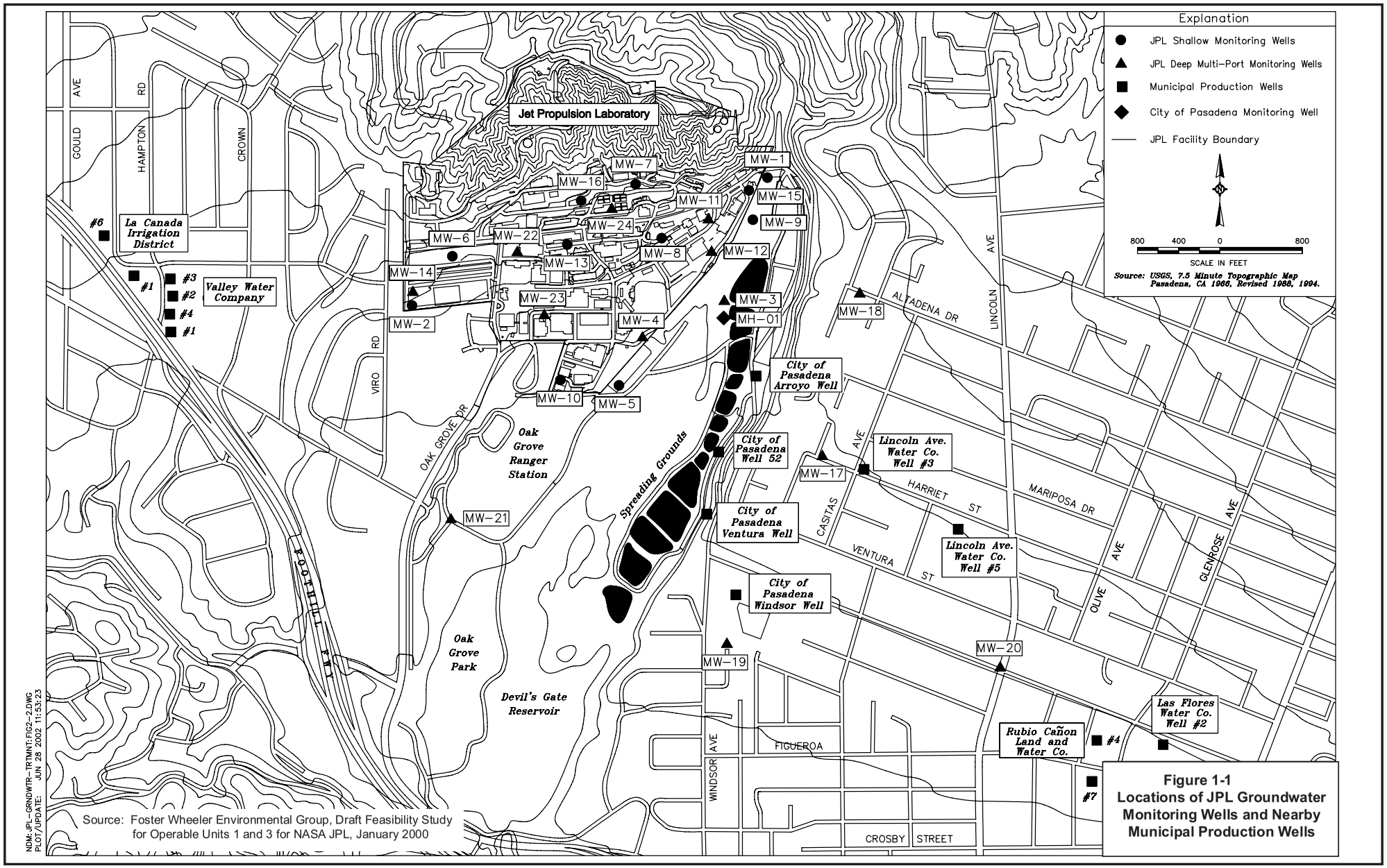


Source: Foster Wheeler Environmental Group, Draft Feasibility Study for Operable Units 1 and 3 for NASA JPL, January 2000

Figure 1-1
Locations of JPL Groundwater Monitoring Wells and Nearby Municipal Production Wells

NDM: JPL--GRNDWTR--TRTMNT: FIG2--2.DWG
PLOT/UPDATE: JUN 28 2002 11:53:23

E072002002SCO/161655.02.08.01/Figure 1-2.INDD 07/02

Figure 1-2
Schematic of Arroyo Well

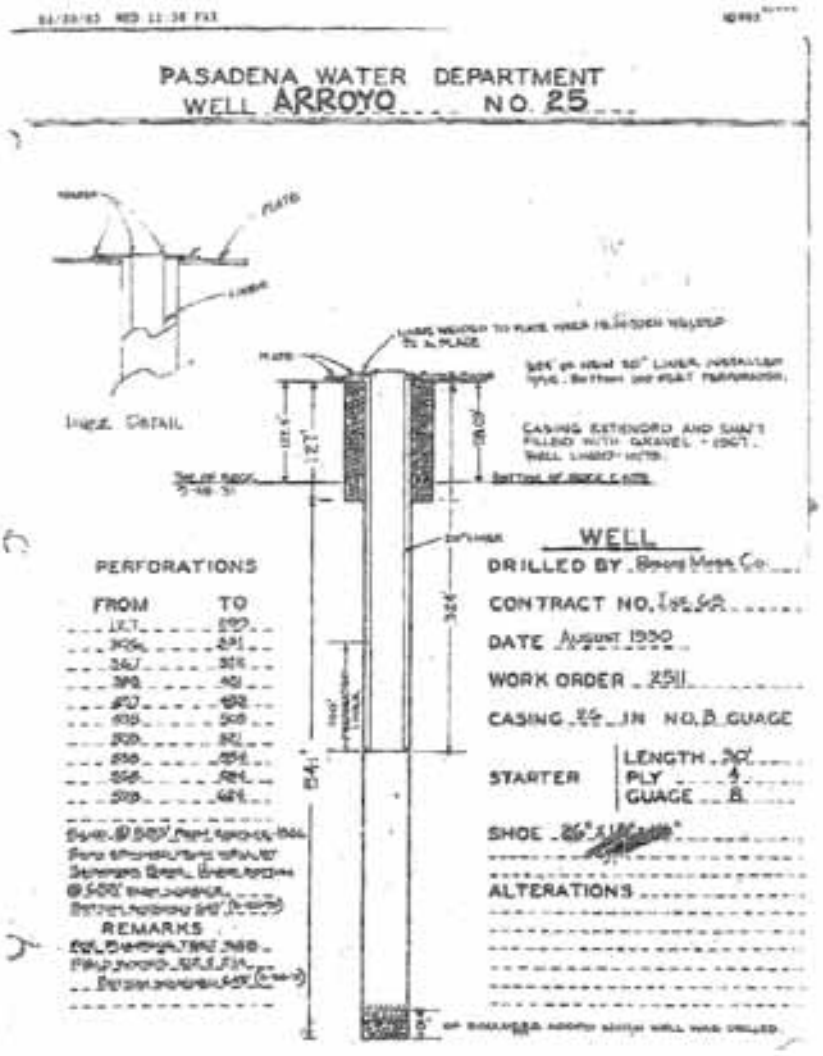
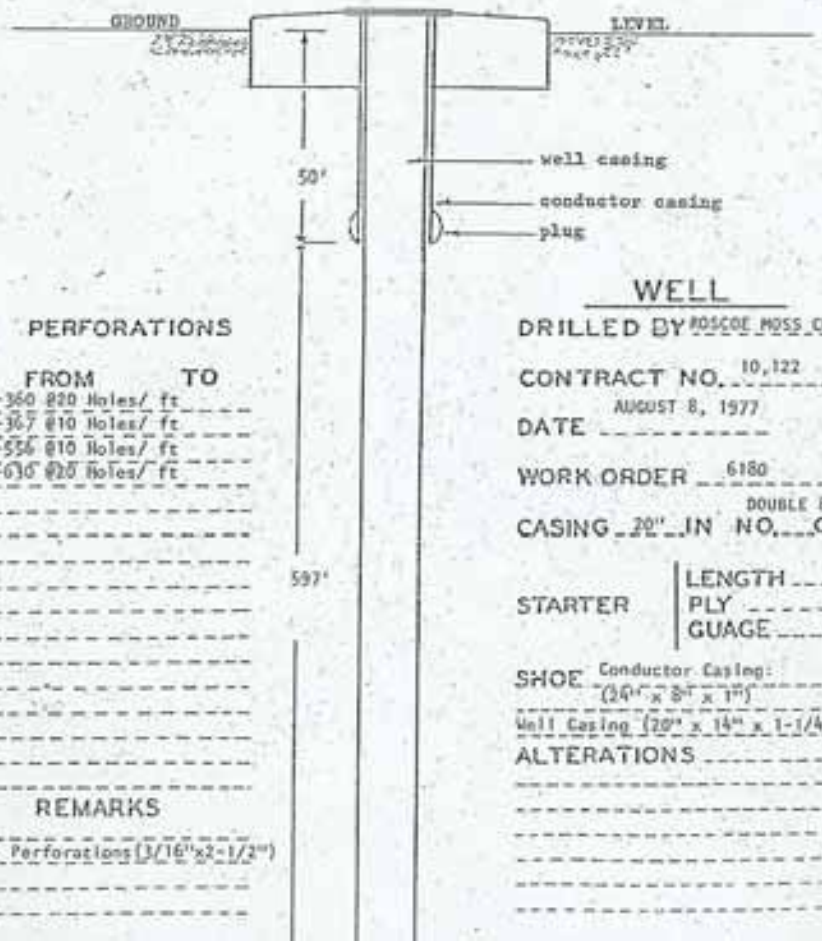


Figure 1-2
Schematic of Arroyo Well

Figure 1-3
Schematic of Well 52

PASADENA WATER DEPARTMENT

WELL _____ NO. 52



PERFORATIONS

FROM	TO	
250	360	@20 Holes/ ft
360	367	@10 Holes/ ft
372	556	@10 Holes/ ft
556	630	@20 Holes/ ft

REMARKS

Size Perforations (3/16"x2-1/2")

WELL

DRILLED BY ROSCOE MOSS COMPANY

CONTRACT NO. 10,122

DATE AUGUST 8, 1977

WORK ORDER 6180

CASING 20" IN NO. DOUBLE 8 GUAGE

STARTER | LENGTH 23' | PLY 3" | GUAGE 8'

SHOE Conductor Casing: (24" x 8" x 1")

Well Casing (20" x 14" x 1-1/4")

ALTERATIONS

Figure 1-4
Schematic of Ventura Well

PASADENA WATER DIVISION

WELL VENTURA NO. 21

Depth to Sand

Date	Depth
11/65	426
11/66	429
3/71	419
7/71	424
12/71	473

PERFORATIONS

FROM	TO
102	141
164	212
241	311
410	468

REMARKS

(1) Casing looks bigger than double 8

473'

Floor Level

WELL

DRILLED BY Roscoe Moss Co.

CONTRACT NO. 1181

DATE 4/25/1924

WORK ORDER 1390

CASING 26 IN NO. 8 (1) GUAGE

STARTER | LENGTH 30' | PLY Double 1/4" | GUAGE

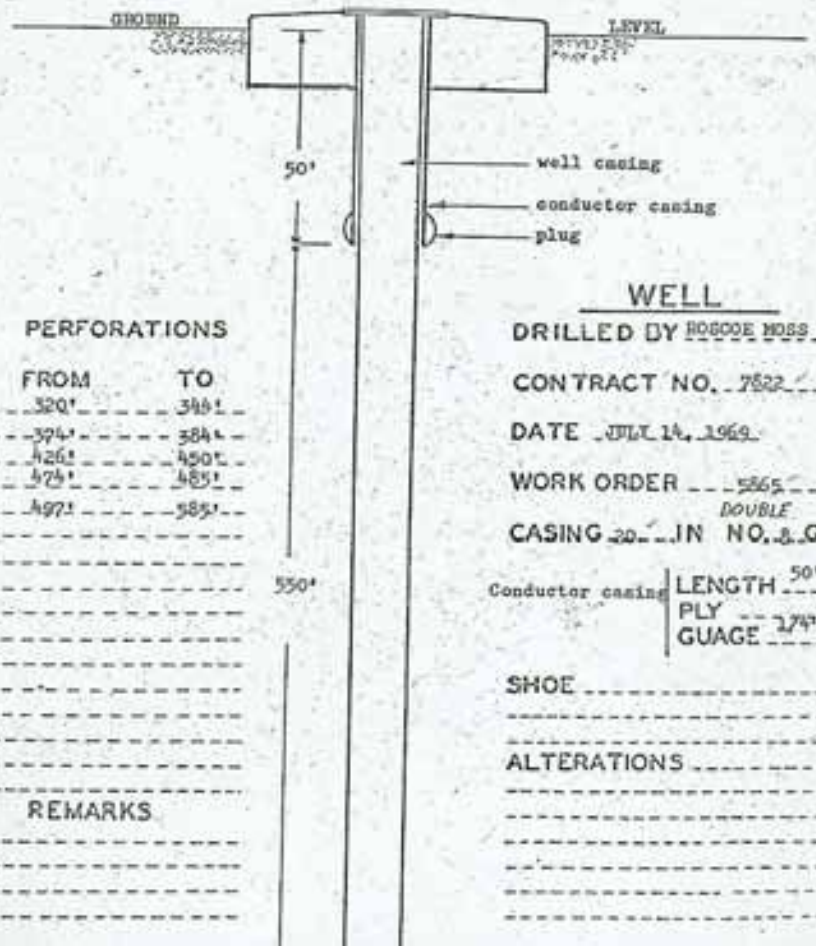
SHOE 26" x 12" x 1/4"

ALTERATIONS

Figure 1-5
Schematic of Windsor Well

PASADENA WATER DEPARTMENT

WELL WINDSOR NO. 48



PERFORATIONS

FROM	TO
320'	349'
374'	384'
426'	450'
474'	485'
497'	585'

REMARKS

WELL

DRILLED BY ROGGOE MOSS CO.

CONTRACT NO. 7822

DATE JULY 14, 1969

WORK ORDER 5865

CASING 20 IN DOUBLE NO. 8 GUAGE

Conductor casing LENGTH 50'
PLY
GUAGE 3/4"

SHOE

ALTERATIONS

Figure 1-6
Well Log for Rubio Canyon #4

INVESTIGATION

DIVISION OF WATER RESOURCES
DEPARTMENT OF PUBLIC WORKS
STATE OF CALIFORNIA

SHEET 1

~~South Coastal Basin~~

WELL LOG

NUMBER ~~C-37-6/8~~

LOCAL DESIGNATION P.W.D. #141
Rubio Canyon Land and Water Assoc. #1
Figueroa St. well #4
Location #40418
1N/12W-8H3

LOCATION ~~230' north of Figueroa St. and 200'~~ east of Crescent Ave., Altadena. No pit.

OWNER Rubio Canyon Land and Water Assoc. #1

DATE COMPLETED ~~February~~ May, 1924

DIAMETER OF CASING ~~26"~~ 20" P.W.D ~~Depth 701'~~

DRILLED BY Local Well Drilling Co.

SOURCE OF INFORMATION P.W.D. & driller

INSPECTED WHILE DRILLING _____ SEE FILE NO. _____

SURFACE ELEVATION ~~1150.6 D.W.R.~~ 11

JCK

DEPTH	ELEVATION OF BOTTOM OF STRATUM	MATERIAL	THICKNESS FEET	% SAND	ABSOLUTE SAND FEET	TOTAL SAND FEET
0-160	991	Dug pit				
160-170	981	Gravel	10			
170-195	956	Clay	25			
195-325	826	Gravel and boulders	130			
325-335	816	Clay	10			
335-347	805	Gravel and boulders	12			
347-425	726	Clay	78			
425-440	711	Conglomerate	15			
440-480	671	Clay	40			
480-485	666	Gravel	5			
485-548	603	Sandy clay	63			
548-553	598	Gravel	5			
553-571	573	Clay	18			
571-582	562	Conglomerate	11			
582-601	501	Clay	19.5			

626' bottom of casing

Perf. 160-170, 195-325, 335-347

Water level 179'

Casing kicked at 400'

MICROFILMED

FOR FIELD COPIES USE ALTERNATE LINES

LOG OBTAINED BY _____ DATE _____

DWR 8-67 5M
CALIFORNIA STATE PRINTING OFFICE

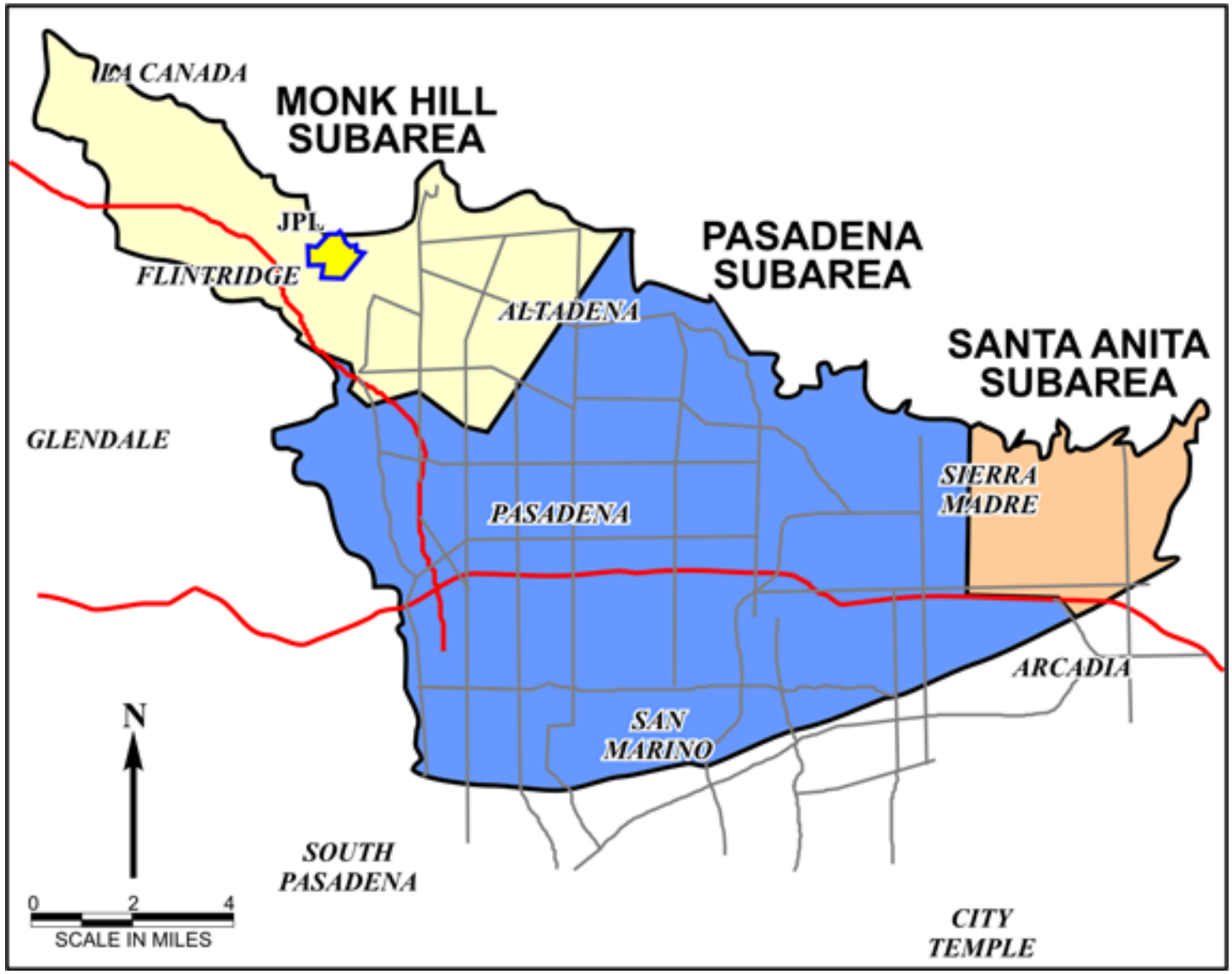
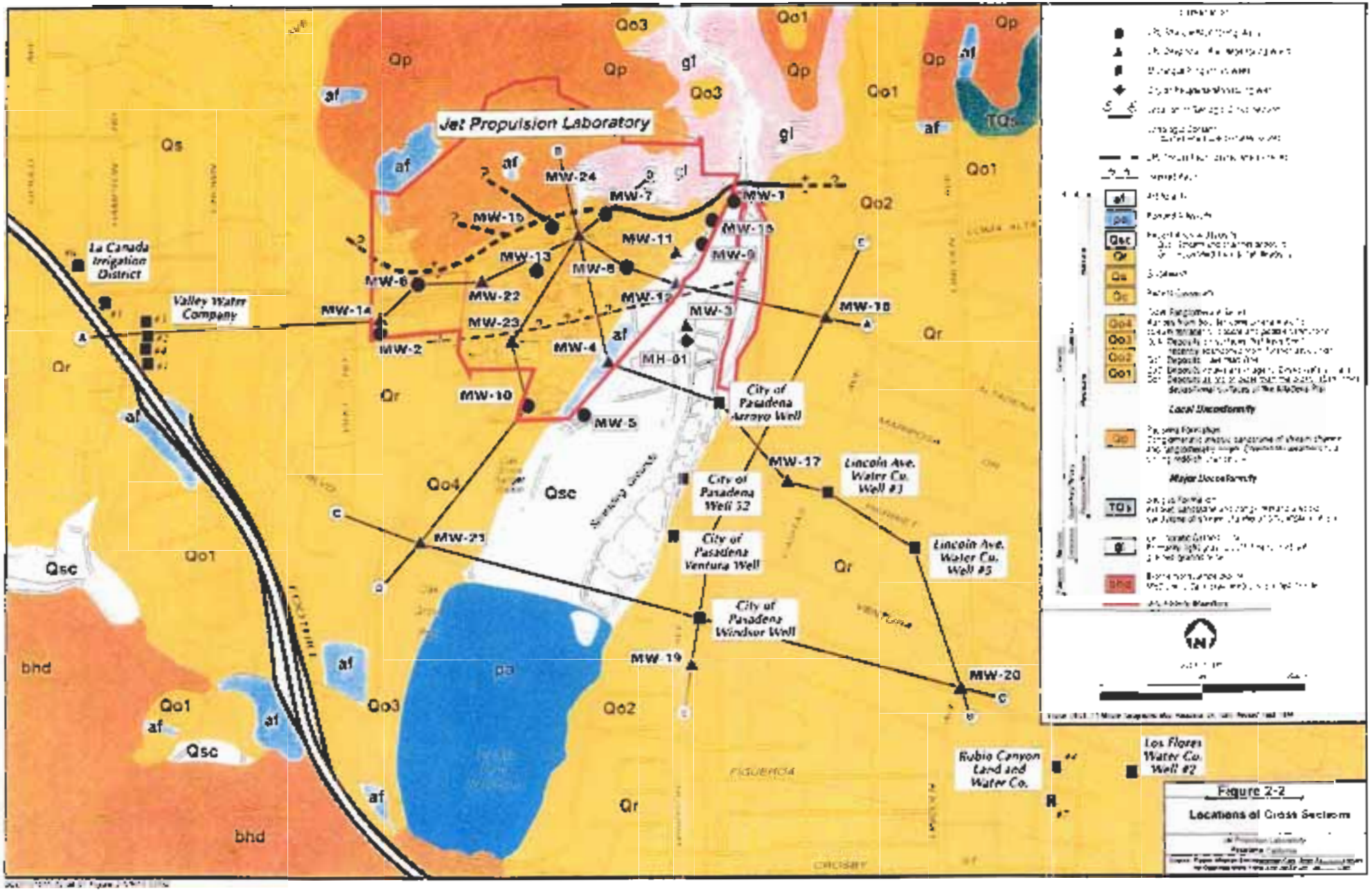
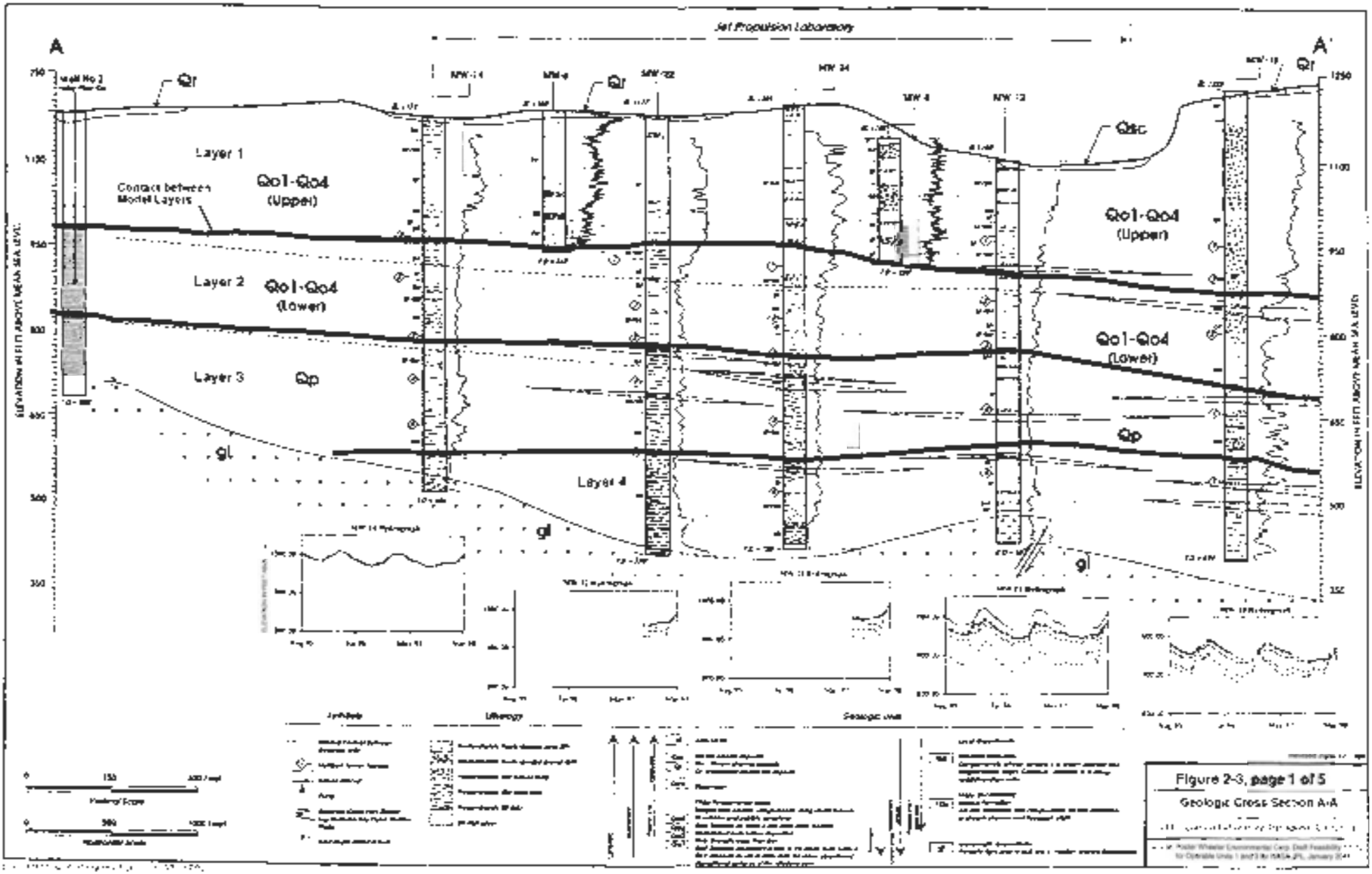


