Environmental Services, Inc.
2111 Jennings Street, San Francisco, CA 94124-3224, Phone (415) 822-4555 FAX (415) 822-5290

GROUNDWATER MONITORING
JULY, 1991
ARROYO SCHOOL
SAN LORENZO, CALIFORNIA

L & W Project 5186D
July 30, 1991

Prepared for
San Lorenzo Unified School District

George Wilson
Vice President

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Civil Engineer 23772

Michael J. Killoran

ARROYO SCHOOL GROUNDWATER MONITORING JULY 1991

Purpose

This report summarizes and presents the results of the quarterly monitoring of three wells at the Arroyo School in San Lorenzo, California. This report, when forwarded to the Alameda County Health Care Services Agency and the Regional Water Quality Control Board (RWQCB), San Francisco Region, will serve as a progress report for the three month period ending in July 31, 1991. Those items which have been completed since submission of L&W Environmental Services, Inc.'s last report are highlighted below.

Chronology

The following list summarizes site-related work done to date:

1/3/91	6000 gallon fuel tank removed.
1/16/91	Borings 1 through 6 drilled.
1/25/91	Borings 7 through 11 drilled.
1/28/91	Borings 12 through 13 drilled.
1/31/91	Monitoring wells MW 1 through MW 3 installed.
2/7/91	Monitoring wells MW 1 through MW 3 monitored and sampled.
3/15/91	Monitoring wells MW 1 through MW 3 monitored and sampled.
4/16/91	Monitoring wells MW 1 through MW 3 monitored and sampled.
7/15/91	**Monitoring wells MW 1 through MW 3 monitored and sampled.**

Site Description

The area investigated is at the Arroyo School located at 1507 Lorenzo Avenue in San Lorenzo, California. The site investigated is an essentially level paved area with only minimal slope to provide surface drainage. Figure 1 in Appendix A is a site plan showing the location of Arroyo School in relation to the nearby streets. The tank which was removed was located between the maintenance boiler room portion of the building and temporary class rooms. This general location is in the approximate middle of the school complex.

Work Performed

The three monitoring wells installed at the site were measured and sampled on July 15, 1991. The depth to water in each well was measured and a preliminary sample was observed for free product or the presence of a hydrocarbon sheen. Each well was then purged of at least four well volumes or until groundwater temperature, pH, and conductivity-were measured and found to be approximately stable on three successive readings. Wells were purged using either an air lift pump or with a teflon bailer. The bailer and all measuring and sampling equipment were decontaminated before use in each well by cleaning in soapy water, a trisodium phosphate (TSP) rinse, and two

clear water rinses. Samples were recovered from each well using a disposable bailer.

The wells were monitored for depth to groundwater and the presence of free product on July 15, 1991. The observations made to date are as follows:

SUMMARY OF GROUNDWATER MEASUREMENTS

Well No.	Date Measured	Top of Casing Elevation	Thickness of Free Product (feet)	Depth to Groundwater (feet)	Piezometric Surface Elevation
MW1	2/07/91	100.00	NONE	11.42	88.58
MW2	2/07/91	100.03	NONE	11.27	88.76
MW3	2/07/91	100.17	NONE	11.44	88.73
MW1	3/15/91	100.00	NONE	10.16	89.84
MW2	3/15/91	100.03	NONE	10.16	89.87
MW3	3/15/91	100.17	NONE	10.48	89.69
MW1	4/16/91	100.00	NONE	10.44	89.56
MW2	4/16/91	100.03	NONE	10.50	89.53
MW3	4/16/91	100.17	NONE	10.72	89.45
MW1	**7/15/91**	**100.00**	**NONE**	**12.06**	**87.94**
MW2	**7/15/91**	**100.03**	**NONE**	**12.04**	**87.99**
MW3	**7/15/91**	**100.17**	**NONE**	**12.20**	**87.97**

The water samples were stored in appropriate containers, labeled and transported in ice chests under Chain-Of-Custody protocol to a California State Certified Laboratory for analysis. Chain-Of-Custody forms are included in Appendix B. Each sample was tested for Total Petroleum Hydrocarbons as diesel (TPH-D); Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX); and Total Oil and Grease (TOG). The following table summarizes the laboratory analyses results to date.

