



Environmental Services, Inc.

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

5186D-07

**GROUNDWATER MONITORING
THREE MONTHS ENDING NOVEMBER 30, 1992
ARROYO SCHOOL
15701 LORENZO AVENUE
SAN LORENZO, CALIFORNIA**

L&W Project 5186D
January 6, 1992 1993

Prepared for
San Lorenzo Unified School District

George Wilson
Vice President

Sudhir Avalakki
Environmental Engineer

John Carver
Civil Engineer 237



GROUNDWATER MONITORING

Purpose

This report summarizes and presents the results of the quarterly monitoring of four 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 November 30, 1992. Those items which have been completed since submission of L&W Environmental Services, Inc.'s (L&W) last report are highlighted below.

Chronology

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

- 01/03/91 A 6,000 gallon fuel tank was removed.
- 01/16/91 Borings 1 through 6 were drilled.
- 01/25/91 Borings 7 through 11 were drilled.
- 01/28/91 Borings 12 and 13 were drilled.
- 01/31/91 Monitoring wells MW1 through MW3 were installed.
- 02/07/91 Monitoring wells MW1 through MW3 were monitored and sampled.
- 03/15/91 Monitoring wells MW1 through MW3 were monitored and sampled.
- 04/16/91 Monitoring wells MW1 through MW3 were monitored and sampled.
- 07/15/91 Monitoring wells MW1 through MW3 were monitored and sampled.
- 10/15/91 Monitoring wells MW1 through MW3 were monitored and sampled.
- 01/03/92 Monitoring wells MW1 through MW3 were monitored and sampled.
- 04/14/92 Monitoring wells MW1 through MW3 were monitored and sampled.
- 07/09/92 Alameda County Health Care Services Agency Order for additional work was published
- 07/21/92 Monitoring wells MW1 through MW3 were monitored and sampled.
- 07/24/92 Work Plan for one more well installation and three additional profile borings were published by L&W.
- 08/10/92 Borings B14, B15, B16 and MW4 were drilled and sampled. Boring MW4 was converted to groundwater monitoring well MW4.
- 09/11/92 Monitoring Well MW 4 was monitored and sampled.
- 11/06/92 Monitoring wells MW1 through MW4 were monitored and sampled.

Site Description

The area investigated is at the Arroyo School located at 15701 Lorenzo Avenue, 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 Vicinity Map 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 class rooms. This general location is in the approximate middle of the school complex. Figure 2, Site Plan of Appendix A shows the location of the monitoring wells and the school buildings.

Work Performed

The four monitoring wells installed at the site were measured and sampled on November 6, 1992. 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 three 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 November 6, 1992. The observations made to date are as follows:

SUMMARY OF GROUNDWATER MEASUREMENTS

Well No.	Date Measured	Top of Casing Elevation	Thickness of Free Product	Depth to Groundwater (feet)	Piezometric Surface Elevation (feet)
MW1	02/07/91	100.00	NONE	11.42	88.58
MW2	02/07/91	100.03	NONE	11.27	88.76
MW3	02/07/91	100.17	NONE	11.44	88.73
MW1	03/15/91	100.00	NONE	10.16	89.84
MW2	03/15/91	100.03	NONE	10.16	89.87
MW3	03/15/91	100.17	NONE	10.48	89.69
MW1	04/16/91	100.00	NONE	10.44	89.56
MW2	04/16/91	100.03	NONE	10.50	89.53
MW3	04/16/91	100.17	NONE	10.72	89.45
MW1	07/15/91	100.00	NONE	12.06	87.94
MW2	07/15/91	100.03	NONE	12.04	87.99
MW3	07/15/91	100.17	NONE	12.20	87.97
MW1	10/15/91	100.00	NONE	12.50	87.50
MW2	10/15/91	100.03	NONE	12.48	87.55
MW3	10/15/91	100.17	NONE	12.60	87.57
MW1	01/03/92	100.00	NONE	11.52	88.48
MW2	01/03/92	100.03	NONE	11.53	88.50
MW3	01/03/92	100.17	NONE	11.70	88.47