Figure 2-1. Subareas of the Raymond Basin


Jet Propulsion Laboratory
La Canada Irrigation District
Valley Water Company
City of Pasadena Arroyo Well
City of Pasadena Well 32
City of Pasadena Ventura Well
City of Pasadena Windsor Well
Lincoln Ave. Water Co. Well #3
Lincoln Ave. Water Co. Well #5
Rubio Canyon Land and Water Co.
Los Flores Water Co. Well #2
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
MW-8
MW-9
MW-10
MW-11
MW-12
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18
MW-19
MW-20
MW-21
MW-22
MW-23
MW-24
MH-01
Qp
Qo1
Qo2
Qo3
Qo4
Qsc
Qs
Qr
af
gl
bhd
TQs
pa
Local Unconformity
Major Unconformity
Figure 2-2
Locations of Cross Sections


Jet Propulsion Laboratory
A
A'
Qf
Layer 1
Qo1-Qo4
(Upper)
Contact between
Model Layers
Layer 2
Qo1-Qo4
(Lower)
Layer 3
Qp
Layer 4
gl
Qdc
Qo1-Qo4
(Upper)
Qo1-Qo4
(Lower)
Qp
gl
Figure 2-3, page 1 of 5
Geologic Cross Section A-A

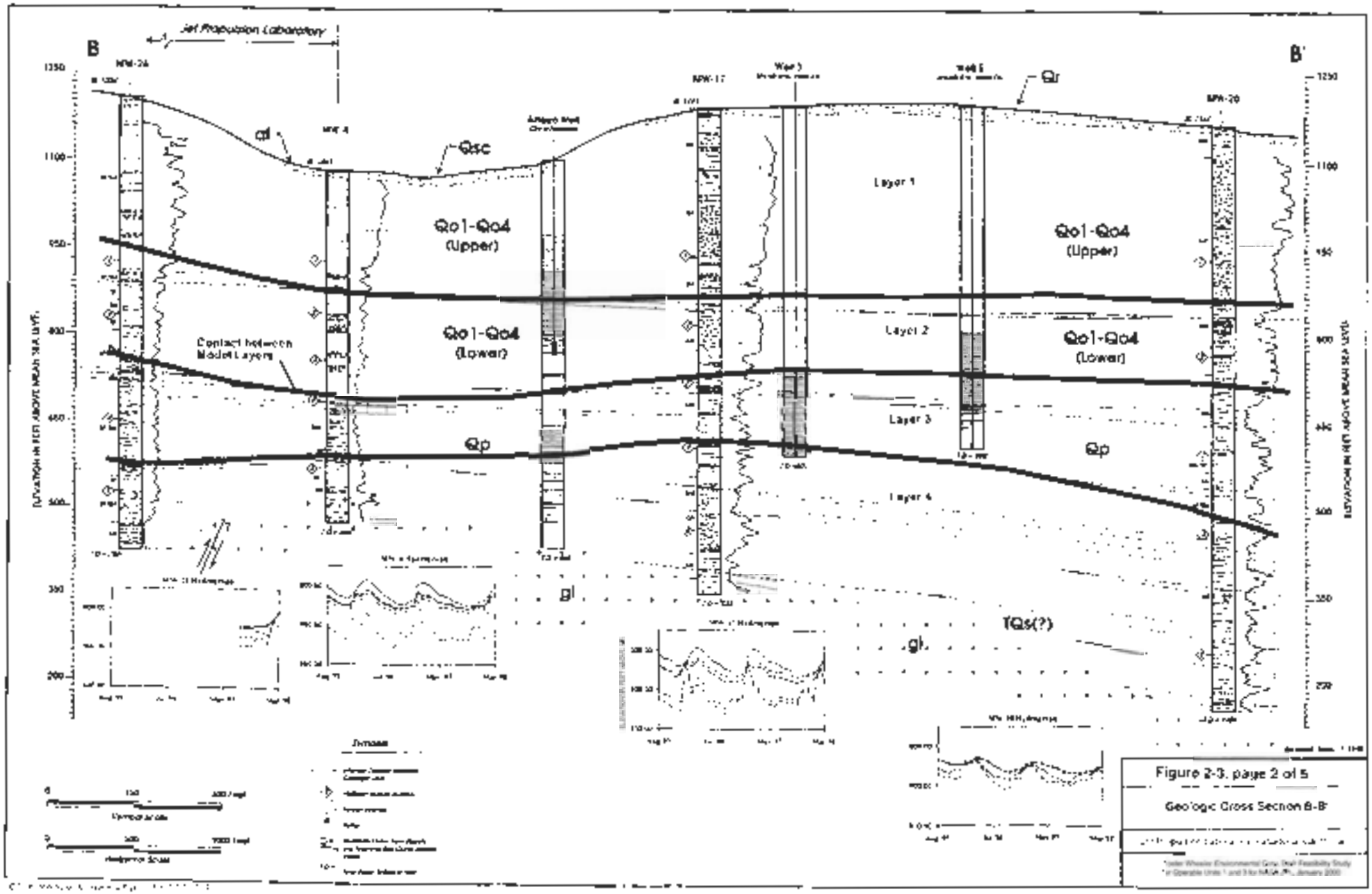


Figure 2-3, page 2 of 5

Geologic Cross Section B-B'

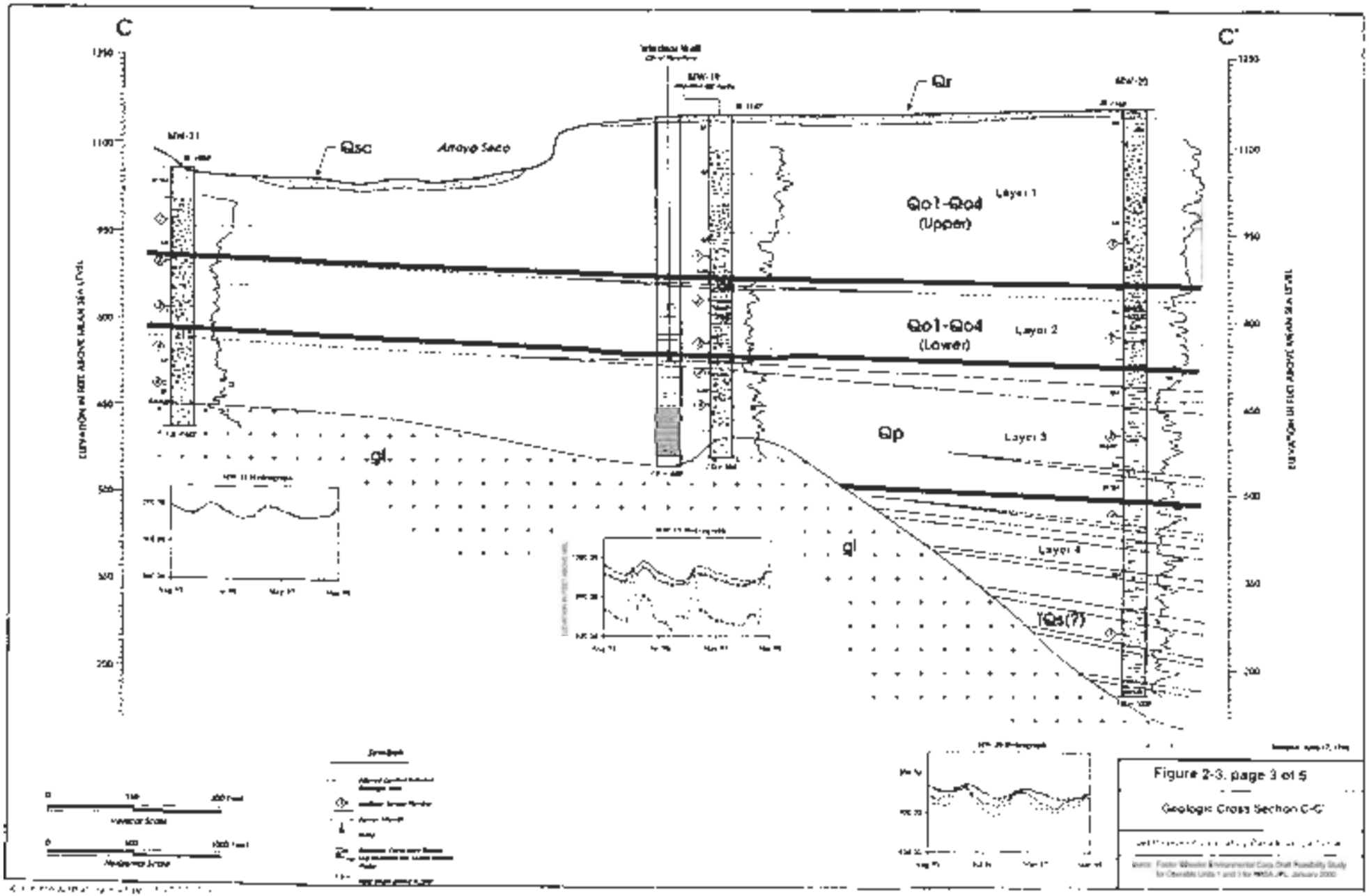


Figure 2-3, page 3 of 5

Geologic Cross Section C-C'

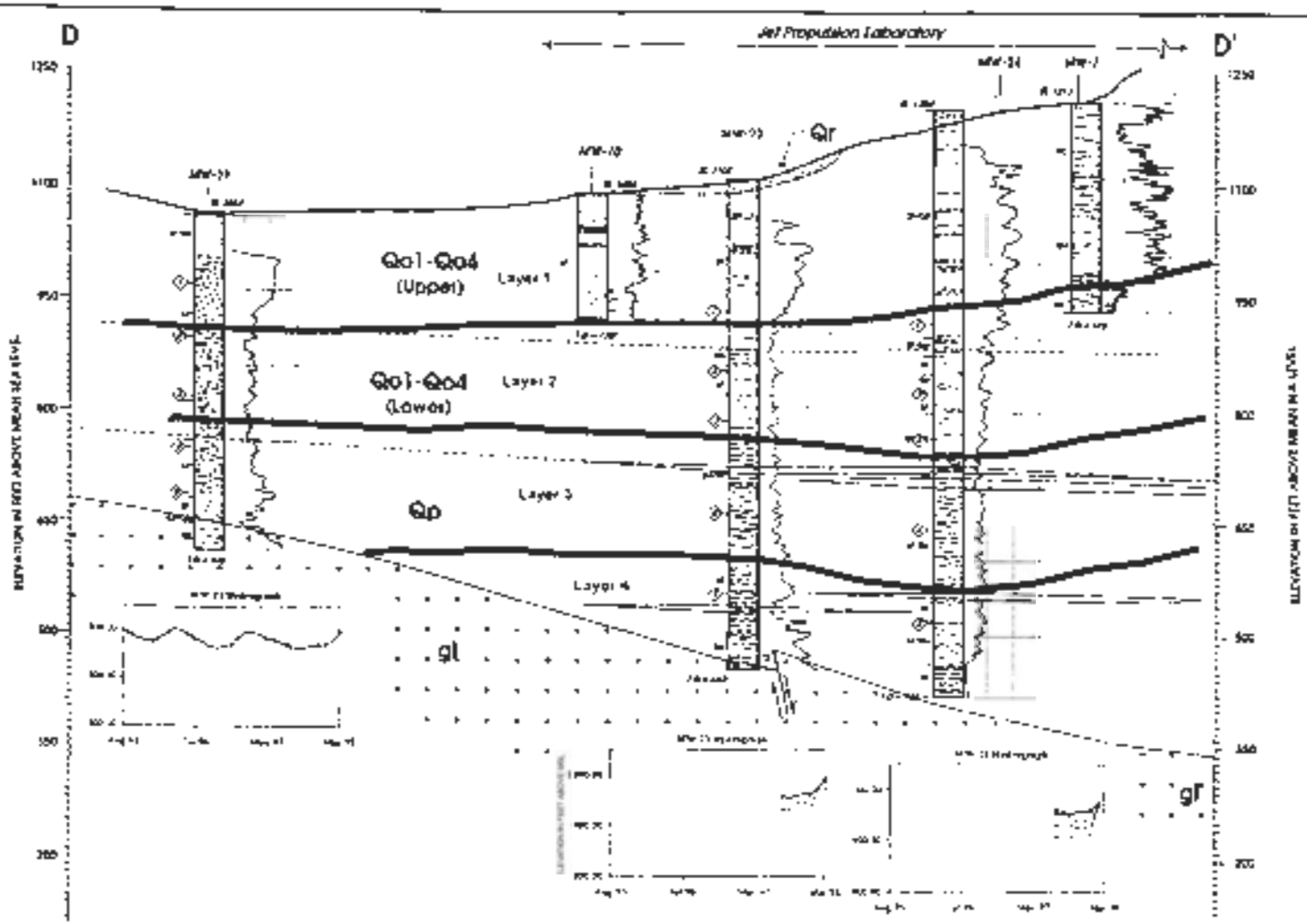


Figure 2-3, page 4 of 5

Geologic Cross Section D-D'

Source: Foster Wheeler Environmental Corp. Draft Feasibility Study for Operable Units 1 and 3 for NASA JPL, January 2000

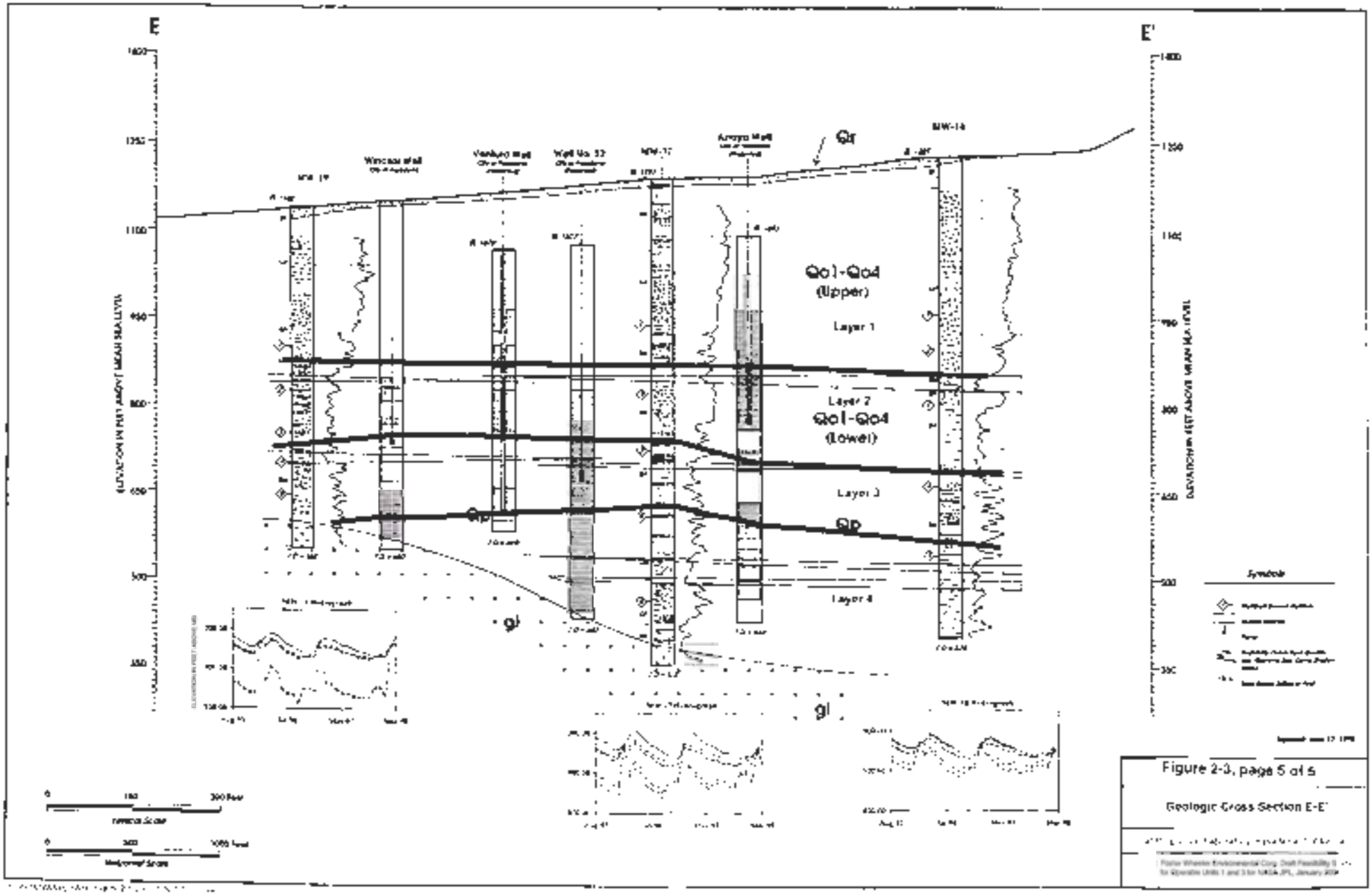


Figure 2-3, page 5 of 5

Geologic Cross Section E-E'

Aquifer Layer 1

Aquifer Layer 2

Aquifer Layer 3

Explanation

- Site boundary
- City of Pasadena municipal production well
- Location of shallow groundwater monitoring well
- Location of deep multi-port groundwater monitoring well
- Direction of groundwater flow
- Screen number
- 3 88.0' Groundwater elevation (ft. above mean sea level) for data collected February 9, 2004

N

Approximate Scale in Feet

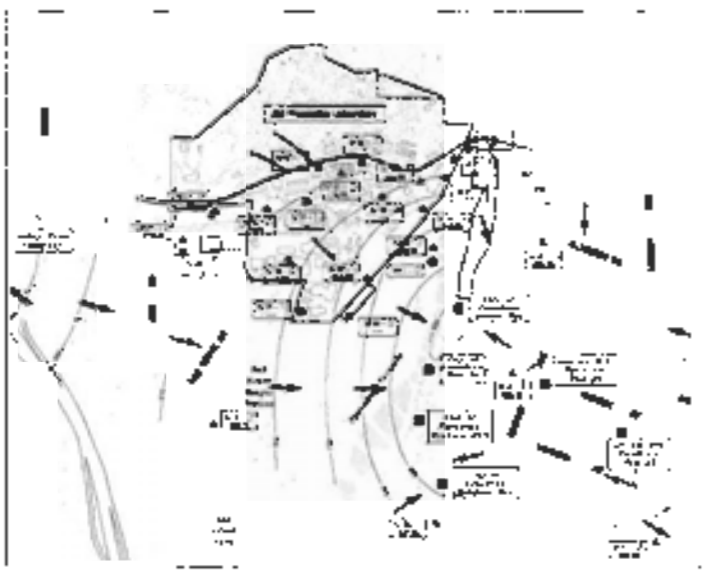
Figure 3-4

Groundwater Elevation Contour Maps for Aquifer Layers 1, 2, and 3 When Nearby Municipal Production Wells are not Operating

