO#13676.00

Service Request: S9601143
Date Analyzed: 7/24/96

Initial Calibration Verification (ICV) Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ppm

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	0.050	0.050	100	85-115
Toluene	0.050	0.050	100	85-115
Ethylbenzene	0.050	0.049	98	85-115
Xylenes, Total	0.050	0.155	310	85-115
Gasoline	1.0	1.05	105	90-110

ICV25AL/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.002/TO#13676.00
Sample Matrix: Soil

Service Request: S9601143
Date Collected: 7/15,16/96
Date Received: 7/17/96
Date Extracted: NA
Date Analyzed: 7/24/96

Matrix Spike/Duplicate Matrix Spike Summary
Inorganic Parameters

Units: mg/Kg (ppm)
As Received Basis

Sample Name: MW-7/3.0'
Lab Code: S9601143-003

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference
Carbon, Total Organic (TOC)	1000	1000	1600	2500	2900	90	130*	75-125	15

* Outside of acceptance limits. Accuracy of spike recovery value is reduced since the amount spiked was less than five times the background level.

ARCO Products Company
Division of AtlanticRichfieldCompany

Chain of Custody

Task Order No. 13676.00

ARCO Facility no. 6002	City (Facility) OAKLAND	Project manager (Consultant) JOHN VICINI	Laboratory name CAS
ARCO engineer WHELAN	Telephone no. (ARCO) 415 3-1640	Telephone no. (Consultant) 408 453 7300	Fax no. (Consultant) (408) 437-9526
Consultant name EMCON	Address (Consultant) 1921 Ringwood San Jose		Contract number

	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 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 ☐	Term. Chlor. Chrom.
1	MW-8/5'			X			X		7/15/96	12:45		X										
	~~MW-7/3~~	~~KC~~							~~7/16/96~~	~~10:50~~												
2	MW-7/5'								7/16	11:00		X										
3	MW-7/3.0								7/16	10:45		X										X

Special detection Limit/reporting: ARCO STANDARD

Special QA/QC:

Remarks: 205805-131.002

Lab number: 5960143

Turnaround time

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

Condition of sample: OK		Temperature received: Cool	
Relinquished by sampler	Date 7/17/96 Time 4:25	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date 7-17-96 Time 16:35

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

Columbia Analytical Services inc.

March 26, 1997

Service Request No.: S9700139

Mr. John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 6002 OAKLAND/20805-131.002/WA#13676.00

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on January 27, 1997. 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 7, 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

2059 Junction Avenue ▪ San Jose, California 95131 ▪ Telephone 408/428-1280 ▪ Fax 408/437-9356

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	**Service Request:**	S9700139
Project:	6002 OAKLAND/20805-131.002/WA#13676.00	**Date Collected:**	1/27/97
Sample Matrix:	Water	**Date Received:**	1/27/97
		Date Extracted:	NA
		Date Analyzed:	2/3-4/97

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Analyte:	Methyl tert-Butyl Ether	TPH as Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes, Total
Units:	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)
Method Reporting Limit:	3	50	0.5	0.5	0.5	0.5
Sample Name **Lab Code**						
MW-7 S9700139-001	**220**	**5,900**	**29**	<5 C1	<5 C1	**580**
Method Blank S970203-WB1	ND	ND	ND	ND	ND	ND
Method Blank S970204-WB1	ND	ND	ND	ND	ND	ND

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

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.002/WA#13676.00
Sample Matrix: Water

Service Request: S9700139
Date Collected: 1/27/97
Date Received: 1/27/97
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Sample Name	Lab Code	PID Detector Percent Recovery 4-Bromofluorobenzene	FID Detector Percent Recovery α,α,α–Trifluorotoluene
MW-7	S9700139-001	112	113
Batch QC (MS)	S9700150-009MS	106	106
Batch QC (DMS)	S9700150-009DMS	105	106
Method Blank	S970203-WB1	105	87
Method Blank	S970204-WB1	108	93
CAS Acceptance Limits:		69-116	69-116

