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NASA - Jet Propulsion Laboratory

SUPERFUND PROJECT

April 12, 1996

BRIEFING
4/2/98

Presented by: Charles L. Buril, P.E.
Manager, Environmental Affairs Office

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OVERVIEW OF JPL SUPERFUND KEY EVENTS

1980	CITY OF PASADENA WELLS SHOW VOC CONTAMINATION BELOW MCLS
1988	NASA/JPL COMPLETES PA/SI AS REQUIRED BY SARA
1990	EXPANDED SITE INSPECTION IS COMPLETED • 7 WELLS INSTALLED • SEEPAGE PITS IDENTIFIED AS POSSIBLE CONTAMINANT SOURCE
10/14/92	JPL LISTED ON NPL
12/23/92	FEDERAL FACILITIES AGREEMENT SIGNED
12/92	WELLS #8 THROUGH #11 COMPLETED
06/93	FIRST SERIES OF DOCUMENTS DUE TO AGENCIES

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JPL/NASA INTERACTIONS

- JPL PROVIDED TEMPORARY PROJECT MANAGER UNTIL NASA-NMO HIRED PROJECT MANAGER

- JPL ACTS IN SUPPORT ROLE TO NASA
  - NASA IS LEAD ON ALL NEGOTIATIONS WITH AGENCIES
  - SEPARATE TASK ORDER (CG-127) TASKS JPL TO SUPPORT NASA

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DEVELOPMENT OF THE SITE HISTORY

APPROACH:

- JPL RECORDS WERE EXHAUSTIVELY RESEARCHED FOR POSSIBLE CLUES REGARDING SOURCES OF CONTAMINATION
  - JPL ARCHIVES
  - FACILITIES DRAWINGS DATING BACK TO THE 1940s
  - SITE PHOTOGRAPHS
- MANY CURRENT AND FORMER EMPLOYEES ALSO INTERVIEWED TO DETERMINE THE OPERATIONS AND THE LOCATIONS OF CONTAMINATION

RESULTS:

- 41 POSSIBLE LOCATIONS WERE IDENTIFIED AND EVALUATED FOR THEIR POTENTIAL TO CONTRIBUTE TO THE CONTAMINATION FOUND IN THE GROUND WATER UNDER AND SURROUNDING JPL
- MOST WERE AREAS OR FACILITIES THAT USED CHEMICALS AND THEN DUMPED THEM INTO SEEPAGE PUTS OR DRY WELLS
  - SOME WERE OPEN DISPOSAL AREAS, STORM DRAINS AND OTHER SIMILAR SITES
  - OTHER AREAS BECAME KNOWN DURING THE COURSE OF TIME (e.g. O.I.L. BUILDING)

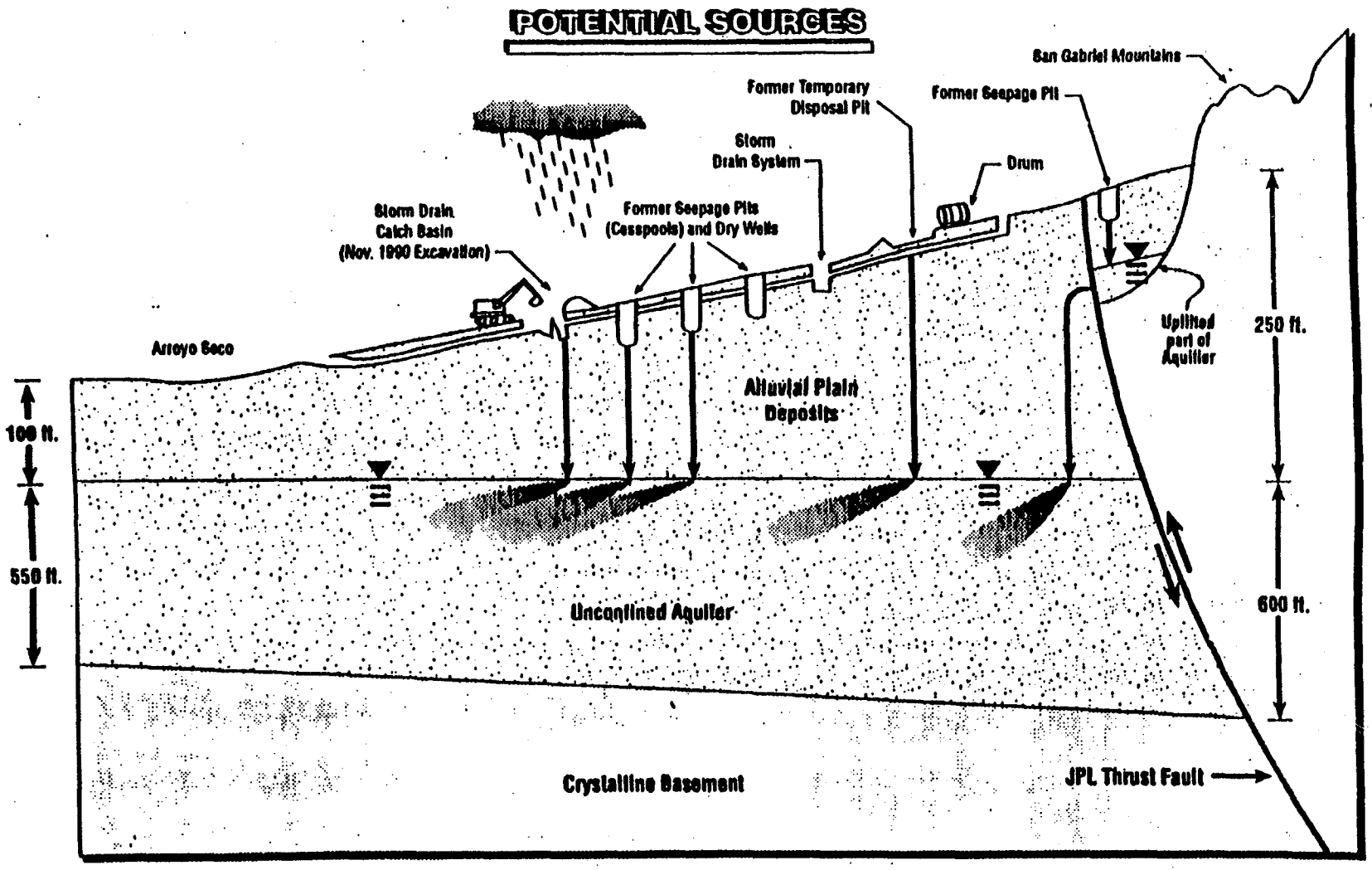

Figure 3 - 2

Conceptual Cross-Section Through the Jet Propulsion Laboratory

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JPL CERCLA PROJECT "OPERABLE UNITS"

- JPL HAS BEEN BROKEN DOWN INTO THREE (3) OPERABLE UNITS (OU)
  - OU-1: ON-SITE GROUNDWATER
  - OU-2: ON-SITE SOURCES (PITS, CESSPOOLS)
  - OU-3: OFF-SITE GROUNDWATER

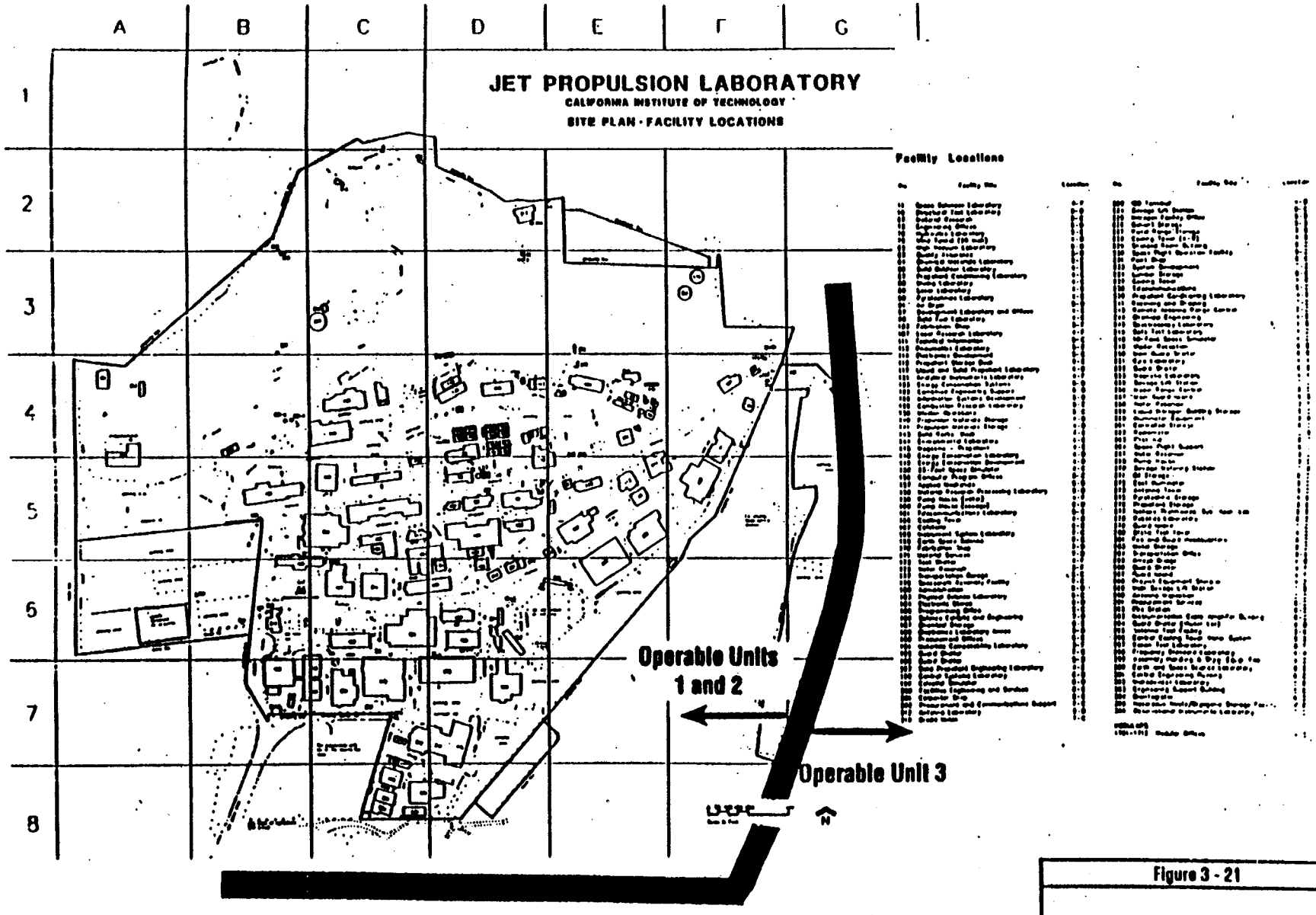

Figure 3 - 21

Operable Unit Boundaries for Jet Propulsion Laboratory

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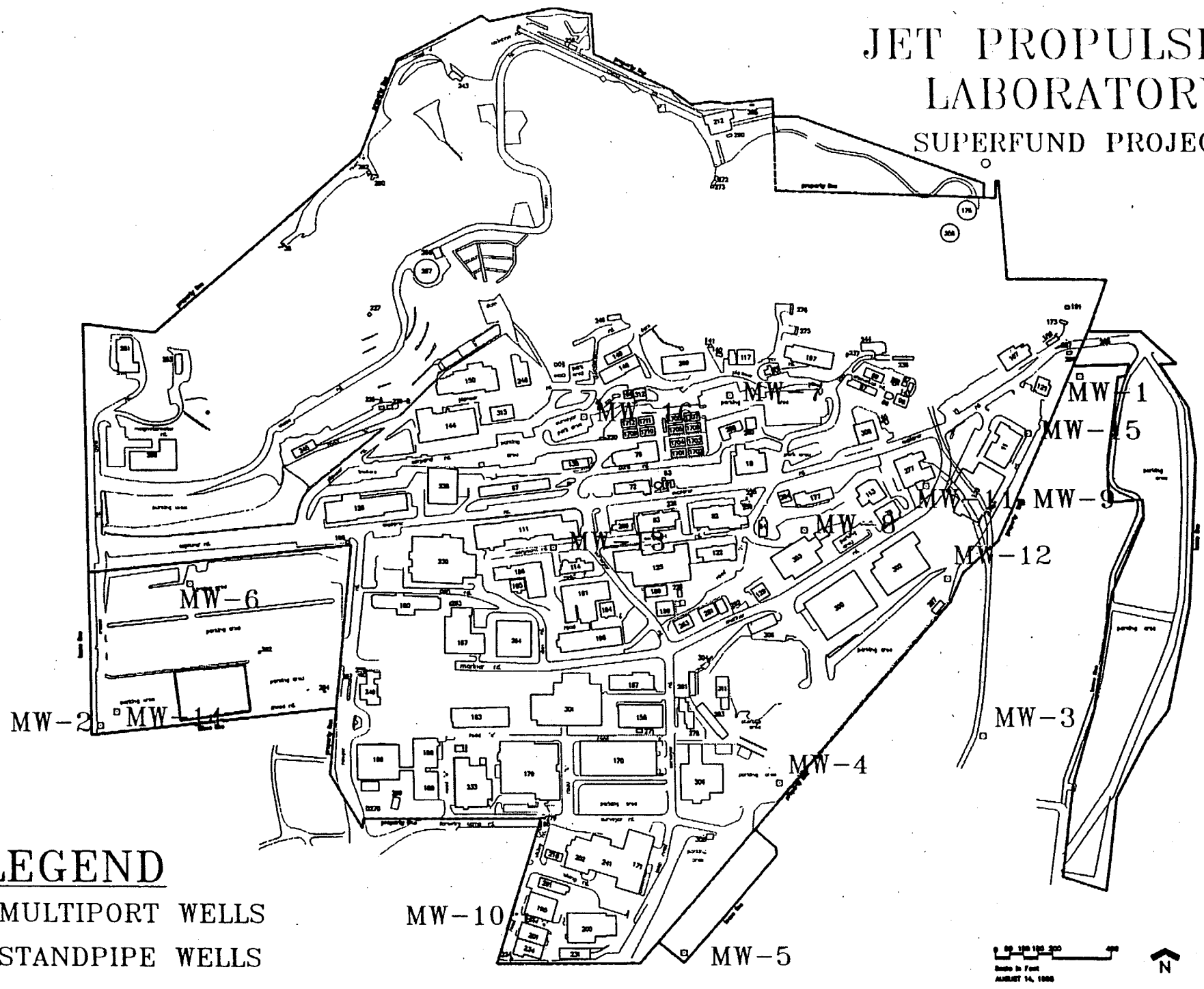
OPERABLE UNIT #1 APPROACH

- INSTALL A TOTAL OF 16 GROUNDWATER MONITORING WELLS ON-SITE AND IN THE ARROYO
  - WELLS ARE CAPABLE OF MONITORING BOTH HORIZONTAL AND VERTICAL EXTENT OF CONTAMINATION
- SAMPLE ALL WELLS IN WET AND DRY SEASONS FOR CONTAMINANTS
  - VOCs AND OTHERS
- DEVELOP 3-D UNDERSTANDING OF CONTAMINANT DISTRIBUTION
  - SUPPLEMENT WITH COMPUTER MODELING
- EVALUATE ALTERNATIVES FOR REMEDIAL ACTION NEEDED (IF ANY)