Well No.	Date Measured	Top of Casing Elevation	Thickness of Free Product	Depth to Groundwater (feet)	Piezometric Surface Elevation (feet)
MW1	04/14/92	100.00	NONE	10.23	89.77
MW2	04/14/92	100.03	NONE	10.24	89.79
MW3	04/14/92	100.17	NONE	10.50	89.67
MW1	07/21/92	100.00	NONE	11.96	88.04
MW2	07/21/92	100.03	NONE	11.96	88.07
MW3	07/21/92	100.17	NONE	12.08	88.09
MW4	09/11/92	100.20	NONE	12.84	87.36
MW1	11/06/92	100.00	NONE	12.20	87.80
MW2	11/06/92	100.03	NONE	12.18	87.85
MW3	11/06/92	100.17	NONE	12.32	87.85
MW4	11/06/92	100.20	NONE	12.60	87.60

The groundwater gradient for the measurements taken during each monitoring episode was calculated, plotted and presented in each separate Monitoring Report. Those gradients are summarized below.

Date	Direction of Gradient	Slope of Gradient
02/07/91	24° west of north	0.59 feet per 100 feet
03/15/91	46° east of north	0.18 feet per 100 feet
04/16/91	82° east of north	0.16 feet per 100 feet
07/15/91	10° west of north	0.17 feet per 100 feet
10/15/91	40° west of north	0.14 feet per 100 feet
01/03/92	32° west of north	0.29 feet per 100 feet
04/14/92	69° east of north	0.25 feet per 100 feet
07/21/92		
and		
09/11/92	23° east of north	2.1 feet per 100 feet
11/06/92	30° east of north	0.7 feet per 100 feet

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. A Chain-Of-Custody form is included in Appendix B. All samples were 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 No.	Date Sampled	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
MW1	10/15/91	0.080	ND/ND/ND/ND	ND
MW2	10/15/91	ND	ND/ND/ND/ND	ND
MW3	10/15/91	ND	ND/ND/ND/ND	ND
MW1	01/03/92	0.14	ND/ND/ND/ND	ND
MW2	01/03/92	ND	ND/ND/ND/ND	ND
MW3	01/03/92	0.065	ND/ND/ND/ND	ND
MW1	04/14/92	ND	ND/23/ND/ND	ND
MW2	04/14/92	ND	ND/0.7/ND/ND	ND
MW3	04/14/92	ND	ND/ND/ND/ND	ND
MW1	07/21/92	ND	ND/ND/ND/ND	ND
MW2	07/21/92	ND	ND/ND/ND/ND	ND
MW3	07/21/92	ND	ND/ND/ND/ND	ND
MW4	09/11/92	0.1	ND/ND/ND/ND	ND
MW1	11/06/92	ND	ND/ND/ND/ND	ND
MW2	11/06/92	ND	ND/ND/ND/ND	ND
MW3	11/06/92	ND	ND/ND/ND/ND	ND
MW4	11/06/92	0.07	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

All copies of the certificates from a California State Certified Laboratory for the most recent groundwater analyses are attached in Appendix B. A copy of the Chain-Of-Custody form is also included in Appendix B.

Discussion

The groundwater flow direction was to the northwest in the first monitoring event performed on February 7, 1991. Measurements taken during March and April 1991 indicated that the groundwater flow direction had moved to the northeast. Measurements taken during July 1991, October 1991 and January 1992 indicate that the groundwater flow direction had moved back to the northwest. The April and July 1992 monitoring events indicated that the groundwater flow direction had shifted back to northeast. The November 1992 monitoring event elevation readings indicate that the gradient remained in the northeast direction. Figure 3 of Appendix A shows the calculated groundwater gradient.

