

779

December 8, 1992 Project 330-06.14

Ms. Juliett Shin
Department of Environmental Health
Hazardous Materials Division
Alameda County Health Care Services Agency
80 Swan Way, Room 200
Oakland, California 94621

Re: ARCO Service Station 608 17601 Hesperian Boulevard San Lorenzo, California

Dear Ms. Shin:

As requested in Alameda County Health Care Services Agency's (ACHCS's) letter dated June 5, 1992, Pacific Environmental Group, Inc. (PACIFIC) is preparing a baseline health risk assessment on behalf of ARCO Products Company. This assessment will determine the potential health risk to the domestic irrigation water well owners resulting from petroleum hydrocarbon-impacted groundwater located downgradient of the referenced site. Potential health risk will be calculated for adults and children via inhalation, ingestion, and dermal contact exposure route pathways.

As you are aware, the determination of maximum reasonable risk should be based on site-specific characterization data when available. PACIFIC has prepared this letter to request ACHCS assistance in determining the appropriate values for the carcinogenic risk parameters (i.e., exposure frequency, concentration, etc.) based on available site-specific data. This letter presents the recommended risk assessment parameter values with justification for your review and approval.



RISK PARAMETER VALUES

Based on site-specific characterization data, the following parameter values are recommended:

Concentration in Water

Contaminant concentration in water should be based on the average benzene concentration (95th percentile) of the hydrocarbon-impacted groundwater. The average benzene concentration (95th percentile) in the domestic irrigation water wells is currently 3.5 parts per billion, and is based on previous analytical data (Table 1). This concentration will be recalculated as additional quarterly sampling data are collected. This concentration is considered conservative because: (1) the average concentration of the impacted groundwater is significantly below the 95th percentile average, (2) primary source removal and hydraulic control of the hydrocarbon-impacted groundwater on site has been achieved, reducing the risk of future migration of on-site dissolved hydrocarbons, and (3) benzene concentrations should decline naturally with time.

Concentration in Air

Contaminant concentration in air should be based on the average benzene concentration (95th percentile) observed before, during, and after domestic irrigation water well operation. The average benzene concentration (95th percentile) in air is 18.9 parts per billion, by volume, and is based on air samples collected July 22, 1992 (Table 2). The certified analytical reports and chain-of-custody documentation are attached. This value is considered conservative because: (1) the background average benzene concentration (95th percentile) in air is 57.6 parts per billion, by volume, which results presumably from automobile traffic, and (2) it assumes the well owners would experience direct and continuous exposure (at the well head without natural dilution effects) during the entire operation of the well.

Ingestion Rate

Ingestion rate should be based on the likelihood of groundwater ingestion by adults and children. Previous analytical results (attached) indicate that the groundwater exceeds the State of California drinking water standards for color, odor, and turbidity (Table 3). Because the likelihood of groundwater ingestion is reduced when aesthetic water quality is low, PACIFIC recommends that an ingestion rate of 0.5 liters per day is appropriate as a maximum. Additionally, the

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domestic irrigation water well owners confirmed that the domestic irrigation water wells are used for irrigation purposes only, and not as a drinking water source.

Exposure Time and Frequency

Exposure time and frequency should be based on actual domestic irrigation water well operational data. Based on data collected from all domestic irrigation water well owners (Table 4), the average exposure time, or duration of well operation, is 2.7 hours per day (95th percentile), and the average exposure frequency, or frequency of well operation, is 140 days per year (95th percentile). These values are considered conservative because they assume well owner direct and continuous exposure to (similar to showering with) the extracted groundwater during the entire operation of the well.

Exposure Duration

Exposure duration is generally based on the national average time at one residence. The national average time at one residence (90th percentile) is 30 years (EPA, 1989). PACIFIC suggests that this residence time is an inappropriate residence time for California homeowners, especially homeowners located in the San Francisco Bay area. The national average time (50th percentile) at one residence is 9 years (EPA, 1989). Although this confidence interval is closer to one standard deviation, PACIFIC suggests that this value better corresponds with California and San Francisco Bay area residence times. This confidence interval is further supported by Chicago Title, a title and deed company. Based on their data, the median California residence time during 1991 (a recessionary year) was 12.4 years. Therefore, even though the national average time of 9 years (50th percentile) may be warranted, PACIFIC recommends the more conservative residence time of 12.4 years for exposure duration.