SUR2/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9700139
Project:	6002 OAKLAND/20805-131.002/WA#13676.00	**Date Collected:**	1/27/97
Sample Matrix:	Water	**Date Received:**	1/27/97
		Date Extracted:	NA
		Date Analyzed:	2/3/97

Matrix Spike/Duplicate Matrix Spike Summary
TPH as Gasoline
EPA Methods 5030/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name: Batch QC
Lab Code: S9700150-009MS, DMS

	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**
Gasoline	250	250	110	330	330	88	88	67-121	<1

DMS1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.002/WA#13676.00

Service Request: S9700139
Date Analyzed: 2/3/97

Initial Calibration Verification (ICV) Summary
BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ppb

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	25.4	102	85-115
Toluene	25	25.0	100	85-115
Ethylbenzene	25	26.9	108	85-115
Xylenes, Total	75	75.4	101	85-115
Methyl tert-Butyl Ether	25	26	104	85-115
Gasoline	250	247	99	90-110

ICV25AL/060194

ARCO Products Company Division of AtlanticRichfieldCompany — Task Order No. 13676.00 — **Chain of Custody**

ARCO Facility no. 6002	City (Facility) Oakland	Project manager (Consultant) John Young	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) 408 453 7300	Fax no. (Consultant)	Contract number
Consultant name Emcon	Address (Consultant) 1921 Ringwood Ave, San Jose	Method of shipment Tech

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 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-7	1	2		X				1/27/97	1200		4									
											↑									
											Add MTBE per Ivy Inouye 3/26/97. JM									

Special detection Limit/reporting — ~~Prep~~ ~~Prev~~ 9B 1/27

Special QA/QC

Remarks: 20505-131.002

Lab number: 97700139

Turnaround time

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

Condition of sample: ok — Temperature received: Cool

	Date	Time		
Relinquished by sampler: Lisa Porter	1-27-97	1500	Received by	
Relinquished by			Received by: RAY BAHDA	
Relinquished by			Received by laboratory: CAS	Date 1/27/97 Time 1500

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

RS

Columbia
Analytical
Services inc.

August 20, 1996

Service Request No.: S9601305

Mr. John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 6002 OAKLAND/20805-131.008/TO#19350.00

Dear Mr. Young:

Attached are the results of the samples submitted to our lab on August 9, 1996. For you reference, our service request number for this work is S9601305.

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

If you have questions or further needs, please call me at (408) 428-1283.

Sincerely,

Steven L. Green
Project Chemist

Cristina V. Kaufman for

Greg Anderson
Regional QA Coordinator

Acronyms

A2LA	American Association for Laboratory Accreditation
ASTM	American Society for Testing and Materials
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BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
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CAS Number	Chemical Abstract Service registry Number
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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.
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MTBE	Methyl tert-Butyl Ether
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ND	Not Detected at or above the method reporting/detection limit (MRL/MDL)
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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: 6002 OAKLAND/20805-131.008/TO#19350.00
Sample Matrix: Water

Service Request: S9601305
Date Collected: 8/9/96
Date Received: 8/9/96
Date Extracted: NA

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name:	MW-8 (13)	MW-4 (24)	MW-5 (22)
Lab Code:	S9601305-001	S9601305-002	S9601305-003
Date Analyzed:	8/13/96	8/13/96	8/14/96

Analyte	MRL			
TPH as Gasoline	50	ND	ND	16,000
Benzene	0.5	ND	ND	420
Toluene	0.5	ND	ND	14
Ethylbenzene	0.5	ND	ND	870
Total Xylenes	0.5	ND	ND	390
Methyl *tert*-Butyl Ether	3	ND	ND	1300

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601305
Project:	6002 OAKLAND/20805-131.008/TO#19350.00	**Date Collected:**	8/9/96
Sample Matrix:	Water	**Date Received:**	8/9/96
		Date Extracted:	NA