JET PROPULSION LABORATORY - CA

CARRIER: 1 | PL: GROUNDTOPO_1234.DGN | 12/04

AQUIFER LAYER 1



AQUIFER LAYER 2

AQUIFER LAYER 3

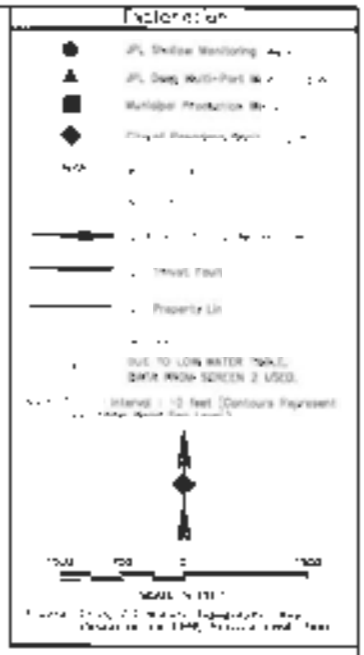


Figure 2-5

GROUNDWATER ELEVATION CONTOUR MAPS FOR AQUIFER LAYERS 1, 2 AND 3 WITH NEARBY MUNICIPAL PRODUCTION WELLS AND OPERATING

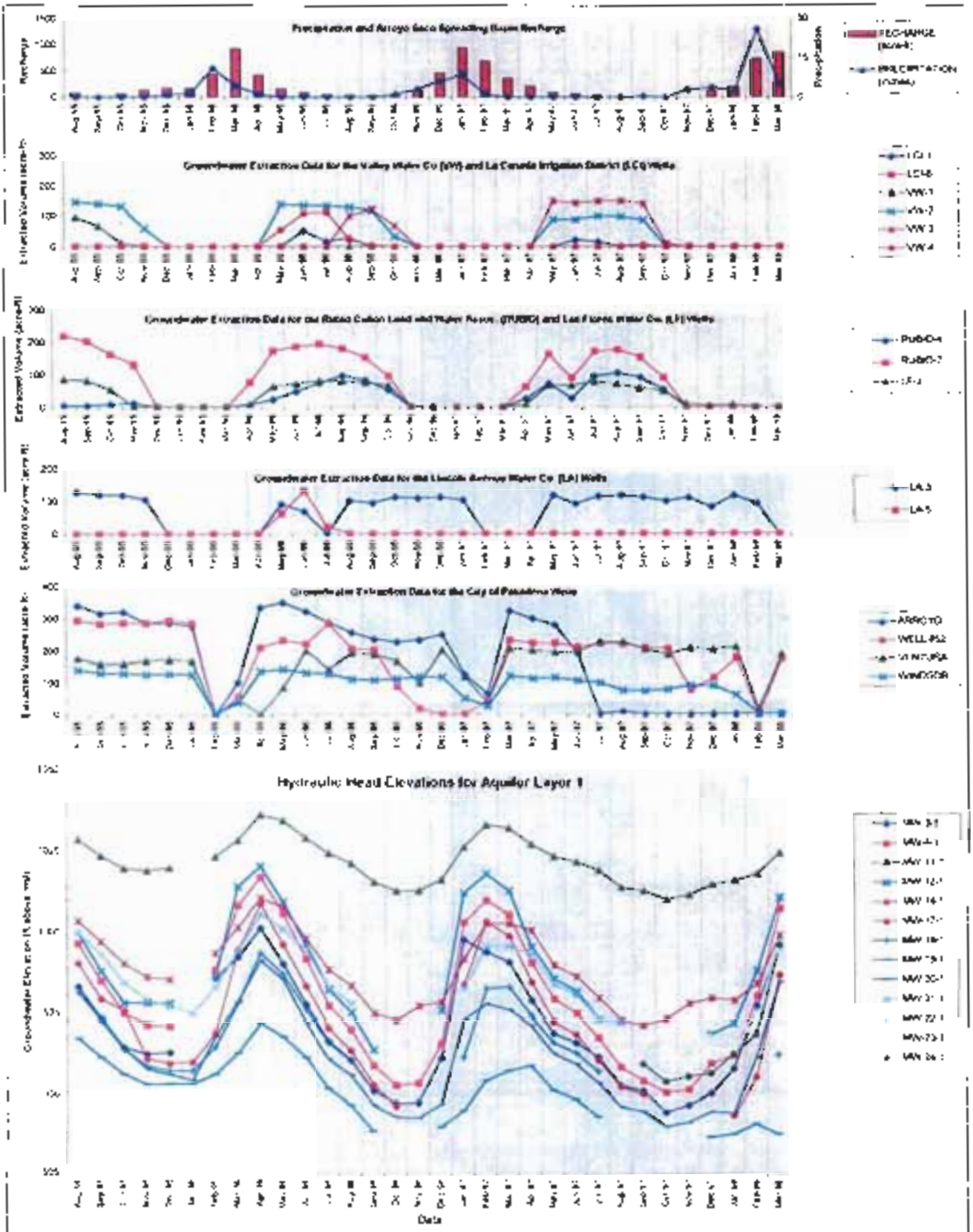


Figure 2-6

MUNICIPAL WELL PUMPING VOLUMES, PRECIPITATION DATA, SPREADING BASIN RECHARGE DATA, AND WATER-LEVEL ELEVATIONS FROM MONITORING WELLS IN AQUIFER LAYER 1

Pasadena, California

Source: Valley Water Environmental Data Warehouse Data, Pasadena Water and Power, Rubio Canyon Land and Water Association, Lincoln Avenue Water Co., La Canada Irrigation District, Pasadena Water Division

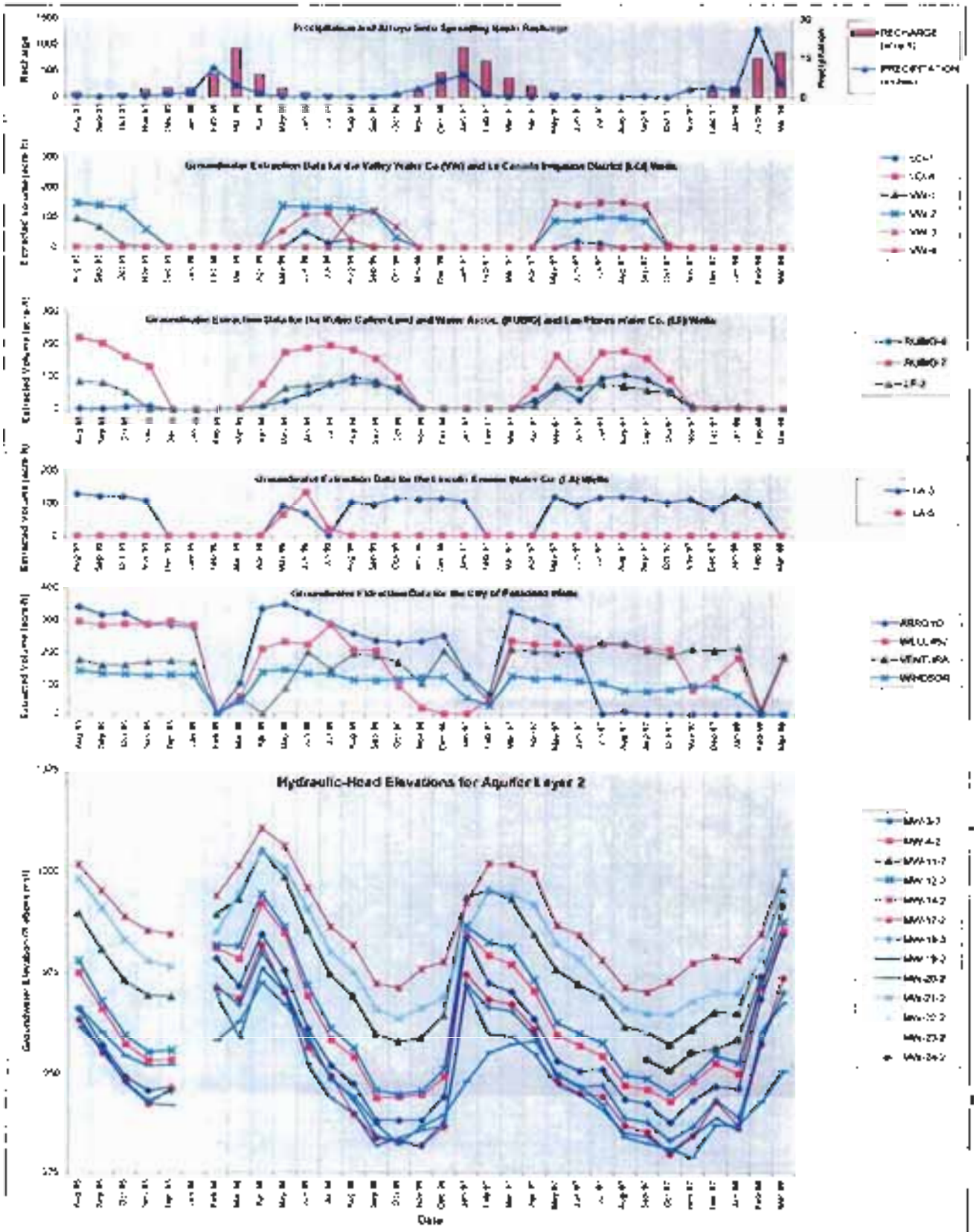


Figure 2-7

[illegible] WELL PUMPING VOLUMES
PRECIPITATION DATA SPREADING BASIN RECHARGE DATA
AND HYDRAULIC-HEAD ELEVATIONS FOR
AQUIFER LAYER 2

[illegible]
Pasadena, California

[illegible]

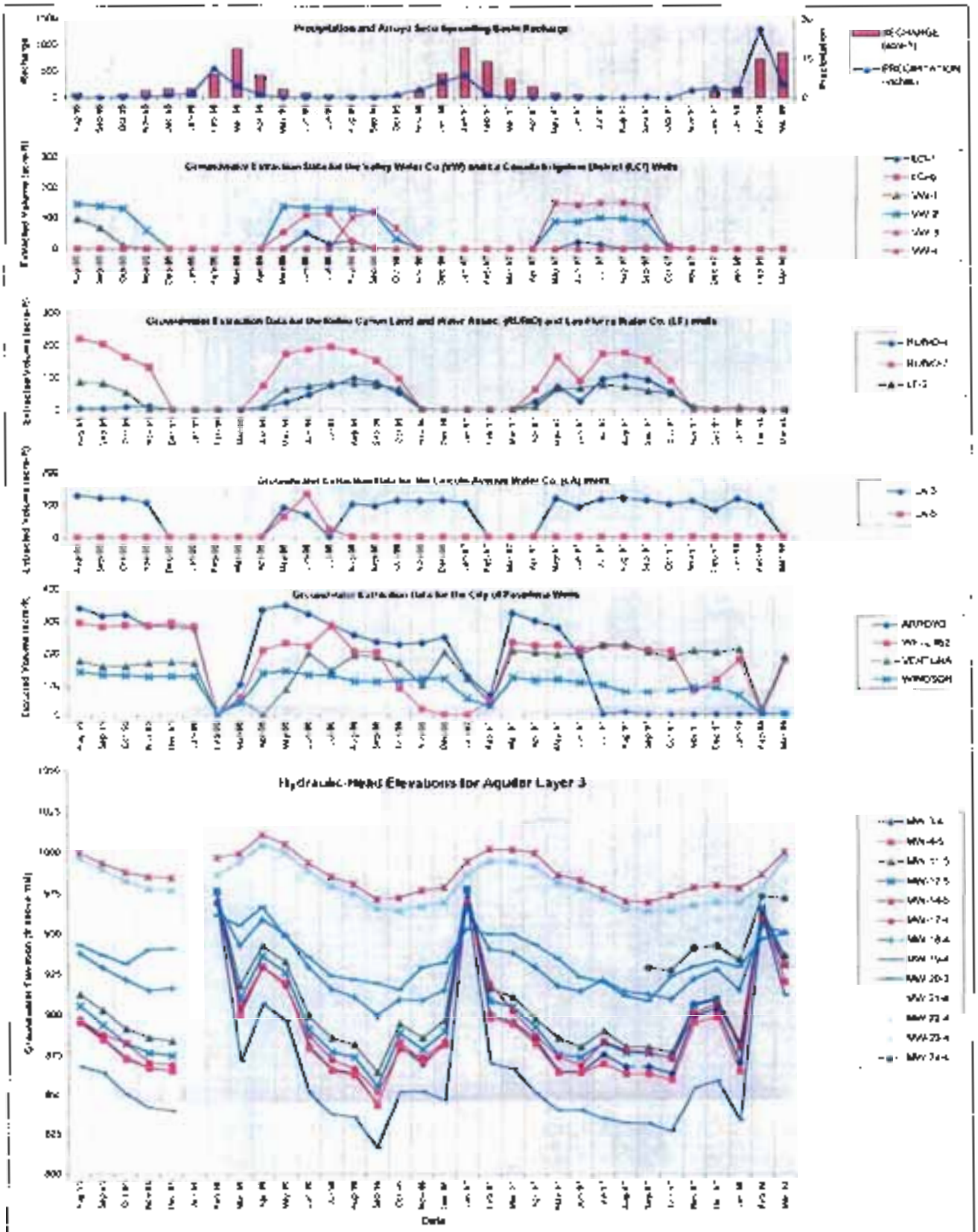


Figure 2-6

MUNICIPAL WELL PUMPING VOLUMES
PRECIPITATION DATA, SPREADING-BASIN RECHARGE DATA
AND HYDRAULIC-HEAD ELEVATIONS FOR
AQUIFER LAYER 3

3000/61885.07/06 A4 Hyd-hd2-11.pld 8/07

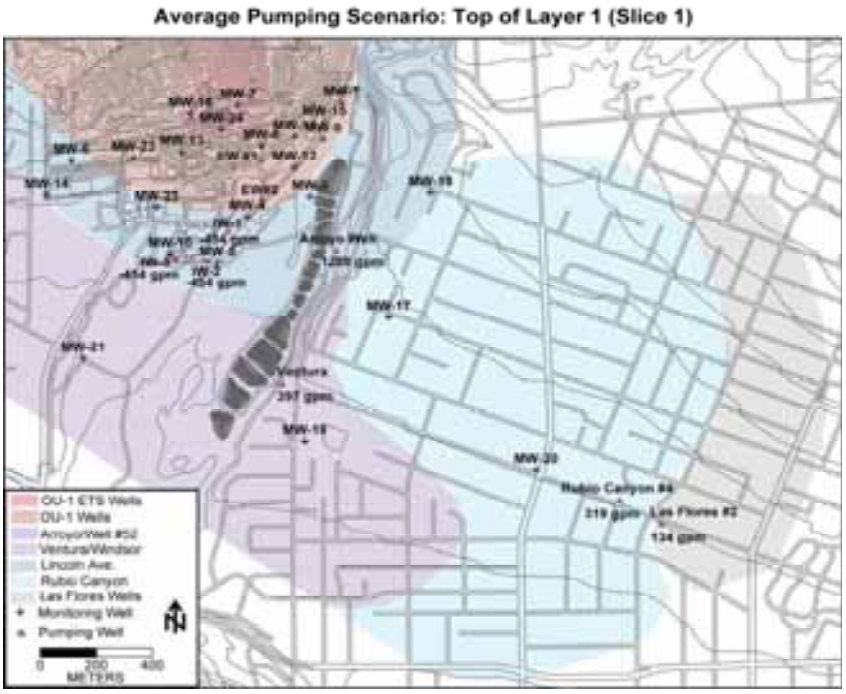


Figure 2-9. Capture Zone for the Wells Located in the Top of Layer 1

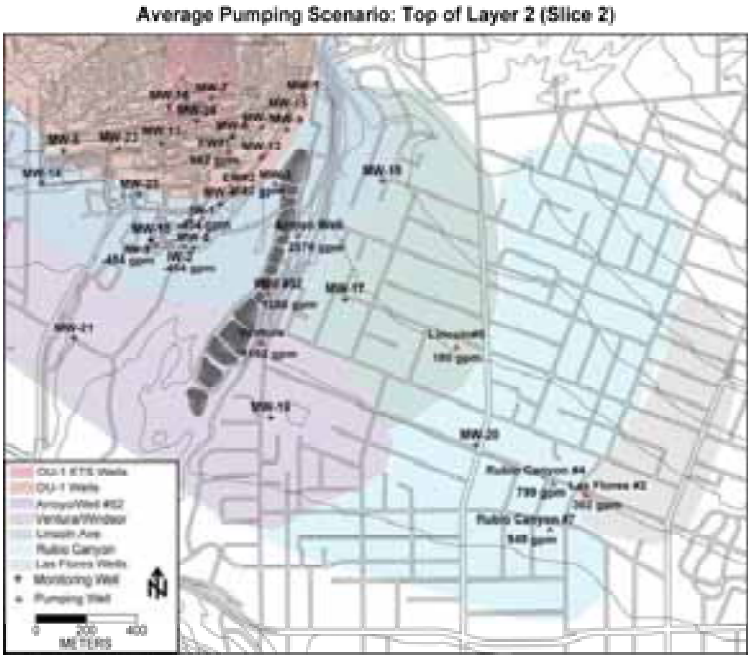


Figure 2-10. Capture Zone for the Wells Located in the Bottom of Layer 1/ Top of Layer 2

Average Pumping Scenario: Top of Layer 3 (Slice 3)

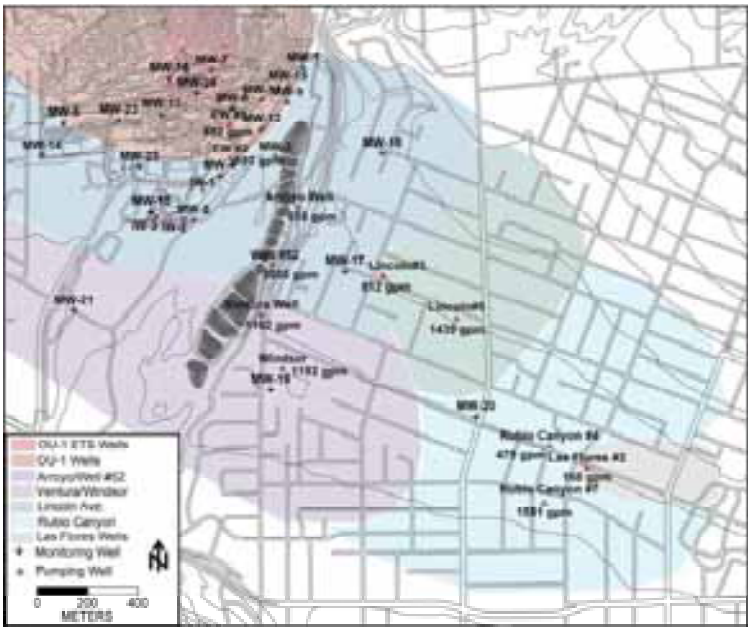


Figure 2-11. Capture Zone for the Wells Located in the Bottom of Layer 2/ Top of Layer 3

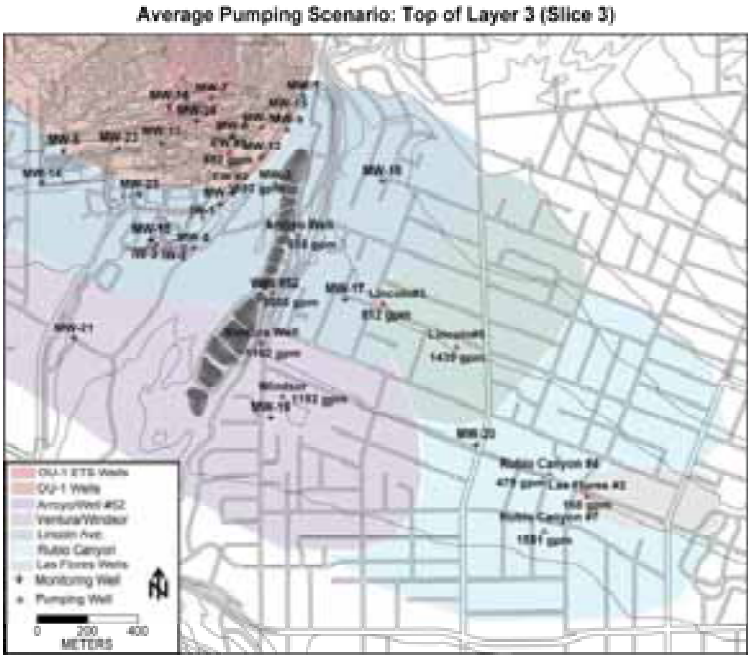


Figure 2-12. Capture Zone for the Wells Located in the Bottom of Layer 3/Top of Layer 4