RESULTS OF GROUNDWATER ANALYSES

Well Sample	Date	TPH-D (ppm)	BTEX (ppb)	TOG (ppm)
MW1	2/07/91	0.3	ND/ND/ND/ND	ND
MW2	2/07/91	ND	ND/ND/ND/ND	ND
MW3	2/07/91	0.3	ND/ND/ND/ND	ND

MW1	3/15/91	ND	ND/ND/ND/ND	ND
MW2	3/15/91	ND	ND/ND/ND/ND	ND
MW3	3/15/91	0.055	ND/ND/ND/ND	ND
MW1	4/16/91	0.20	ND/ND/ND/ND	ND
MW2	4/16/91	ND	ND/ND/ND/ND	ND
MW3	4/16/91	ND	ND/ND/ND/ND	ND
MW1	**7/15/91**	**ND**	**ND/0.3/ND/ND**	**ND**
MW2	**7/15/91**	**ND**	**ND/ND/ND/ND**	**ND**
MW3	**7/15/91**	**ND**	**ND/ND/ND/ND**	**ND**

Notes:
(ppm) parts per million.
(ppb) parts per billion.
ND Not detected at or above limit of detection.

Analytical Certificates
Original certificates from a California certified laboratory for the most recent groundwater analyses are attached in Appendix B. Copies of the Chain-of-Custody are also included in Appendix B.

Discussion
The difference between groundwater elevations in the monitoring wells is very slight being less than 0.40 feet across a distance of about 250 feet, thus indicating a very flat groundwater gradient. Under such conditions, the groundwater gradient may change direction more frequently and be much more sensitive to measurement accuracy than in an area that has a higher gradient.

The groundwater flow direction as indicated by measurements taken on February 7, 1991 was to the southeast. Measurements taken on March 15, 1991 indicated that the groundwater flow direction had moved to the northeast. Measurements taken during April, 1991 indicate that the groundwater flow direction had moved to the north-northeast. **Measurements taken during July, 1991 indicate that the groundwater flow direction had moved once again, this time to the northwest.** Refer to Figure 2 of Appendix A, which shows the well locations and the calculated groundwater gradient.

Levels of TPH-D, BTEX, and TOG were found to occur at non-detectable concentrations in water samples from all wells, except in the sample from MW1, which contained 0.3 parts per billion of Toluene, a component of BTEX.

Proposed Future Work

Measurements taken during July, 1991 indicate that the groundwater flow direction has moved to the northwest, due to the very flat groundwater gradient. In the July analyses, TPH-D had decreased to non-detectable levels in all wells, but water samples from MW1 contained 0.3 parts per billion of Toluene, a component of BTEX. We recommend that the monitoring of the three groundwater wells be continued as part of a quarterly schedule.The next scheduled episode should occur in October, 1991.