JET PROPULSION LABORATORY

SUPERFUND PROJECT



LEGEND

- MULTIPORT WELLS
- STANDPIPE WELLS

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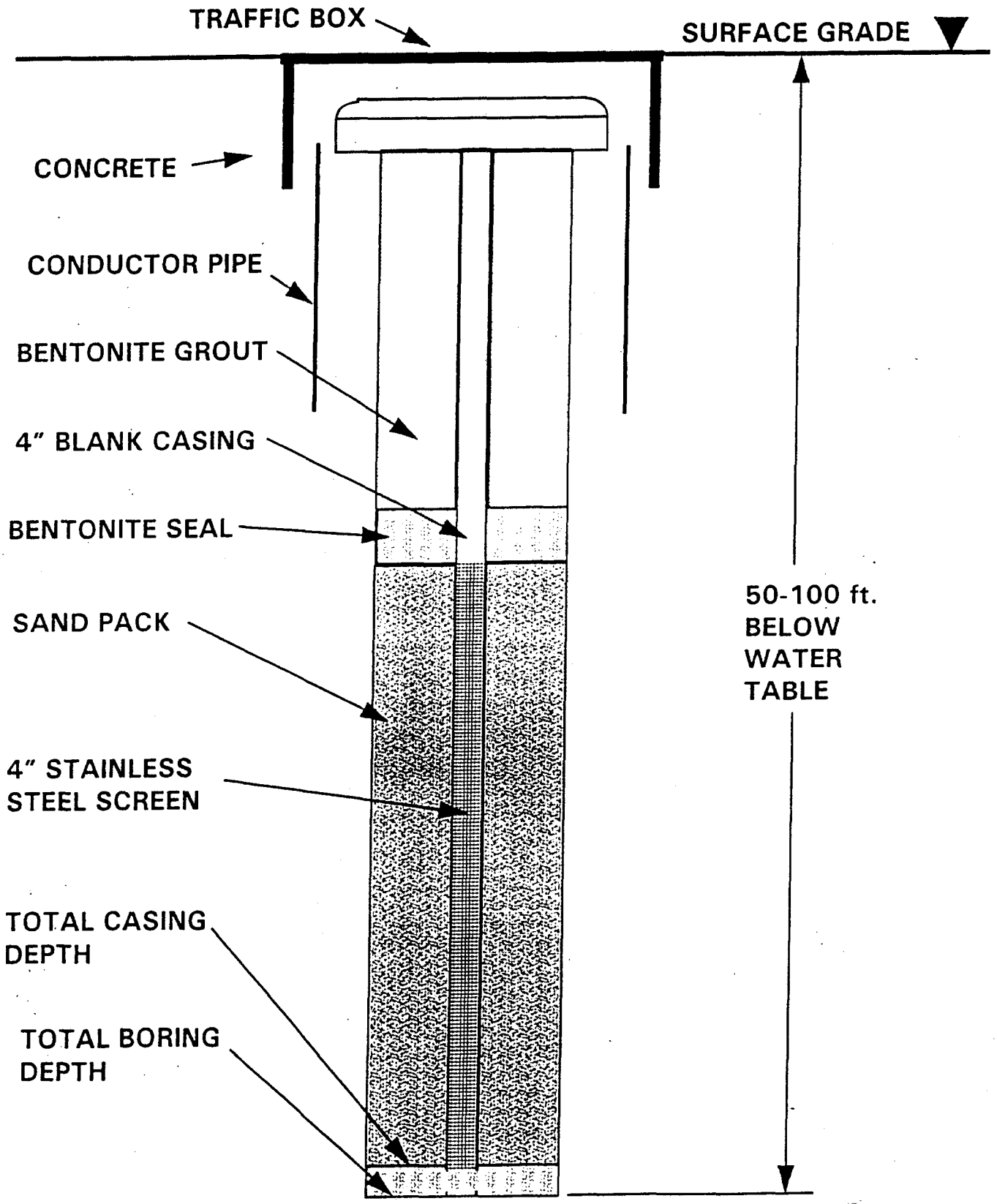
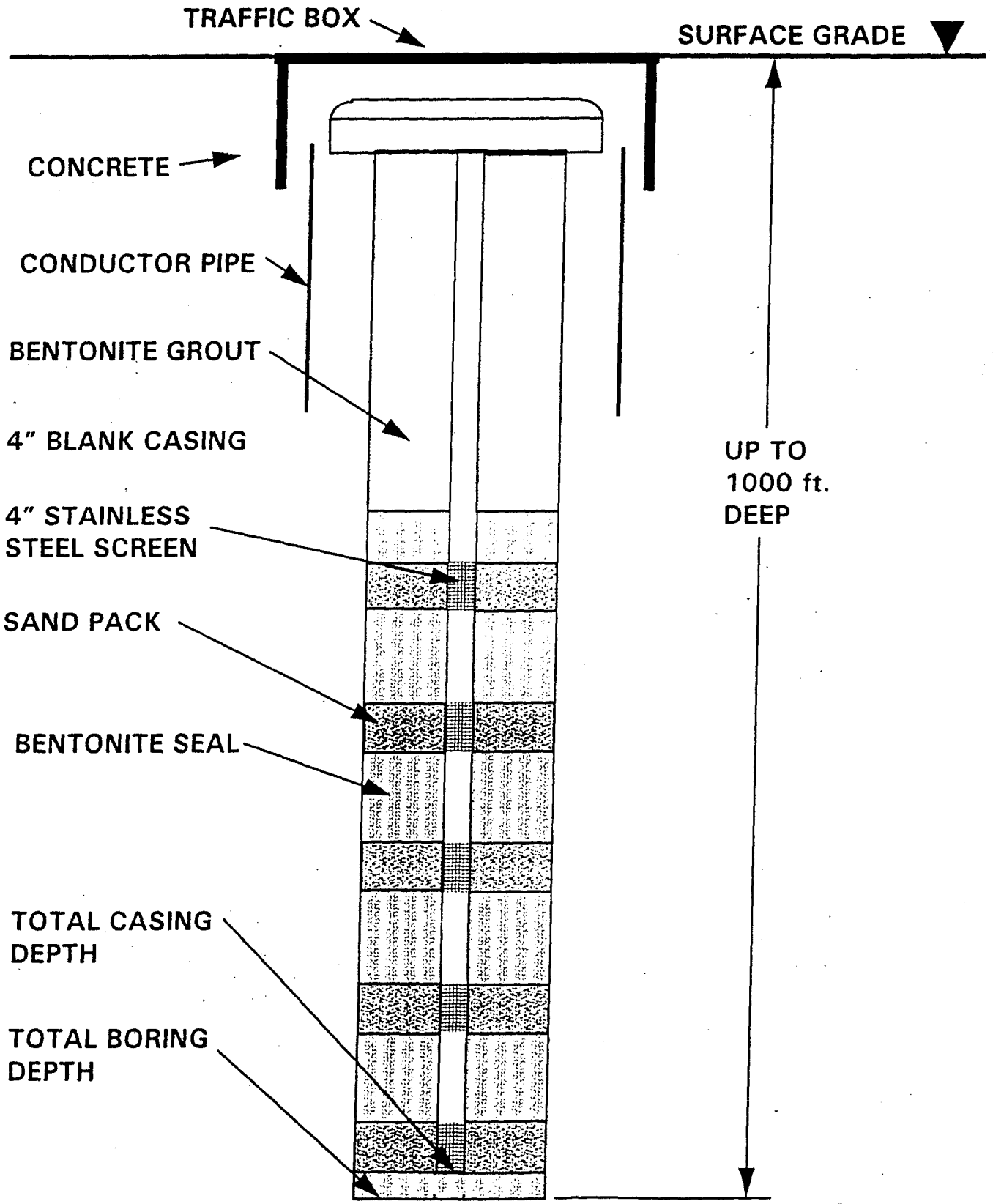
JPL STANDPIPE WELL CONSTRUCTION



JPL MULTIPORT WELL CONSTRUCTION



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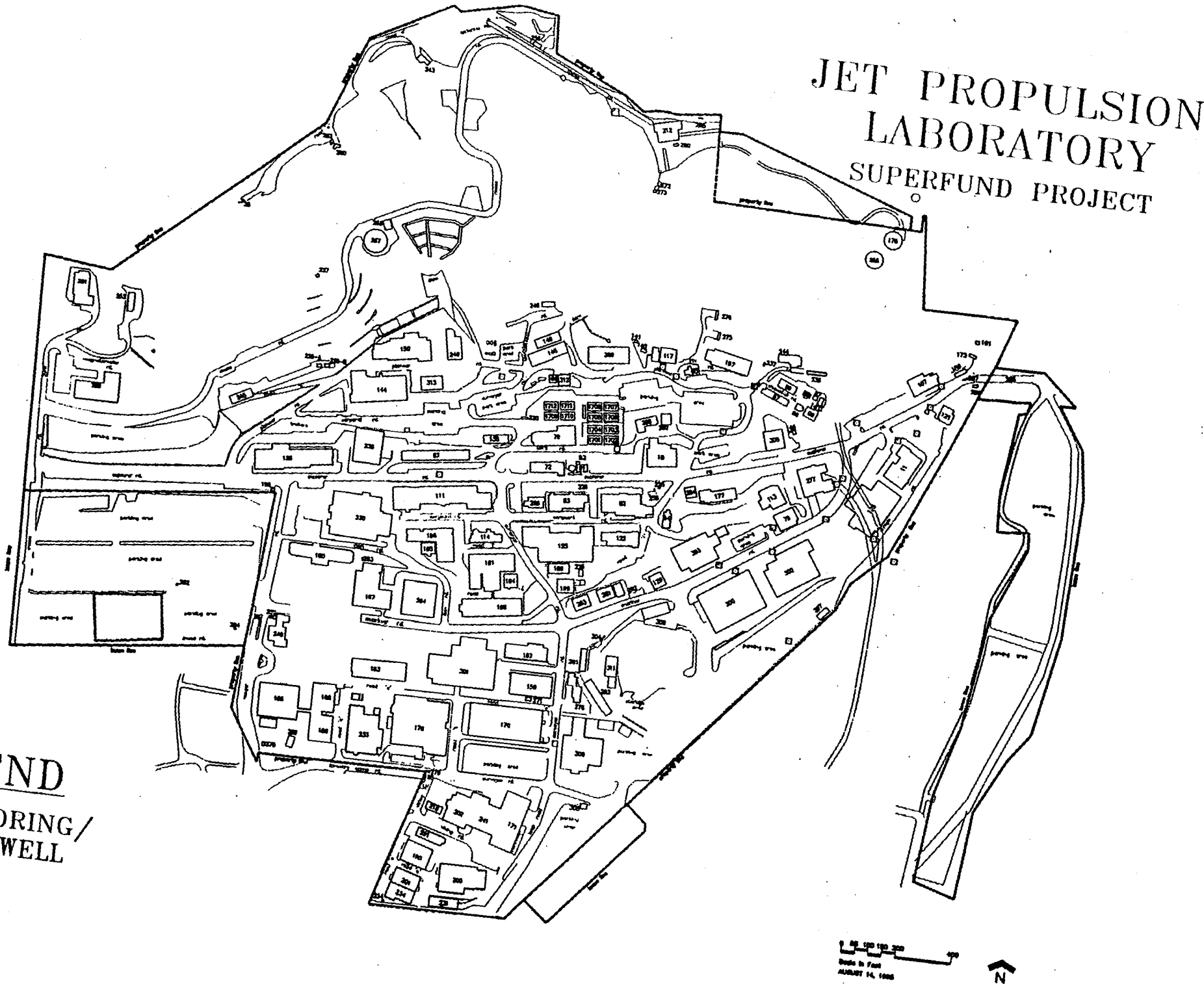
OPERABLE UNIT #2 APPROACH

- PERFORM SOIL VAPOR ANALYSES AT IDENTIFIED SEEPAGE PIT LOCATIONS
  - ANALYZE FOR VOCs
- SAMPLE SOIL AT 24 LOCATIONS FOR NON-VOLATILE CONTAMINATION (METALS, etc.)
- INSTALL NESTED SOIL VAPOR WELLS AT THE SOIL SAMPLE LOCATIONS
  - HELPS TO DETERMINE VERTICAL DISTRIBUTION OF SOIL VAPORS
- DEVELOP 3-D UNDERSTANDING OF SOIL VAPOR AND SOIL CONTAMINATION
- EVALUATE REMEDIAL ALTERNATIVES REQUIRED (IF ANY)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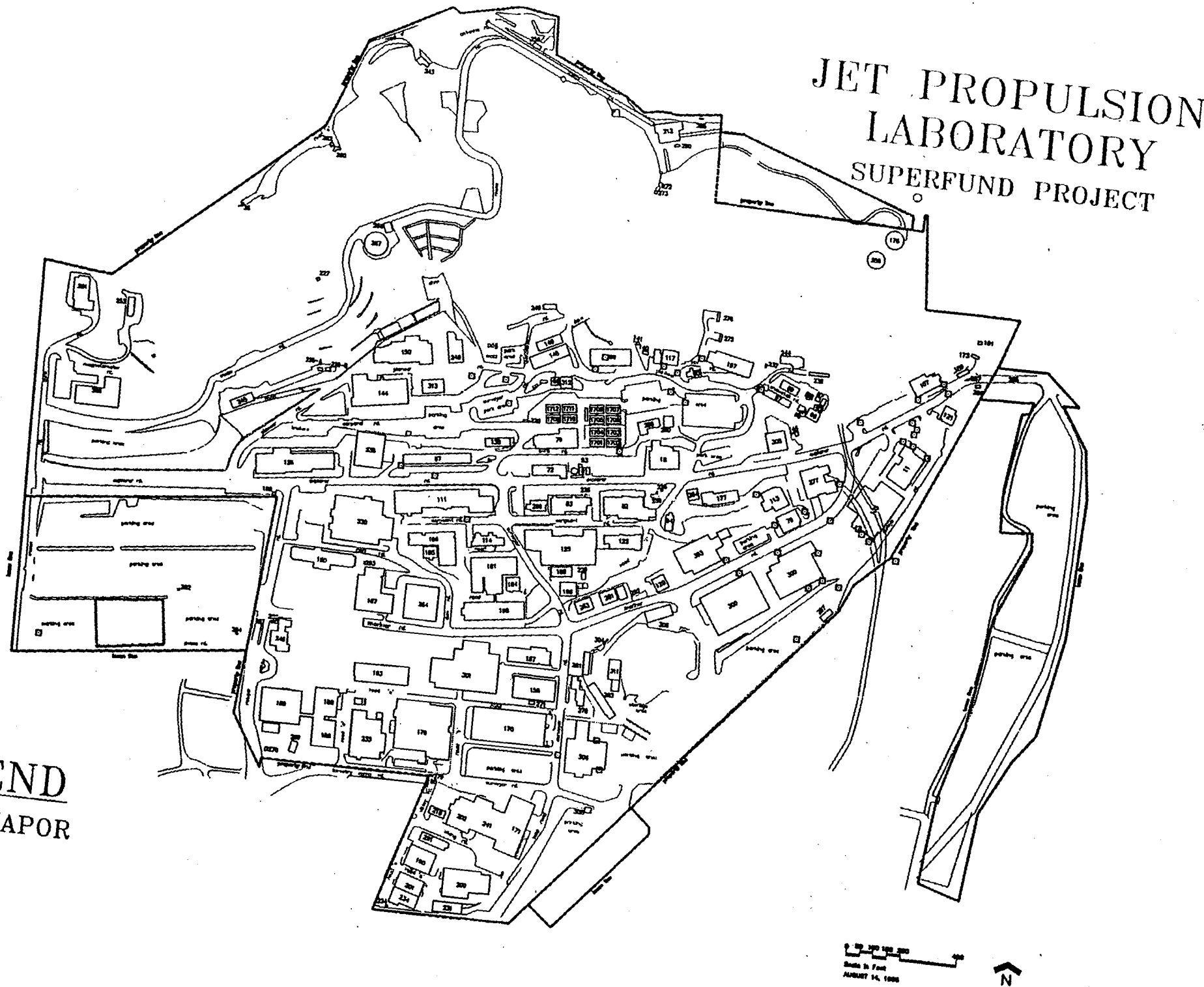
LABORATORY
SUPERFUND PROJECT
LEGEND
SOIL BORING/
VAPOR WELL
N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SOIL VAPOR
PROBE
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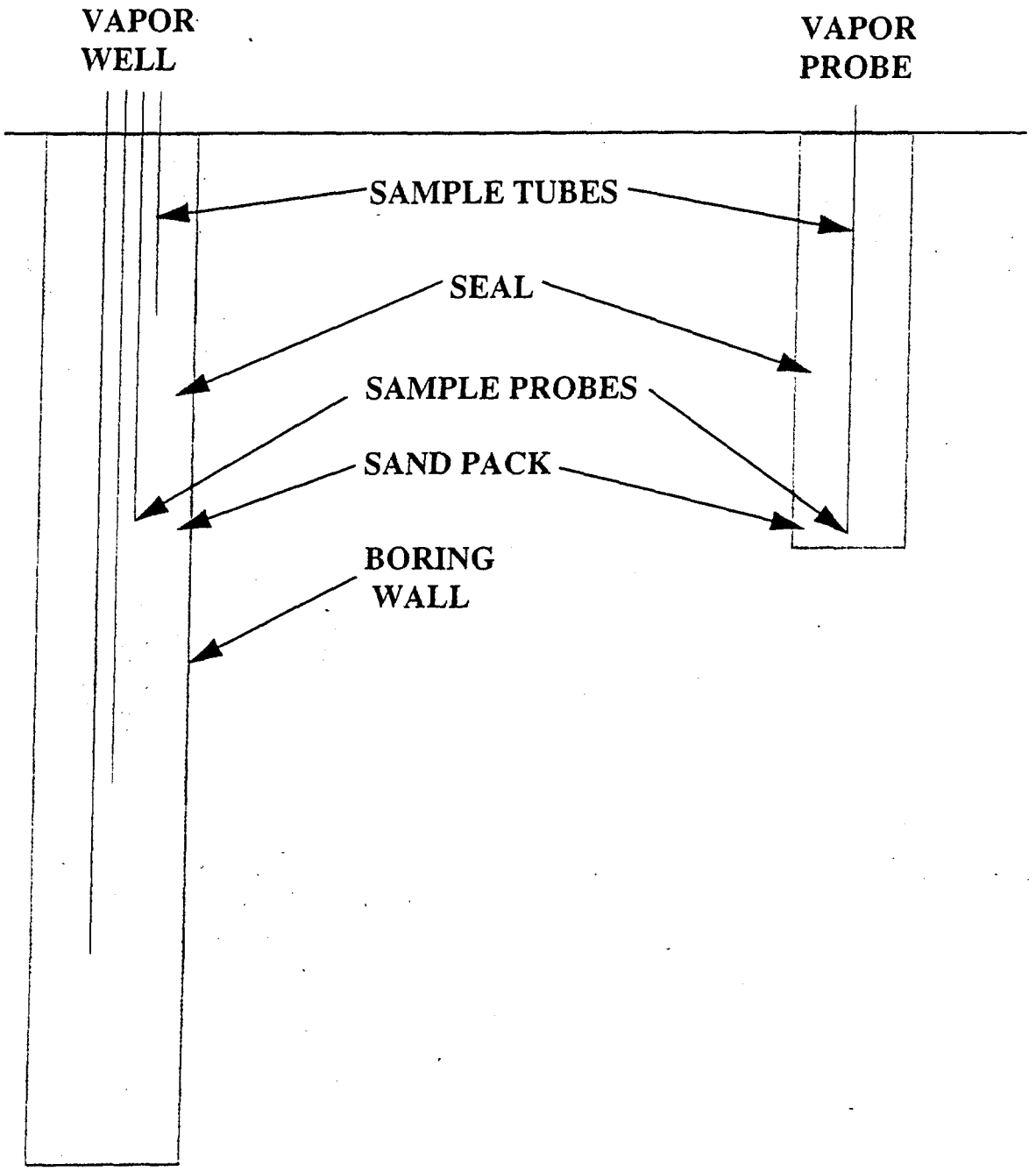
SOIL PROBE AND SOIL VAPOR WELL CONSTRUCTION