SUMMARY

On behalf of ARCO, PACIFIC is preparing a baseline health risk assessment for the referenced site. PACIFIC has requested ACHCS assistance in determining the appropriate carcinogenic risk parameter values based on available site-specific data. This letter presents the recommended risk assessment parameter values with justification for ACHCS review and approval.

ARCO and PACIFIC greatly appreciate ACHCS cooperation and assistance with the review and approval of the recommended parameter values. We look forward to working closely with ACHCS to expedite remedial action to maintain protection of public health. Toward this end, we would like to meet with you after you have had an opportunity to review this letter, to discuss this project in detail and to present a schedule for remedial action.

If you have any questions regarding this letter, please do not hesitate to contact us.

Sincerely,

Pacific Environmental Group, Inc.

Keith Winemiller Senior Staff Engineer

Debra J. Moser Project Manager

Attachments:

Table 1 - Domestic Irrigation Water Well Sampling Results -

Total Petroleum Hydrocarbons Analyses

Table 2 - Off-Site Air Sampling Results - Total Petroleum

Hydrocarbons Analyses

Table 3 - Domestic Irrigation Water Well Analytical Results -

Drinking Water Analyses

Table 4 - Domestic Irrigation Water Well Operational Data

Certified Analytical Reports and Chain-of-Custody

Documentation

REFERENCE

Environmental Protection Agency (EPA), 1989, Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual (Part A) Interim Final, Office of Emergency and Remedial Response, EPA/540/1-89/002.

cc: Mr. Michael Whelan, ARCO Products Company

Mr. Chris Winsor, ARCO Products Company

Mr. Charles Lapin, ARCO Products Company
Mr. John Meck, ARCO Products Company

Mr. John Meck, ARCO Products Company

Mr. Eddie So, Regional Water Quality Control Board

Table 1

Domestic Irrigation Water Well Sampling Results Total Petroleum Hydrocarbons Analyses

ARCO Service Station 608 17601 Hesperian Boulevard San Lorenzo, California

	Sampled	09-11/91	Sample	d 10/92
Well Address	Gasoline (ppb)	Benzene (ppb)	Gasoline (ppb)	Benzene (ppb)
17349 VM	780	(13)	2,200	<5.0
17372 VM	300	5.5	220	<1.0
17302 VM	72	0.64	NS	NS
590 H	<30	<0.3	<50	<0.5
633 H	NS	NS	NS	NS
634 H	NS	NS	NS	NS
642 H	<30	<0.3	<50 .	<0.5
675 H	NS	NS	NS	NS
17197 VM	<30	<0.3	<50	< 0.5
17200 VM	440	2.7	NS	NS
17203 VM	<30	< 0.3	NS	NS
17348 VM	NS	NS	NS	NS
17371 VM	870	9.0	<50	< 0.5
17393 VM	31	<0.3	NS	NS
Average	NA Partila)	3.2	NA	0.7
(50th perce Average (95th perce	NA	6.4	NA	1.6
	erage (95th per pling events	centile)		3.5

ppb = Parts per billion

NS = Not sampled

NA = Not applicable

Averages include ND-samples calculated as one-half of the noted detection limit.

Stephen some

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Table 2 Off-Site Air Sampling Results Total Petroleum Hydrocarbons Analyses