Concentrations of TOG were non-detectable in water samples from all wells in all the eight monitoring events performed. BTEX values in the last two consecutive monitoring events were non-detectable in water samples from all the four wells. TPH-D in MW1, MW2 and MW3 were below the method detection limit. TPH-D level in MW4 reduced from 0.1 ppm indicated during September 1992 monitoring to 0.07 ppm during this monitoring event.

Proposed Future Work

All four monitoring wells must be monitored and sampled for at least one more year on a quarterly basis. The water samples must be analyzed for TPH-D and BTEX. However, testing for TOG is not necessary based on the previous non-detectable levels in the eight monitoring events performed. The next quarterly monitoring event must occur in February 1993.

Report Submittal

Copies of this report have been submitted to:

Hazardous Materials Division
Department of Environmental Health
Alameda County Health Care Services Agency
80 Swan Way Rm 200
Oakland, CA 94621
Attn.: Pamela J Evans

California Regional Water Quality Control Board
San Francisco Bay Region
2101 Webster Street, Suite 500
Oakland, CA 94162

APPENDIX A

Figure 1 Vicinity Map

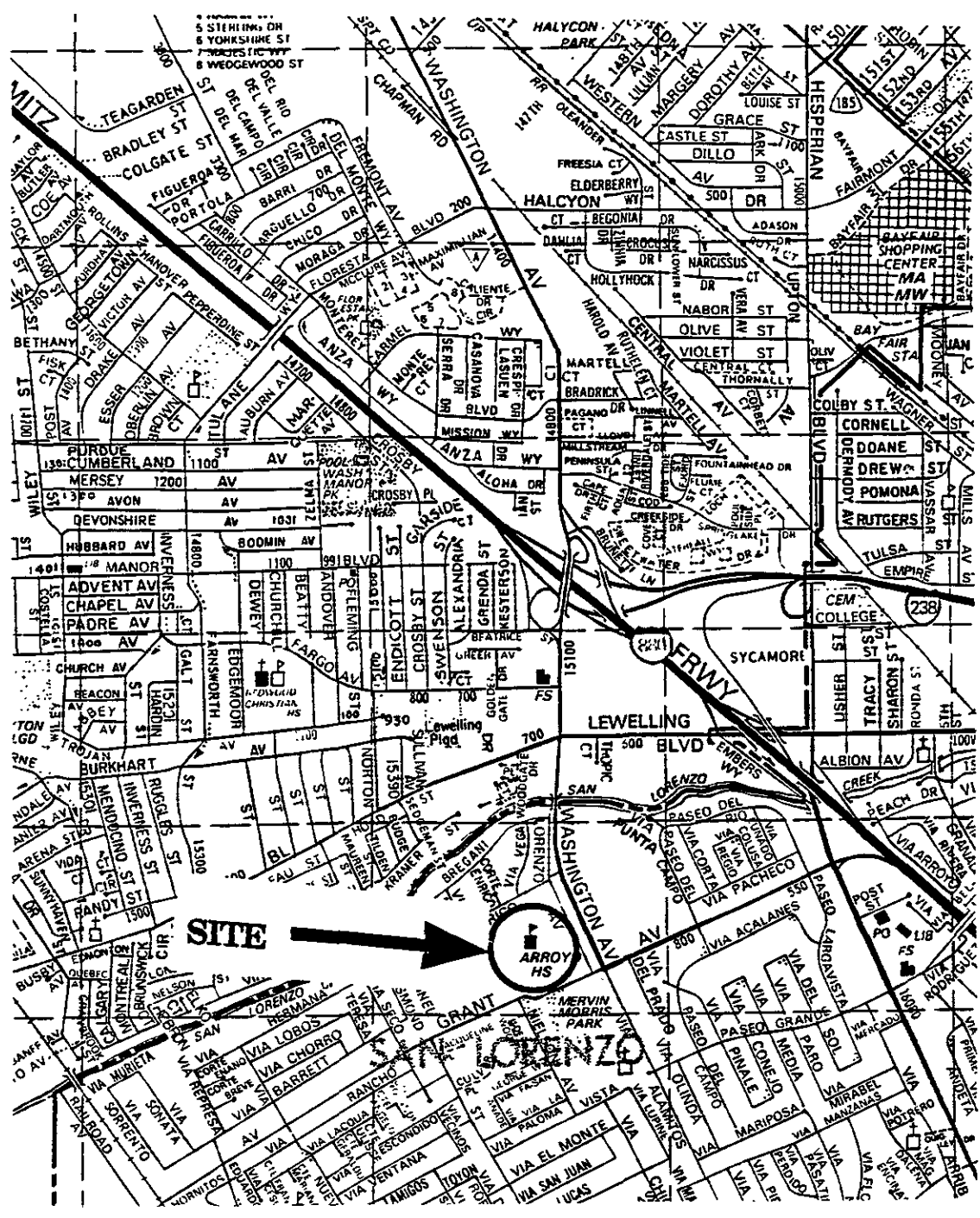
Figure 2 Site Plan

Figure 3 Groundwater Gradient

GROUNDWATER MONITORING

ARROYO HIGH SCHOOL
15701 LORENZO AVENUE
SAN LORENZO, CALIFORNIA

L&W Project 5186D
January 6, 1992



L & W Environmental Services, Inc.
2111 Jennings Street
San Francisco, California

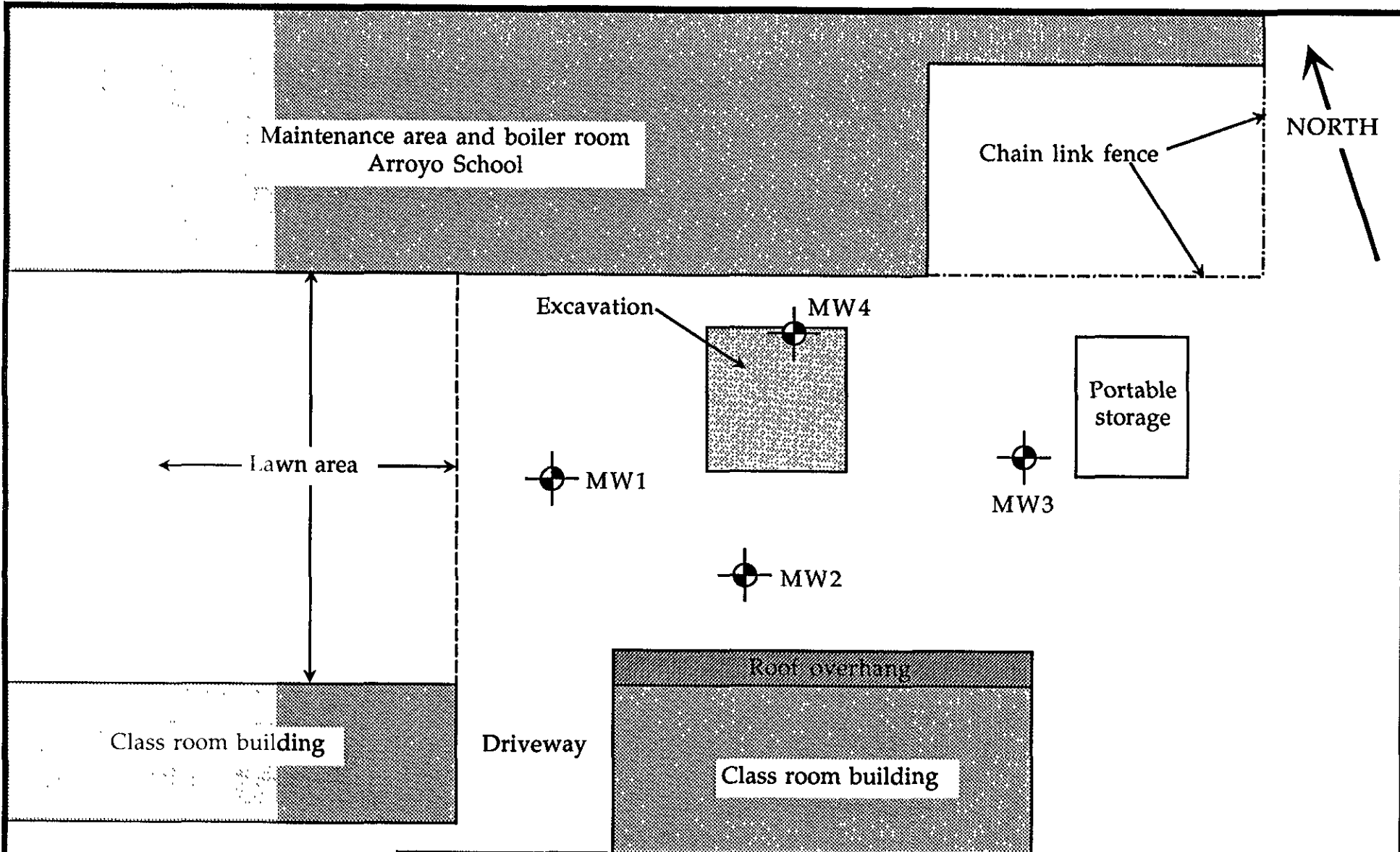
Vicinity Map
Arroyo High School
San Lorenzo, California