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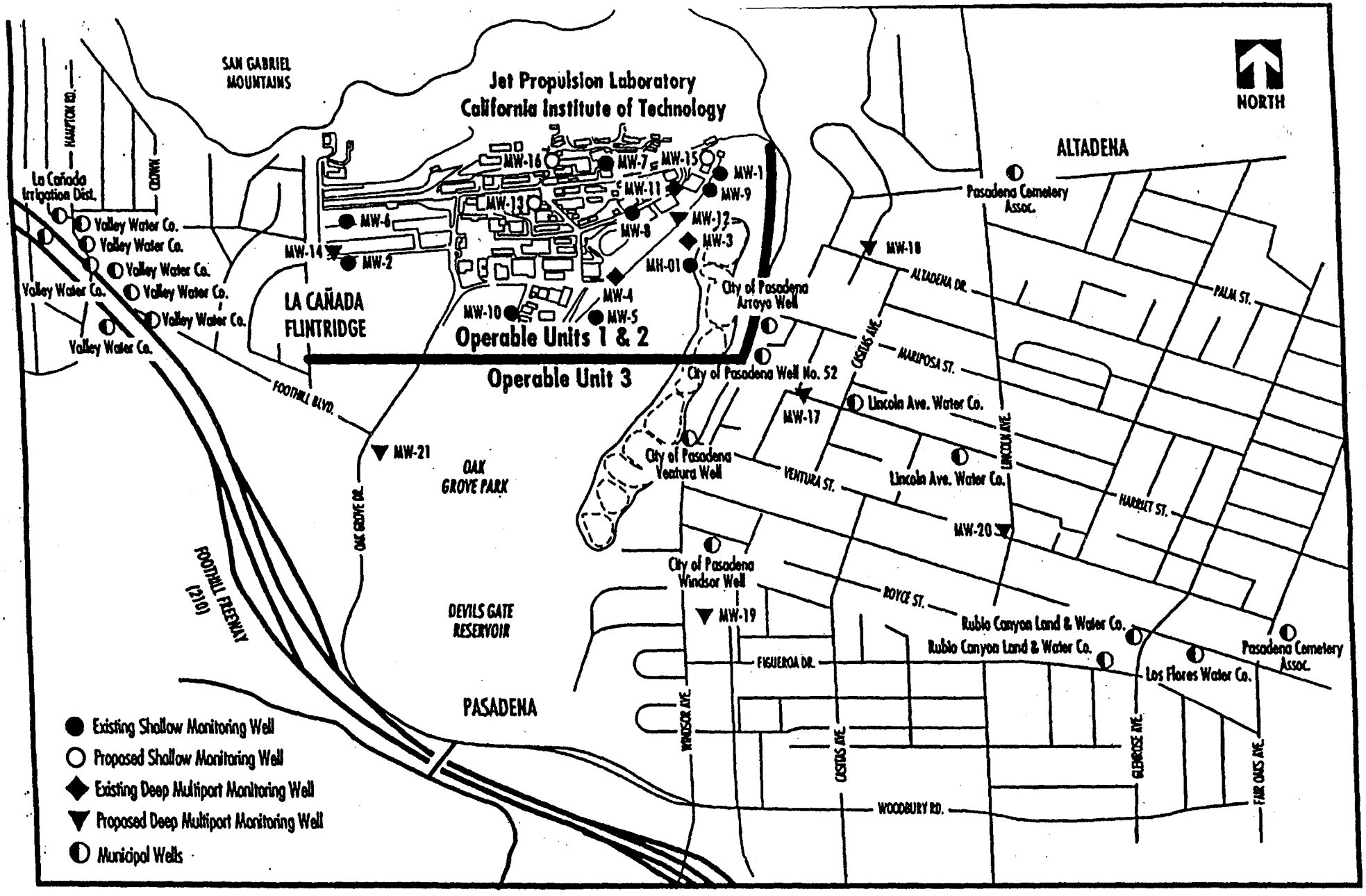
OPERABLE UNIT #3 APPROACH

- INSTALL FIVE (5) WELLS IN ALTADENA AND PASADENA
  - WELLS ARE CAPABLE OF MONITORING BOTH HORIZONTAL AND VERTICAL EXTENT OF CONTAMINATION
- SAMPLE ALL WELLS IN WET AND DRY SEASONS FOR CONTAMINANTS
  - VOCs AND OTHERS
- DEVELOP 3-D UNDERSTANDING OF CONTAMINANT DISTRIBUTION
  - SUPPLEMENT WITH COMPUTER MODELING
- EVALUATE ALTERNATIVES FOR REMEDIAL ACTIONS (IF ANY)



This map shows the general locations of monitoring and municipal wells at JPL and in the surrounding communities.

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TECHNICAL INFORMATION AVAILABLE TO DATE AND INTERPRETATION

TABLE

SUMMARY OF WELL CONSTRUCTION DETAILS FOR JPL GROUNDWATER MONITORING WELLS

Well Number	Well Type	Year Installed	Drilling Method	Depth to Bottom of Casing (feet)	Depth of Screened Interval (feet)	Elevation Top 4-inch Casing (feet above mean sea level)	Elevation of Screened Interval (feet above mean sea level)	Multi-Port Well Screen Number
MW-1	Shallow Standpipe	1989	Mud Rotary	120	70-110	1116.70	1006.70-1046.70	-
MW-2	Shallow Standpipe	1989	Mud Rotary	177	127-167	1168.85	1001.85-1041.85	-
MW-3	Deep Multi-Port	1990	Mud Rotary	700	170-180 250-260 344-354 555-565 650-660	1099.82	919.82-929.82 839.82-849.82 745.82-755.82 534.82-544.82 433.82-443.82	1 2 3 4 5
MW-4	Deep Multi-Port	1990	Mud Rotary	559	147-157 237-247 318-328 389-399 509-519	1082.72	925.72-935.72 835.72-845.72 754.72-764.72 683.72-693.72 563.72-573.72	1 2 3 4 5
MW-5	Shallow Standpipe	1990	Air Percussion	140	85-135	1071.60	936.60-986.60	-
MW-6	Shallow Standpipe	1990	Air Percussion	245	195-245	1188.52	943.52-993.52	-
MW-7	Shallow Standpipe	1990	Air Percussion	275	225-275	1212.88	937.88-987.88	-
MW-8	Shallow Standpipe	1992	Air Percussion	205	155-205	1139.53	934.53-984.53	-
MW-9	Shallow Standpipe	1992	Air Percussion	68	18-68	1106.02	1038.02-1088.02	-
MW-10	Shallow Standpipe	1992	Air Percussion	155	105-155	1087.71	932.71-982.71	-
MW-11	Deep Multi-Port	1992	Mud Rotary	680	140-150 250-260 420-430 515-525 630-640	1139.35	989.35-999.35 879.35-889.35 709.35-719.35 614.35-624.35 499.35-509.35	1 2 3 4 5

TABLE (Continued)

Well Number	Well Type	Year Installed	Drilling Method	Depth to Bottom of Casing (feet)	Depth of Screened Interval (feet)	Elevation Top 4-inch Casing (feet above mean sea level)	Elevation of Screened Interval (feet above mean sea level)	Multi-Port Well Screen Number
MW-12	Deep Multi-Port	1994	Mud Rotary	596	135-145 240-250 315-325 430-440 546-556	1102.14	957.14-967.14 852.14-862.14 777.14-787.14 662.14-672.14 546.14-556.14	1 2 3 4 5
MW-13	Shallow Standpipe	1994	Air Rotary	235	180-230	1183.47	953.47-1003.47	-
MW-14	Deep Multi-Port	1994	Mud Rotary	588	205-215 275-285 380-390 453-463 538-548	1173.42	958.42-968.42 888.42-898.42 783.42-793.42 710.42-720.42 625.42-635.42	1 2 3 4 5
MW-15	Shallow Standpipe	1994	Air Percussion	74	19-69	1120.66	1051.66-1101.66	-
MW-16	Shallow Standpipe	1994	Air Percussion	285	230-280	1236.27	956.27-1006.27	-

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MW-1	Shallow Standpipe	1989	Mud Rotary	120	70-110	1116.70	1006.70-1046.70	-
MW-2	Shallow Standpipe	1989	Mud Rotary	177	127-167	1168.85	1001.85-1041.85	-
MW-3	Deep Multi-Port	1990	Mud Rotary	700	170-180	1099.82	919.82-929.82	1
					250-260		839.82-849.82	2
					344-354		745.82-755.82	3
					555-565		534.82-544.82	4
					650-660		433.82-443.82	5
MW-4	Deep Multi-Port	1990	Mud Rotary	559	147-157	1082.72	925.72-935.72	1
					237-247		835.72-845.72	2
					318-328		754.72-764.72	3
					389-399		683.72-693.72	4
					509-519		563.72-573.72	5
MW-5	Shallow Standpipe	1990	Air Percussion	140	85-135	1071.60	936.60-986.60	-
MW-6	Shallow Standpipe	1990	Air Percussion	245	195-245	1188.52	943.52-993.52	-
MW-7	Shallow Standpipe	1990	Air Percussion	275	225-275	1212.88	937.88-987.88	-
MW-8	Shallow Standpipe	1992	Air Percussion	205	155-205	1139.53	934.53-984.53	-
MW-9	Shallow Standpipe	1992	Air Percussion	68	18-68	1106.02	1038.02-1088.02	-
MW-10	Shallow Standpipe	1992	Air Percussion	155	105-155	1087.71	932.71-982.71	-
MW-11	Deep Multi-Port	1992	Mud Rotary	680	140-150	1139.35	989.35-999.35	1
					250-260		879.35-889.35	2
					420-430		709.35-719.35	3
					515-525		614.35-624.35	4
					630-640		499.35-509.35	5

TABLE (Continued)

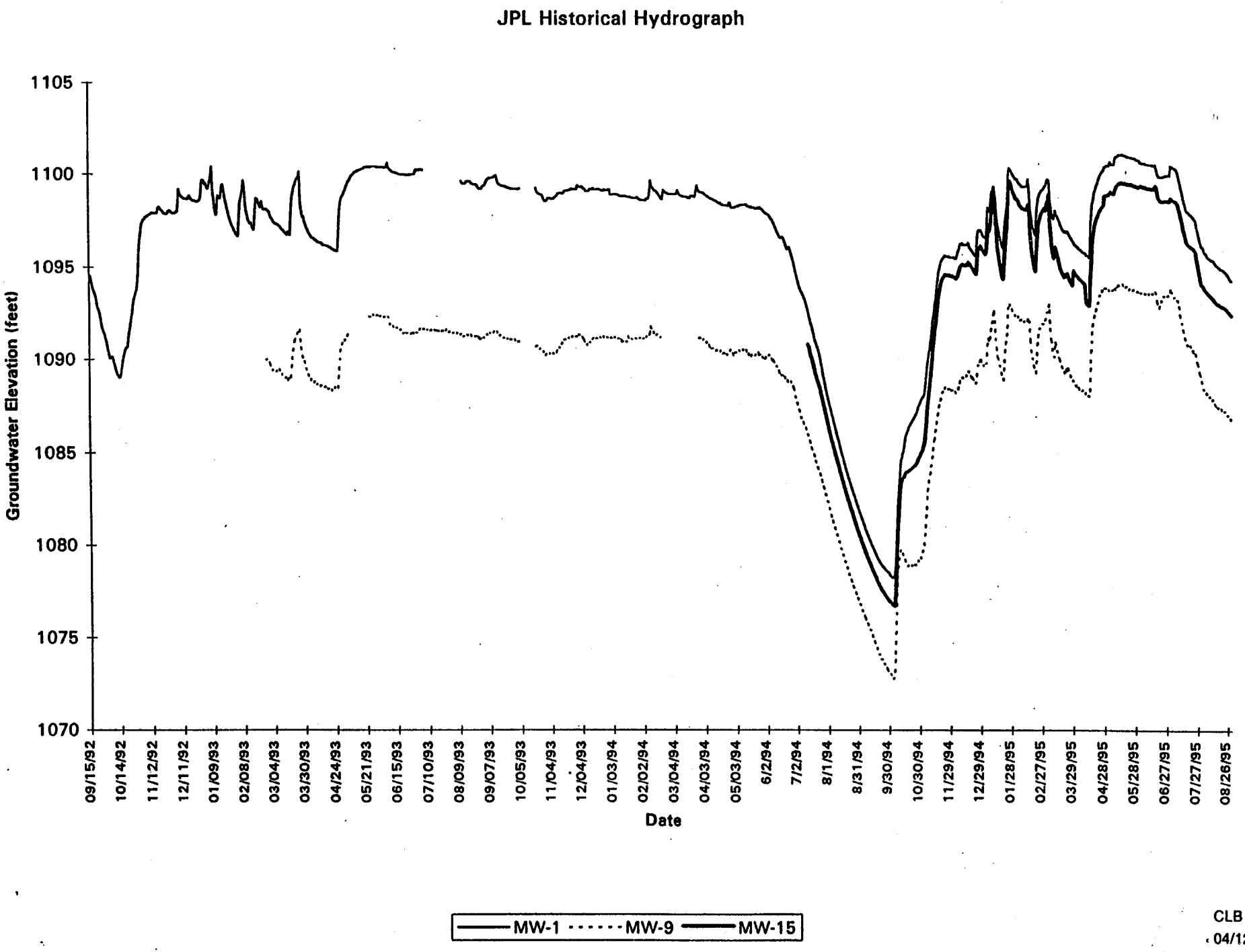
Well Number	Well Type	Year Installed	Drilling Method	Depth to Bottom of Casing (feet)	Depth of Screened Interval (feet)	Elevation Top 4-inch Casing (feet above mean sea level)	Elevation of Screened Interval (feet above mean sea level)	Multi-Port Well Screen Number
MW-12	Deep Multi-Port	1994	Mud Rotary	596	135-145	1102.14	957.14-967.14	1
					240-250		852.14-862.14	2
					315-325		777.14-787.14	3
					430-440		662.14-672.14	4
					546-556		546.14-556.14	5
MW-13	Shallow Standpipe	1994	Air Rotary	235	180-230	1183.47	953.47-1003.47	-
MW-14	Deep Multi-Port	1994	Mud Rotary	588	205-215	1173.42	958.42-968.42	1
					275-285		888.42-898.42	2
					380-390		783.42-793.42	3
					453-463		710.42-720.42	4
					538-548		625.42-635.42	5
MW-15	Shallow Standpipe	1994	Air Percussion	74	19-69	1120.66	1051.66-1101.66	-
MW-16	Shallow Standpipe	1994	Air Percussion	285	230-280	1236.27	956.27-1006.27	-
MW-17	Deep Multi-Port	1995	Mud Rotary	774	246-256	1190.99	934.99-944.99	1
					366-376		814.99-824.99	2
					466-476		714.99-724.99	3
					578-588		602.99-612.99	4
					723-733		457.99-467.99	5
MW-18	Deep Multi-Port	1995	Mud Rotary	732	266-276	1225.34	949.34-959.34	1
					326-336		889.34-899.34	2
					421-431		794.34-804.34	3
					561-571		654.34-664.34	4
					681-691		534.34-544.34	5
MW-19	Deep Multi-Port	1995	Mud Rotary	543	240-250	1143.20	893.20-903.20	1
					310-320		823.20-833.20	2
					390-400		743.20-753.20	3
					442-452		691.20-701.20	4
					492-502		641.20-651.20	5

TABLE (Continued)

Well Number	Well Type	Year Installed	Drilling Method	Depth to Bottom of Casing (feet)	Depth of Screened Interval (feet)	Elevation Top 4-inch Casing (feet above mean sea level)	Elevation of Screened Interval (feet above mean sea level)	Multi-Port Well Screen Number
MW-20	Deep Multi-Port	1995	Mud Rotary	948	228-238	1164.89	926.89-936.89	1
					388-398		766.89-776.89	2
					558-568		596.89-606.89	3
					698-708		456.89-466.89	4
					898-908		256.89-266.89	5
MW-21	Deep Multi-Port	1995	Mud Rotary	416	86-96	1058.99	962.99-972.99	1
					156-166		892.99-902.99	2
					236-246		812.99-822.99	3
					306-316		742.99-752.99	4
					366-376		682.99-692.99	5