ARCO Service Station 608 17601 Hesperian Boulevard San Lorenzo, California

Sample Date	Benzene (ug/m³)	Sample Location Description		
07/22/92	3.4	Across Via Magdalena 100' Downwind		
07/22/92	9.6	Corner of Hacienda Avenue and Via Magdalena		
07/22/92	6.8	Corner of Hacienda Avenue and Hesperian Boulevard		
07/22/92	*	Corner of Via Magdalena and Potrero Court		
Background Average (50th percentile) 6.6 ug/m ³ , (or 26.6 ppbv)				
e (95th percenti	ile) 14.3 ug/n	n ³ , (or 57.6 ppbv)		
07/22/92	2.5	Well 17349 (Well Before Operation)		
07/22/92	2.8	Well 17349 (Well During Operation)		
07/22/92	3.8	Well 17349 (Well After Operation)		
(50th percentile	e) 3.0 ug/n	n ³ , (or 12.1 ppbv)		
Well 17349 Average (95th percentile) 4.7 ug/m³, (or 18.9 ppbv)				
07/22/92	2.5	Irrigation Vapor (During Well 17349 Operation)		
07/22/92	2.1	Plant Vapor (During Well 17349 Operation)		
	Date 07/22/92 07/22/92 07/22/92 07/22/92 07/22/92 07/22/92 (50th percentile of	Date (ug/m³) 07/22/92 3.4 07/22/92 9.6 07/22/92 * e (50th percentile) 6.6 ug/n e (95th percentile) 14.3 ug/n 07/22/92 2.5 07/22/92 2.8 07/22/92 3.8 (50th percentile) 3.0 ug/n (95th percentile) 4.7 ug/n 07/22/92 2.5		

ug/m³ = Micrograms per cubic meter ppbv = Parts per billion, by volume

* = Sample container failed (no analysis was conducted on sample)

3.003 x24.5 = 45 mr mm.
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December 8, 1992

Table 3 Domestic Irrigation Water Well Analytical Results -**Drinking Water Analyses**

ARCO Service Station 608 17601 Hesperian Boulevard San Lorenzo, California

Well Identification	Odor (units)	Color (units)	Turbidity (NTU)
Well 17349	-	20	9
Well 17203	50	5	8.6
Regulatory Limit*	3	15	5

NTU = Nephelometric Turbidity Unit

* California Secondary Standards for Drinking Water Samples collected July 22, 1992

Table 4 Domestic Irrigation Water Well Operational Data

ARCO Service Station 608 17601 Hesperian Boulevard San Lorenzo, California

Well Identification	Well Status	Frequency of Operation (days/year)	Duration of Operation (hours/day)
590	Operational	52	6 to 7
633	Non-Operational	NA	· NA
634	Non-Operational	NA	NA
642	Operational	260	1 to 1.5
675	Non-Operational	NA	NA .
17197	Unknown*	52	NA
17200	Non-Operational	NA	NA
17203	Operational	24	1.5
17302	Unknown*	156	5
17348	Non-Operational	NA	NA
17349	Operational	260	1
17371	Operational	24	2
17372	Operational	260	2
17393	Non-Operational	NA	NA
Average (50th percentile)		78	1.5
Average (95tl	n percentile)	140	2.7

NA = Not available

^{* =} Classified as operational until status is confirmed Averages include non-operational status wells.



Environmental Analytical Service, Inc.

August 5, 1992

Reference Number: 20961

Keith Winemiller Pacific Environmental Group 2025 Gateway Plaza, Suite 440 San Jose, CA 95110

Dear Keith:

Enclosed is the analytical report for the samples which were received by Environmental Analytical Service on July 23, 1992.

The report consists of the following sections:

I. Sample Description

II. Analysis Request

III. Laboratory Narrative

IV. Quality Control Report

V. Analysis Results

If you have any questions on the analytical data or the report please contact myself or Vivian Longacre at (805) 541-3666.

Sincerely.

Steven D. Hoyy Ph.D Laboratory Director

SDH/sg enclosures

ANALYTICAL REPORT

Reference Number: 20961

Analysis performed for: Pacific Environmental Group

L Sample Description

The following samples were received for analysis by the methods described in Section 1.2.

Client Number	Lab Number	Client Number	Lab Number
B017349	20961	AVM100	20962
AH&VM	20963	AH&H	20964
1V173492	20965	D017349	20966
A017349	20967	P17349	20968

II. Analysis Requested

GC/FID BTXE (1-10)/TPH

III. Laboratory Narrative

All laboratory quality control criteria were met for the samples in this report.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above.