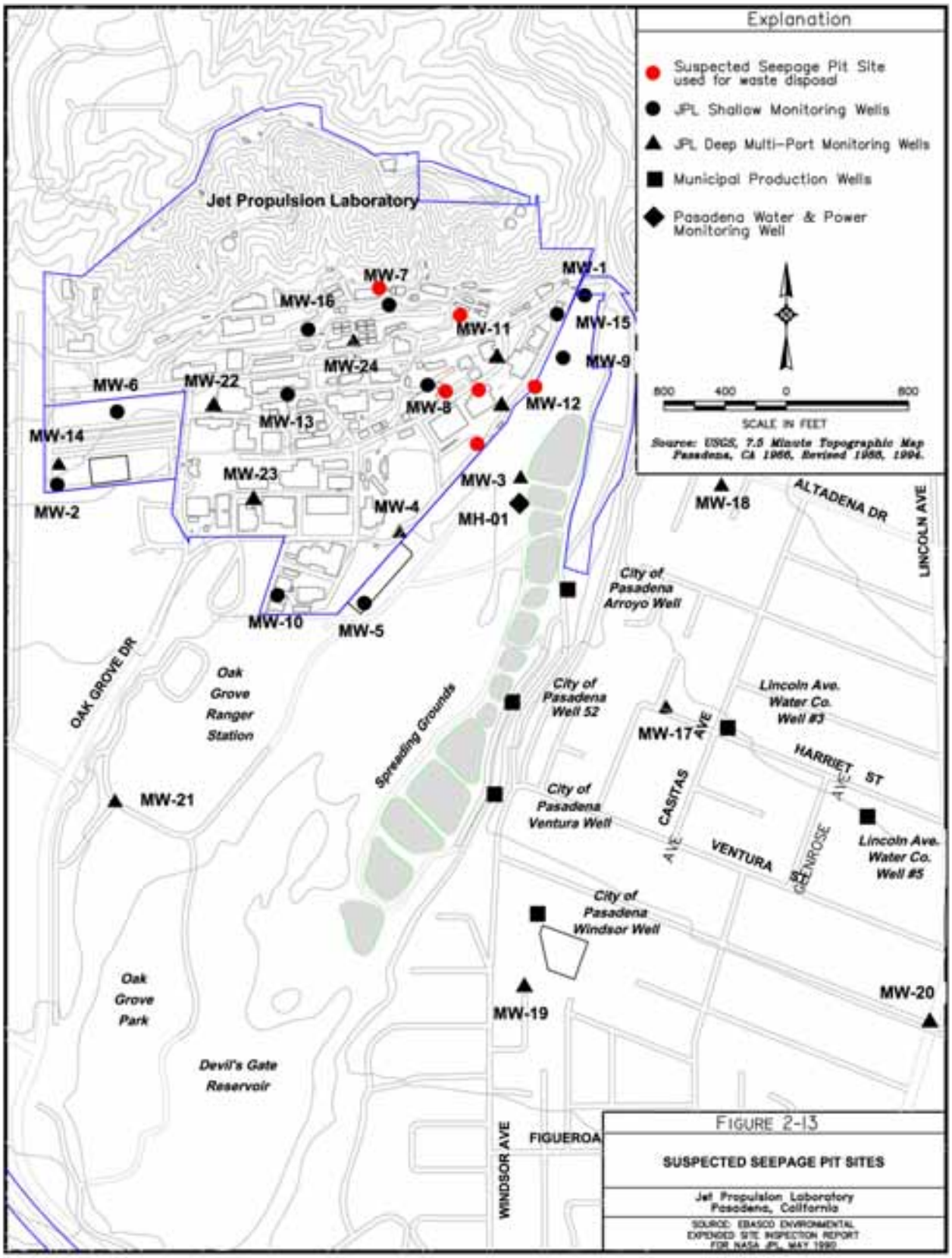


FIGURE 2-13

SUSPECTED SEEPAGE PIT SITES

Jet Propulsion Laboratory
Pasadena, California

SOURCE: EBASCO ENVIRONMENTAL
EXPENDED SITE INSPECTION REPORT
FOR NASA JPL MAY 1990

NDM: WALKUP: JPL-GRNDWTR-TRTMNT: FIG3-8A.DWG
PLOT/UPDATE: NOV 13 2002 11:53:23

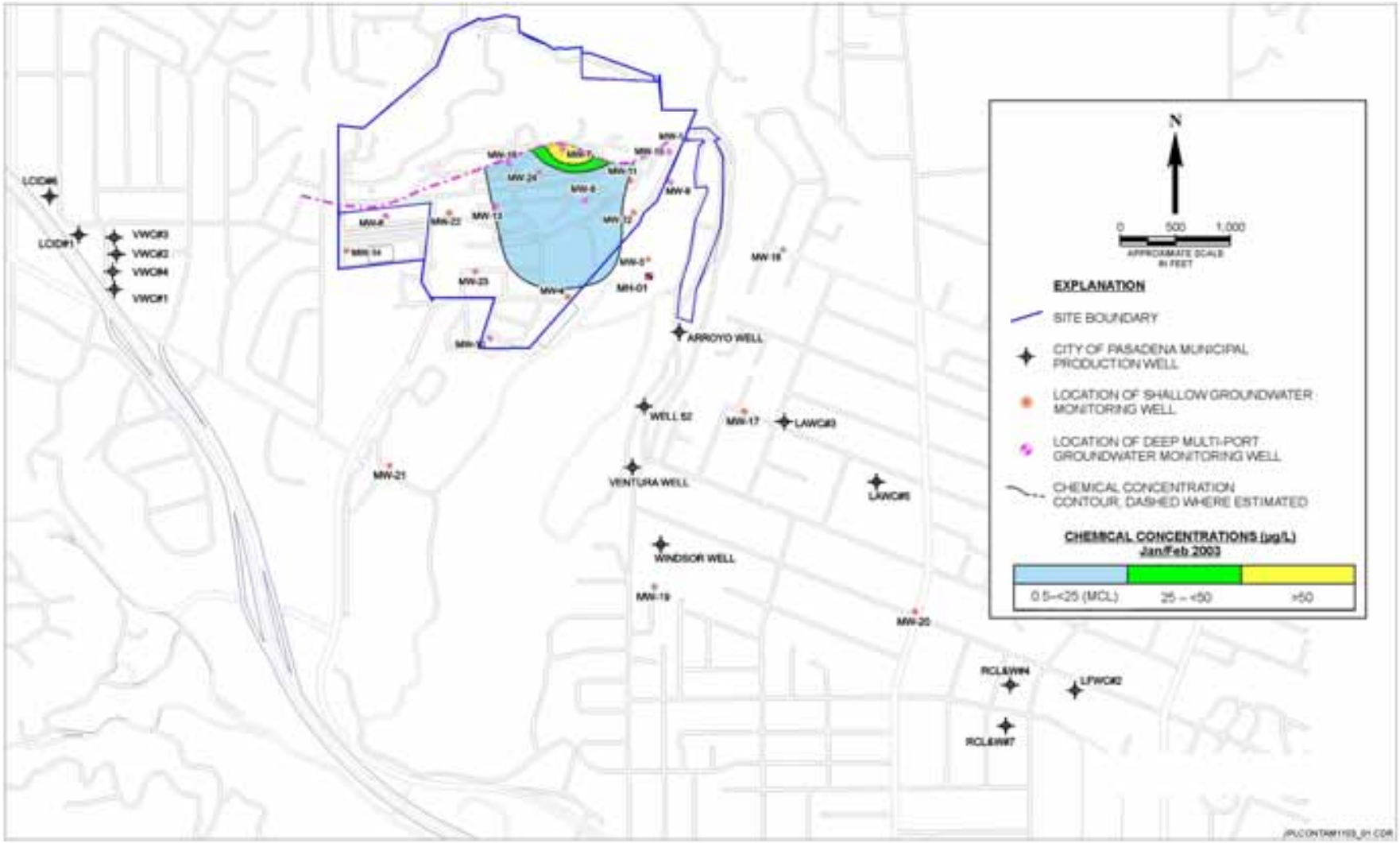


Figure 2-14. Contours of Carbon Tetrachloride Concentrations in Aquifer Layer 1

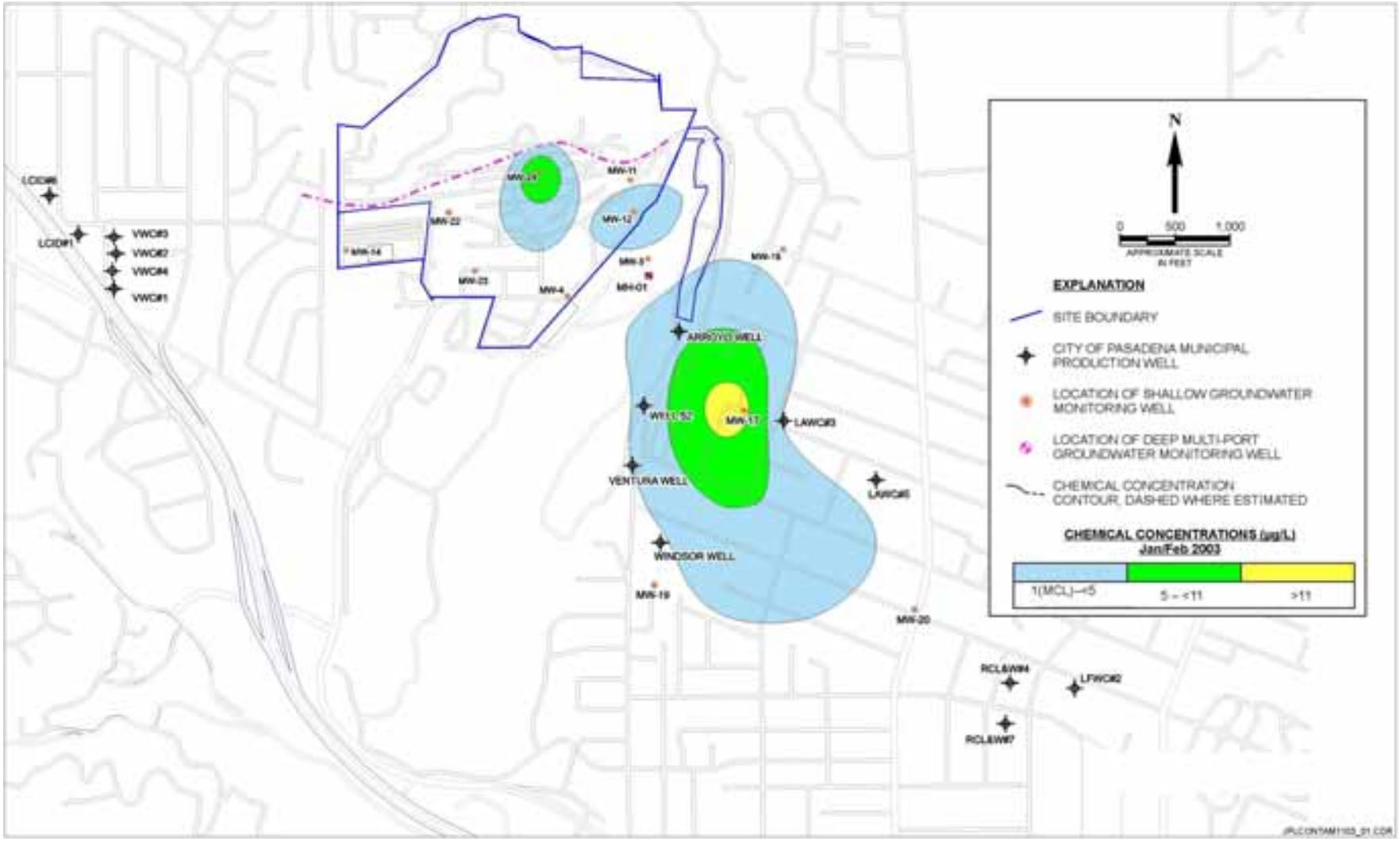


Figure 2-15 Contours of Carbon Tetrachloride Concentrations in Aquifer Layer 2

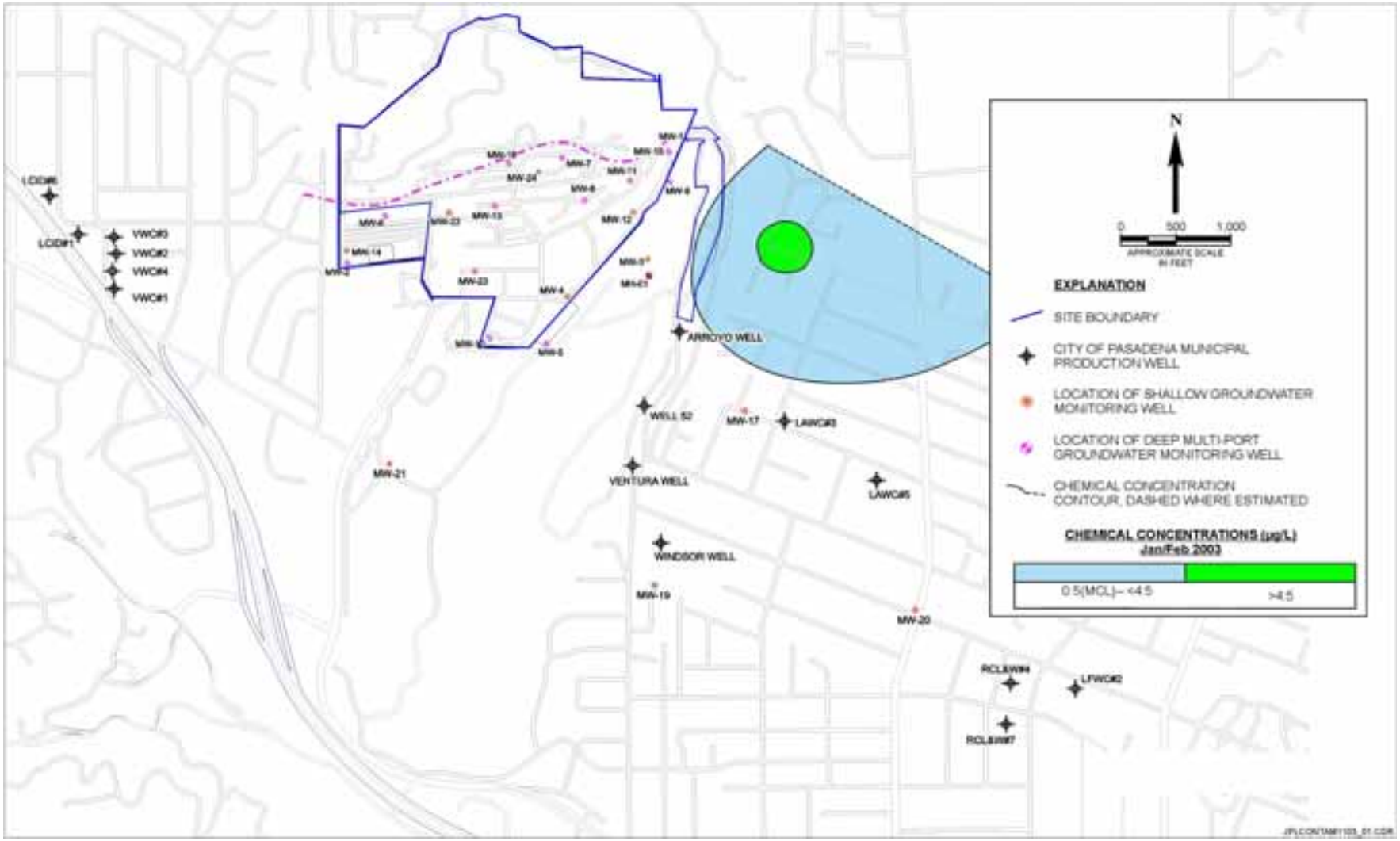


Figure 2-16. Contours of Carbon Tetrachloride Concentrations in Aquifer Layer 3

Figure 2-17. Contours of Perchlorate Concentrations in Aquifer Layer 1

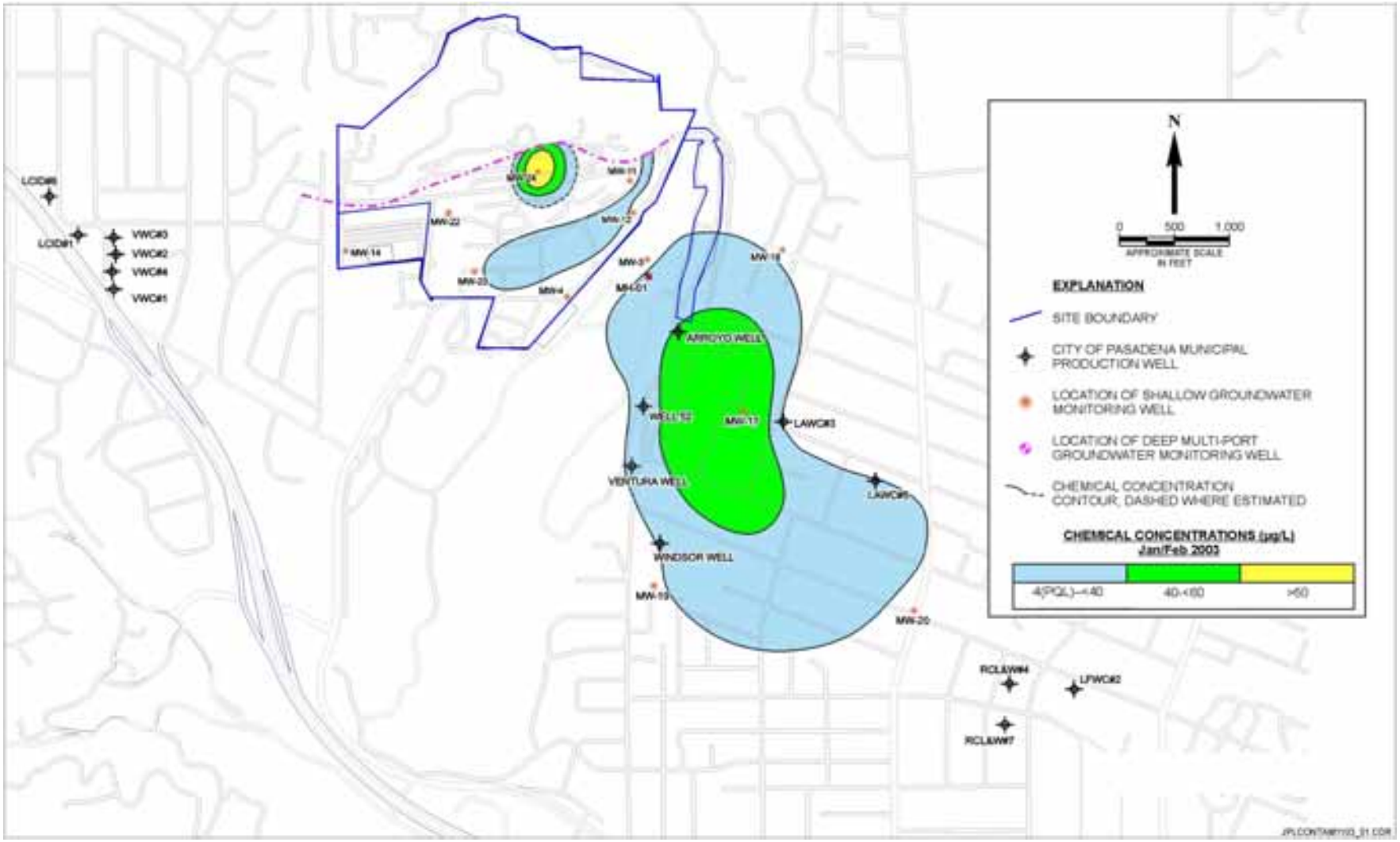


Figure 2-18. Contours of Perchlorate Concentrations in Aquifer Layer 2

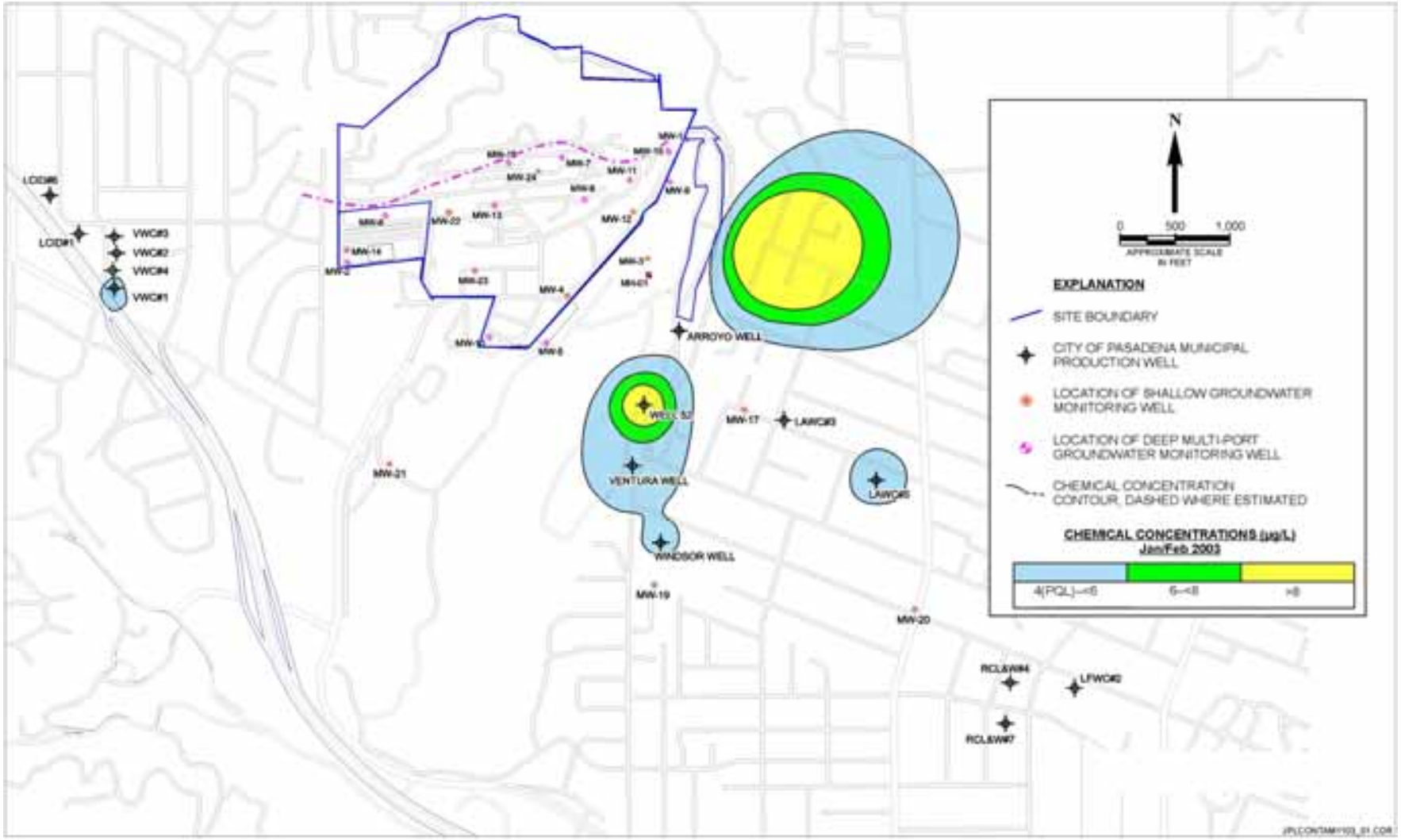


Figure 2-19. Contours of Perchlorate Concentrations in Aquifer Layer 3

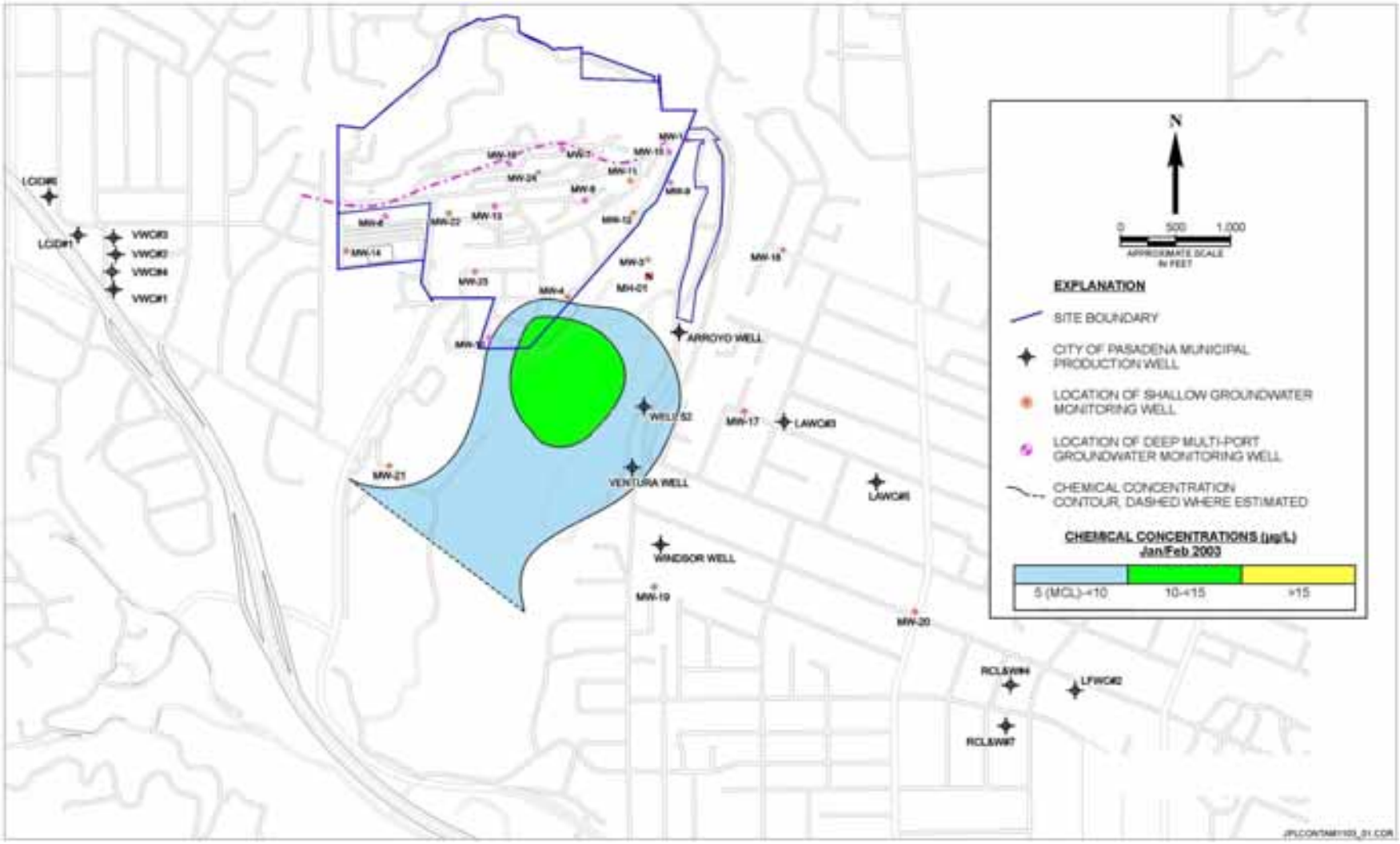