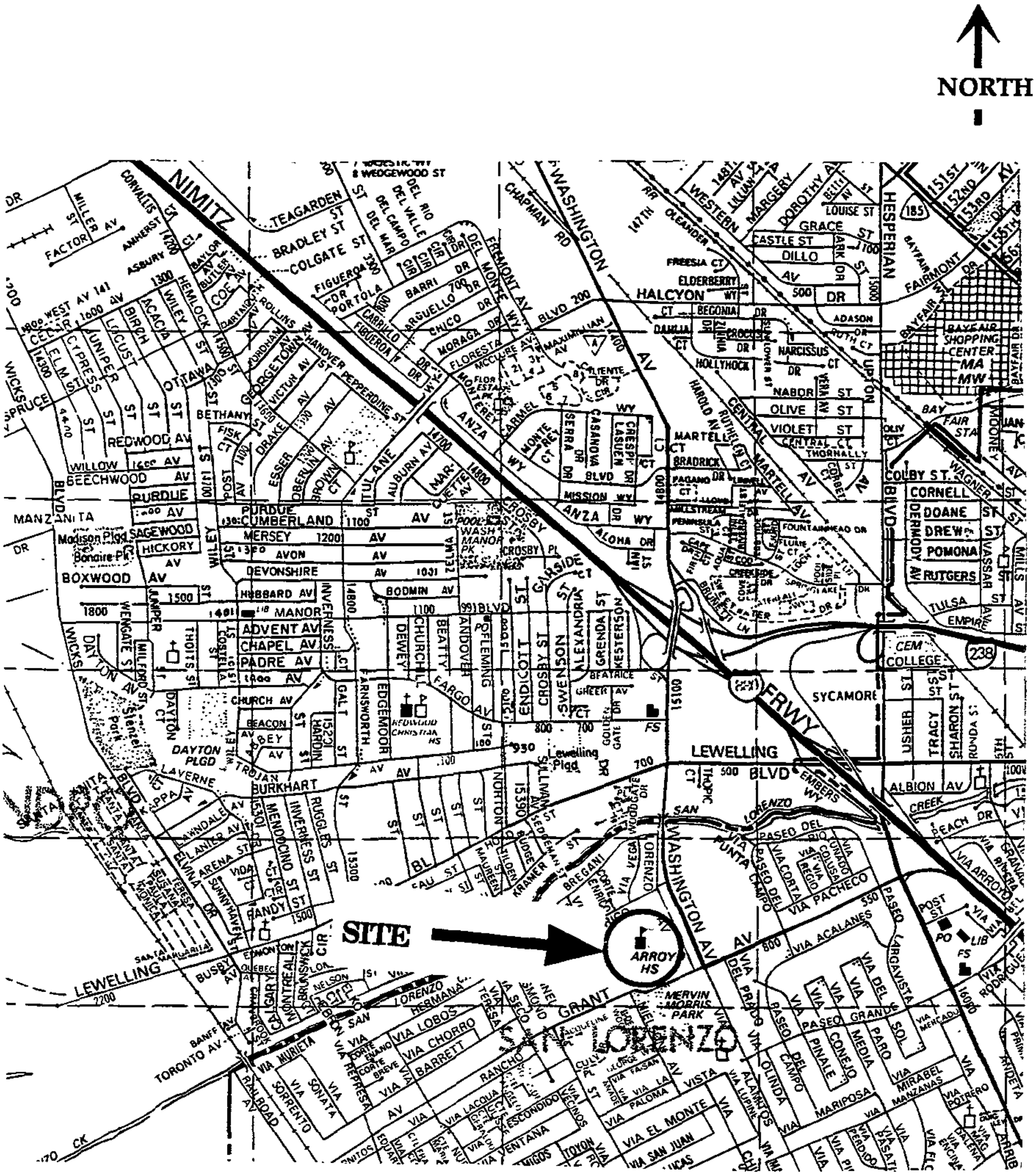
APPENDIX A

Figures 1 through 2

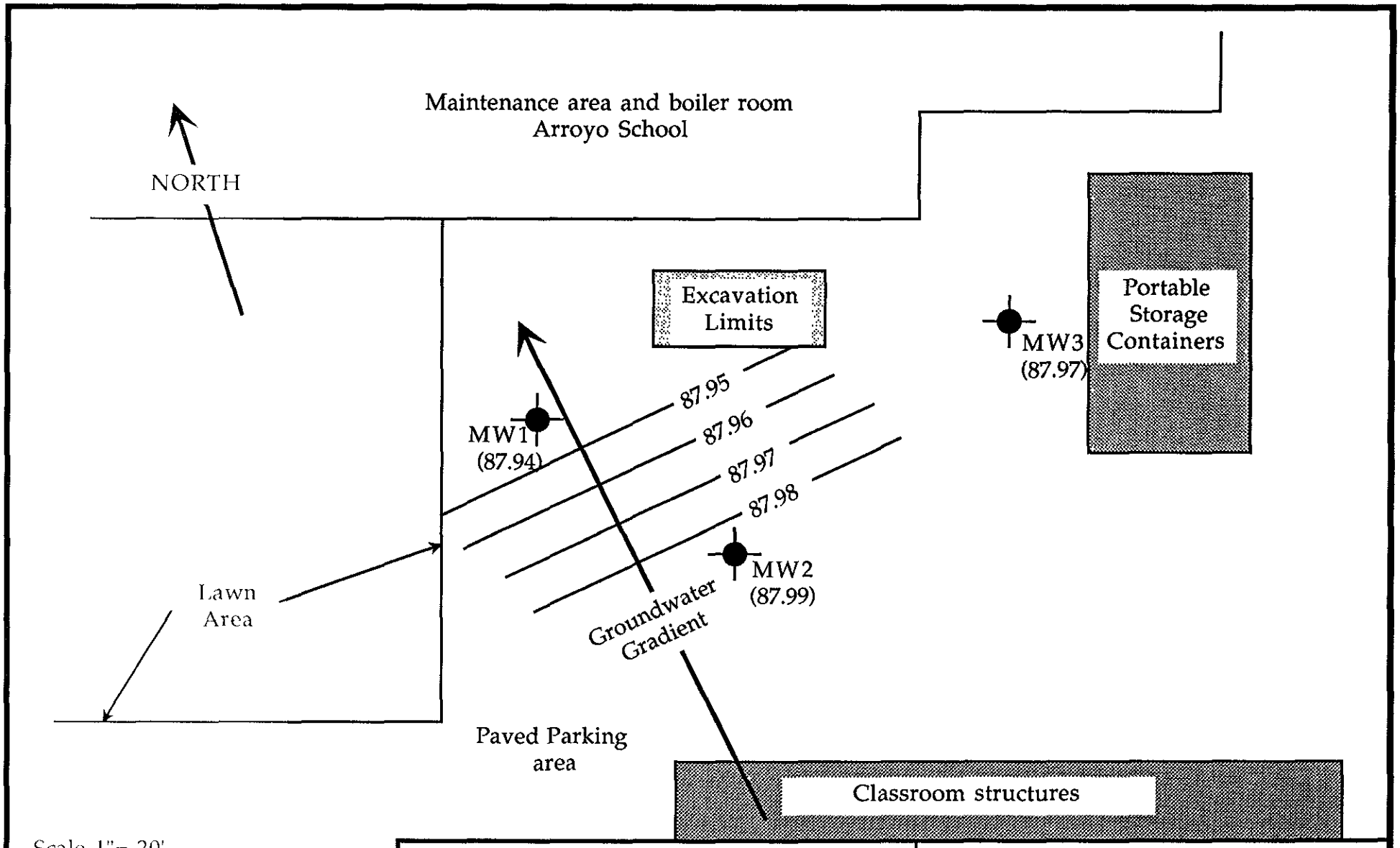
GROUNDWATER MONITORING

ARROYO HIGH SCHOOL
SAN LORENZO, CALIFORNIA

L&W Project 5186D
July 30, 1991



L & W Environmental Services, Inc. 2111 Jennings Street San Francisco, California		Site Plan Arroyo High School San Lorenzo, California	
Project Number: 5186D	Drawn by: JNC	Date: July 1991	Figure Number: 1



L & W Environmental Services, Inc.