Steven D. Hoyt-Laboratory Director

Vivian Longacre - Air Lab Supervisor

ANALYTICAL REPORT

Reference Number: 20961

Analysis performed for: Pacific Environmental Group

IV. Quality Control

Project Specific QC Report.

No project specific QC (i.e. spikes and/or duplicates) was requested

Normal Laboratory OC Report.

A method blank is a laboratory-generated sample which assesses the degree to which laboratory operations and procedures cause false-positive analytical results for your samples. A copy of the batch blank is included with the report.

Duplicate Control Samples.

A DCS is a well-characterized matrix (blank water, ambient air, or actual sample) which may or may not be spiked and run in duplicate with your sample batch. The results are on the attached Duplicate Sample/Spike results. Precision is measured using duplicate tests by Relative Percent Difference (RPD) as in:

RPD = $\frac{(\% \text{ recovery test } 1 - \% \text{ recovery test } 2)}{(\text{recovery test } 1 + \text{recovery test } 2)/2} \times 100$



METHOD BLANK REPORT

Blan	ık Run 🛊	#: 748			Ar	nalyst:	Tobe Cox
INMHC	<u> </u>	ug/m3	ppbC	. 	(* - 140 * - 140 * 140 		
	•	1.3	2.0				
ug/m3	ppbC	Compound			ug/m3	ppbC	Compound
		Ethane					Cyclohexane
		Ethene					2-Methylhexane
		Acetylene					2,3-Dimethylpentane
		Propane					3-Methylhexane
		Propene					2,2,4-Trimethylpentane
		i-Butane					n-Heptane
		i-Butene					Methylcyclohexane
		1-Butene					2,2,3-Trimethylpentane
		1,3-Butadie	ne				2,4-Dimethylhexane
		n-Butane					2,3,4-Trimethylpentane
		t-2-Butene	•				Toluene
		2,2-Dimethy	lpropane				2,3-Dimethylhexane
		c-2-Butene					2-Methylheptane
		3-Methyl-1-1	butene				3-Ethylhexane
		i-Pentane					n-Octane
		1-Pentene					Ethylcyclohexane
		2-Methyl-1-1	outene				Ethylbenzene
		n-Pentane					m-xylene (p-xylene)
		Isoprene					p-xylene
		t-2-Pentene					Styrene
		c-2-Pentene					o-Xylene
		-2-Methy1-2-1	butene				n-Nonane
		2,2-Dimethy	Lbutane				alpha-Pinene
		Cyclopenten	е				i-Propylbenzene
		4-Methyl-1-	pentene				n-Propylbenzene
		Cyclopentan	e				m-Ethyltoluene
		2,3-Dimethyl					p-Ethyltoluene
		c-4-Methyl-		;			1,3,5-Trimethylbenzene
		2-Methylpent	tane				o-Ethyltoluene
		3-Methylpent	tane				beta-Pinene
		2-Methyl-1-	pentene				t-Butylbenzene
		1-Hexene					1,2,4-Trimethylbenzene
		n-Hexane					i-Butylbenzene
		t-2-Hexene					sec-Butylbenzene
		2-Methyl-2-	pentene	•			n-Decane
		c-2-Hexene					1,2,3-Trimethylbenzene
		Methylcyclo	pentane				Methylstyrene
		2,4-Dimethy					1,3-Diethylbenzene
		Benzene	=			•	1,4-Diethylbenzene