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name:		**Method Blank**	**Method Blank**
Lab Code:		S960813-WB1	S960814-WB1
Date Analyzed:		8/13/96	8/14/96
Analyte	**MRL**		
TPH as Gasoline	50	ND	ND
Benzene	0.5	ND	ND
Toluene	0.5	ND	ND
Ethylbenzene	0.5	ND	ND
Total Xylenes	0.5	ND	ND
Methyl *tert*-Butyl Ether	3	ND	ND

3S22/060194

QA/QC Report

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.008/TO#19350.00
Sample Matrix: Water

Service Request: S9601305
Date Collected: 8/9/96
Date Received: 8/9/96
Date Extracted: NA
Date Analyzed: 8/13-14/96

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Sample Name	Lab Code	PID Detector Percent Recovery 4-Bromofluorobenzene	FID Detector Percent Recovery α,α,α–Trifluorotoluene
MW-8 (13)	S9601305-001	102	100
MW-4 (24)	S9601305-002	103	102
MW-5 (22)	S9601305-003	100	109
Batch QC (MS)	S9601276-010MS	100	101
Batch QC (DMS)	S9601276-010DMS	99	97
Method Blank	S960813-WB1	99	98
Method Blank	S960814-WB1	99	99
CAS Acceptance Limits:		69-116	69-116

SUR2/060194

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601305
Project:	6002 OAKLAND/20805-131.008/TO#19350.00	**Date Collected:**	8/9/96
Sample Matrix:	Water	**Date Received:**	8/9/96
		Date Extracted:	NA
		Date Analyzed:	8/13/96

Matrix Spike/Duplicate Matrix Spike Summary
BTE
EPA Methods 5030/8020
Units: ug/L (ppb)

Sample Name: Batch QC
Lab Code: S9601276-010

	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**
Benzene	25	25	0.7	25.9	24.7	101	96	75-135	5
Toluene	25	25	ND	25.6	24.3	102	97	73-136	5
Ethylbenzene	25	25	ND	25.3	24.2	101	97	69-142	4

DMS1S/060194

QA/QC Report

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.008/TO#19350.00

Service Request: S9601305
Date Analyzed: 8/13/96

Initial Calibration Verification (ICV) Summary
BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ppb

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	25.6	102	85-115
Toluene	25	26.1	104	85-115
Ethylbenzene	25	25.6	102	85-115
Xylenes, Total	75	77.2	103	85-115
Gasoline	250	251	100	90-110
Methyl *tert*-Butyl Ether	50	48	96	85-115

ICV25AL/060194

ARCO Products Company Division of AtlanticRichfieldCompany

Task Order No. [illegible]

Chain of Custody

ARCO Facility no. 6002 | City (Facility) Oakland | Project manager (Consultant) [illegible]

ARCO engineer Mike Whelan | Telephone no. (ARCO) | Telephone no. (Consultant) (408)453-7300 | Fax no. (Consultant) (408)453-0452

Consultant name EMCON | Address (Consultant) 1921 Ringwood Ave San Jose CA 95131

Laboratory name: CAS

Contract number:

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, acid HCl 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 ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
1) MW-8	(13)	2		X		X	HCl	~~8-9-96~~ NO SAMPLE	~~1212~~		X	(lots of sediment in VOAs)										
~~MW-8~~	~~( )~~	2		X		X	HCl	8-9-96 ~~[illegible]~~	1212		X											
2) MW-4	(24)	2		X		X	HCl	8-9-96	1240		X											
3) VW-1	(13)	2		X		X	HCl	↓	1253		X											
4) VW-4	24	2		X		X	HCl	↓	1310		X											
5) MW-5	(24)	2		X		X	HCl	↓	1340		X											

Method of shipment: Sampler will deliver

Special detection Limit/reporting: Lowest Possible

Special QA/QC: As normal

Remarks: 2-40ml HCl VOAs. EMCON reported VW-1 and VW-4 by [illegible] on a different [illegible]. #20805 RICO[illegible]

Lab number: S960130S

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

Condition of sample: ok | Temperature received: Cool

Relinquished by	Date	Time	Received by	Date	Time
Relinquished by sampler: [signature]	8-9-96	1430	Received by		
Relinquished by			Received by		
Relinquished by			Received by laboratory: [signature] Grace Brown	8-9-96	1430

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

R8

Columbia Analytical Services, Inc.