Figure 2-20. Contours of Trichloroethene Concentrations in Aquifer Layer 1

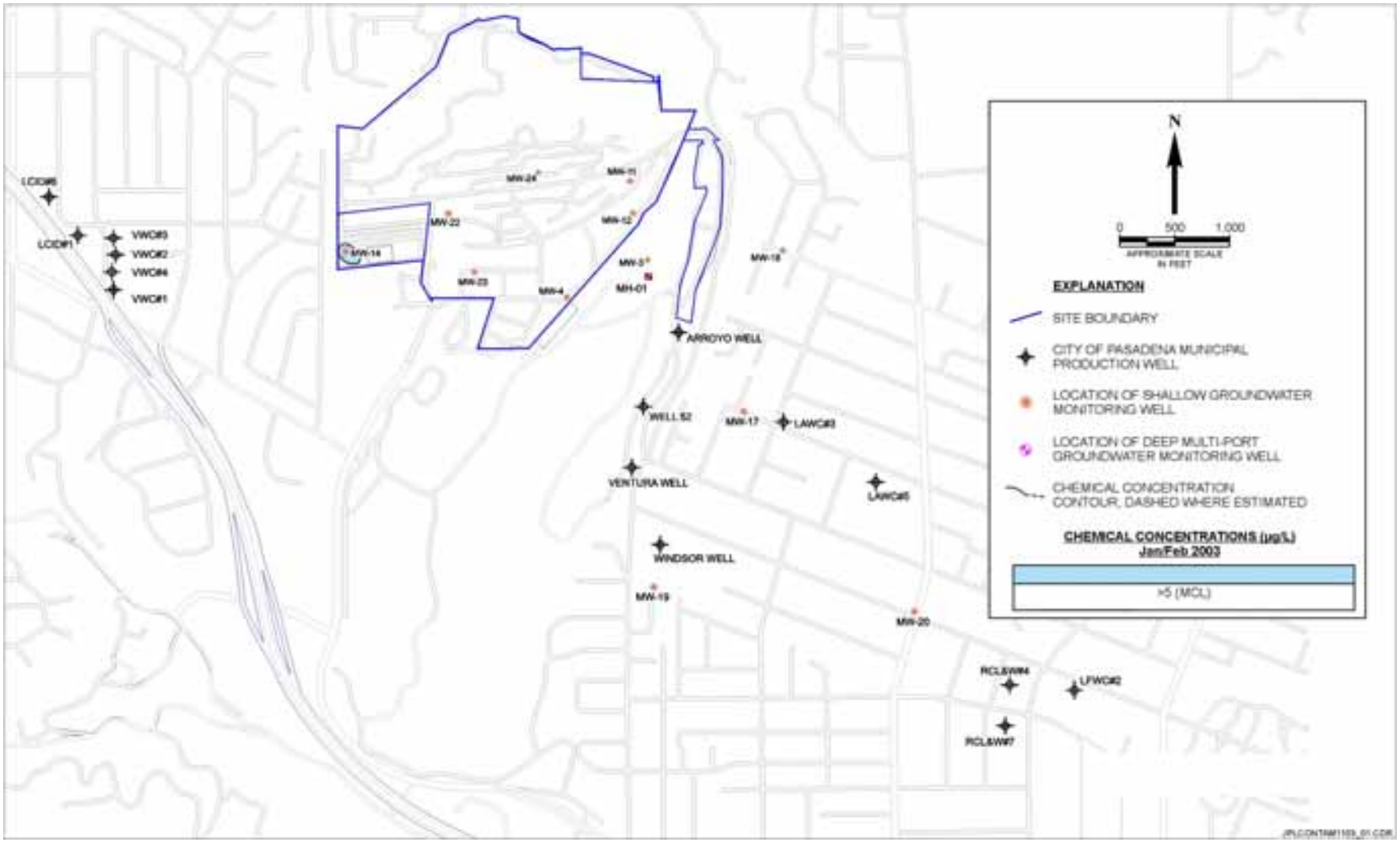


Figure 2-21. Contours of Trichloroethene Concentrations in Aquifer Layer 2

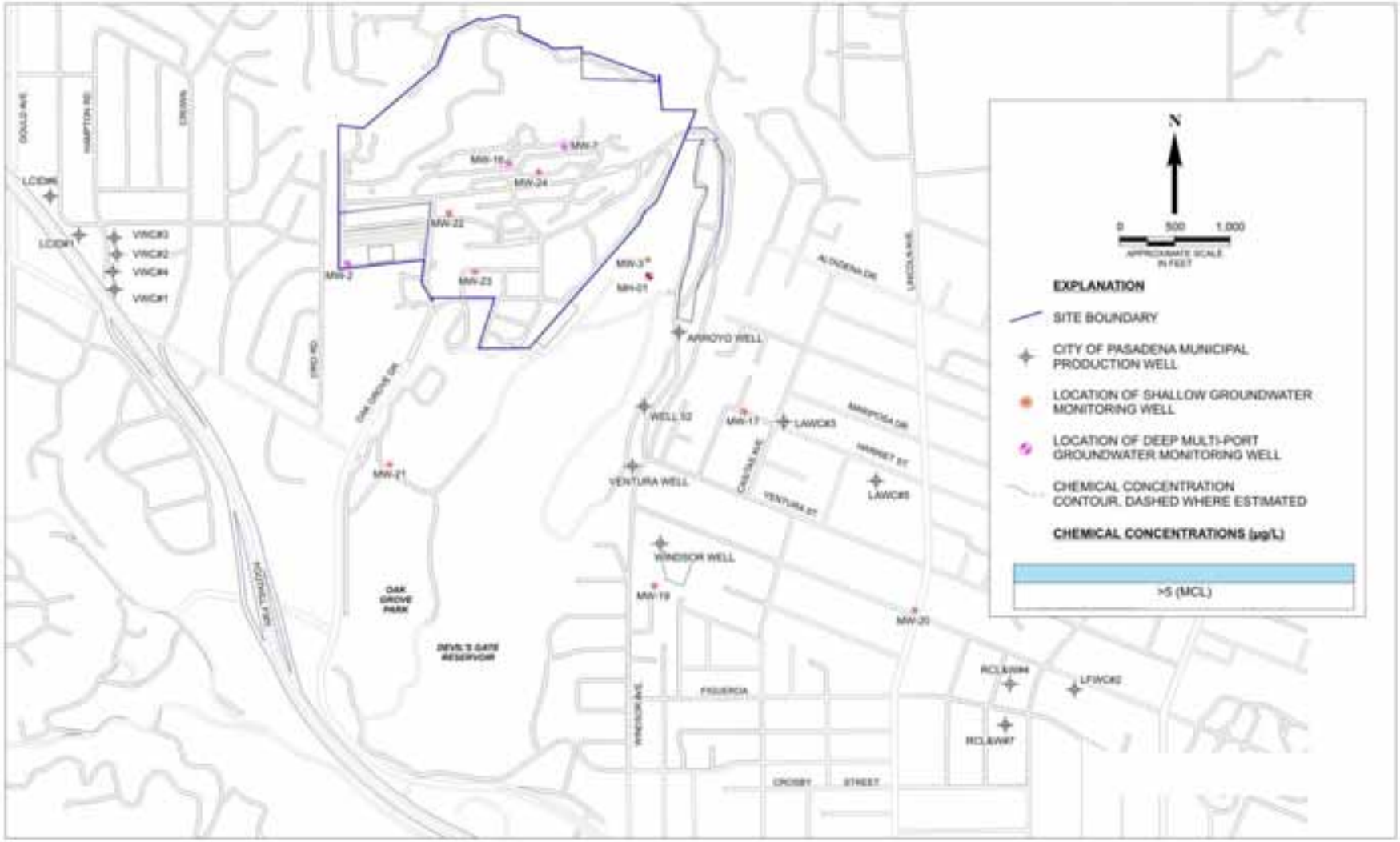


Figure 2-22. Contours of Trichloroethene Concentrations in Aquifer Layer 3

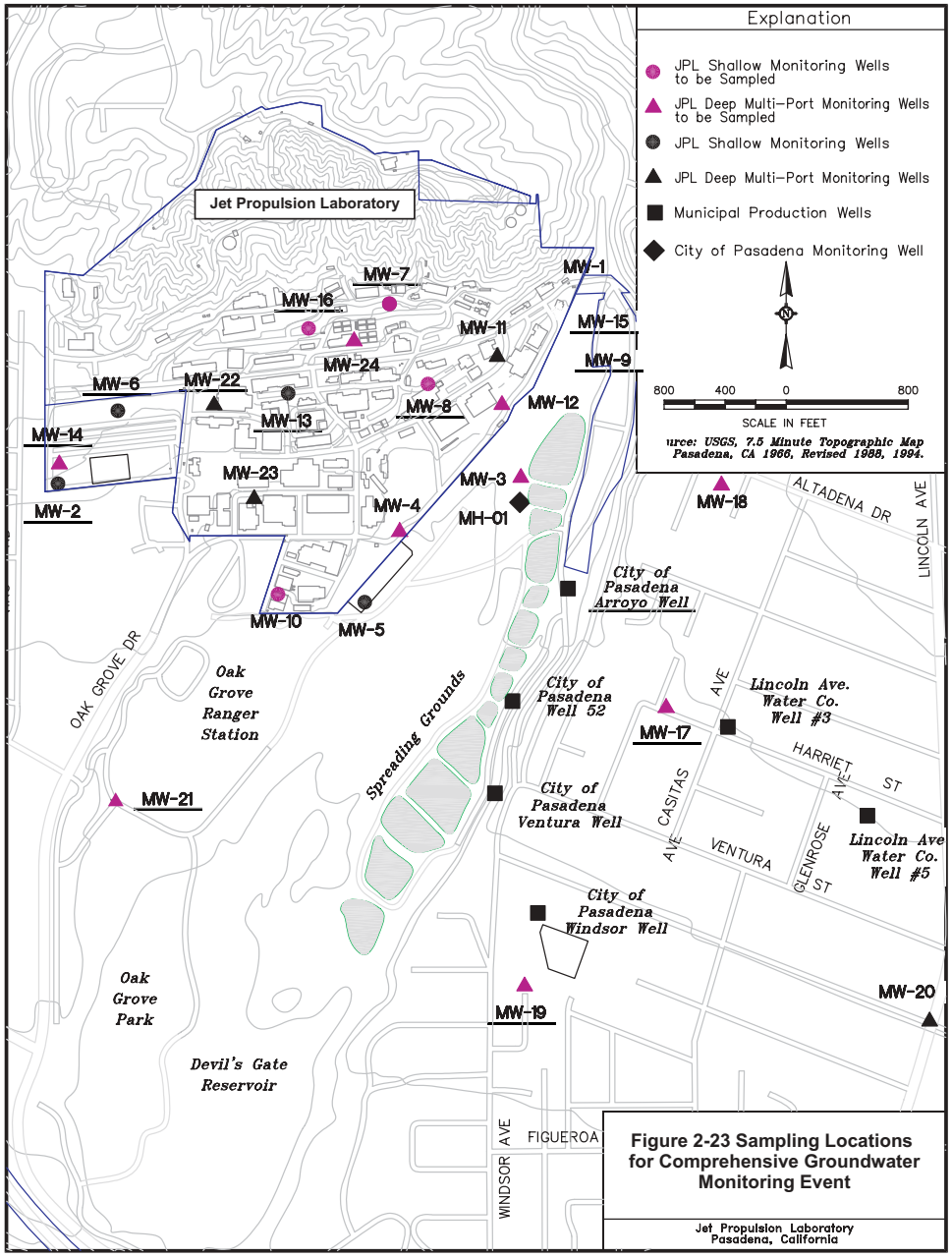


Figure 2-23 Sampling Locations for Comprehensive Groundwater Monitoring Event

Jet Propulsion Laboratory
Pasadena, California

SCO161655.02.05.A6 sampling.ai 9/03

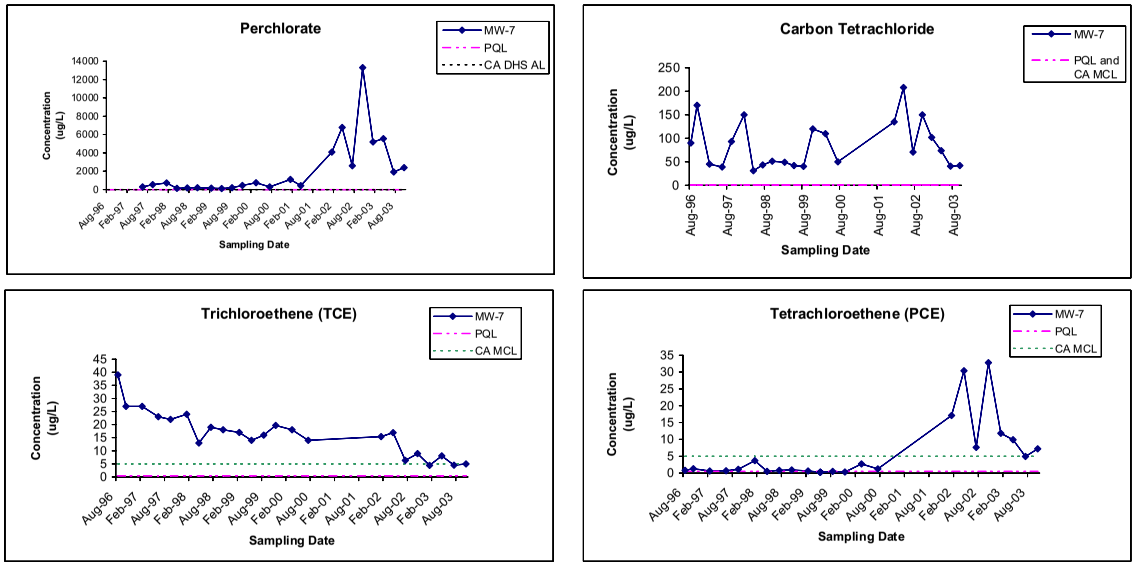


Figure 2-24. MW-7 Perchlorate and VOCs Concentration vs. Time

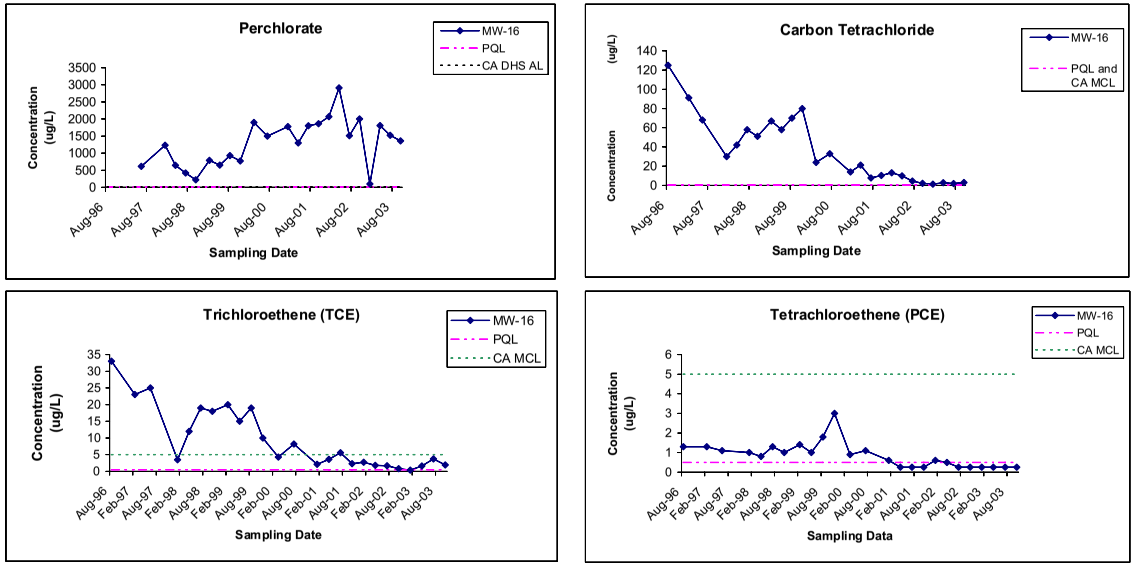


Figure 2-25 MW-16 Perchlorate and VOCs Concentration vs. Time

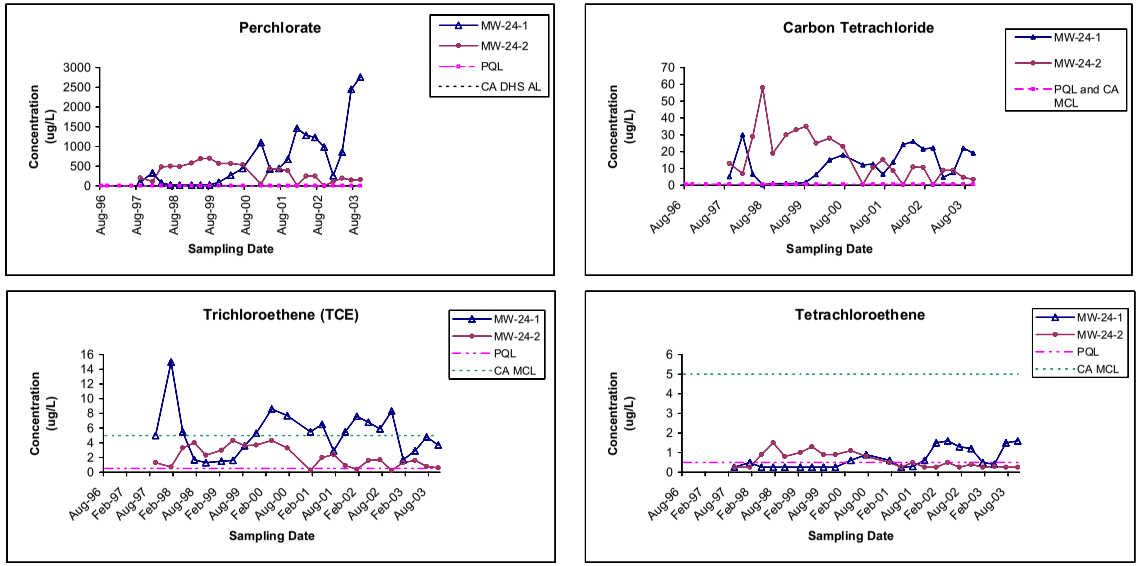


Figure 2-26 MW-24 Sccreens 1and 2, Perchlorate and VOCs Concentration vs. Time

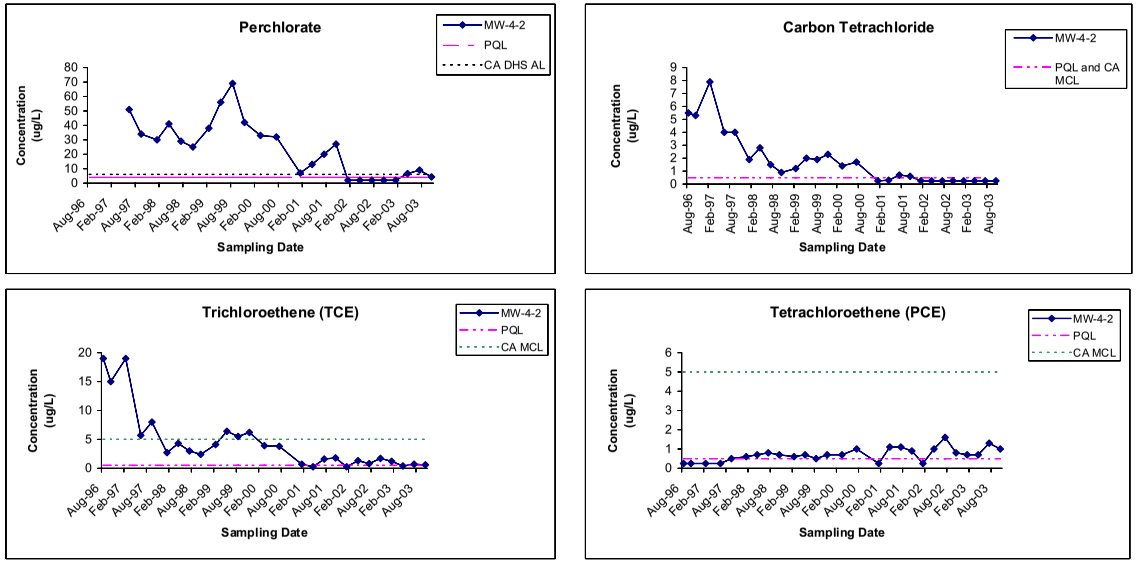


Figure 2-27 MW-4Screen 2, Perchlorate and VOCs Concentration vs. Time

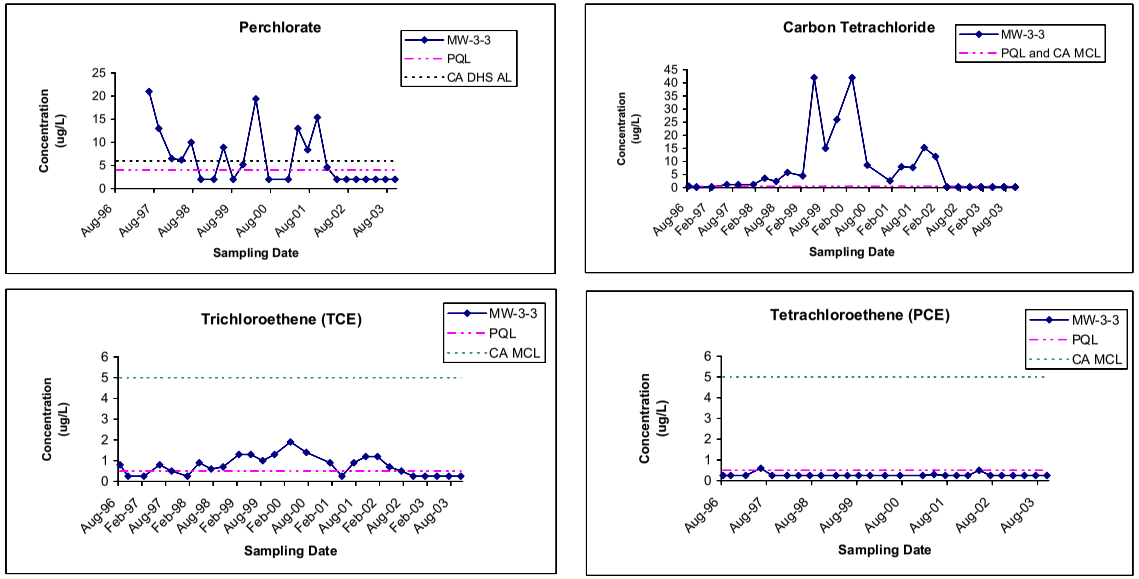