DUPLICATE SAMPLE RESULTS



Sample: Hydrocarbon STD Duplcte: Hydrocarbon STD Batch: 7-29-92

Batch: 7-29-92 Method: C2-C10 Hydrocarbons by GC/FID

		•	*.	
Compound	Sample ppbC	Duplicate ppbC	% RPD	QC Limits
Ethane	2.05	2.78	30	30
Propane	4.62	5.13	10	30
n-Butane	4.17	4.01	4	30
i-Pentane	2.94	3.81	26	30
n-Pentane	4.82	3.98	19	30
Cyclopentane	2.75	2.07	28	30
2-Methylpentane	6,36	4.86	27	30
n-Hexane	9.14	6.88	28	30
Methylcyclopentane	8.82	6.52	30	30
Benzene	7.31	5.30	32	30
Cyclohexane	2.37	1.84	25	30
3-Methylhexane	6.04	5.02	18	30
n-Heptane	7.23	5.27	31	30
2,4-Dimethylhexane	3.53	2.81	23	30
Toluene	6.98	6.24	11	30
2-Methylheptane	3.89	3.38	14	30
n-Octane	6.15	5.51	11	30
Ethylbenzene	12.91	13.89	. 7	30
m-xylene (p-xylene)	18.28	20.31	11	30
n-Nonane	8.09	8.91	10	30
p-Ethyltoluene	3.32	3.80	14	30
1,3,5-Trimethylbenzene	4.09	4.93	19	30
1,2,3-Trimethylbenzene	10.41	12.28	17	30



Hydrocarbons by GC/FID

Client:

Pacific Environ.

Sample Date:

7-22-92

Sample #: Lab #:

B017349

20961

Date Analyzed: Analyst: 7-29-92 Tobe Cox

Compound	Concentration ug/m3	Concentration ppbC	
Benzene Toluene Ethylbenzene Xylenes	2.0 6.2 1.4 5.1	3.8 12 2.6 9.5	
Total Petroleum Hydrocarbons	272 ppbC	170 ug/m3	



Hydrocarbons by GC/FID

Lab #:

Pacific Environ. Client: Sample #:

AVM100

20962

Sample Date:

7-22-92

Date Analyzed: Analyst:

7-29-92

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Compound	Concentration ug/m3	Concentration ppbC	·
Benzene	2.7	5.1	
Toluene	9.1	17	
Ethylbenzene	2.2	4.0	
Xylenes	9.3	17	
Total Petroleum Hydrocarbons	980 ppbC	612 ug/m3	



Hydrocarbons by GC/FID

Client: Sample #:

Lab #:

Pacific Environ.

AH&VM

20963

Sample Date:

Date Analyzed:

7-22-92 7-29-92

Analyst:

			ozeż
Compound	Concentration ug/m3	Concentration ppbC	
(
Benzene	7.7	14	
Toluene	20	38	
Ethylbenzene	5.7	11	
Xylenes	24	44	
	· · · · · · · · · · · · · · · · · · ·		
Total Petroleum Hydrocarbons	733 ppbC	458 ug/m3	



Hydrocarbons by GC/FID

Client:

Pacific Environ.

Sample Date: Date Analyzed:

7-22-92

Sample #:

AH&H

7-29-92

Lab #: 20964

Analyst:

Compound	Concentration ug/m3	Concentration ppbC	
Benzene Toluene Ethylbenzene	5.4 9.6 1.7	10 18 3.1	
Xylenes	7.4	14	_
Total Petroleum Hydrocarbons	346 ppbC	217 ug/m3	



Hydrocarbons by GC/FID

Client:

Pacific Environ.

Sample Date: Date Analyzed:

7-22-92

Sample #: Lab #:

1V17349

7-29-92

20965

Analyst:

Compound	Concentration ug/m3	Concentration ppbC	
Benzene	2.0	3.8	
Toluene	5.4	10	
Ethylbenzene	0.80	1.5	
Xylenes	3.6	6.6	
Total Petroleum Hydrocarbons	224 ppbC	140 ug/m3	



Hydrocarbons by GC/FID

Client: Pacific Environ. Sample Date: 7-22-92
Sample #: D017349 Date Analyzed: 7-29-92
Lab #: 20966 Analyst: Tobe Cox

Compound	Concentration ug/m3	Concentration ppbC	
Benzene	2 3	4.2	
Toluene	6.3	12	
Ethylbenzene	1.2	2.2	
Xylenes	5.5	10	
Total Petroleum Hydrocarbons	429 ppbC	268 ug/m3	



Hydrocarbons by GC/FID

Pacific Environ. Client:

Sample #: A017349 Lab #:

20967

Sample Date:

7-22-92

Date Analyzed:

7-29-92

Analyst:

Compound	Concentration ug/m3	Concentration ppbC	
Benzene Toluene Ethylbenzene	3.0 30 3.6	5.7 55 6.6 15	
Xylenes Total Petroleum Hydrocarbons	7.9 1633 ppbC	1021 ug/m3	



Hydrocarbons by GC/FID

Client:

Pacific Environ.