JPL Historical Hydrograph

MH-01 ····· MW-5 — MW-6 — MW-7 — MW-8 — MW-10 — MW-13 — MW-16



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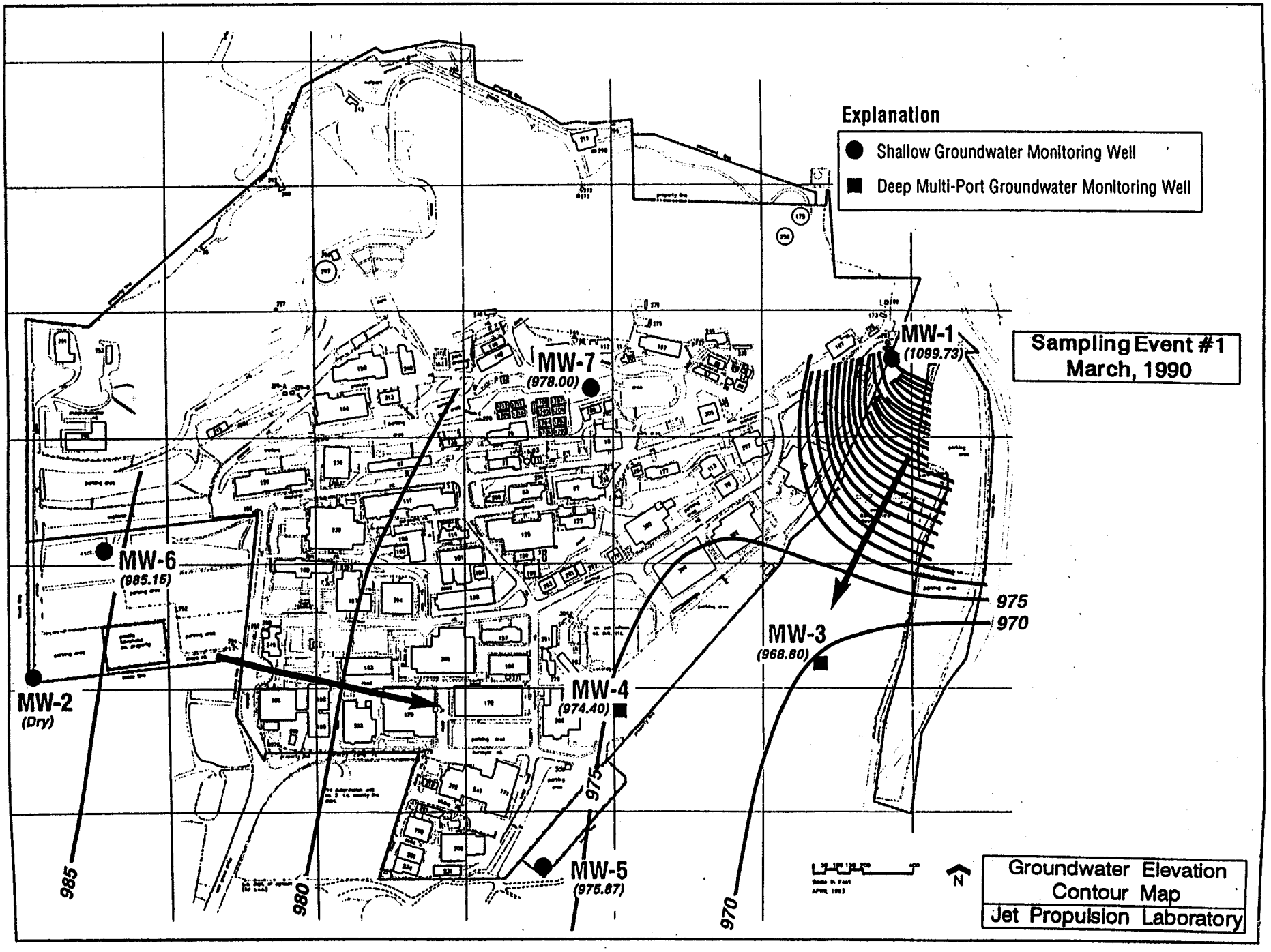

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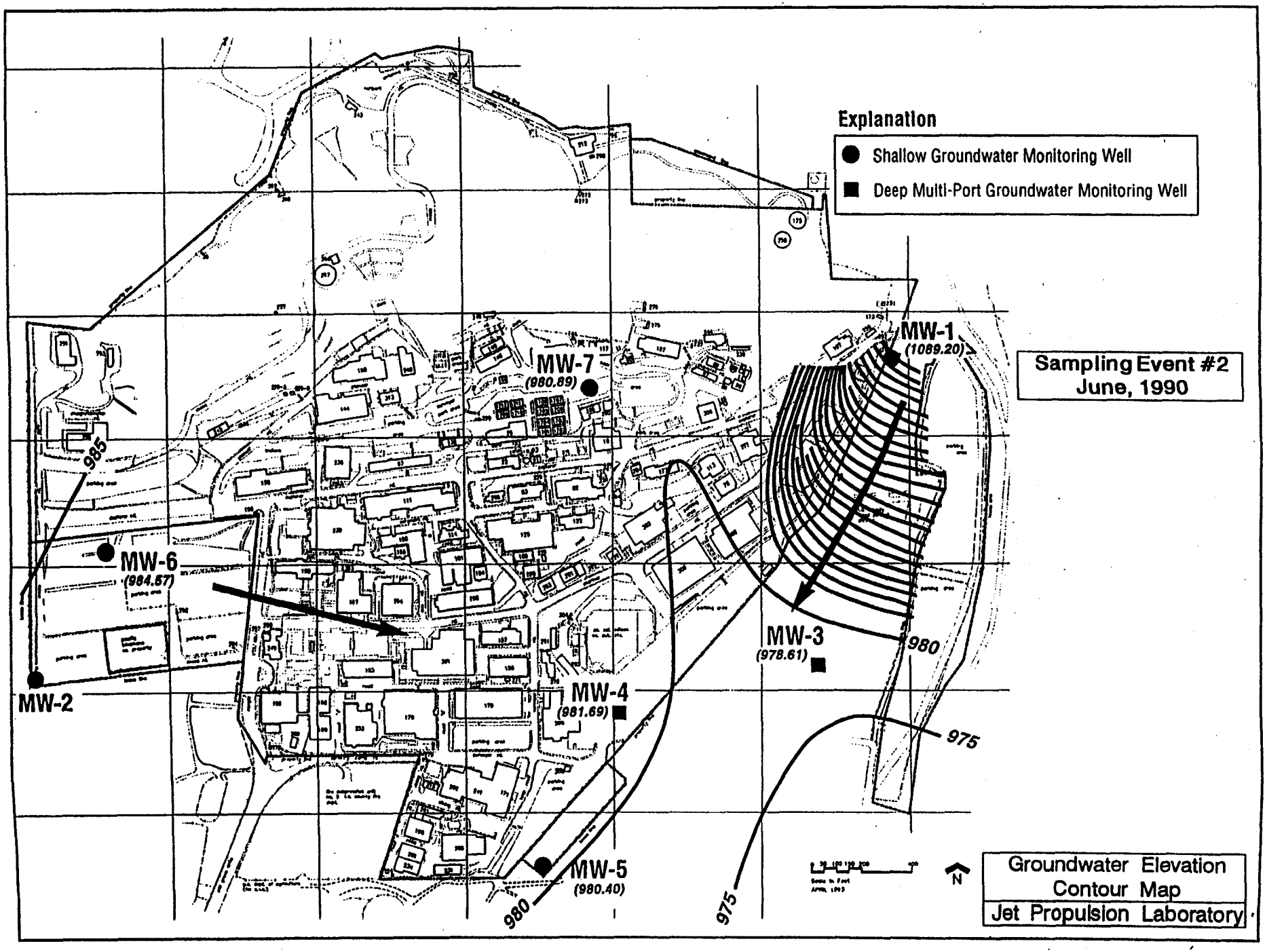

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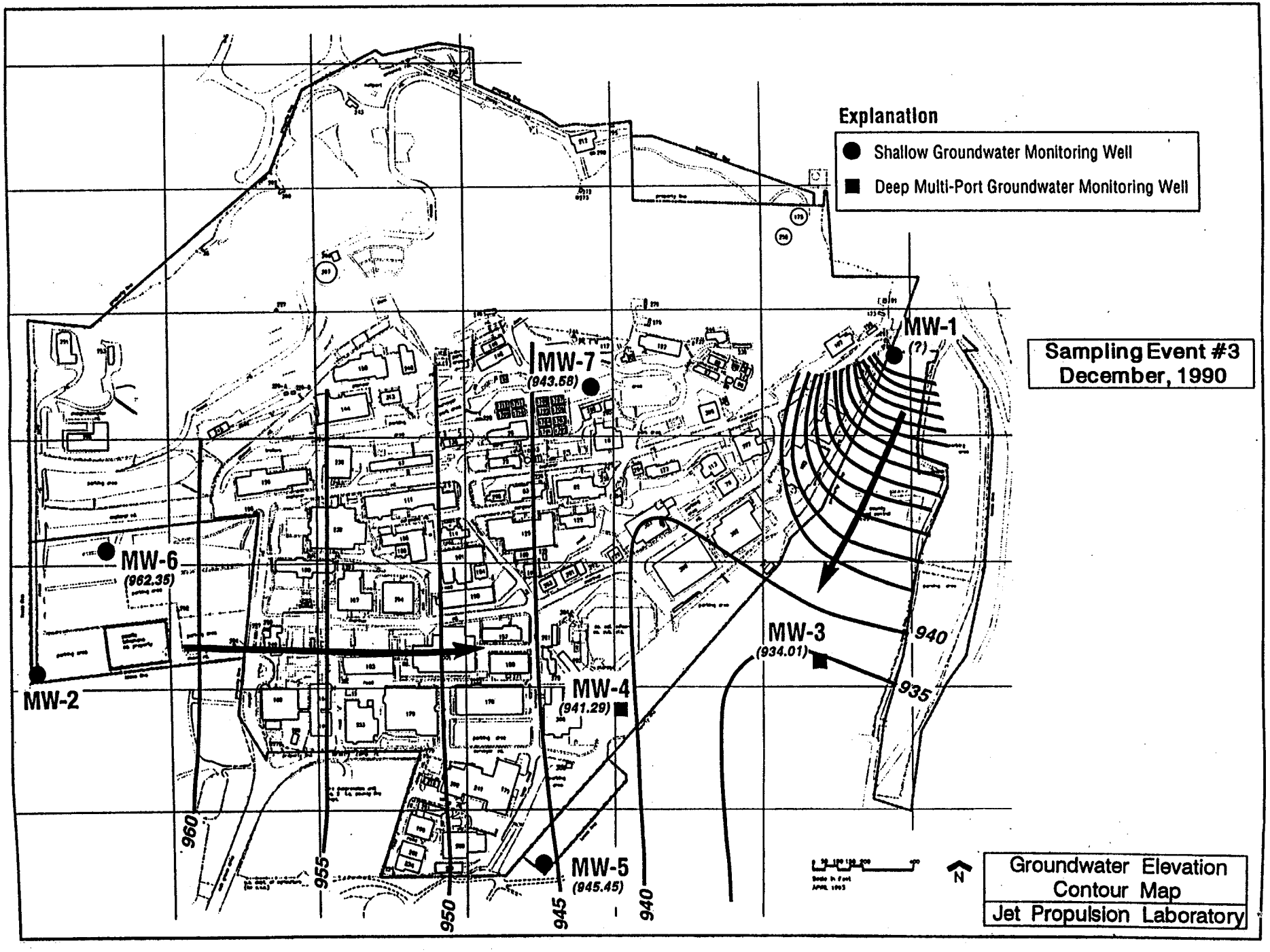

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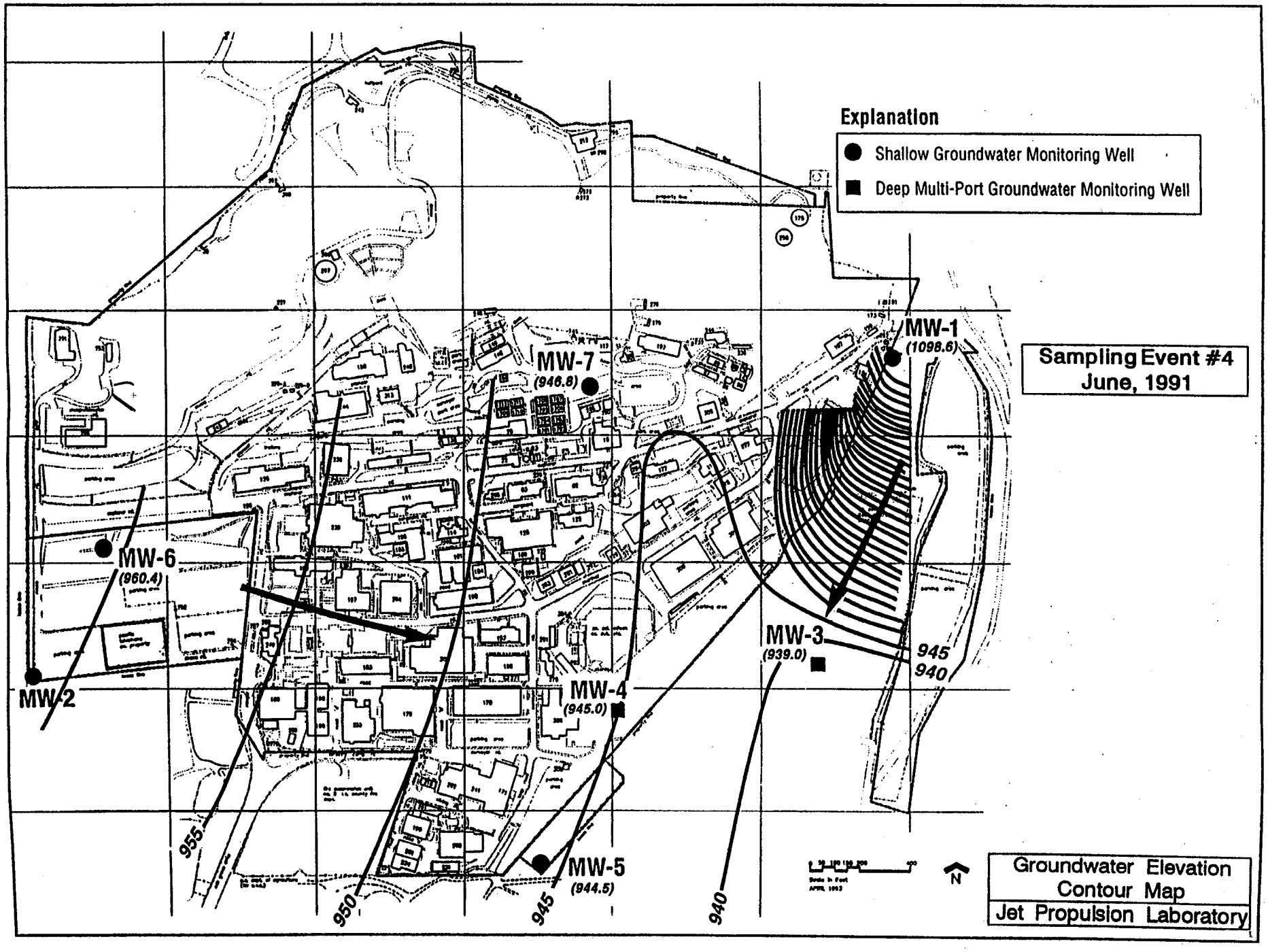

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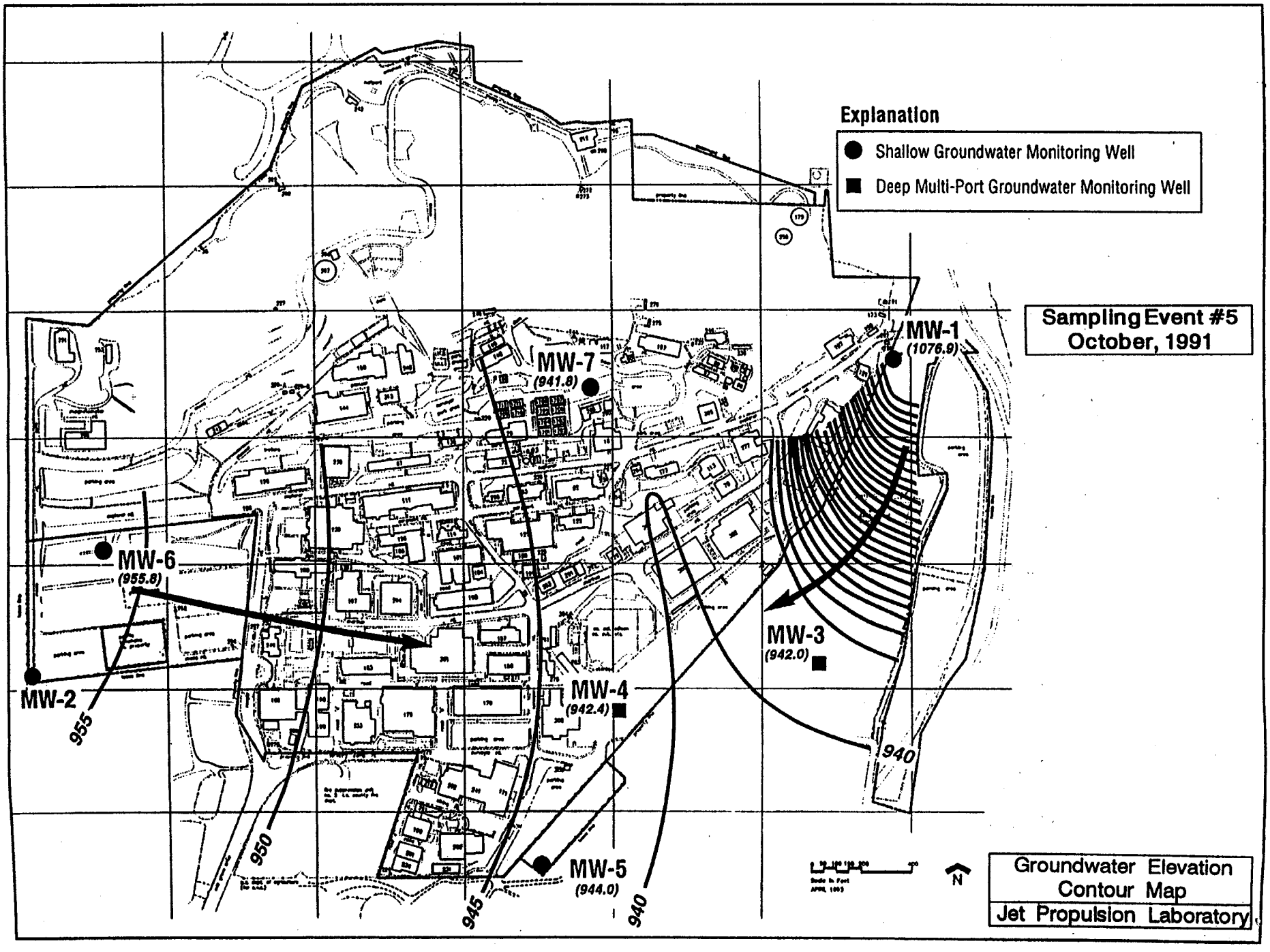