Project Number: 5186

Drawn by: SA

December, 1992

Figure Number: 1



 Location of monitoring well

L & W Environmental Services, Inc.
 2111 Jennings Street
 San Francisco, California

Site Plan
Arroyo School
 San Lorenzo, California

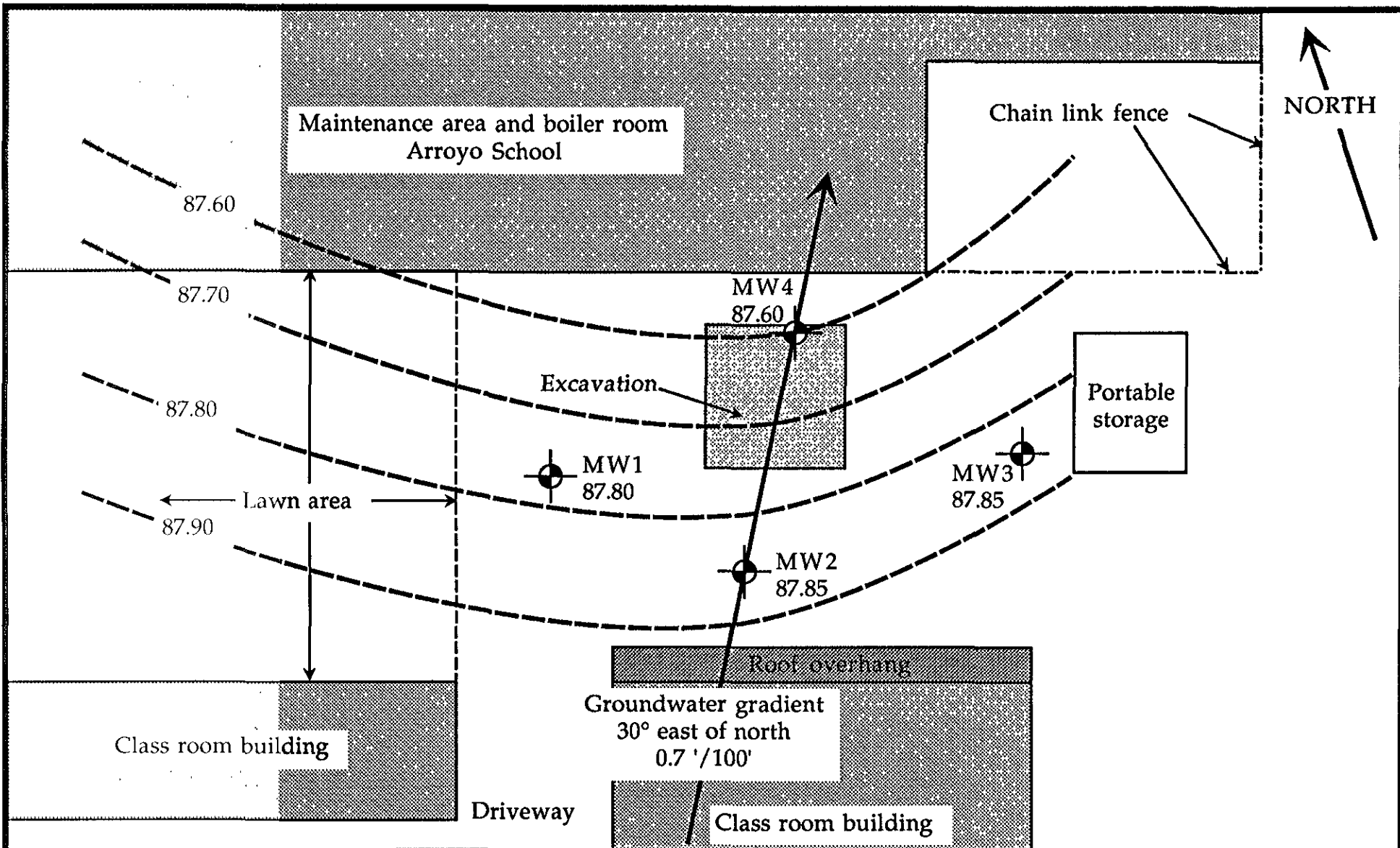
Project Number: 5186


By: SA


Scale: 1" = 20'

December, 1992

Figure Number: 2



 Location of monitoring well

 Contours of equal groundwater surface elevation

L & W Environmental Services, Inc.
 2111 Jennings Street
 San Francisco, California

Groundwater Gradient
 11/06/92
Arroyo School
 San Lorenzo, California

Project Number: 5186

By: SA

Scale: 1" = 20'

December, 1992

Figure Number: 3

APPENDIX B

Copies of Laboratory Certificates
Chain of Custody Form

GROUNDWATER MONITORING

ARROYO HIGH SCHOOL
15701 LORENZO AVENUE
SAN LORENZO, CALIFORNIA

L&W Project 5186D
January 6, 1992