P17349

Sample #: Lab #:

Sample Date:

Date Analyzed:

7-22-92 7-29-92

Tobe Cox

20968 Analyst:

Concentration Concentration Compound ppbC ug/m3 3.2 Benzene 1.7 6.1 Toluene 3.3 9.9 5.4 Ethylbenzene 43 Xylenes 23 Total Petroleum Hydrocarbons 241 ug/m3 385 ppbC

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

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Condition of	sample:		 	' '''						Temp	erature	receive	d:	•									_
Relinquishe	d by sam	oler	7				Date		Time	Recei	ived by										•	Rush 2 Business Days	
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AUG 04 1992
PACIFIC ENVIRONMENTAL GROUP, INC

Pacific Environmental Group 2025 Gateway Place, Suite 440 San Jose, CA 95110 Attention: Keith Winemiller

Project: 330-06.14/ARCO 0608, San Lorenzo

Enclosed are the results from 1 water sample received at Sequoia Analytical on July 22,1992. The requested analyses are listed below:

SAMPLE # SAMPLE DESCRIPTION DATE OF COLLECTION TEST METHOD

2073307 Water, GW17203 7/22/92 General Mineral, General Physical, & Inorganic Chemical Analysis

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Christine L. Middleton Project Manager

San Jose, CA 95110

Attention: Keith Winemiller

Client Project ID: Sample Descript:

Lab Number:

330-06.14/ARCO 0608, San Lorenzo

Water, GW17203

Received:

Jul 22, 1992 Jul 22, 1992

Analyzed: Reported:

Sampled:

7/23-30/92 Aug 4, 1992

GENERAL MINERAL, GENERAL PHYSICAL, & INORGANIC CHEMICAL ANALYSES

207-3307

Sample Results **Detection Limit Analyte** mg/L (ppm) mg/L (ppm)

Aluminum	0.10	***************************************	0.11
Arsenic	0.0050	************	0,0051
Barjum	0.10	*************	0.15
Bicarbonate Alkalinity	1.0		540
Cadmium	0.010	***************************************	N.D.
Calcium	0.50	************	120
Carbonate Alkalinity	2.0		N.D.
Chloride:	0.20	************************	32
Chromium	0.010		N.D.
Color (color units)	3.0	***********	5.0
Copper	0.010	XeXeXeXeXeXeXeXeXeXeXeXeXeXeXeXeXeXeXe	0.014
Fluoride	0.10	***********	0.25
Hardness	1.0	************************	520
Hydroxide Alkalinity	0.10	***************************************	N.D.
Iron	0.010	*****************************	0.83
Lead	0.0050	***************************************	N.D.
Magnesium	0.10	********	40
Manganese	0.010		3.8
Mercury	0.0000	***************************************	N.D.
Nitrate as NO3	1.0	***************************************	N.D.
Odor (threshold units)	1.0	***********	50
pH (pH units)	N.A.		6.7
Potassium	1.0		N.D.
Selenium	0.0050	***************************************	N.D.
Silver	0.010	*******	N.D.
Sodium	0.50	**********	67
Specific Conductance (µmhos/cm)	1.0	#******##***************************	1,100
Sulfate	0.10	201010101010101010101010101010101010101	9.7
Surfactants	0.020	**************************	0.14
Total Dissolved Solids	1.0	***********	560
Turbidity (NTU)		******************************	8.6
Zinc	0.010	*****************************	0.11

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Christine L. Middleton Project Manager