March 26, 1997 Service Request No.: S9700139

Mr. John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 6002 OAKLAND/20805-131.002/WA#13676.00

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on January 27, 1997. 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 7, 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

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CAS Number	Chemical Abstract Service registry Number
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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)

ACRONLST.DOC 7/14/95

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700139
Project:	6002 OAKLAND/20805-131.002/WA#13676.00	**Date Collected:**	1/27/97
Sample Matrix:	Water	**Date Received:**	1/27/97
		Date Extracted:	NA
		Date Analyzed:	2/3-4/97

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Analyte:	**Methyl tert-Butyl Ether**	**TPH as Gasoline**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes, Total**
Units:	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)
Method Reporting Limit:	3	50	0.5	0.5	0.5	0.5
Sample Name **Lab Code**						
MW-7 S9700139-001	220	5,900	29	<5 C1	<5 C1	580
Method Blank S970203-WB1	ND	ND	ND	ND	ND	ND
Method Blank S970204-WB1	ND	ND	ND	ND	ND	ND

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

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.002/WA#13676.00
Sample Matrix: Water

Service Request: S9700139
Date Collected: 1/27/97
Date Received: 1/27/97
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Sample Name	Lab Code	PID Detector Percent Recovery 4-Bromofluorobenzene	FID Detector Percent Recovery α,α,α–Trifluorotoluene
MW-7	S9700139-001	112	113
Batch QC (MS)	S9700150-009MS	106	106
Batch QC (DMS)	S9700150-009DMS	105	106
Method Blank	S970203-WB1	105	87
Method Blank	S970204-WB1	108	93
CAS Acceptance Limits:		69-116	69-116

SUR2/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9700139
Project:	6002 OAKLAND/20805-131.002/WA#13676.00	**Date Collected:**	1/27/97
Sample Matrix:	Water	**Date Received:**	1/27/97
		Date Extracted:	NA
		Date Analyzed:	2/3/97

Matrix Spike/Duplicate Matrix Spike Summary
TPH as Gasoline
EPA Methods 5030/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name: Batch QC
Lab Code: S9700150-009MS, DMS

	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**
Gasoline	250	250	110	330	330	88	88	67-121	<1

DMS1S/060194

Client: ARCO Products Company
Project: 6002 OAKLAND/20805-131.002/WA#13676.00

Service Request: S9700139
Date Analyzed: 2/3/97

Initial Calibration Verification (ICV) Summary
BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ppb

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	25.4	102	85-115
Toluene	25	25.0	100	85-115
Ethylbenzene	25	26.9	108	85-115
Xylenes, Total	75	75.4	101	85-115
Methyl tert-Butyl Ether	25	26	104	85-115
Gasoline	250	247	99	90-110

ARCO Products Company
Division of AtlanticRichfieldCompany

~~97b0139-1~~ Task Order No. 13676.00

Chain of Custody

ARCO Facility no. 6002	City (Facility) Oakland	Project manager (Consultant) John Young	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) 408 453 7300	Fax no. (Consultant)	Contract number
Consultant name Emcon	Address (Consultant) 1921 Ringwood Ave, San Jose	Method of shipment Tech

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 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-7	1	2		X				1/27/97	1200		4									
											⇑									
											Add MTBE per Ivy Inouye 3/26/97. JM									

Special detection Limit/reporting

~~Report in~~ ~~Print~~ AB 1/27

Special QA/QC

Remarks

20805-131.002

Lab number

59700139

Turnaround time

Priority Rush 1 Business Day [ ]

Rush 2 Business Days [ ]

Expedited 5 Business Days [ ]

Standard 10 Business Days [X]

Condition of sample: ok		Temperature received: Cool	
Relinquished by sampler: Lee Ruby	Date 1-27-97	Time 1500	Received by:
Relinquished by:	Date	Time	Received by: RAY BATH
Relinquished by:	Date	Time	Received by laboratory: CAS	Date 1/27/97	Time 1500

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

RS