SAMPLERS: (Signature)

[Signature]

PROJECT NAME:

Arroyo USD

JOB NUMBER:

5186D

DESCRIPTION:

Quarterly Ground Water Monitoring

ADDRESS:

15701 Lorenzo, San Lorenzo

ANALYSIS REQUESTED

TOTAL PETROLEUM HYDROCARBONS DIESEL
BTEX & E
VOC - EPA 8240
TOTAL OIL & GREASE
TETRAETHYL LEAD

CROSS REFERENCE NUMBER	DATE	TIME	SOL	WATER	STATION LOCATION	TOTAL PETROLEUM HYDROCARBONS DIESEL	BTEX & E	VOC - EPA 8240	TOTAL OIL & GREASE	TETRAETHYL LEAD	REMARKS
5186D-mw1	11-6-92	12:30		X	12.23 FT INTO MW1	X	X				2 Lit 3 UDA
5186D-mw2	11-6-92	12:45		X	12.24 FT INTO MW2	X	X				2 Lit 3 UDA
5186D-mw3	11-6-92	13:00		X	12.33 FT INTO MW3	X	X				2 Lit 3 UDA
5186D-mw4	11-6-92	13:15		X	12.64 FT INTO MW4	X	X				2 Lit 3 UDA

RELINQUISHED BY: (Signature)

[Signature]

DATE 11-6-92

TIME 4:00

RECEIVED BY: (Signature)

[Signature]

DATE 11-6-92

TIME 4:00 PM

RELINQUISHED BY: (Signature)