2073307.PPP <1>



Client Project ID: 330-06.14/ARCO 0608, San Lorenzo

San Jose, CA 95110

Attention: Keith Winemiller

QC Sample Group: 207-3307

Reported: Aug 4, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	·			
	Arsenic	Selenium	Mercury	Lead
Method: Analyst: Reporting Units: Date Analyzed: QC Sample #:	EPA 206.2 F. Contreras mg/L Jul 29, 1992 207-3307	EPA 270.2 F. Contreras mg/L Jul 29, 1992 207-3307	EPA 245.1 J. Martinez mg/L Jul 24, 1992 207-3307	EPA 239.2 S. Chin mg/L Jul 30, 1992 207-3307
Sample Conc.:	0.0051	N.D.	N.D.	N.D.
Spike Conc. Added:	0.25	0.25	0.0020	0.050
Conc. Matrix Spike:	0.24	0.25	0.0020	0.050
Matrix Spike % Recovery:	94	100	100	100
Conc. Matrix Spike Dup.:	0.26	0.28	0.0020	0.050
Matrix Spike Duplicate % Recovery:	102	112	100	100
Relative % Difference:	8.0	11	0.0	0.0

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Christine L. Middleton Project Manager

Conc. of M.S. - Conc. of Sample x 100 % Recovery: Spike Conc. Added Conc. of M.S. - Conc. of M.S.D. x 100 Relative % Difference: (Conc. of M.S. + Conc. of M.S.D.) / 2

2073307.PPP <2>



Client Project ID: 330-06.14/ARCO 0608, San Lorenzo

San Jose, CA 95110

Attention: Keith Winemiller

QC Sample Group: 207-3307

Reported: Aug 4, 1992

QUALITY CONTROL DATA REPORT

ANALYTE					0 - 41	7:	Canad
	Barium	Cadmium	Chromium	Potassium	Sodium	Zinc	Copper
Method: Analyst: Reporting Units: Date Analyzed: QC Sample #:	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889	mg/L	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889
Sample Conc.:	0.14	N.D.	0.023	N.D.	190	0.25	0.14
Spike Conc. Added:	1.0	1.0	1.0	100	100	1.0	1.0
Conc. Matrix Spike:	1.2	0.95	1.0	82	270	1.2	1.1
Matrîx Spike % Recovery:	106	95	98	82	80	95	96
Conc. Matrix Spike Dup.:	1.1	0.92	0.97	82	270	1.2	1.1
Matrix Spike Duplicate % Recovery:	96	92	95	82	80	95	96
Relative % Difference:	8.7	3.2	3.0	0.0	0.0	0.0	0.0

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Christine L. Middleton Project Manager

x 100 Conc. of M.S. - Conc. of Sample % Recovery: Spike Conc. Added

Conc. of M.S. - Conc. of M.S.D. x 100 Relative % Difference: (Conc. of M.S. + Conc. of M.S.D.) / 2

2073307.PPP <3>



Pacific Environmental Group 2025 Gateway Place, Suite 440 San Jose, CA 95110

Attention: Keith Winemiller

Client Project ID: 330-06.14/ARCO 0608, San Lorenzo

QC Sample Group: 207-3307 and the same of the second of the contract of the contract of the second

Reported: Aug 4, 1992

QUALITY CONTROL DATA REPORT

AMALVIC		· · · · · · · · · · · · · · · · · · ·	·			
ANALYTE	Iron	Magnesium	Manganese	Calcium	Aluminum	Silver
Method: Analyst: Reporting Units: Date Analyzed: QC Sample #:	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889	EPA 200.7 C. Medetesser mg/L Jul 29, 1992 207-3889	EPA 200.7 C. Medefesser mg/L Jul 29, 1992 207-3889
Sample Conc.:	0.54	1.9	N.D.	8.6	0.41	N.D.
Spike Conc. Added:	1.0	1.0	1.0	100	1.0	1.0
Conc. Matrix Spike:	1.5	2.7	0.97	110	1.4	0.95
Matrix Spike % Recovery:	96	80	97	.101	99	95
Conc. Matrix Spike Dup.:	1.5	2.8	0.94	110	1.4	0.92
Matrix Spike Duplicate % Recovery:	96	90	94	101	99	92
Relative % Difference:	0.0	3.6	3.1	0.0	0.0	3.2

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Christine L. Middleton **Project Manager**