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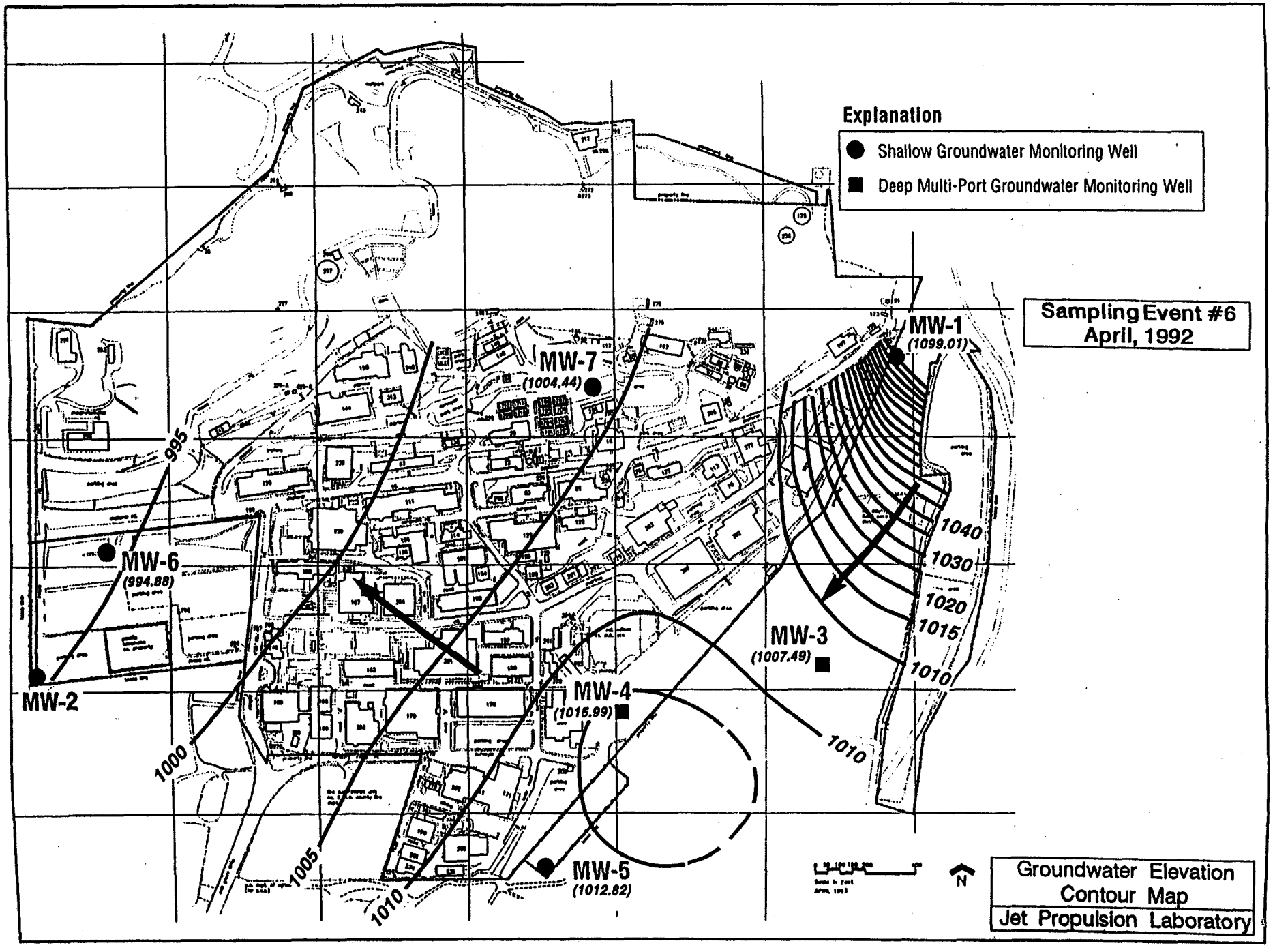

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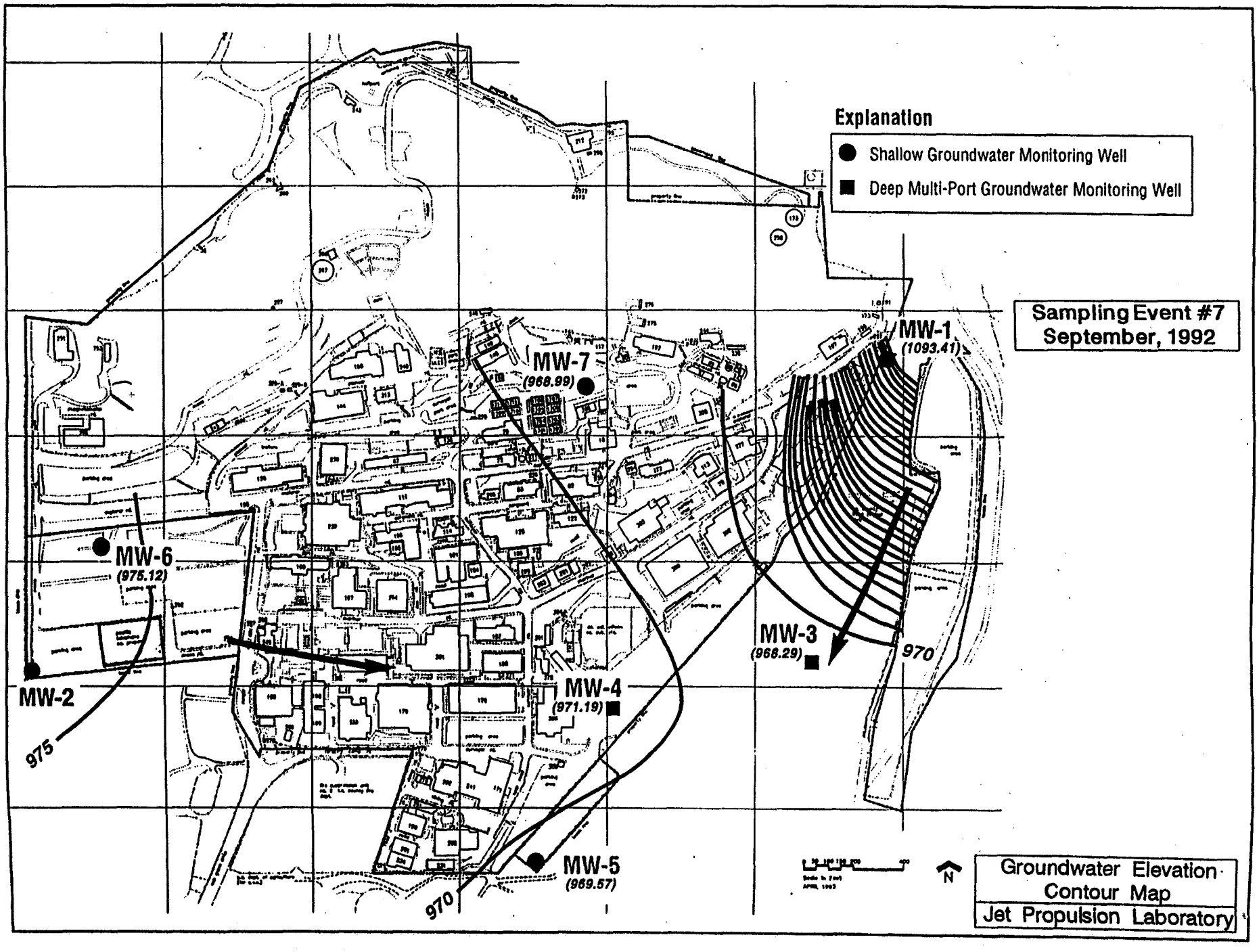

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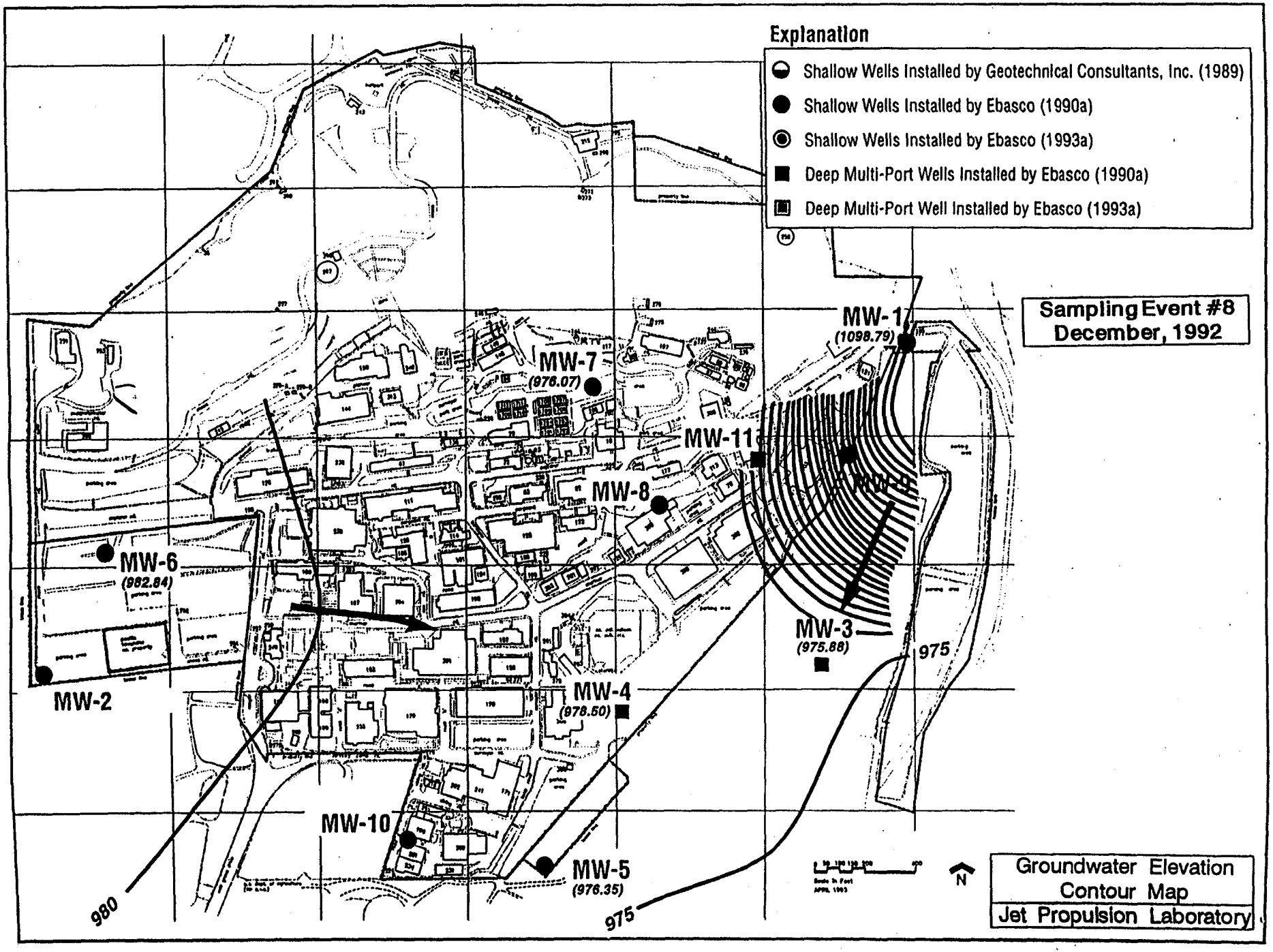

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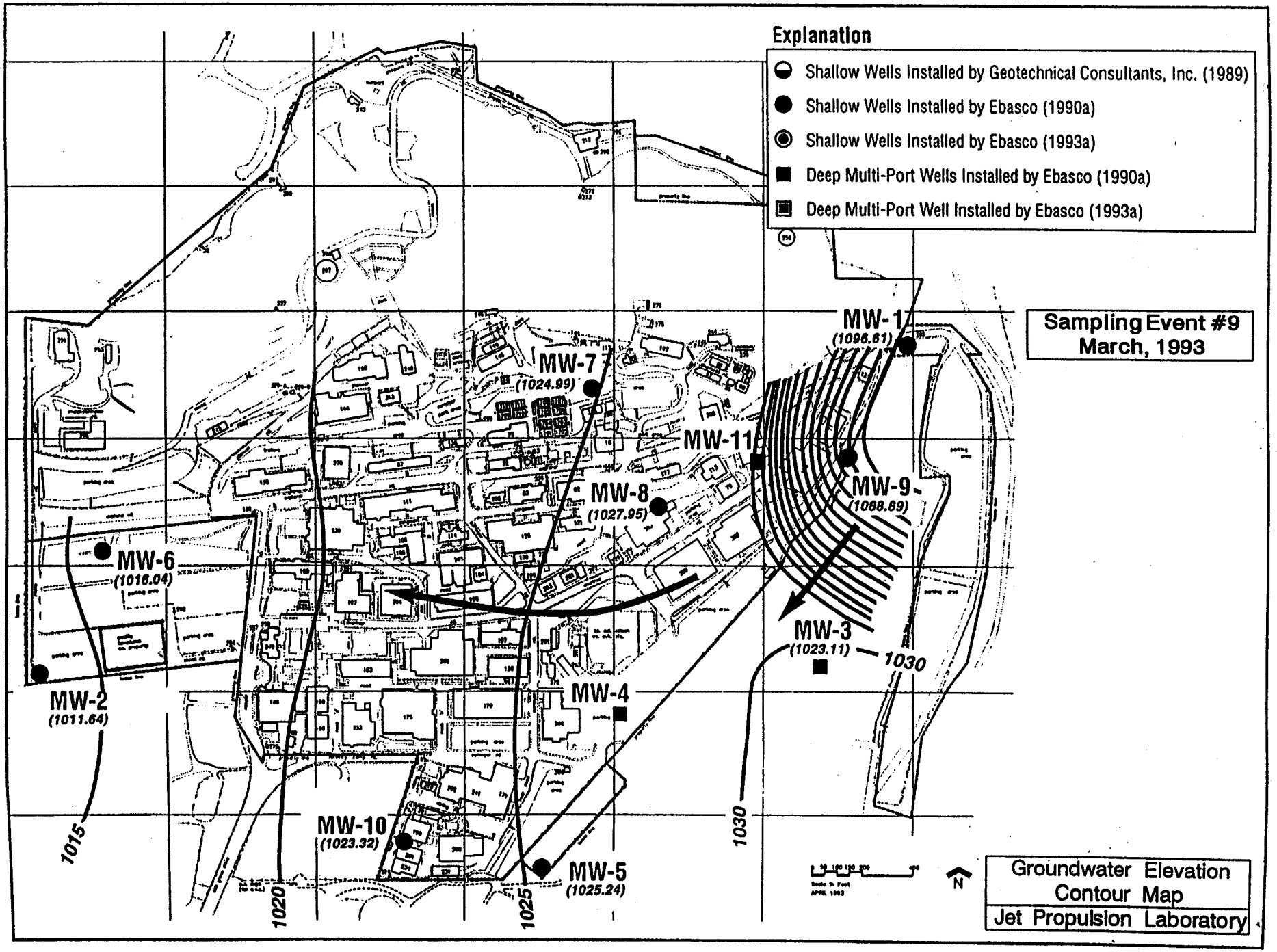

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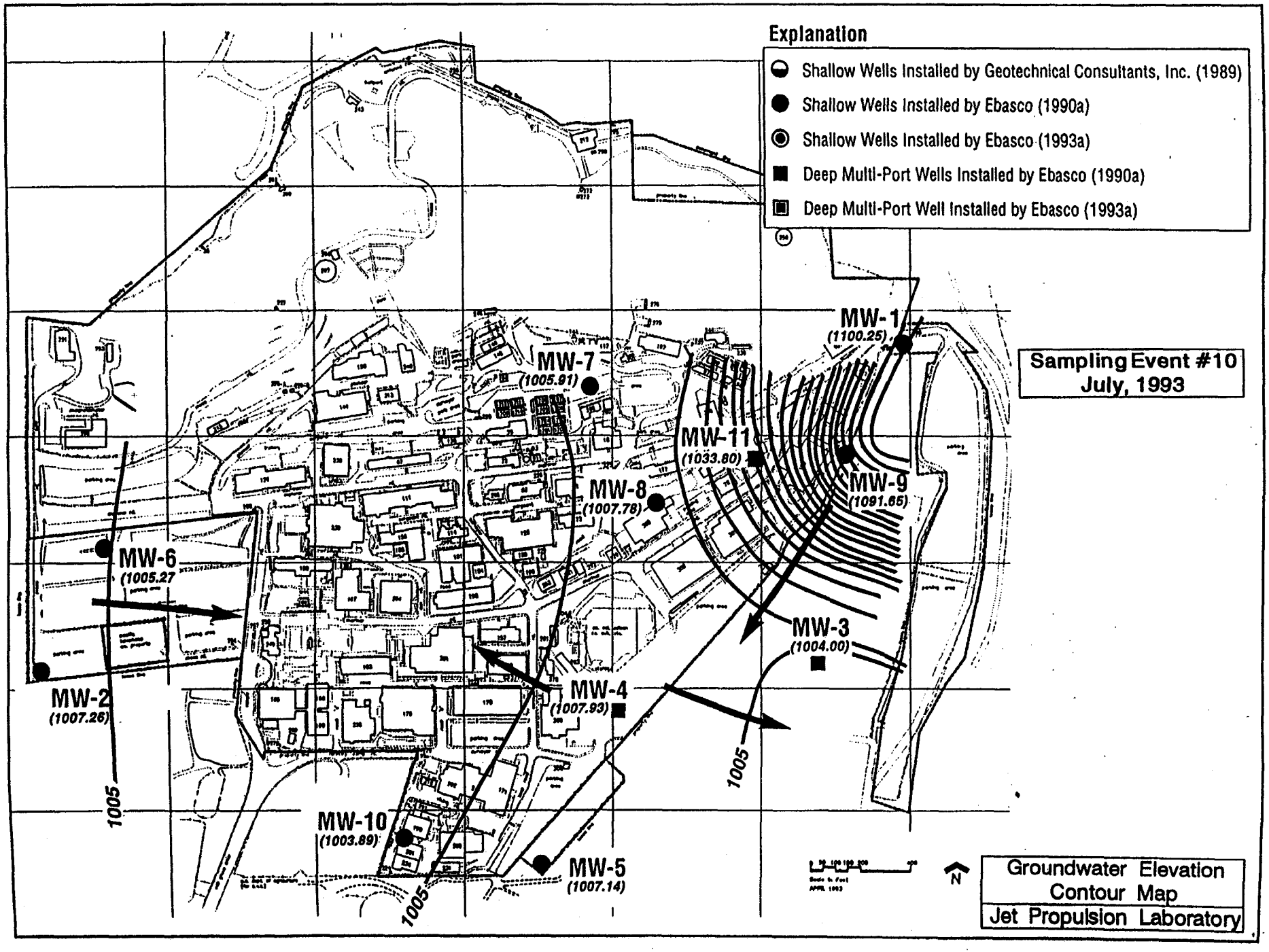