Figure 2-28. MW-3 , Sccreen 3, Perchlorate and VOCs Concentration vs. Time

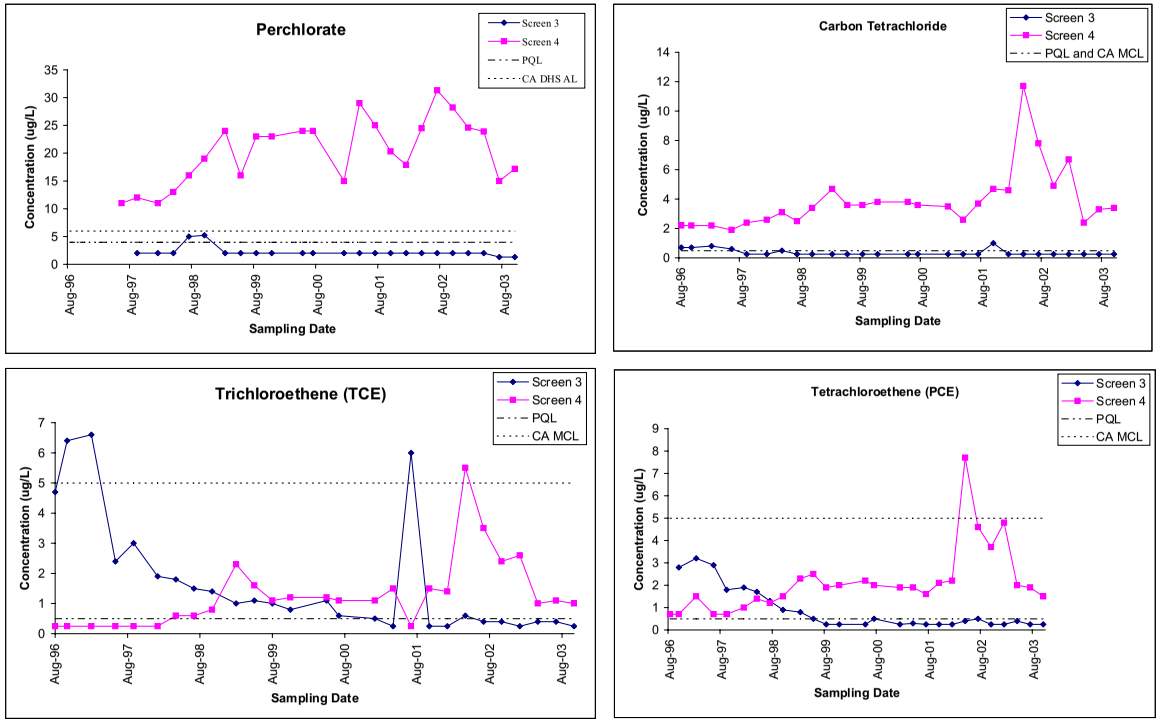


Figure 2-29. MW-18 Perchlorate and VOC's Concentration vs Time

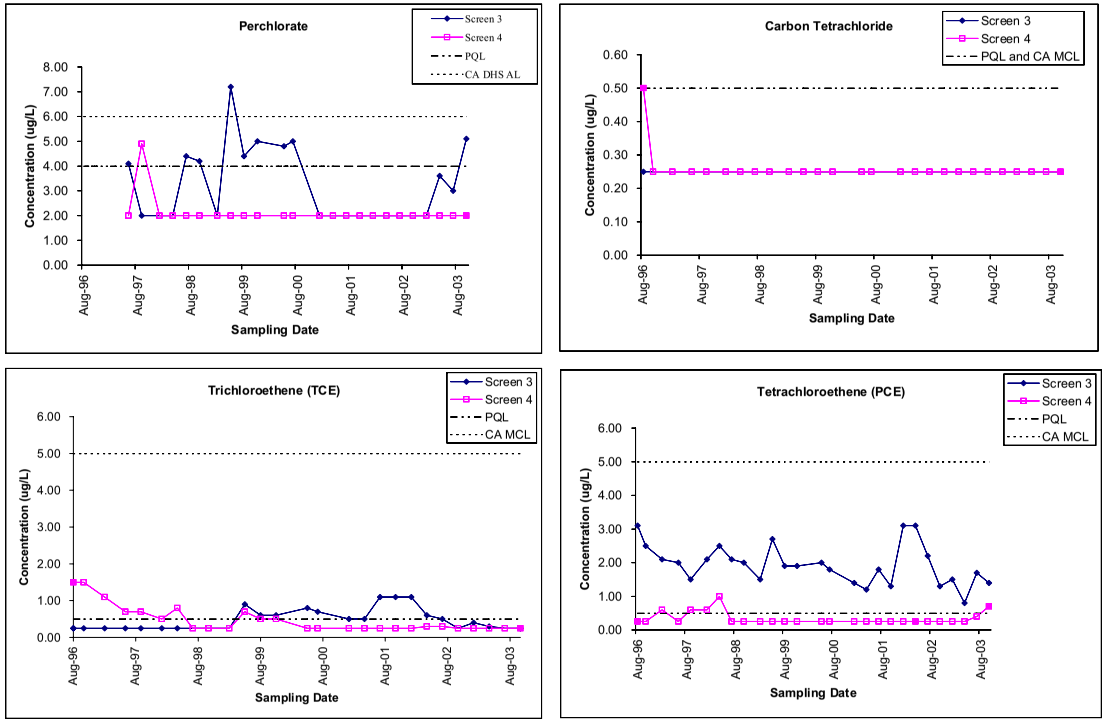


Figure 2-30. MW-19 Perchlorate and VOC's Concentration vs Time

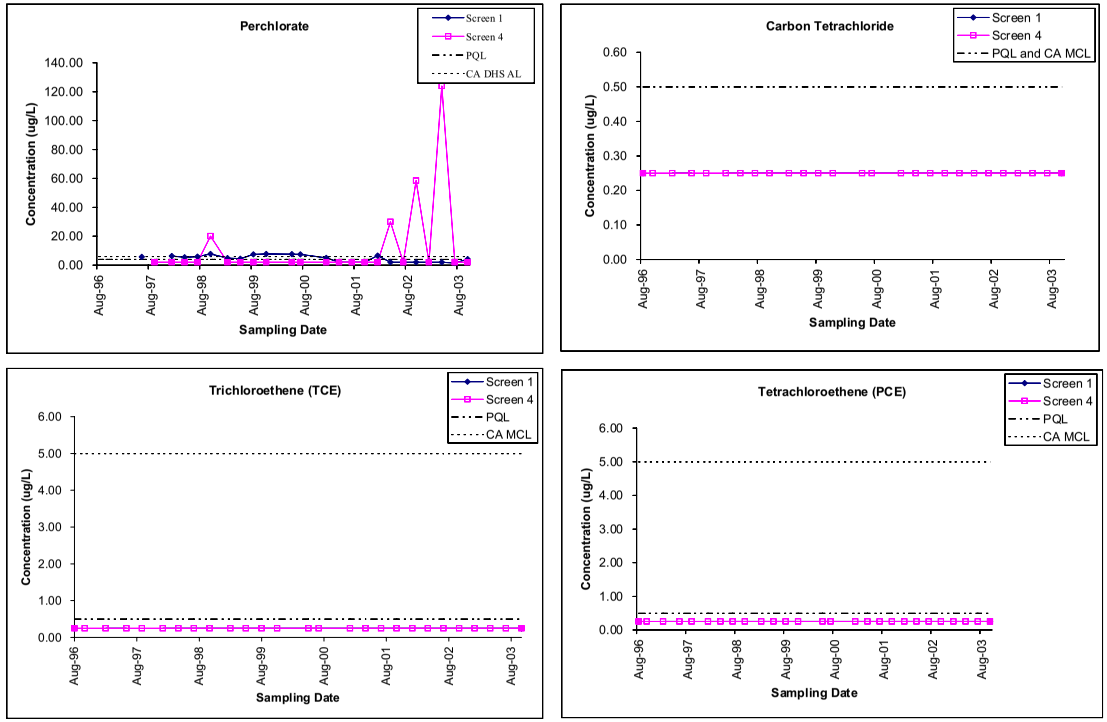


Figure 2-31. MW-20 Perchlorate and VOC's Concentration vs Time

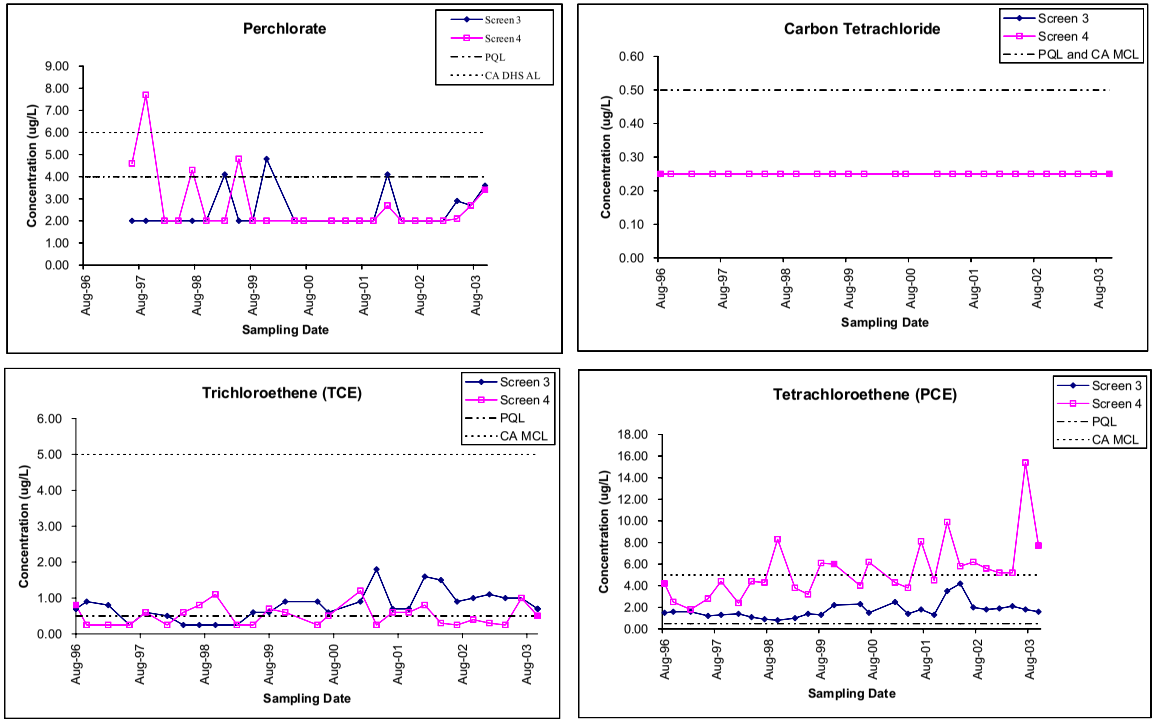


Figure 2-32. MW-21 Perchlorate and VOC's Concentration vs Time

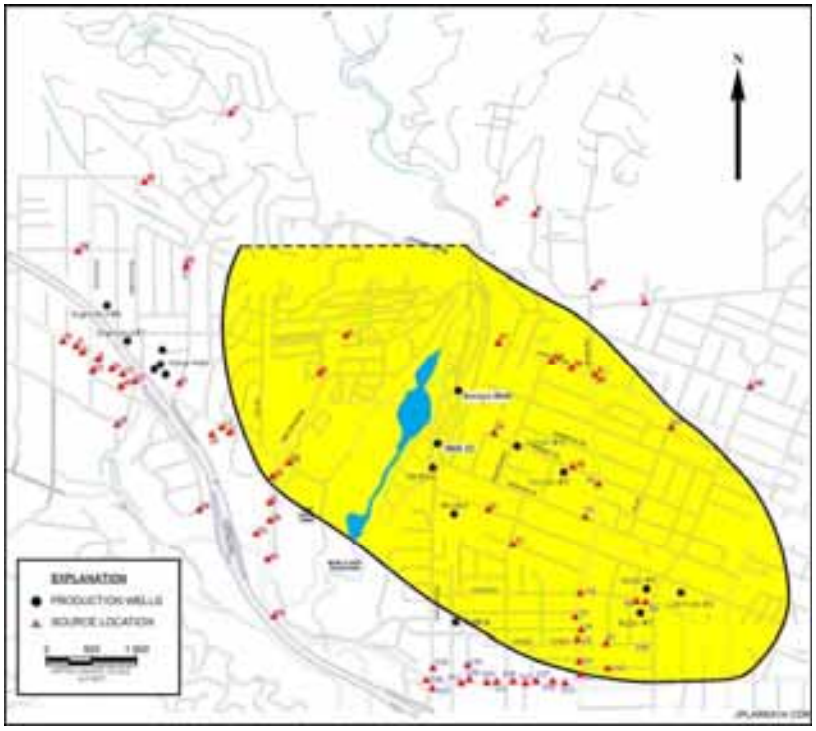


Figure 2-33. Known and Potential Source Locations Within the Capture Zones

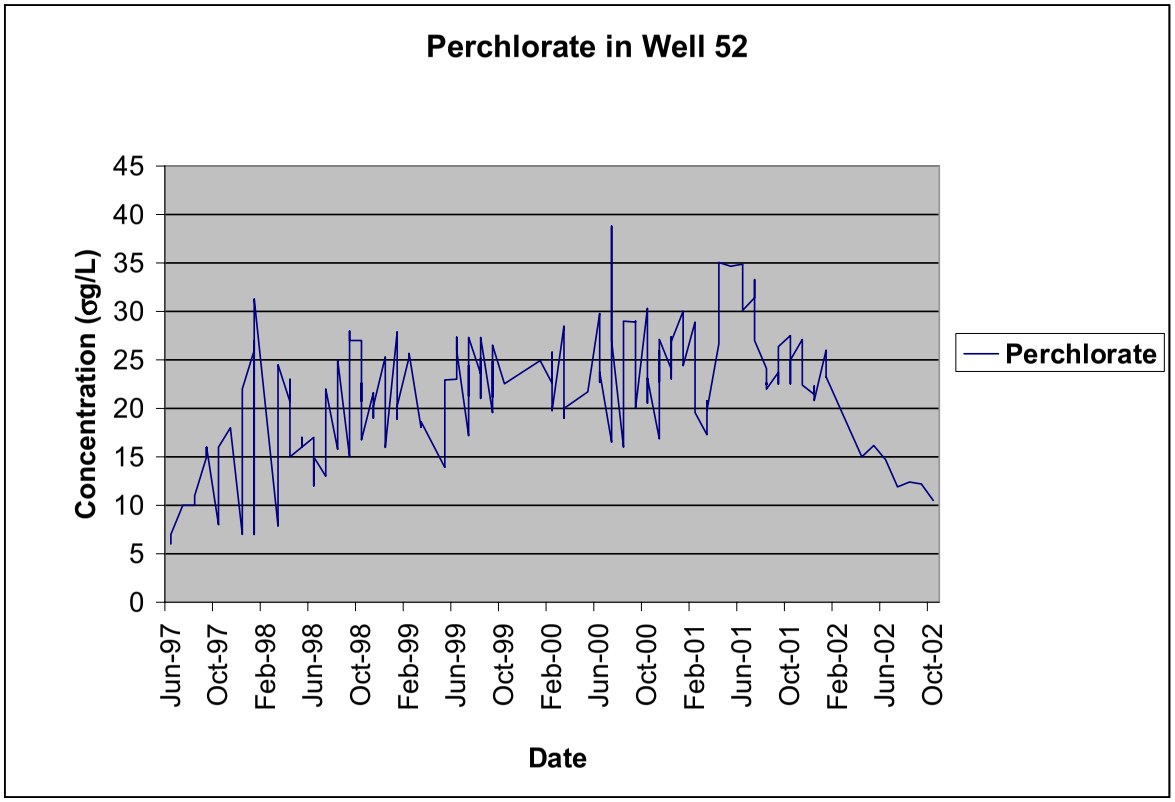


Figure 3-1. Perchlorate Concentrations Over Time in Well 52

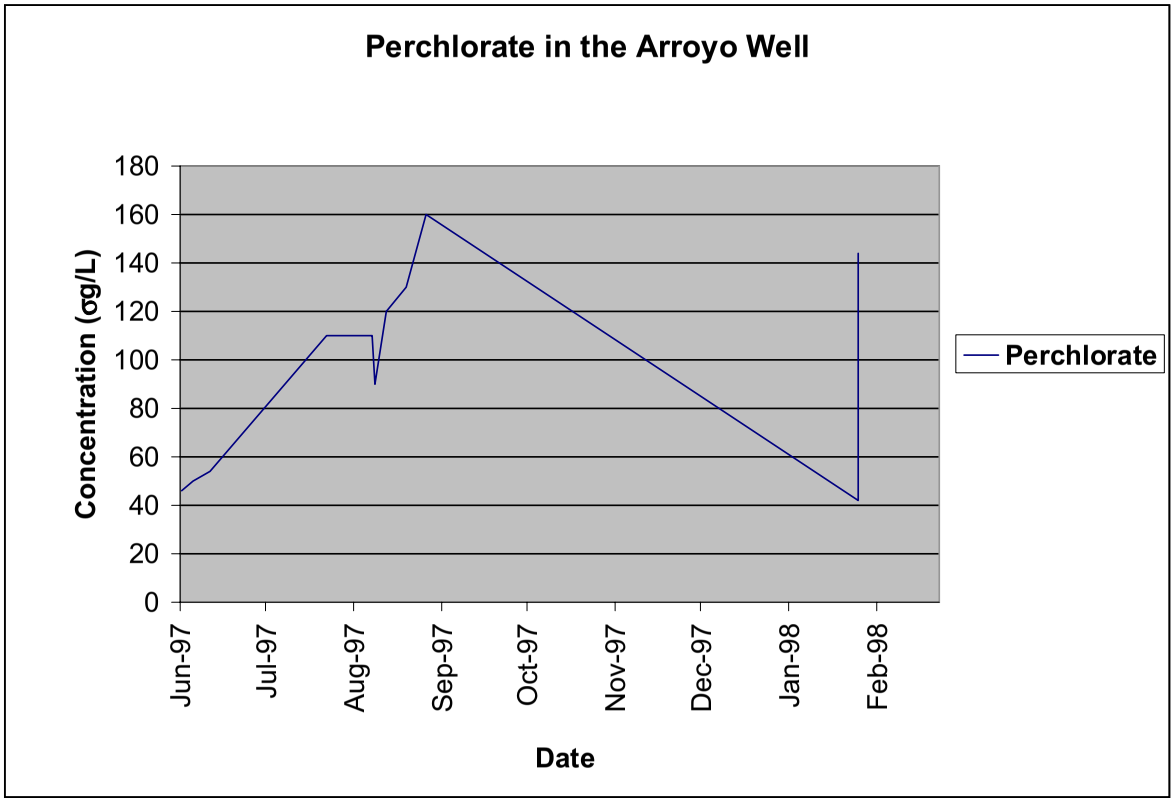


Figure 3-2. Perchlorate Concentrations Over Time in the Arroyo Well

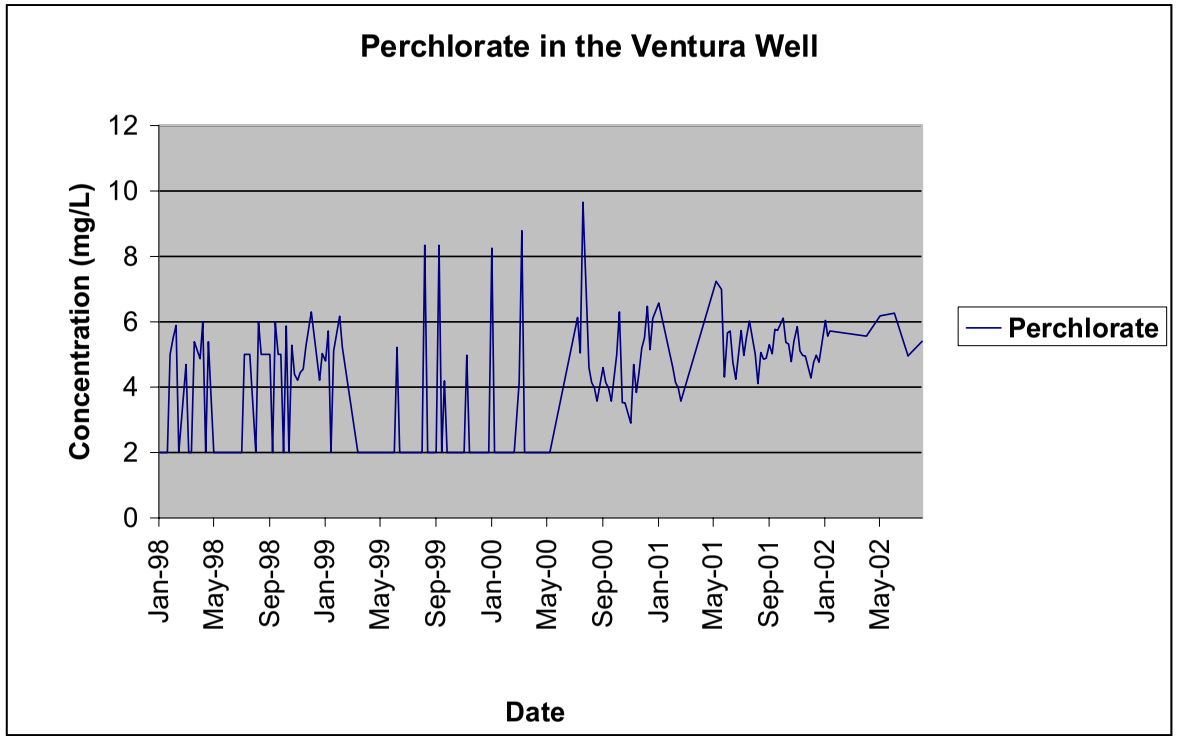


Figure 3-3. Perchlorate Concentrations Over Time in the Ventura Well

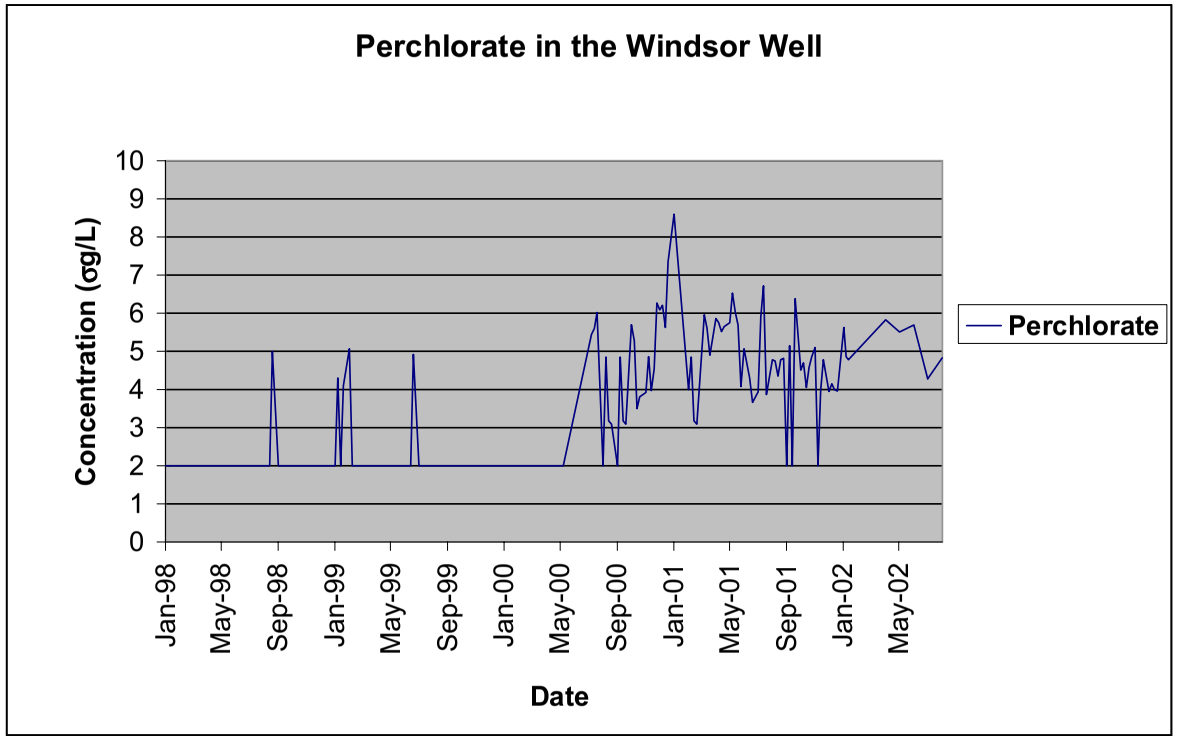


Figure 3-4. Perchlorate Concentrations Over Time in the Windsor Well