% Recovery:	Conc. of M.S Conc. of Sample	x 100		
_	Spike Conc. Added			
Relative % Difference:	Conc. of M.S Conc. of M.S.D.	x 100		
_	(Conc. of M.S. + Conc. of M.S.D.) / 2			
			2073307.PPP <4>	>



Pacific Environmental Group 2025 Gateway Place, Suite 440 San Jose, CA 95110 Attention: Keith Winemiller Client Project ID: 330-06.14/ARCO 0608, San Lorenzo

QC Sample Group: 207-3307

Reported: Aug 4, 1992

QUALITY CONTROL DATA REPORT

ANALYTE						
	Surfactants	Chloride	Nitrate	Sulfate	Alkalinity	Hardness
Method: Analyst: Reporting Units: Date Analyzed: QC Sample #:	SM 512B M. Fazzio mg/L Jul 23. 1992 207-2870	EPA 300.0 G. Fish mg/L Jul 24, 1992 Blank	EPA 300.0 G. Fish mg/L Jul 24, 1992 Blank	EPA 300.0 G. Fish mg/L Jul 24, 1992 Blank	SM403 G. Kern mg/L Jul 27, 1992 207-3805	SM2340 G. Kern mg/L Jul 28, 1992 207-3707
ample Conc.:	N.D.	N.D.	N.D.	N.D.	140	N.D.
Spike Conc. Added:	0.050	1.0	1.0	1.0	N.A.	100
Conc. Matrix Spike:	0.059	1.1	0.94	0.92	N.A.	99
Matrix Spike % Recovery:	117	110	94	92	N.A.	9 9
Conc. Matrix Spike Dup.:	0.055	1.1	0.92	0.89	130	99
Matrix Spike Duplicate % Recovery:	110	110	92	89	N.Ą.	99
Relative % Difference:	7.0	0.0	2.2	3.3	7.4	0.0

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

Ou + Du

SEQUOIA ANALYTICAL

Christine L. Middleton Project Manager % Recovery:

Conc. of M.S. - Conc. of Sample Spike Conc. Added x 100

Relative % Difference:

Conc. of M.S. - Conc. of M.S.D.

x 100

native a billetence.

(Conc. of M.S. + Conc. of M.S.D.) / 2

2073307.PPP <5>



Client Project ID: 330-06.14/ARCO 0608, San Lorenzo

San Jose, CA 95110

Attention: Keith Winemiller

QC Sample Group: 207-3307

Reported: Aug 4, 1992

QUALITY CONTROL DATA REPORT

ANALYTE		Total Dissolved			•
	Fluoride	Solids	Conductivity	рН	
Method:	EPA 340.2	EPA 160.1	EPA 120.1	EPA 9040	
· Analyst:	G. Fish	Y. Arteaga	Y. Arteaga	Y. Arteaga	
Reporting Units:	mg/L	mg/L	μ mhos/cm	Ń.A.	•
Date Analyzed:	Jul 23, 1992	Jul 24, 1992	Jul 23, 1992	Jul 23, 1992	
QC Sample #:	207-3307	207-3307	207-3306	207-3332	
Sample Conc.:	0.25	280	550	8.9	•
		٠.			
Spike Conc.					
Added:	1.0	220	710	N.A.	
713404.	1.0	220		14271	
Ones Madriti					
Conc. Matrix		540	4000	NI A	
Spike:	1.1	540	1300	N.A.	•
					,
Matrix Spike					
% Recovery:	85	118	105	N.A.	
Conc. Matrix					
Spike Dup.:	1.1	540	1300	8.9	
				:	
Matrix Spike					
Duplicate	oc.	110	105	NI A	
% Recovery:	85	118	105	N.A.	
Relative					
% Difference:	0.0	0.0	0.0	0.0	

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Christine L. Middleton
Project Manager

% Recovery:

Conc. of M.S. - Conc. of Sample x 100

Spike Conc. Added

Relative % Difference: Conc. of M.S. - Conc. of M.S.D. x 100

(Conc. of M.S. + Conc. of M.S.D.) / 2

2073307.PPP <6>