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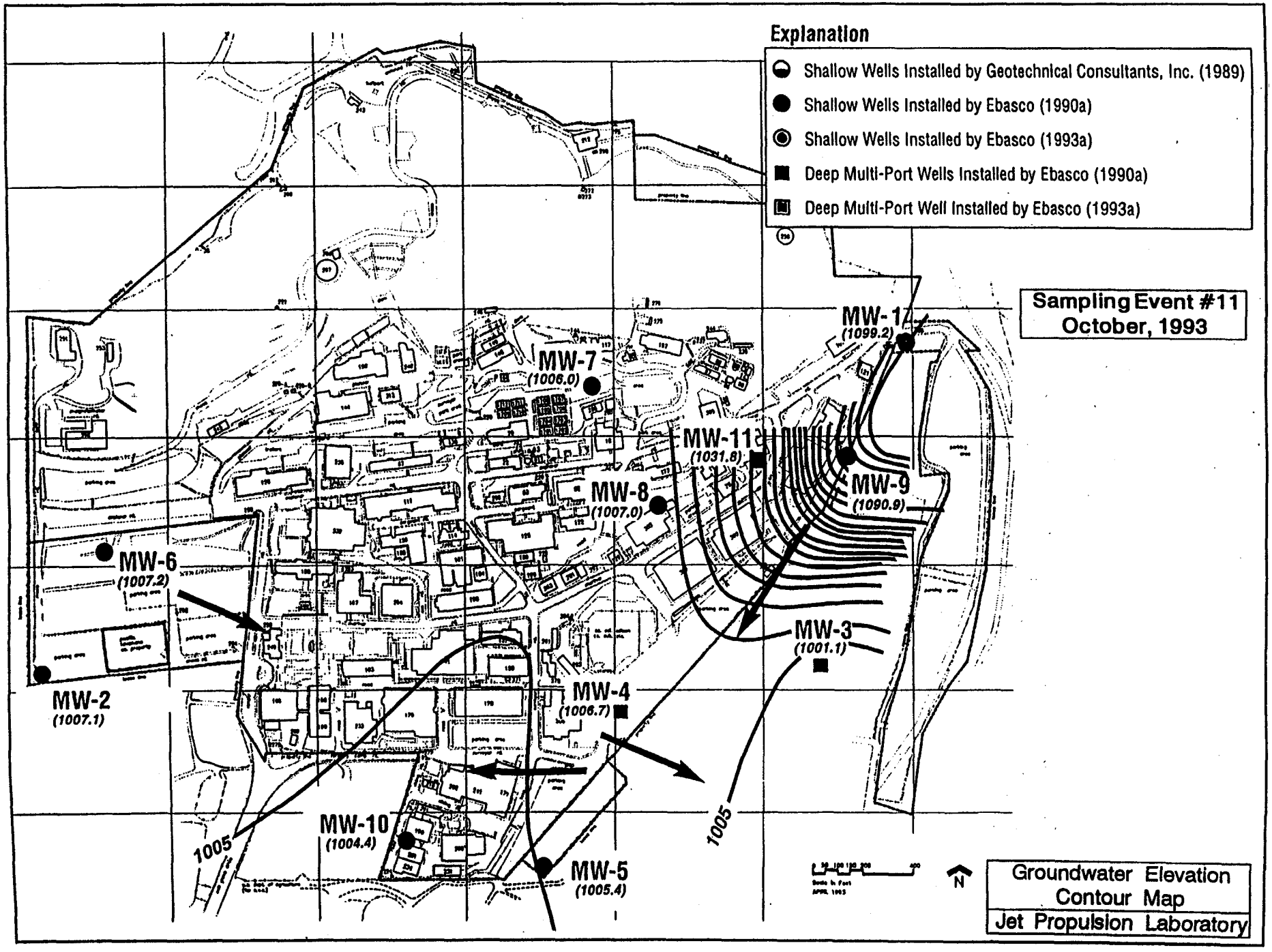

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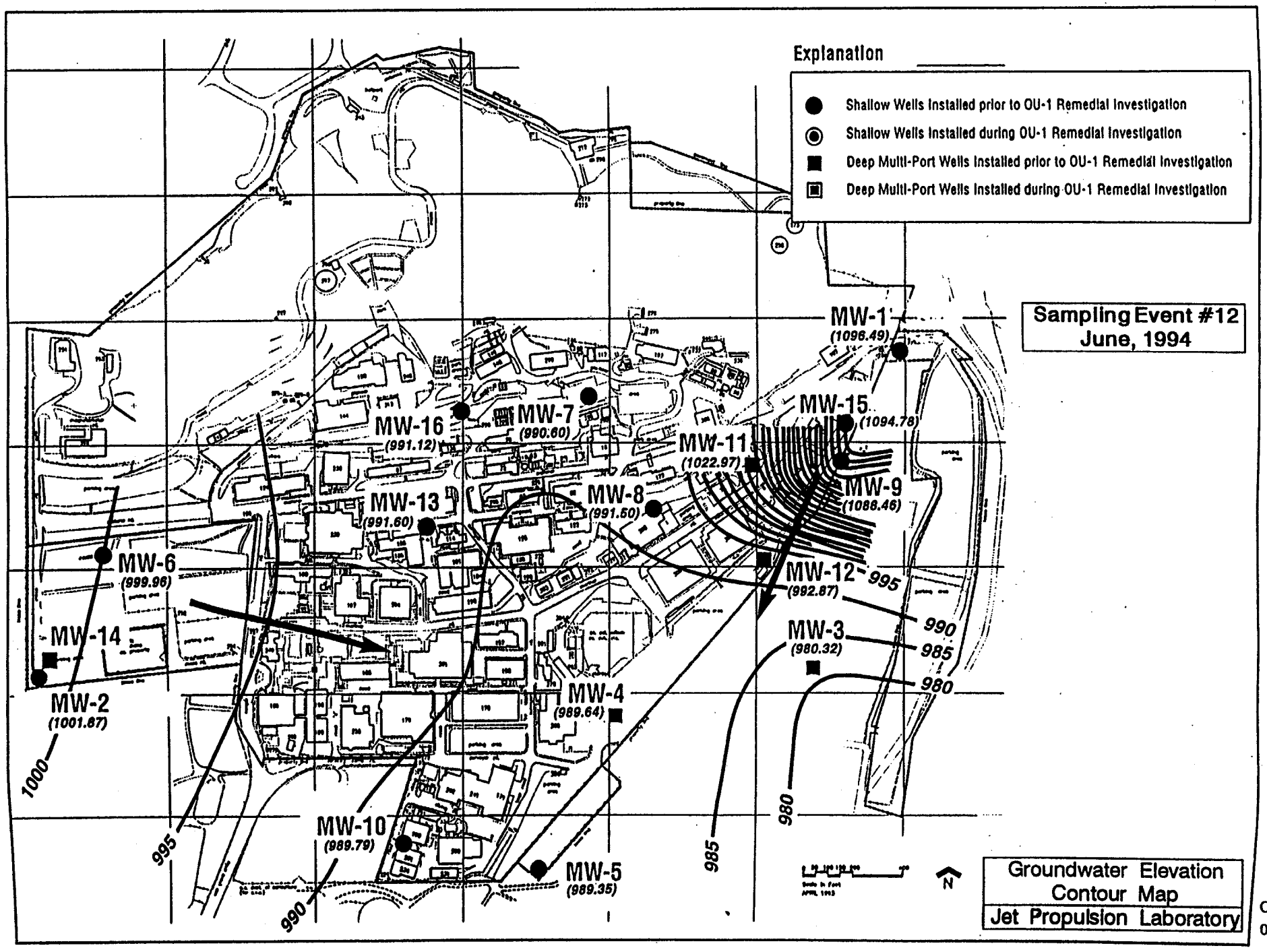

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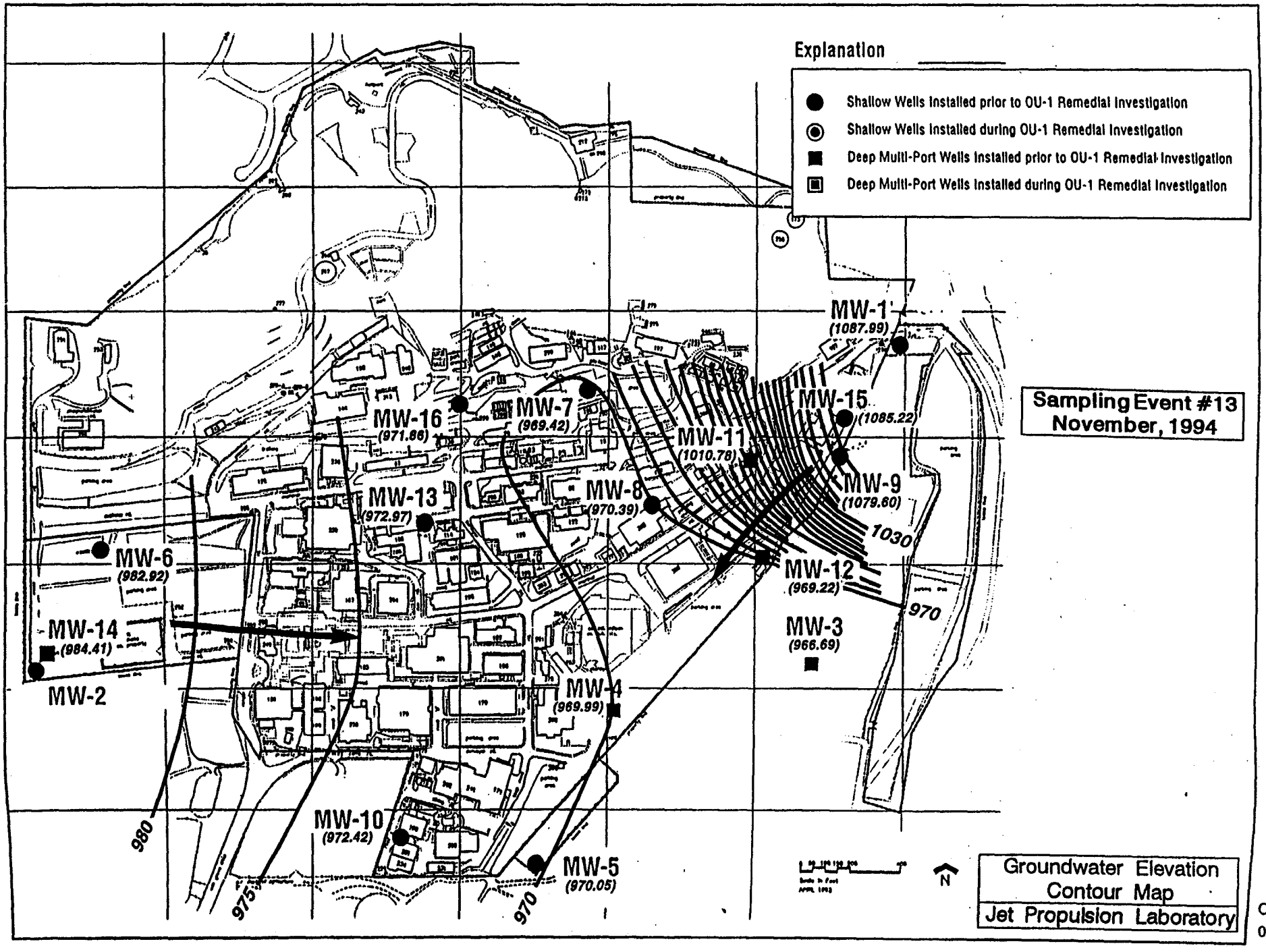

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PRELIMINARY OU-3 SAMPLE RESULTS (in ppb)

	MW-17	MW-18	MW-19	MW-20	MW-21	MCL*
CCl_4	--*	--	0.6	--	--	0.5
TCE	--	--	--	--	29	5.0

*Notes:

MCL = Maximum Contaminant Level established by the regulatory agencies

-- = None Detected above MCL

- Data are still being validated
- Second round of samples are being collected now

DETECTED VOCs IN OU-2 SOIL VAPOR SAMPLES (ug/l-vapor)

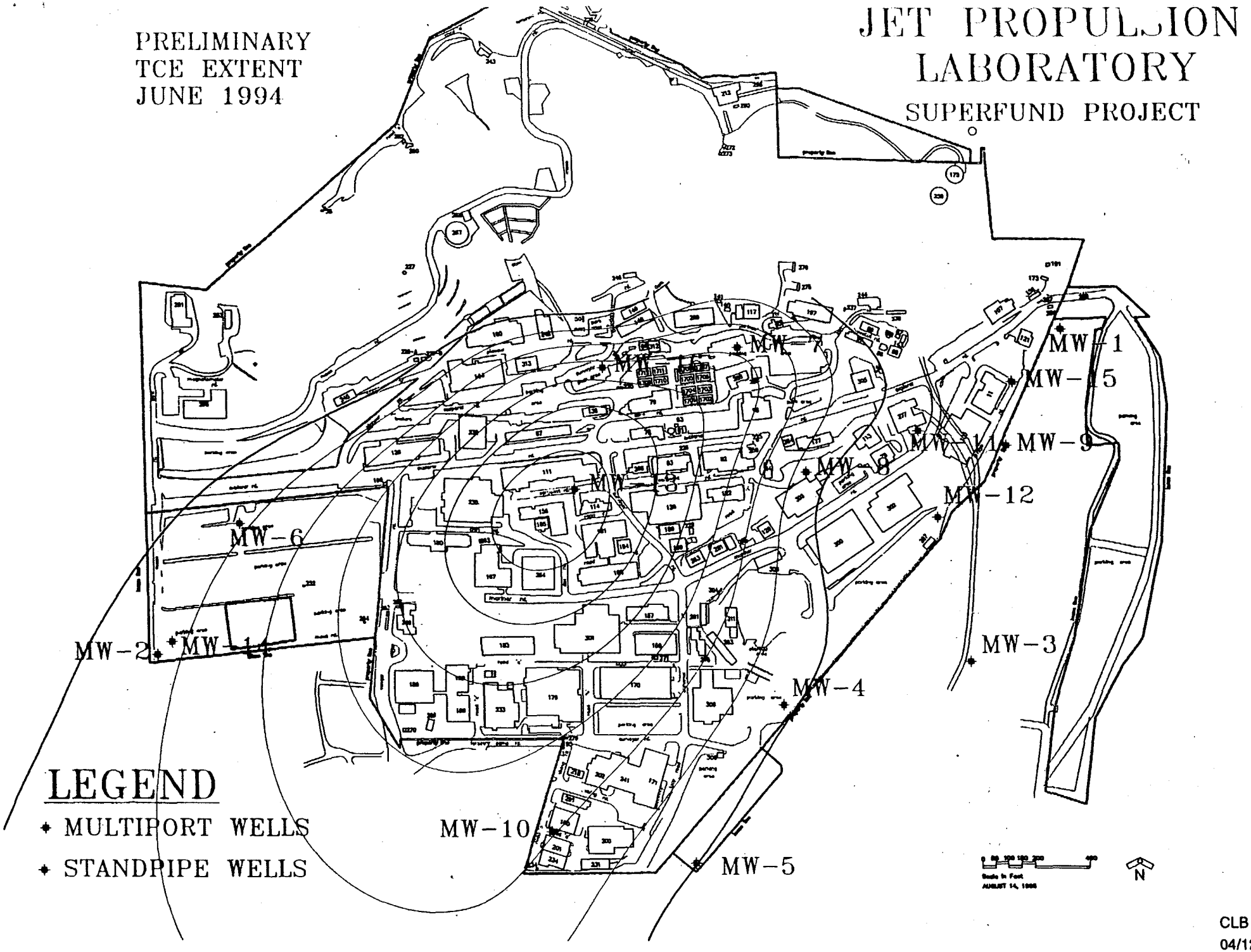
SOIL BORING NUMBER Round number:	TOTAL VOCs	SAMPLE DEPTH(feet)	CARBON TETRACHLORIDE 1	CARBON TETRACHLORIDE 2	CHLOROFORM 1	CHLOROFORM 2	FREON 113 1	FREON 113 2	TCE 1	TCE 2	1,1,DCI 1	1,1,DCI 2
B-16	473.8	20	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		40	N/S	N/S	N/S	N/S	2.8	N/S	N/S	N/S	N/S	N/S
		60	8.9	8	N/S	1	22.5	32.7	N/S	N/S	2.6	N/S
		80	175.9	106.5	N/S	N/S	18.3	23.6	1.2	N/S	2.7	N/S
		95	218.5	239.8	N/S	N/S	21	20.3	1.4	N/S	1.9	N/S
B-22	361.5	20	8.9	27.8	N/S	N/S	9.1	27.4	2.8	9.6		
		40	8.2	38.2	N/S	2	11.9	33.9	2.9	6.4		
		60	18.5	40	1.4	2.8	19.9	29.3	4.8	15.8		
		80	15.1	28.7	1.3	2.3	14.9	22.5	4.5	15.5		
		95	13.7	28.3	1.1	2	11.1	27.5	6.4	6.2		
B-6	264.7	20	1.5	7.4			1.6	19.9	N/S	N/S		
		40	4.7	43.6			6.1	50	1.4	N/S		
		60	11.7	28.6			8.6	18.6	1.4	2.4		
		77	11.4	28.8			13.5	24.6	N/S	1.4		
		96	13.8	6.1			29.5	33.3	N/S	N/S		
B-4	202	11	3.7	7.5			N/S	1.5	52.2	45.7		
		20	4.9	24.4			N/S	4.6	35.5	47.1		
		35	20	28				3.1	33.1	40.1		
		56	W	W			W	W	W	W		