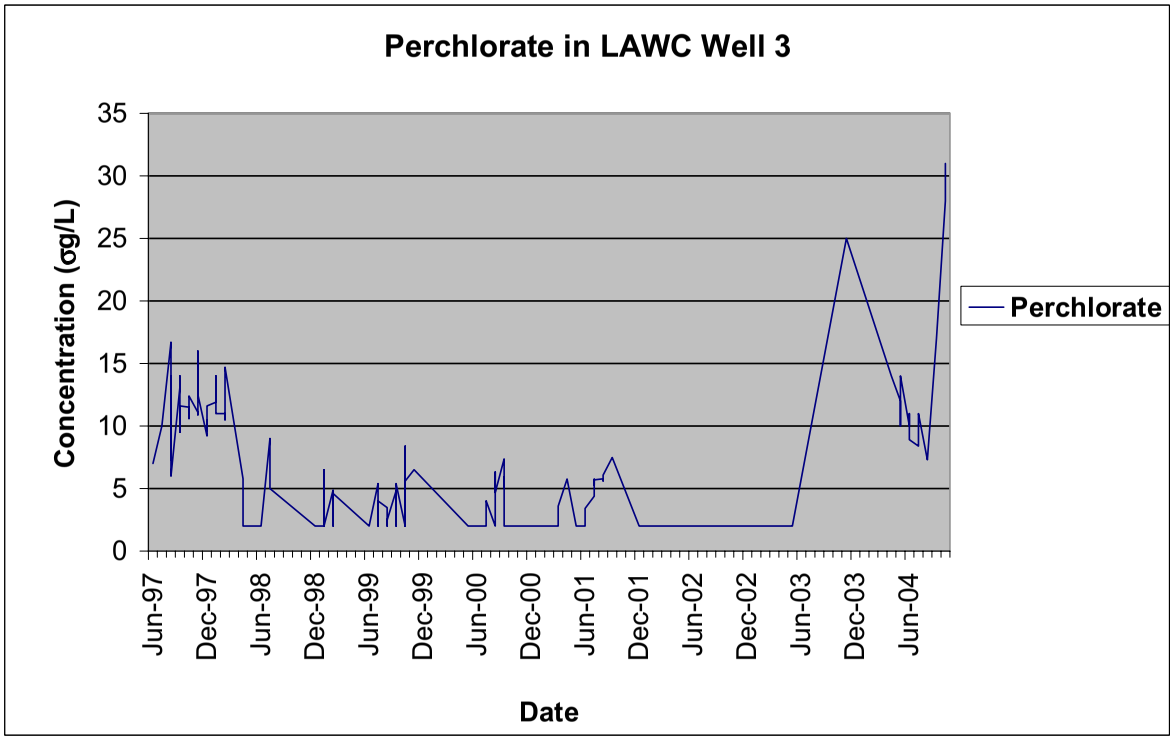


Figure 3-5. Perchlorate Concentrations Over Time in LAWC Well 3

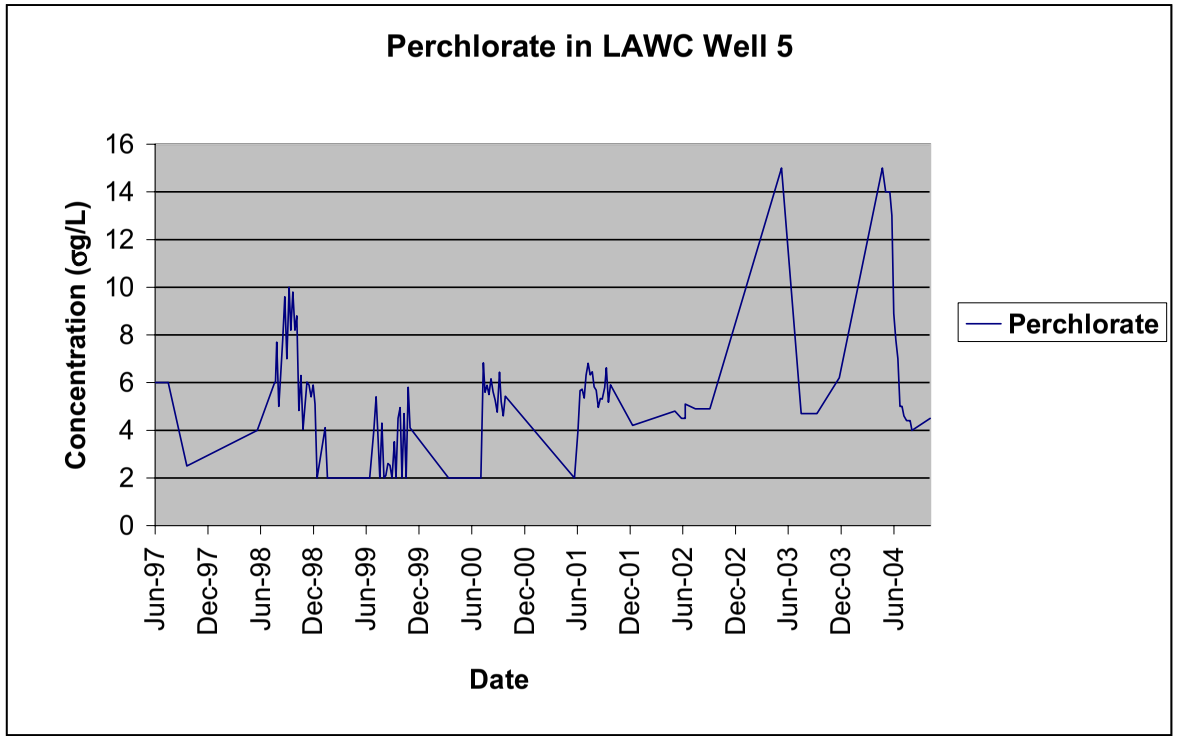


Figure 3-6. Perchlorate Concentrations Over Time in LAWC Well 5

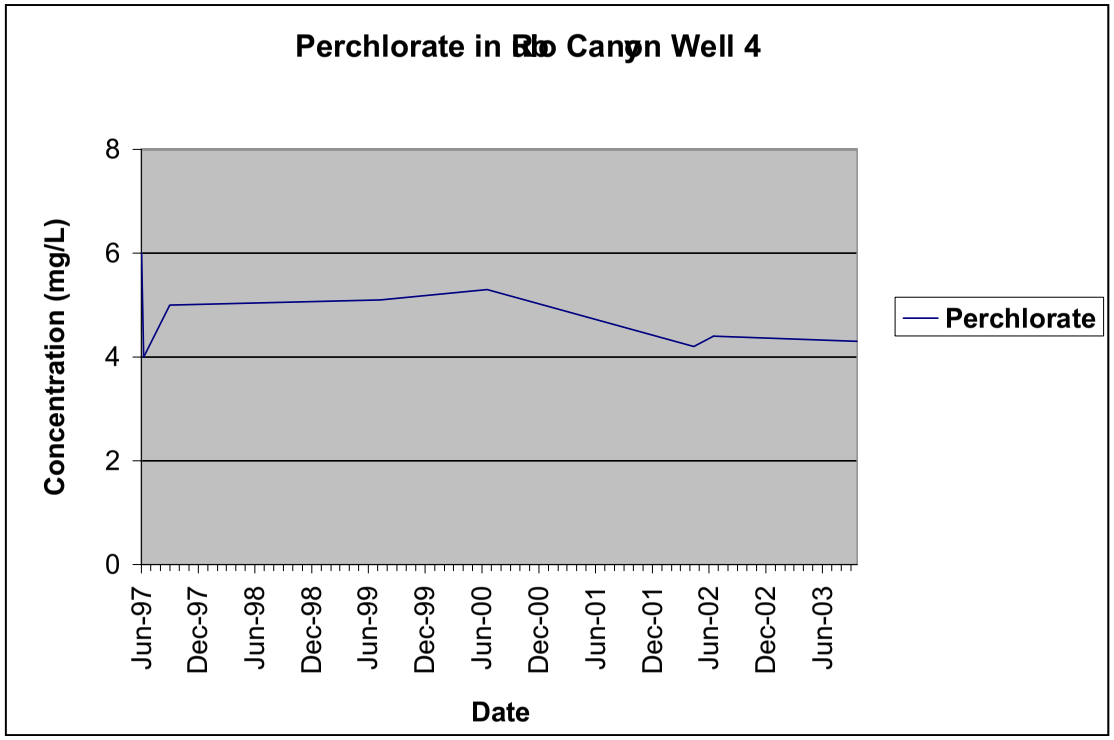


Figure 3-7 Perchlorate Concentrations Over Time in Rio Canyon Well 4

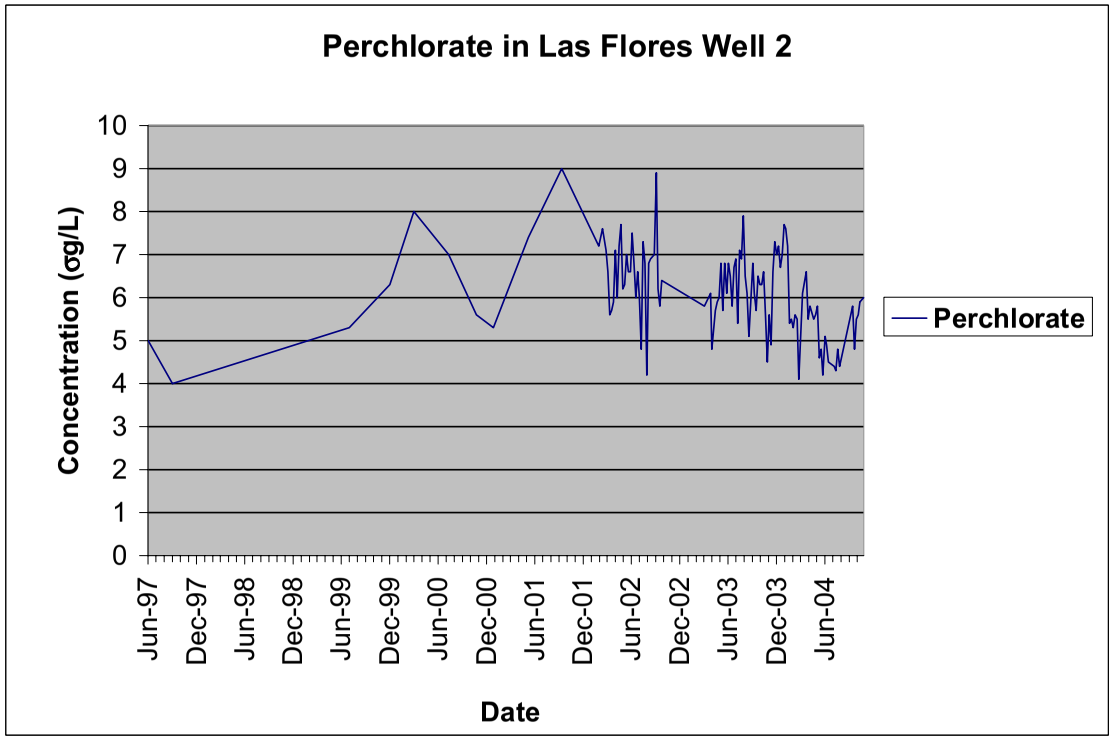


Figure 3-8. Perchlorate Concentrations Over Time in Las Flores Well 2

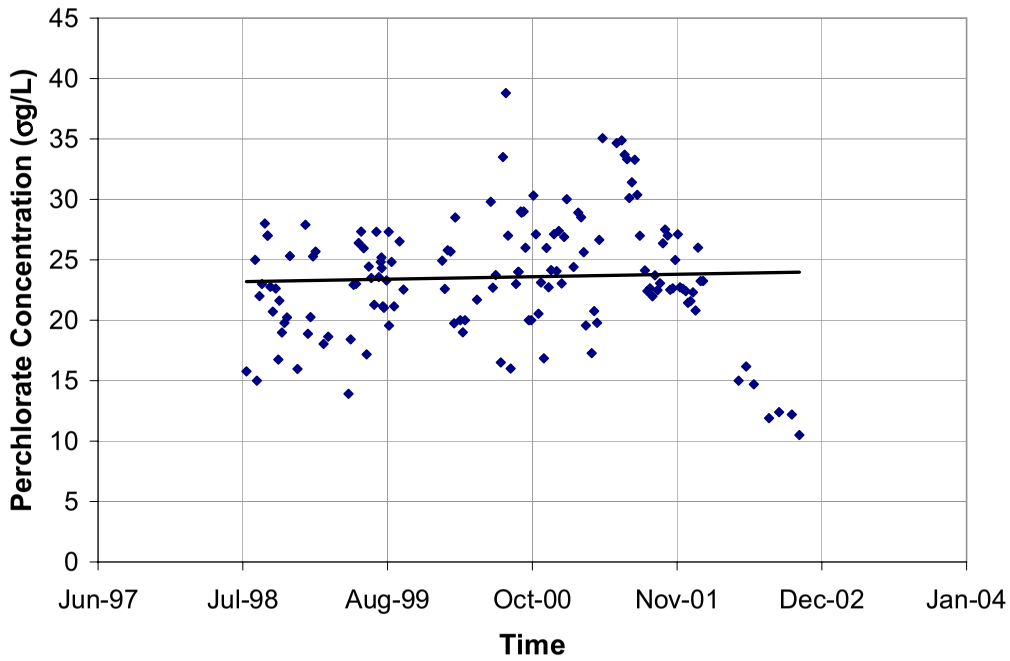


Figure 3-9
Variation of
Perchlorate in Well 2

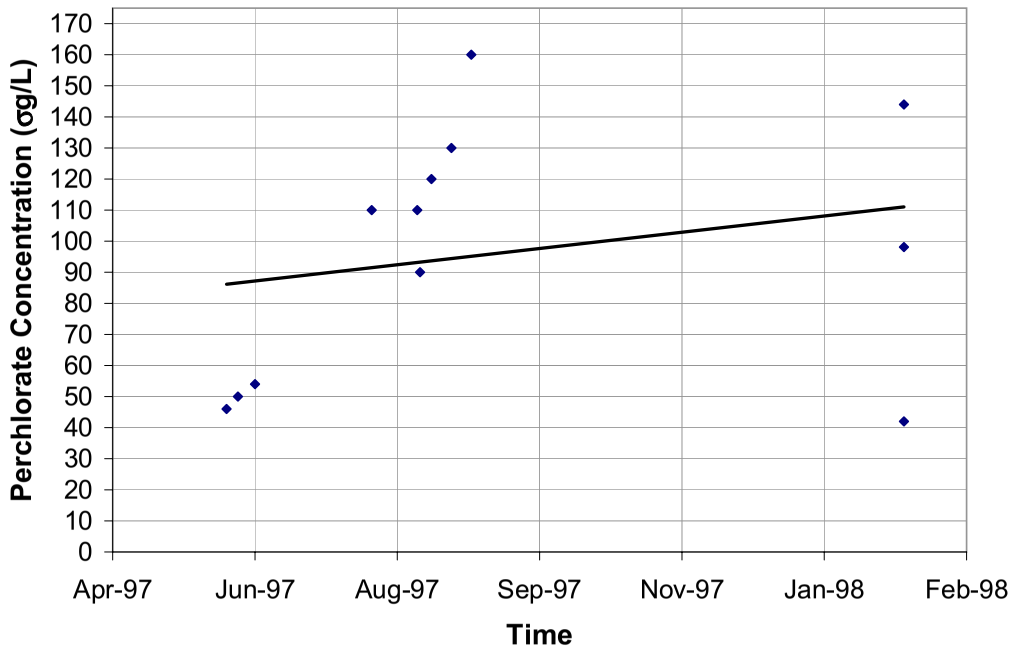


Figure 3-0
Variation of Perchlorate in Arroyo Well

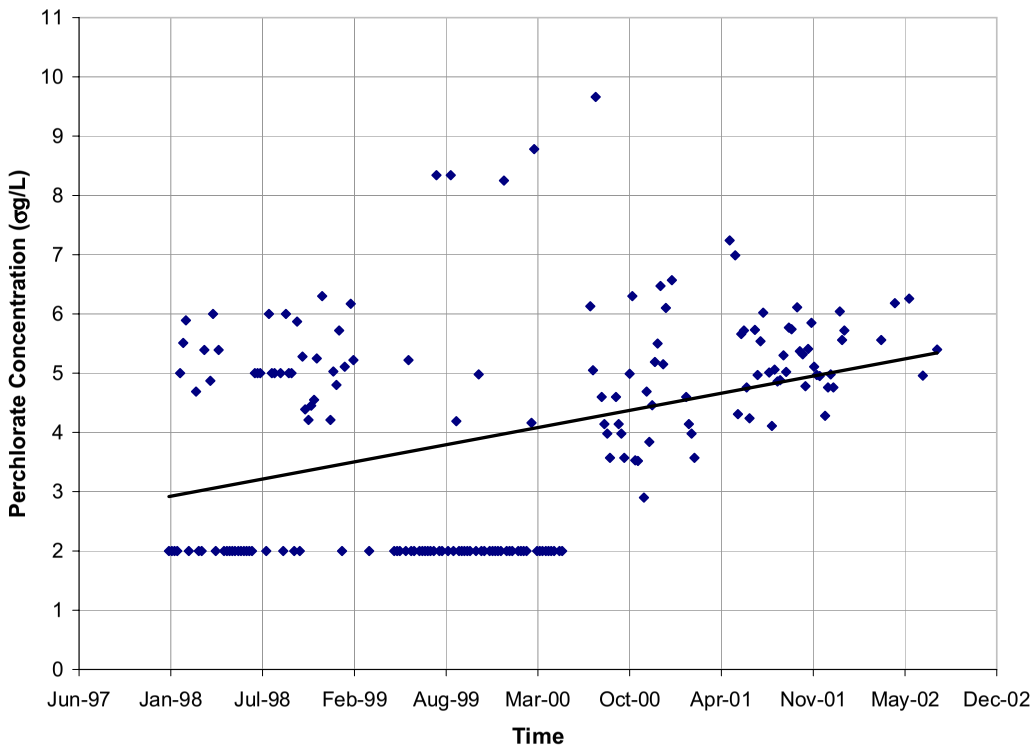


Figure 3-1
Variation of Perchlorate in the Ventura Well

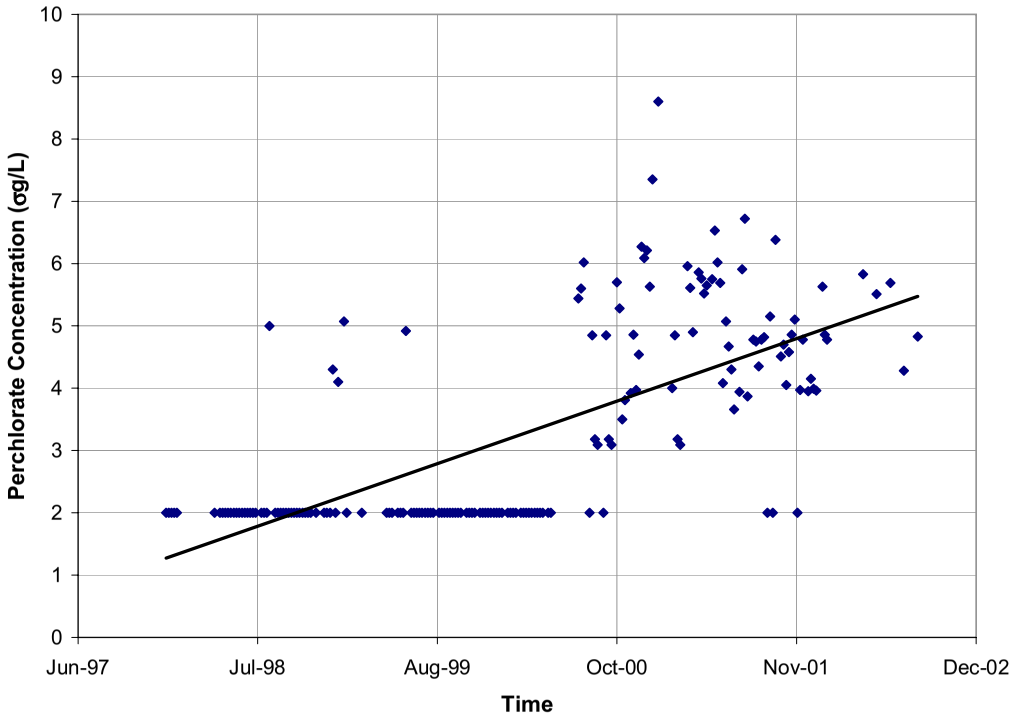


Figure 3-2
Variation of Perchlorate in the Windsor Well

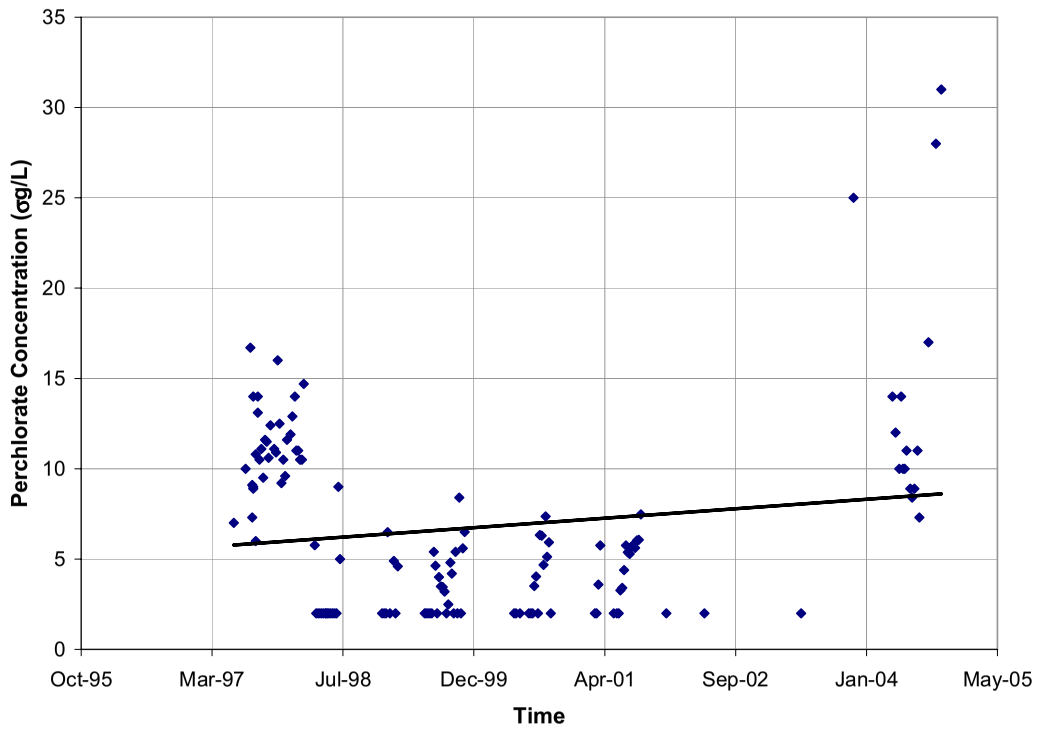


Figure 3-13
Variation of Perchlorate in LAWC Well 3

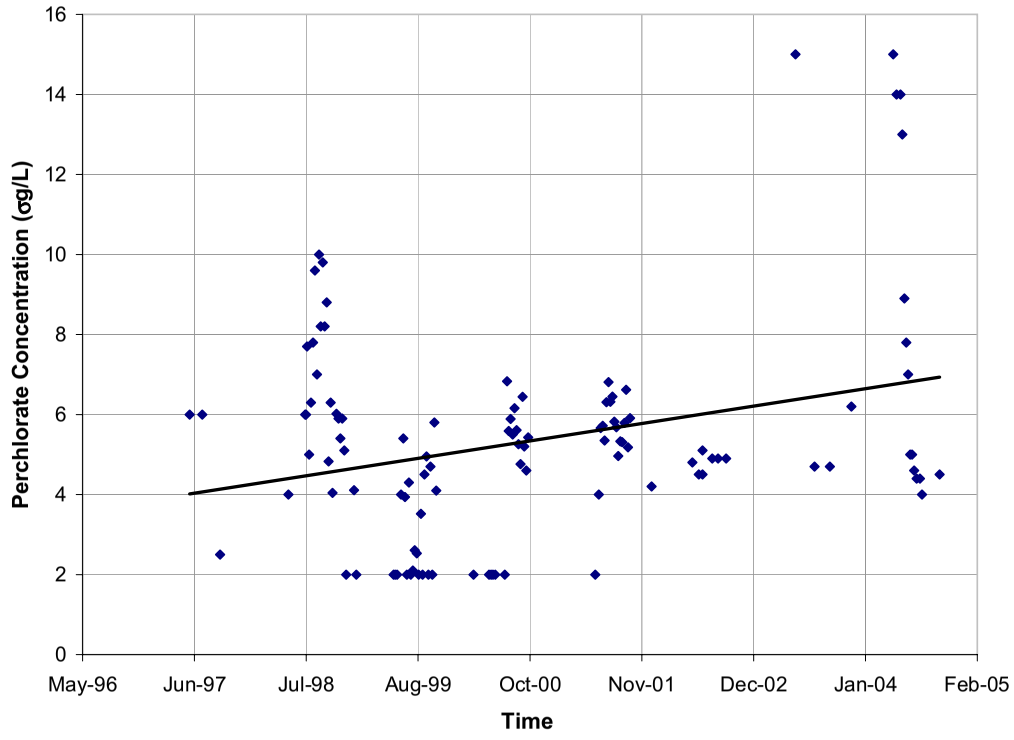


Figure 3-14
Variation of Perchlorate in LAWC Well 5