2111 Jennings Street
San Francisco, California

GROUNDWATER GRADIENT

Arroyo School
San Lorenzo, California

Project Number: 5186D	Drawn by: MJK	Date: July, 1991	Figure Number: 2

APPENDIX B

Laboratory Certificates and Chain of Custody Forms

GROUNDWATER MONITORING

ARROYO HIGH SCHOOL
SAN LORENZO, CALIFORNIA

L&W Project 5186D
July 30, 1991

Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE, RICHMOND, CA 94806 PHONE (415) 222-3002 FAX (415) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. E 750

Received: 07/17/91
Reported: 07/26/91
Job #: 72626

Attn: George Wilson
L & W Environmental
2111 Jennings Street
San Francisco, CA 94124

Project: Arroyo High
San Lorenzo Unified School District
Matrix: Water

Total Oil and Grease
Standard Methods, 17th Edition, 5520-B
mg/L

Lab ID	Client ID	Oil and Grease	MDL
72626-1	5186D-MW1 Depth of Water 12.08	ND<5	5
72626-2	5186D-MW2 Depth of Water 12.08	ND<5	5
72626-3	5186D-MW3 Depth of Water 12.22	ND<5	5

QA/QC: Spike Recovery: 94%

MDL: Method Detection Limit. Compound below this level would not be detected.

Jaime Chow
Laboratory Director

JC/td

Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE, RICHMOND, CA 94806 PHONE (415) 222-3002 FAX (415) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. E 750

Received: 07/17/91
Reported: 07/26/91
Job #: 72626

Attn: George Wilson
L & W Environmental
2111 Jennings Street
San Francisco, CA 94124

Project: Arroyo High
San Lorenzo Unified School District
Matrix: Water

Total Petroleum Hydrocarbon Analysis
DHS Extraction Method (LUFT)
mg/L

Lab ID	Client ID	Diesel	MDL
72626-1	5186D-MW1 Depth of Water 12.08	ND<0.15	0.15
72626-2	5186D-MW2 Depth of Water 12.08	ND<0.05	0.05
72626-3	5186D-MW3 Depth of Water 12.22	ND<0.05	0.05

QA/QC: Spike Recovery for Diesel: 104%

MDL: Method Detection Limit. Compound below this level would not be detected.

Jaime Chow
Laboratory Director

JC/td

Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE, RICHMOND, CA 94806 PHONE (415) 222-3002 FAX (415) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. E 750

Received: 07/17/91
Reported: 07/26/91
Job #: 72626

Attn: George Wilson
L & W Environmental
2111 Jennings Street
San Francisco, CA 94124

Project: Arroyo High
San Lorenzo Unified School District
Matrix: Water

Aromatic Volatile Hydrocarbon Analysis
EPA Method 602
µg/L

Lab ID	Client ID	Benzene	MDL	Toluene	MDL
72626-1	5186D-MW1 Depth of Water 12.08	ND<0.3	0.3	0.3	0.3
72626-2	5186D-MW2 Depth of Water 12.08	ND<0.3	0.3	ND<0.3	0.3
72626-3	5186D-MW3 Depth of Water 12.22	ND<0.3	0.3	ND<0.3	0.3

Lab ID	Client ID	Ethyl-benzene	MDL	Xylenes	MDL
72626-1	5186D-MW1 Depth of Water 12.08	ND<0.3	0.3	ND<0.3	0.6
72626-2	5186D-MW2 Depth of Water 12.08	ND<0.3	0.3	ND<0.6	0.6
72626-3	5186D-MW3 Depth of Water 12.22	ND<0.3	0.3	ND<0.6	0.6

QA/QC: Spike Recovery for Benzene: 104%
Spike Recovery for Toluene: 106%
Spike Recovery for Xylene: 104%

MDL: Method Detection Limit. Compound below this level would not be detected.

Jaime Chow
Laboratory Director

JC/td

Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE, RICHMOND, CA 94806 PHONE (415) 222-3002 FAX (415) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. E 750

Received: 07/24/91
Reported: 07/25/91
Job #: 72647

Attn: George Wilson
L & W Environmental
2111 Jennings Street
San Francisco, CA 94124

Project: Mary Carter, 730 Ellis Street
Matrix: Water

Total Petroleum Hydrocarbon Analysis
EPA Method 5030
µg/L

Lab ID	Client ID	Gasoline	MDL
72647-1	33.92 Feet to Water in Well #1	ND<50	50
72647-2	33.56 Feet to Water in Well #2	ND<50	50
72647-3	34.0 Feet to Water in Well #3	ND<50	50

QA/QC: Spike Recovery for Gasoline: 96%

MDL: Method Detection Limit. Compound below this level would not be detected.