JPL

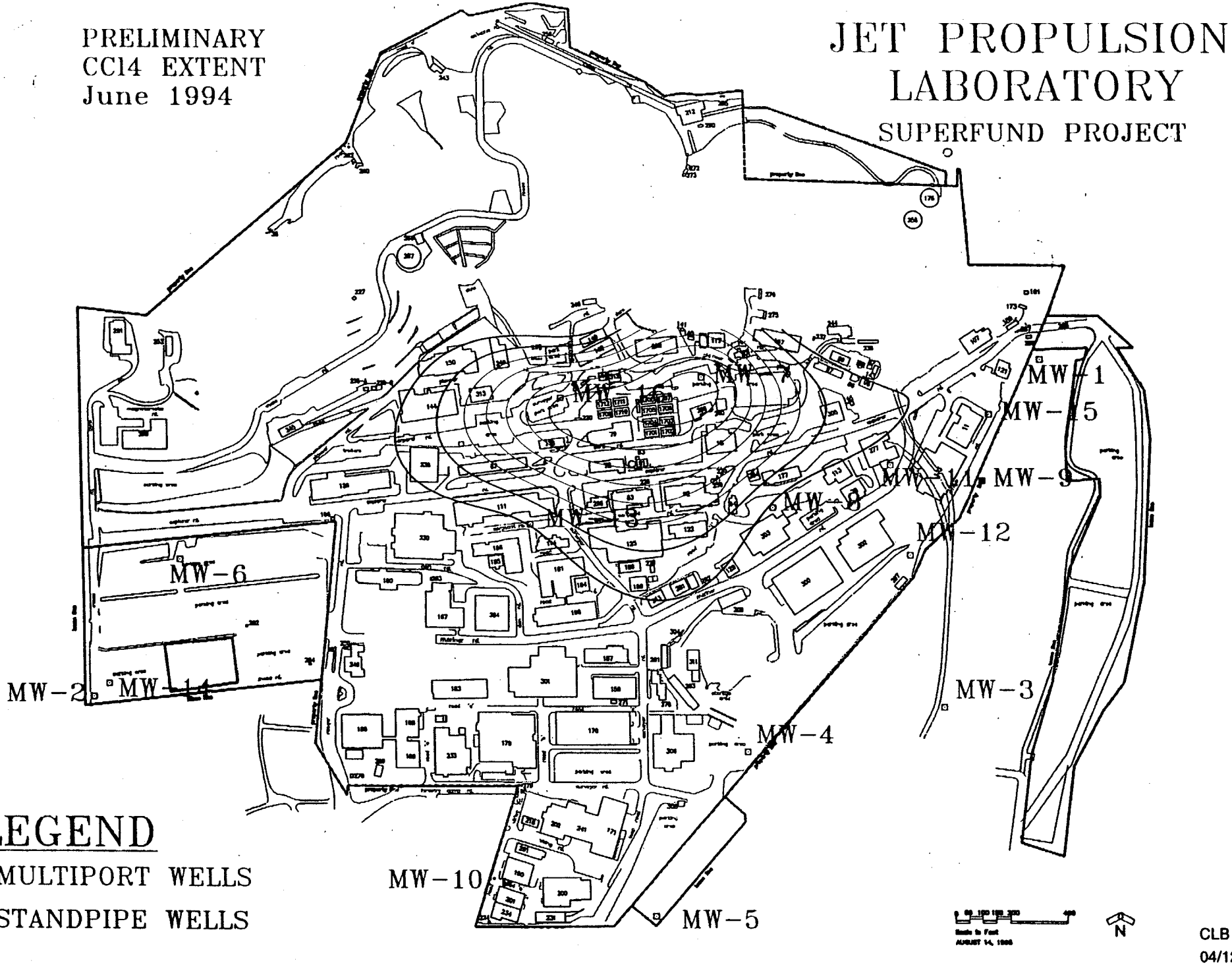
SELECTED OU-1 CONTAMINANT CONCENTRATION RESULTS

(in ppb)

	CARBON TET		TCE	
	JUN 94	NOV 94	JUN 94	NOV 94
MW-1	--	--	--	--
MW-3	--	--	--	--
MW-4	--	--	--	--
MW-5	--	--	--	--
MW-6	--	--	--	--
MW-7	180	310	33	30
MW-8	--	5.3	--	3.5
MW-9	--	--	--	--
MW-10	0.5	--	24	14
MW-11	0.6	--	--	--
MW-12	--	--	--	--
MW-13	15	71	70	48
MW-14	--	--	--	--
MW-15	--	--	--	--
MW-16	150	43	200	30