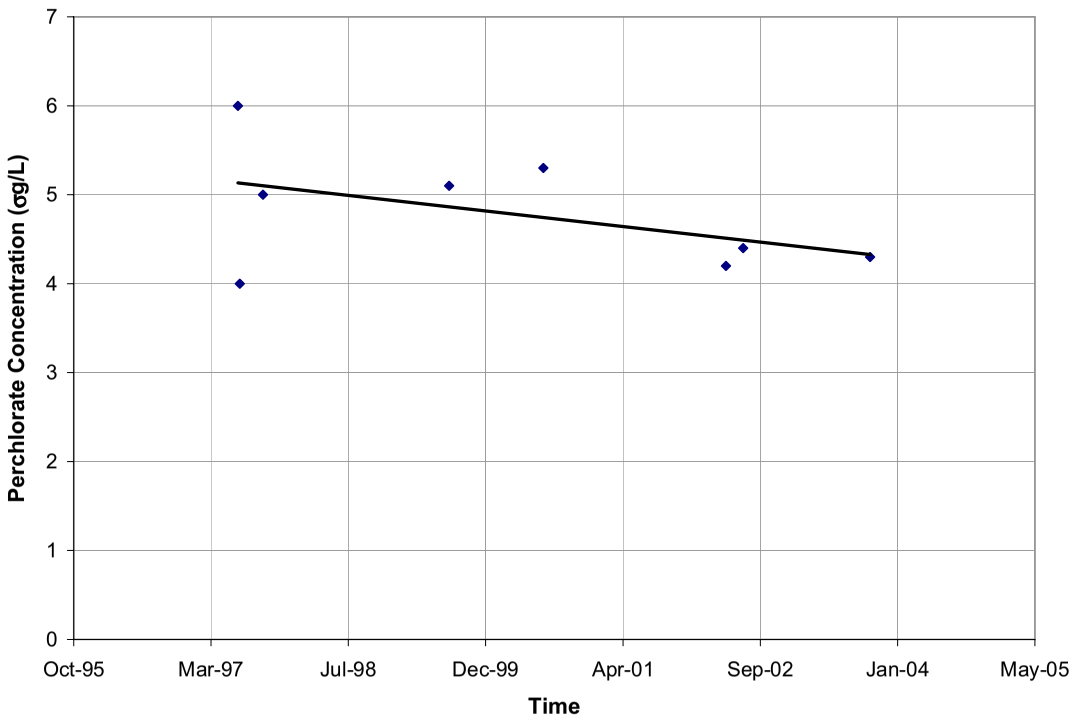


Figure 3-15
Variation of Perchlorate in Rubio Canyon Well 4

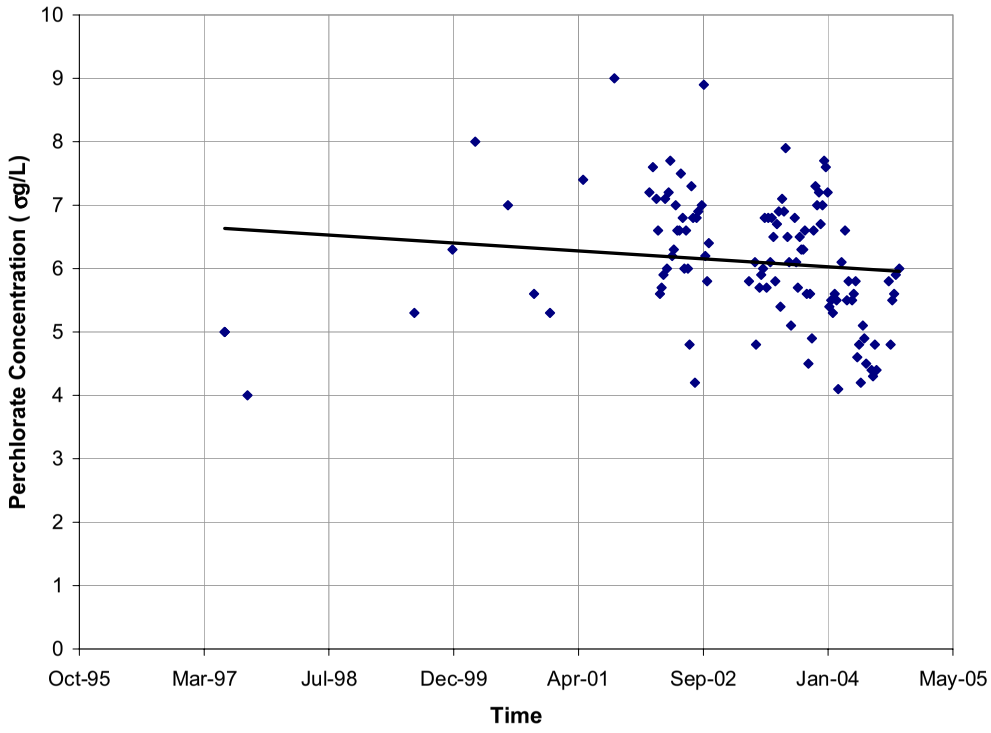


Figure 3-16
Variation of Perchlorate in Las Flores Well 2

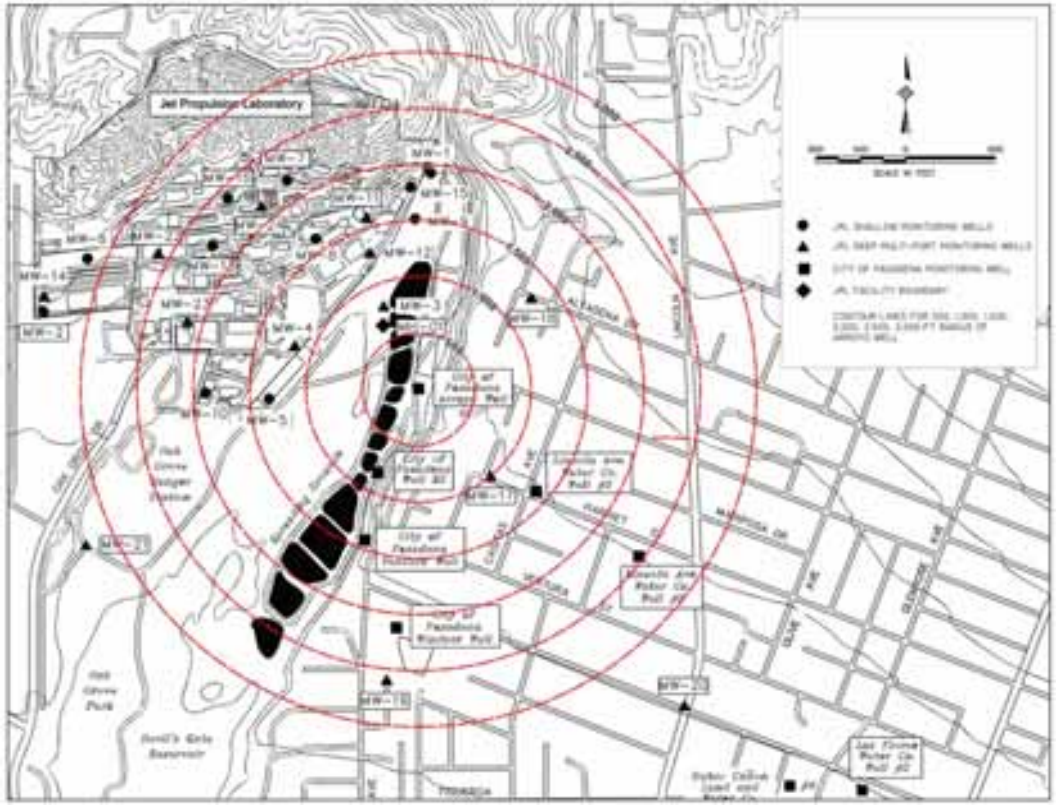


Figure 3-17. Groundwater Model Radii Around the Arroyo Well and JPL Monitoring Well Locations

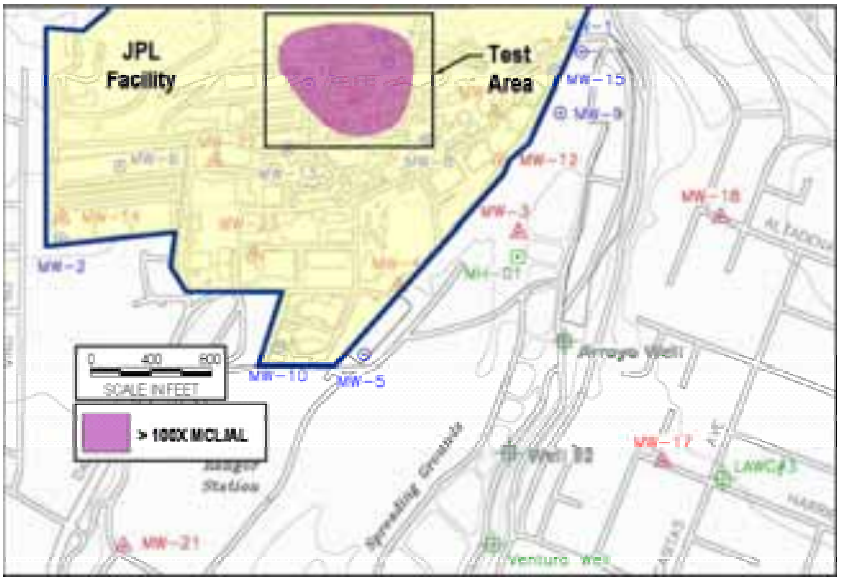


Figure 4-1. OU-1 Proposed Test Area

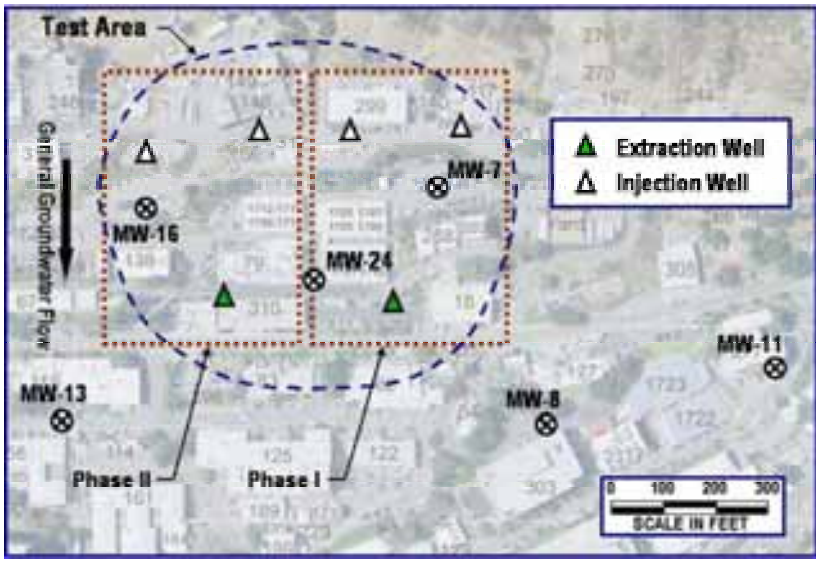


Figure 4-2. Conceptual Diagram of OU-1 Project Phasing

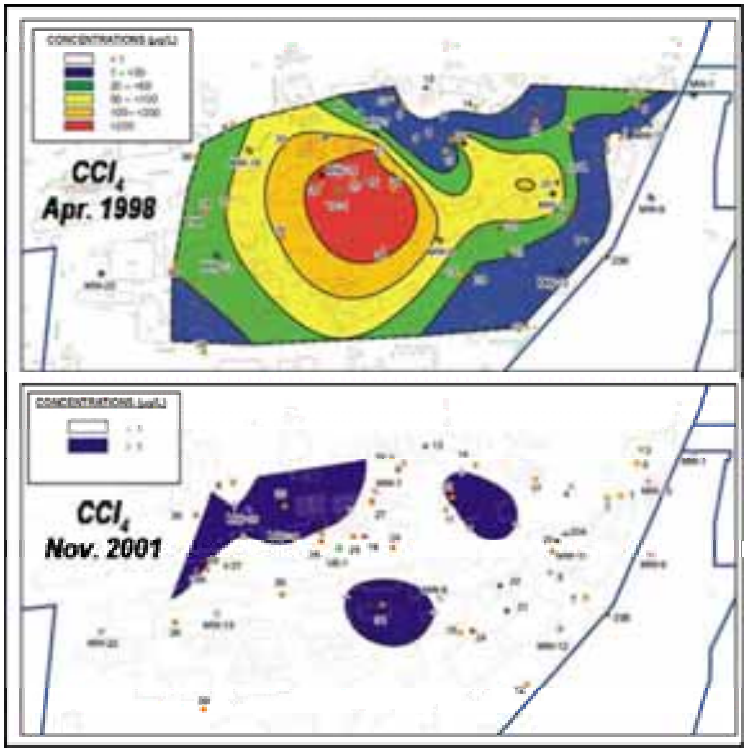


Figure 4-3. Soil Vapor Concentrations for CCl_4 Before and After Pilot Test

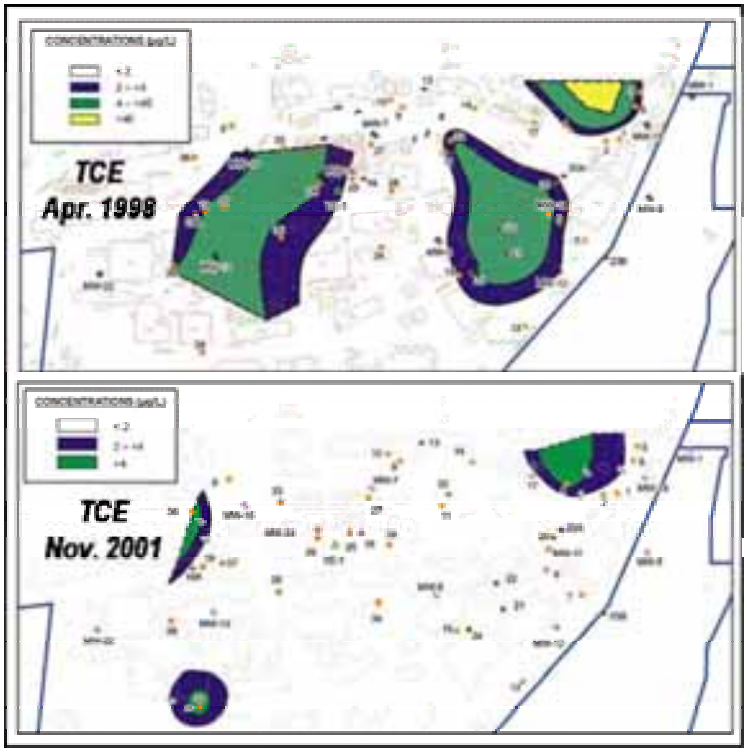


Figure 4-4. Soil Vapor Concentrations for TCE Before and After Pilot Test

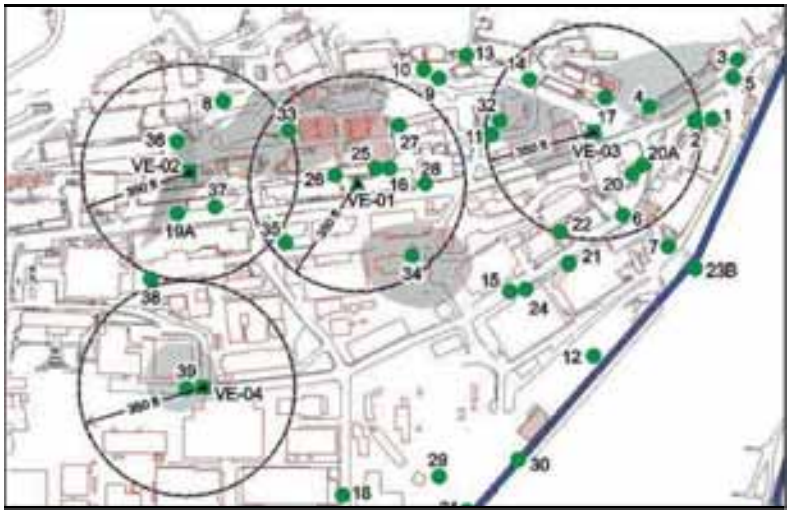


Figure 4-5. SVE System Layout for OU-2

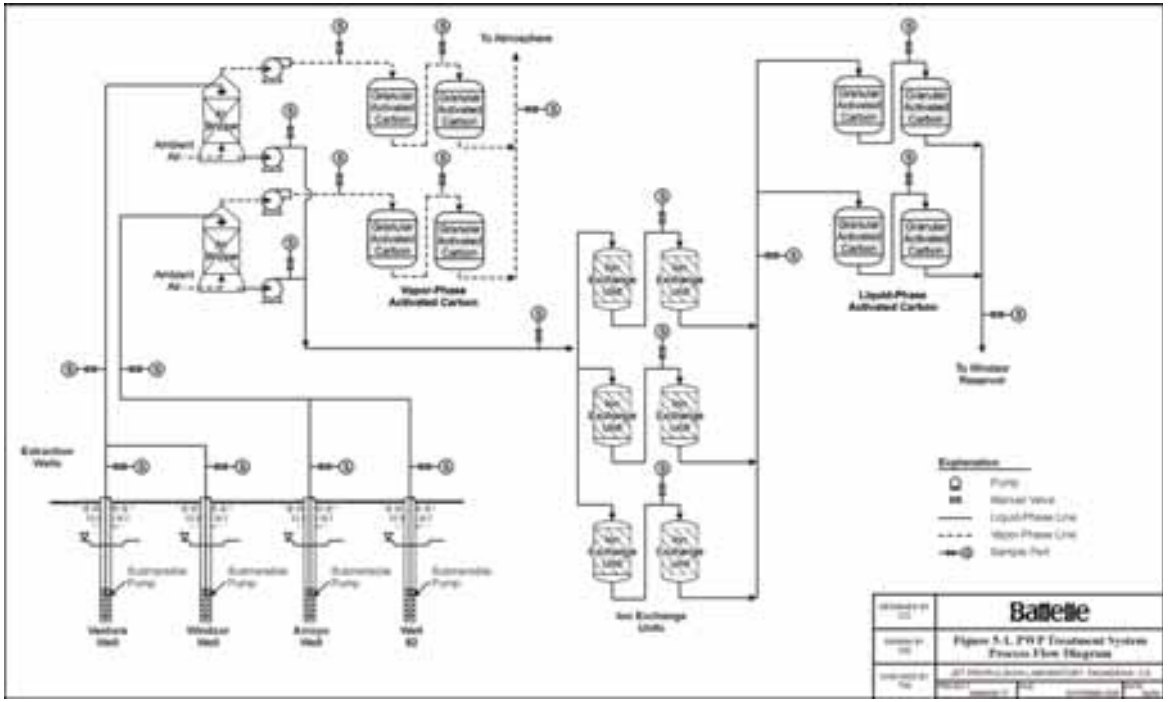


Figure 5-1. PWP Treatment System Process Flow Diagram

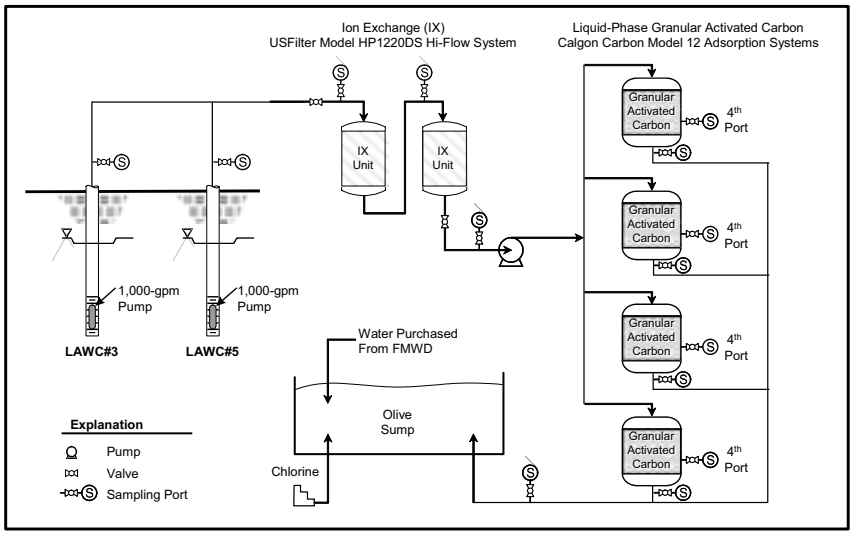


Figure 5-2. LAWC Treatment System Process Flow Diagram