Jaime Chow
Laboratory Director

JC/td

Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE, RICHMOND, CA 94806 PHONE (415) 222-3002 FAX (415) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. E 750

Received: 07/24/91
Reported: 07/25/91
Job #: 72647

Attn: George Wilson
L & W Environmental
2111 Jennings Street
San Francisco, CA 94124

Project: Mary Carter, 730 Ellis Street
Matrix: Water

Aromatic Volatile Hydrocarbon Analysis
EPA Method 602
µg/L

Lab ID	Client ID	Benzene	MDL	Toluene	MDL
72647-1	33.92 Feet to Water in Well #1	2.8	0.3	3.4	0.3
72647-2	33.56 Feet to Water in Well #2	0.4	0.3	0.6	0.3
72647-3	34.0 Feet to Water in Well #3	ND<0.3	0.3	ND<0.3	0.3

Lab ID	Client ID	Ethyl-benzene	MDL	Xylenes	MDL
72647-1	33.92 Feet to Water in Well #1	0.5	0.3	3.4	0.6
72647-2	33.56 Feet to Water in Well #2	ND<0.3	0.3	0.6	0.6
72647-3	34.0 Feet to Water in Well #3	ND<0.3	0.3	ND<0.6	0.6

QA/QC: Spike Recovery for Benzene: 91%
Spike Recovery for Toluene: 104%
Spike Recovery for Xylene: 102%

MDL: Method Detection Limit. Compound below this level would not be detected.

Jaime Chow
Laboratory Director

JC/td

Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE, RICHMOND, CA 94806 PHONE (415) 222-3002 FAX (415) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. E 750

Received: 07/24/91
Reported: 07/25/91
Job #: 72647

Attn: George Wilson
L & W Environmental
2111 Jennings Street
San Francisco, CA 94124

Project: Mary Carter, 730 Ellis Street
Matrix: Water

Analysis Method EPA 6010
Preparation Method 3010
mg/L

Lab ID #	Client ID	Total Lead	MDL
72647-1	33.92 Feet to Water in Well #1	0.09	0.044
72647-2	33.56 Feet to Water in Well #2	ND<0.044	0.044
72647-3	34.0 Feet to Water in Well #3	ND<0.044	0.044

QA/QC: Spike Recovery: 96%

MDL: Method Detection Limit. Compound below this level would not be detected.

Jaime Chow
Laboratory Director

JC/td

CHAIN OF CUSTODY

SAMPLES: (Signature)

PROJECT NAME: (Print) Arroyo High JOB NUMBER: 5186D

DESCRIPTION: Quarterly Well Monitoring

ADDRESS: San Lorenzo Unified School Dist.

CROSS REFERENCE NUMBER	DATE	TIME	SOIL	WATER		SAMPLE LOCATION	TOTAL PETROLEUM HYDROCARBONS DIESEL	BTEX	MOC - EPA 8240	TOTAL OIL AND GREASE	TETRAETHYL LEAD	EPA - 8270	METALS			REMARKS
							ANALYSIS REQUESTED									
5186D-mw1	7-15-91	1:15		X		Monitoring Well #1 Depth of water 12.08	X	X		X						2 Liter VOA
5186D-mw2	7-15-91	1:35		X		Monitoring Well #2 Depth of water 12.08	X	X		X						2 Liter VOA
5186D-mw3	7-15-91	1:50		X		Monitoring Well #3 Depth of WATER 12.22	X	X		X						2 Liter VOA

RELINQUISHED BY: (Signature)	DATE / TIME	RECEIVED BY: (Signature)	DATE / TIME
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L&W ENVIRONMENTAL SERVICES, INC