[Signature]

DATE 11/6/92

TIME 6 PM

RECEIVED BY: (Signature)

[Signature]

DATE 11/6/92

TIME 6 PM

RELINQUISHED BY: (Signature)

[Signature]

DATE 8 AM

TIME 11/9/92

RECEIVED BY: (Signature)

[Signature]

DATE 8 AM

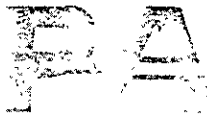
TIME 11/9/92

RELINQUISHED BY: (Signature)

RECEIVED FOR LABORATORY BY: (Signature)

DATE

TIME



Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE, RICHMOND, CA 94806

PHONE (510) 222-3002

FAX (510) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. 1150

Received: 11/09/92
Extraction: 11/13/92
Reported: 12/18/92
Job #: 74083

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

Project: Arroyo U.S.D.
15701 Lorenzo, San Lorenzo, CA
Matrix: Water

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

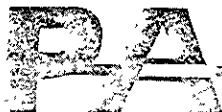
Table with 4 columns: Lab I.D., Client I.D., Diesel Range, MDL. Rows include samples 74083-1 through 74083-4 with corresponding client IDs and detection limits.

QA/QC: Spike Recovery: 101%

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

Signature of Jaime Chow
Jaime Chow
Laboratory Director

JC/td



Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE, RICHMOND, CA 94806

PHONE (510) 222-3002

FAX (510) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. 1150

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

Received: 11/09/92
Reported: 12/18/92
Job #: 74083

Project: Arroyo U.S.D.
15701 Lorenzo, San Lorenzo, CA
Matrix: Water

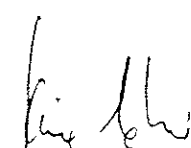
Aromatic Volatile Hydrocarbon Analysis
EPA Method 602
µg/L

<u>Lab I.D.</u>	<u>Client I.D.</u>	<u>Benzene</u>	<u>MDL</u>	<u>Toluene</u>	<u>MDL</u>
74083-1	5186D-MW1	ND<0.3	0.3	ND<0.3	0.3
74083-2	5186D-MW2	ND<0.3	0.3	ND<0.3	0.3
74083-3	5186D-MW3	ND<0.3	0.3	ND<0.3	0.3
74083-4	5186D-MW4	ND<0.3	0.3	ND<0.3	0.3

<u>Lab I.D.</u>	<u>Client I.D.</u>	<u>Ethyl- benzene</u>	<u>MDL</u>	<u>Xylenes</u>	<u>MDL</u>
74083-1	5186D-MW1	ND<0.3	0.3	ND<0.6	0.6
74083-2	5186D-MW2	ND<0.3	0.3	ND<0.6	0.6
74083-3	5186D-MW3	ND<0.3	0.3	ND<0.6	0.6
74083-4	5186D-MW4	ND<0.3	0.3	ND<0.6	0.6

QA/QC: Spike Recovery for Benzene: 92%
Spike Recovery for Toluene: 99%
Spike Recovery for Xylene: 110%

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



Jaime Chow
Laboratory Director

JC/td

OUTSTANDING QUALITY AND SERVICE
CALIFORNIA STATE CERTIFIED LABORATORY



Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE, RICHMOND, CA 94806

PHONE (510) 222-3002

FAX (510) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. 1150

Received: 11/09/92

Reported: 12/18/92

Job #: 74083

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

Project: Arroyo U.S.D.
15701 Lorenzo, San Lorenzo, CA
Matrix: Water

Total Oil and Grease Analysis
EPA Method 5520B
mg/L

Table with 4 columns: Lab I.D., Client I.D., Total Oil and Grease, MDL. Rows show samples 74083-1 to 74083-4 with results ND<5 and MDL 5.

QA/QC: Spike Recovery: 84%

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

Signature of Jaime Chow
Jaime Chow
Laboratory Director

JC/td