CLB - 41
04/12/96



CLB - 42
04/12/96

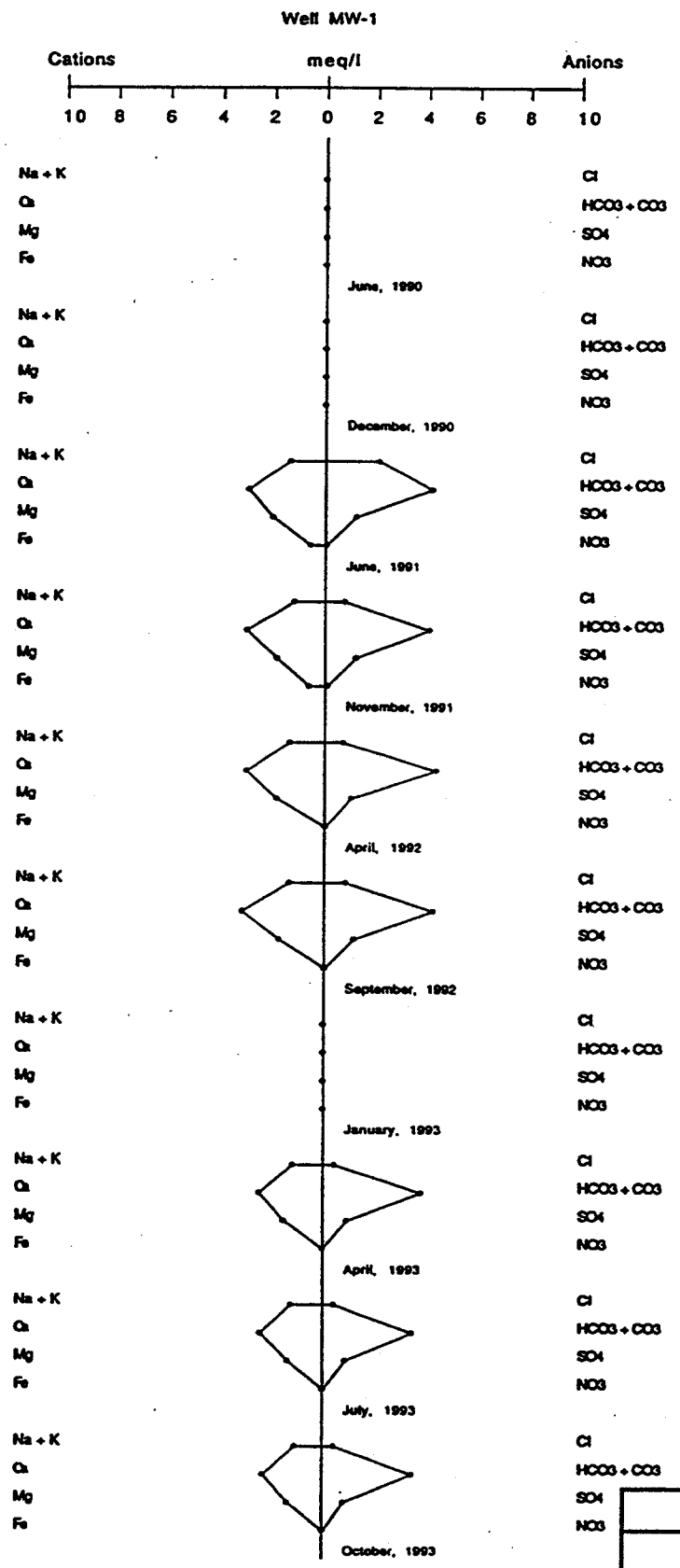


Figure C-1

Stiff Diagrams from Well MW-1

CLB - 43
04/12/96

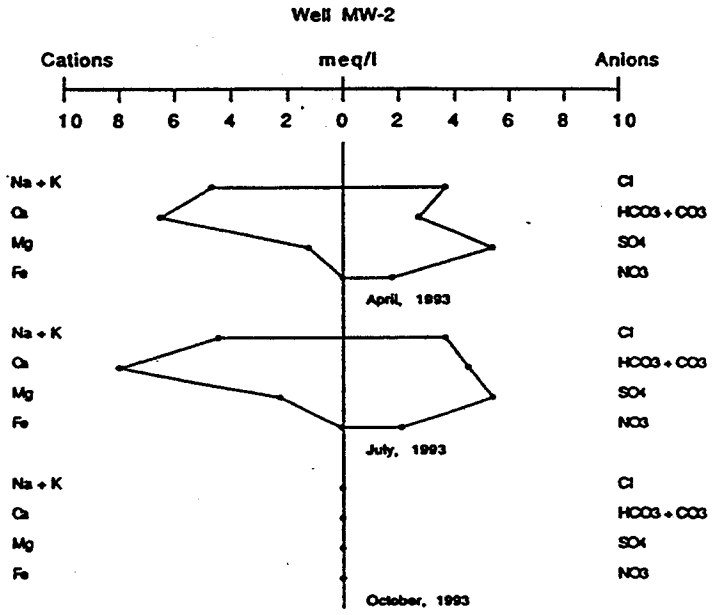


Figure C-2

Stiff Diagrams from Well MW-2

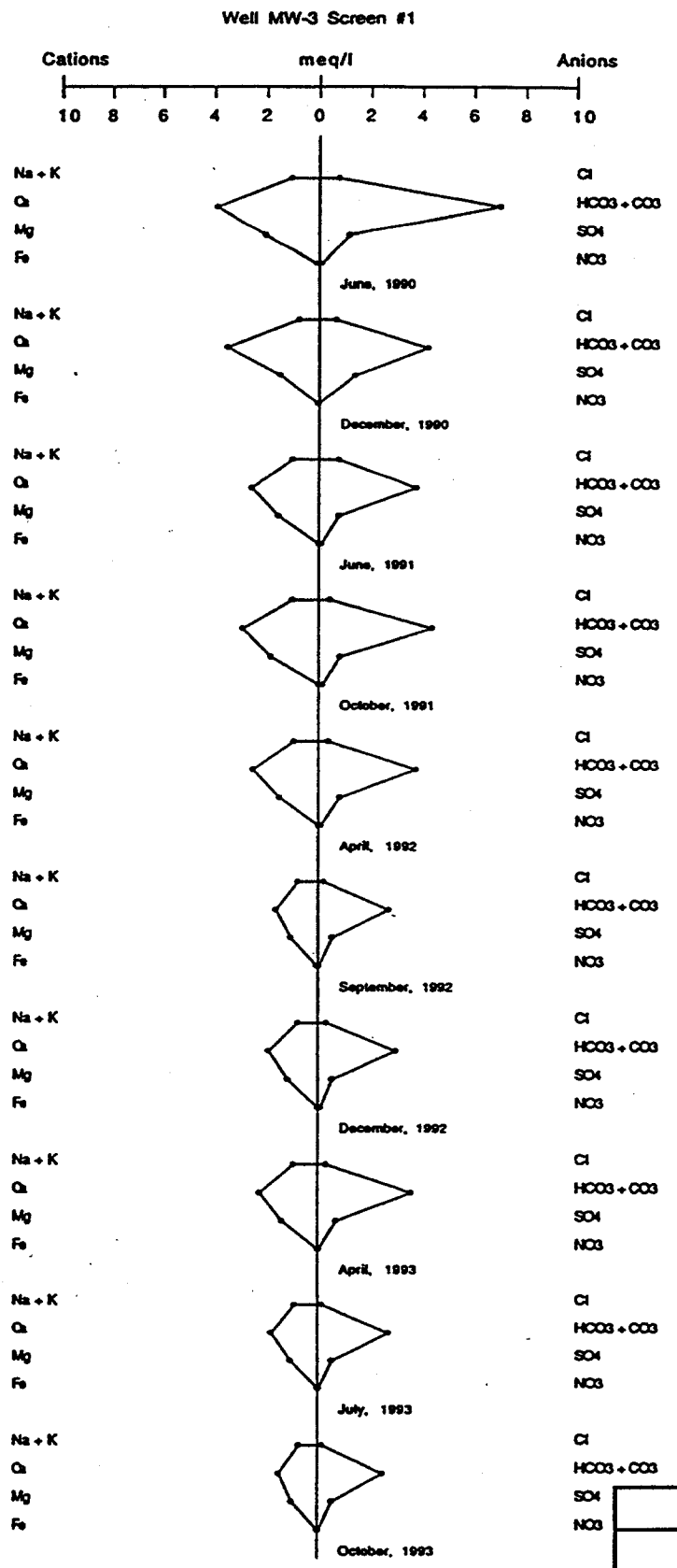


Figure C-3

Stiff Diagrams from Well MW-3 Screen #1

CLB - 45
04/12/96

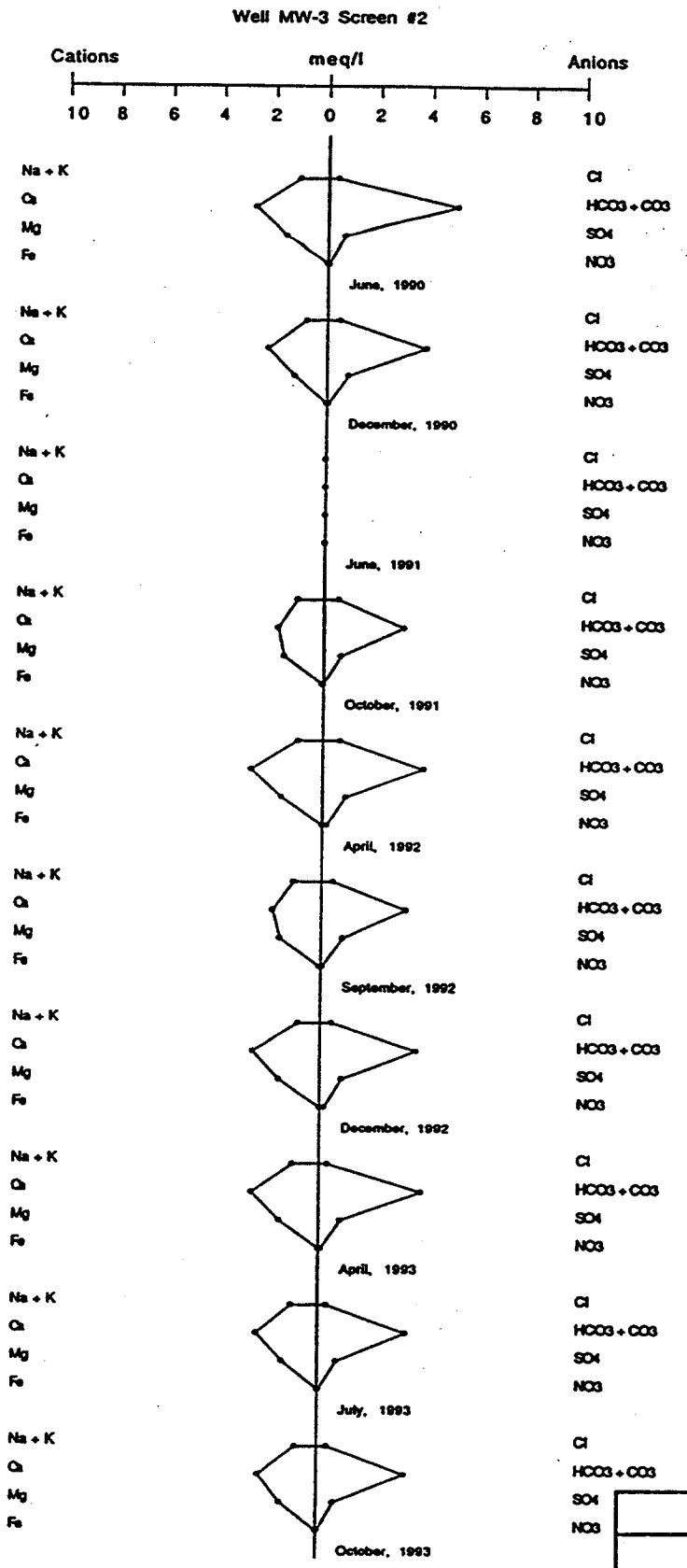


Figure C-4

Stiff Diagrams from Well MW-3 Screen #2

CLB - 46
04/12/96

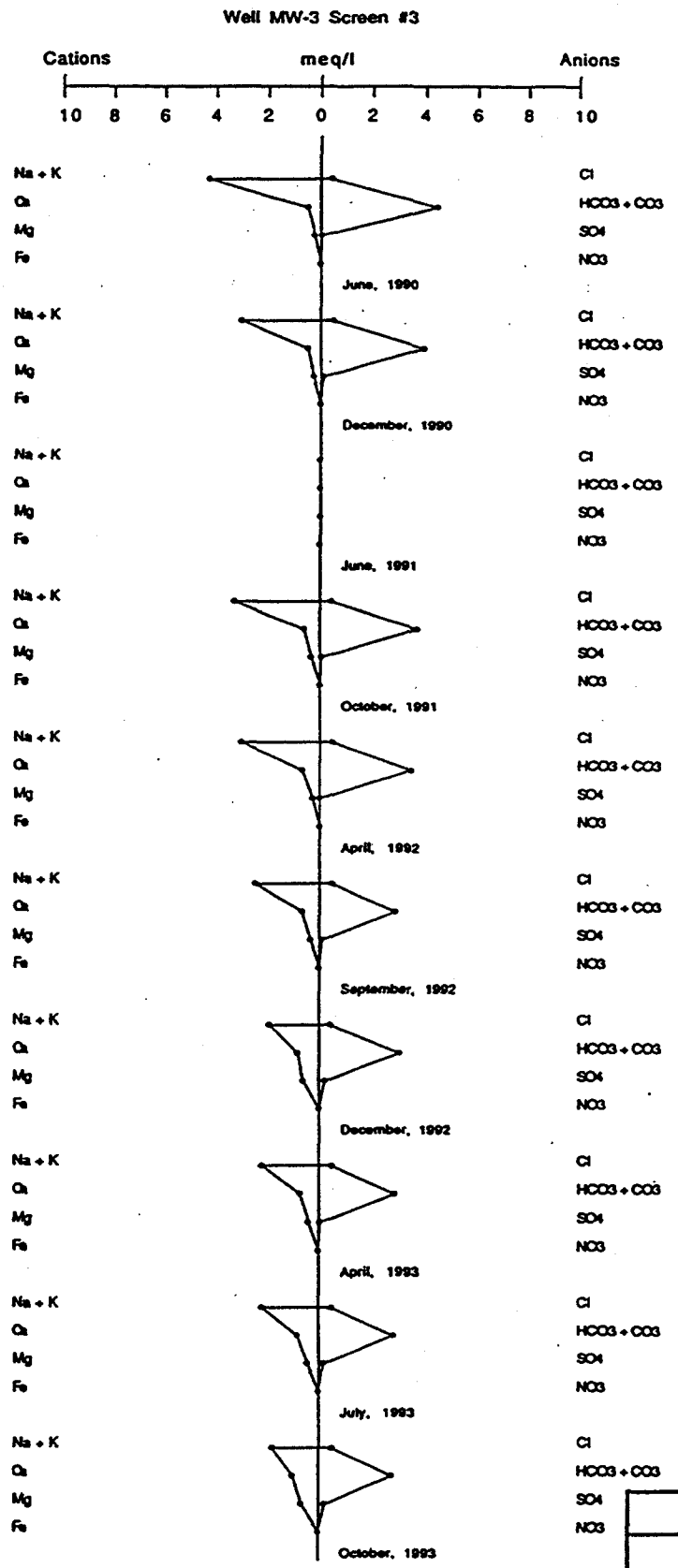


Figure C-5

Stiff Diagrams from Well MW-3 Screen #3

CLB - 47
04/12/96

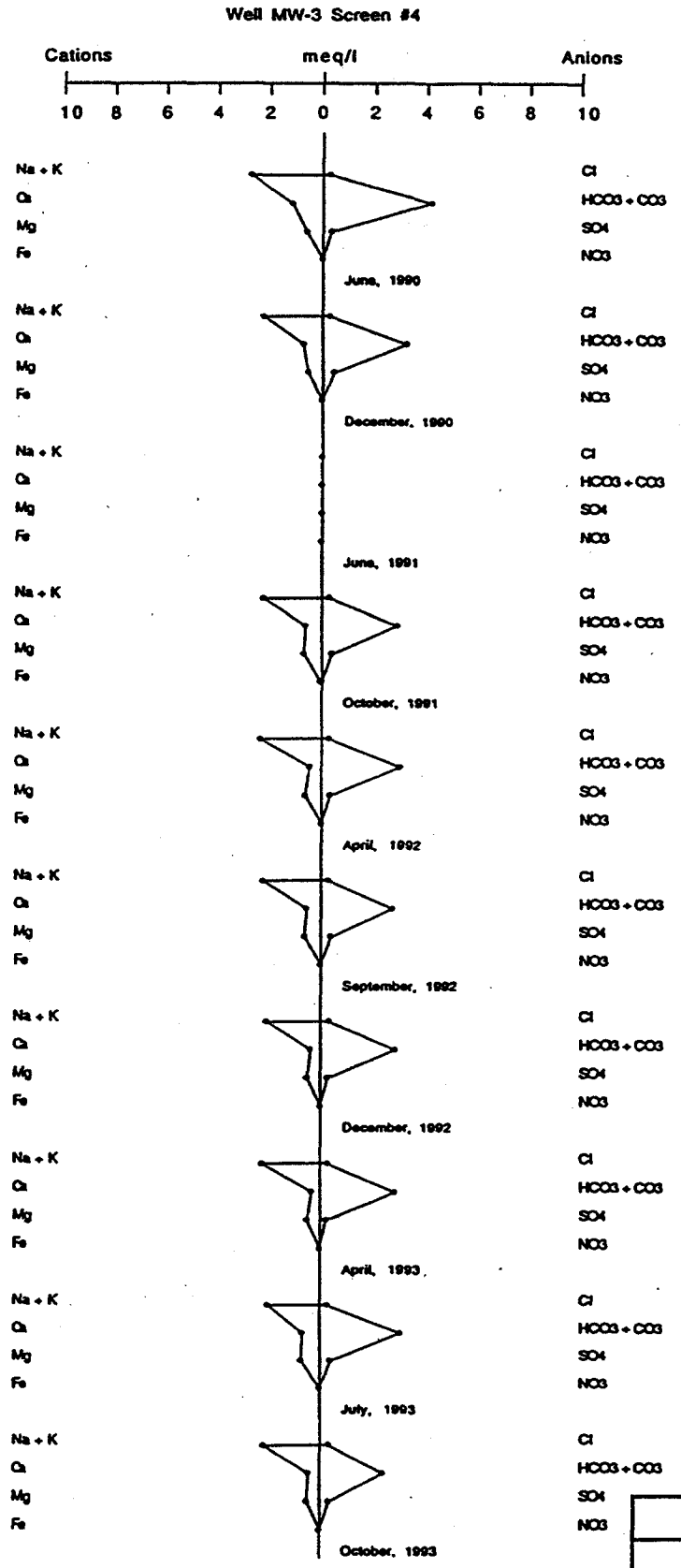


Figure C-6

Stiff Diagrams from Well MW-3 Screen #4

CLB - 48
04/12/96

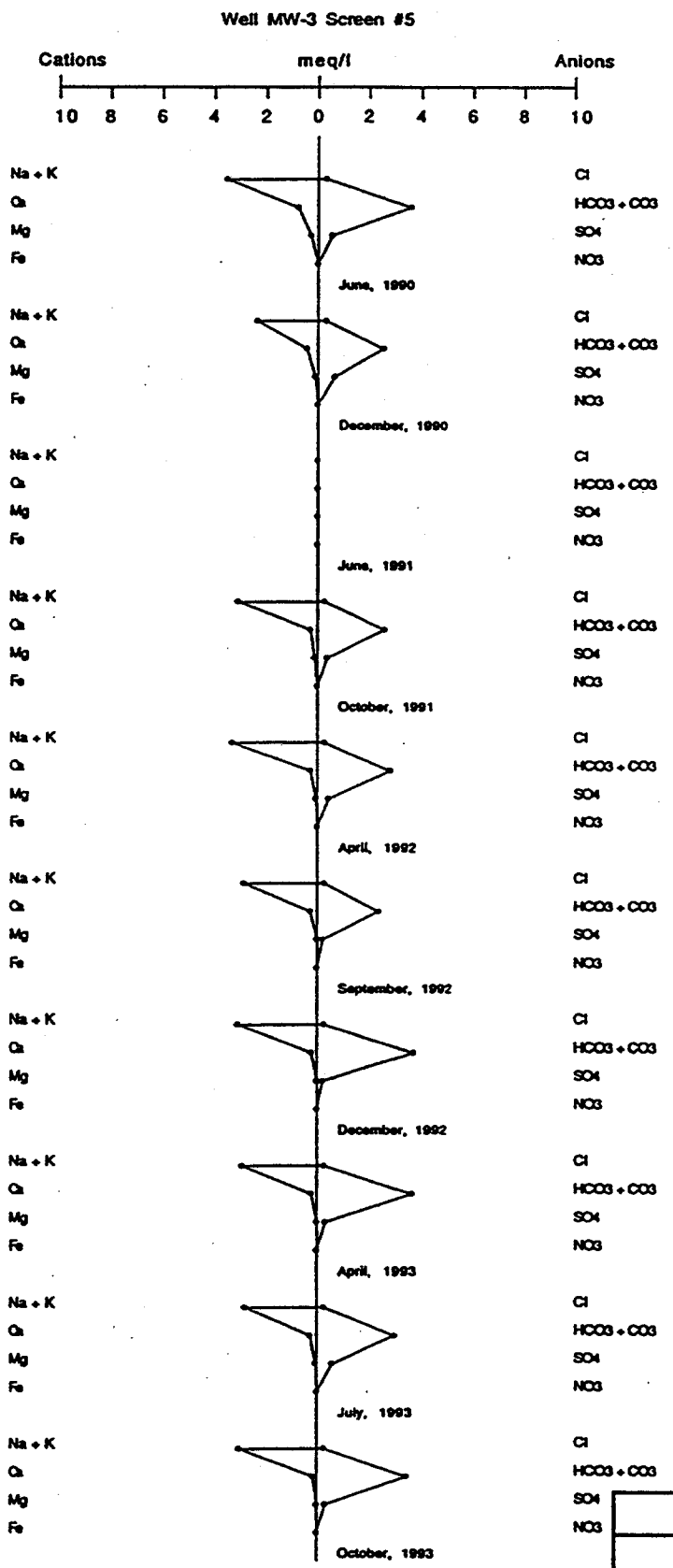


Figure C-7

Stiff Diagrams from Well MW-3 Screen #5

CLB - 49
04/12/96

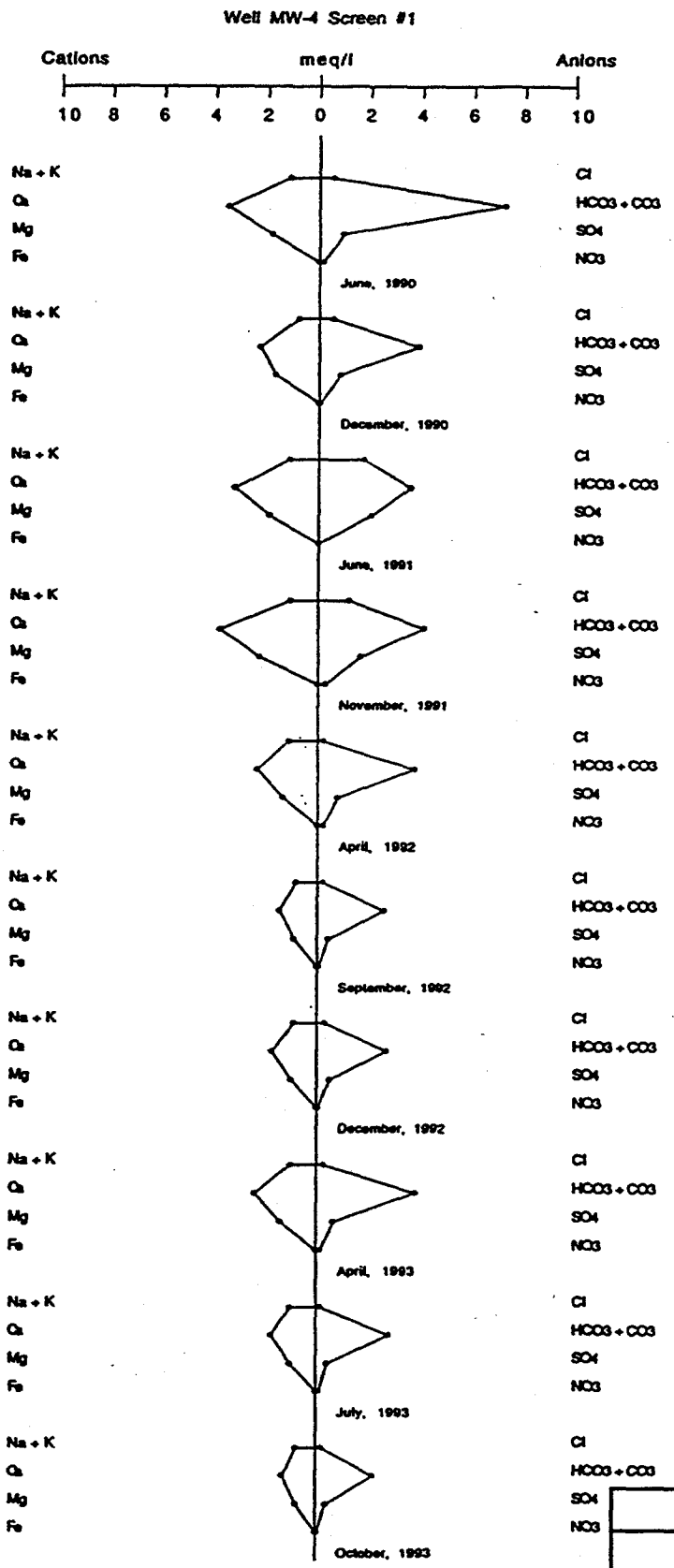


Figure C-8

Stiff Diagrams from Well MW-4 Screen #1

CLB - 50
04/12/96

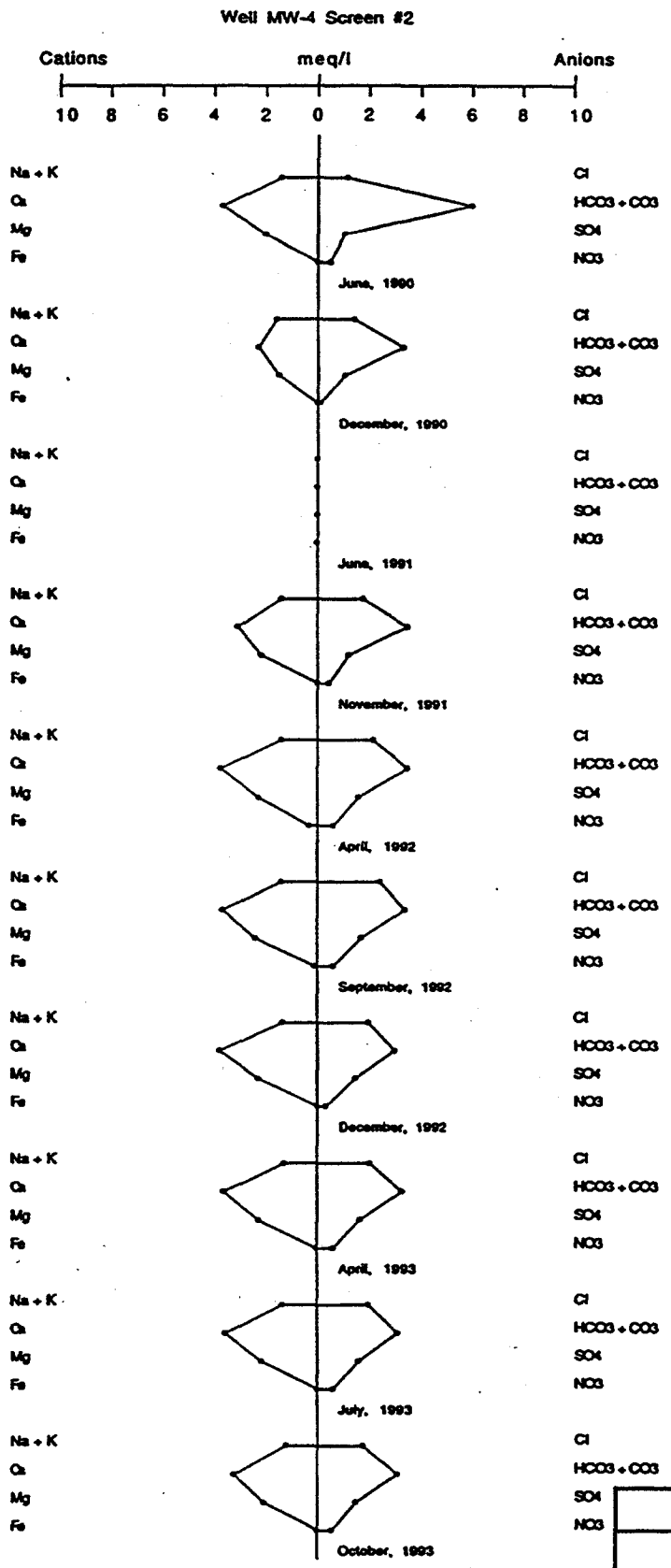


Figure C-9

Stiff Diagrams from Well MW-4 Screen #2

CLB - 51
04/12/96

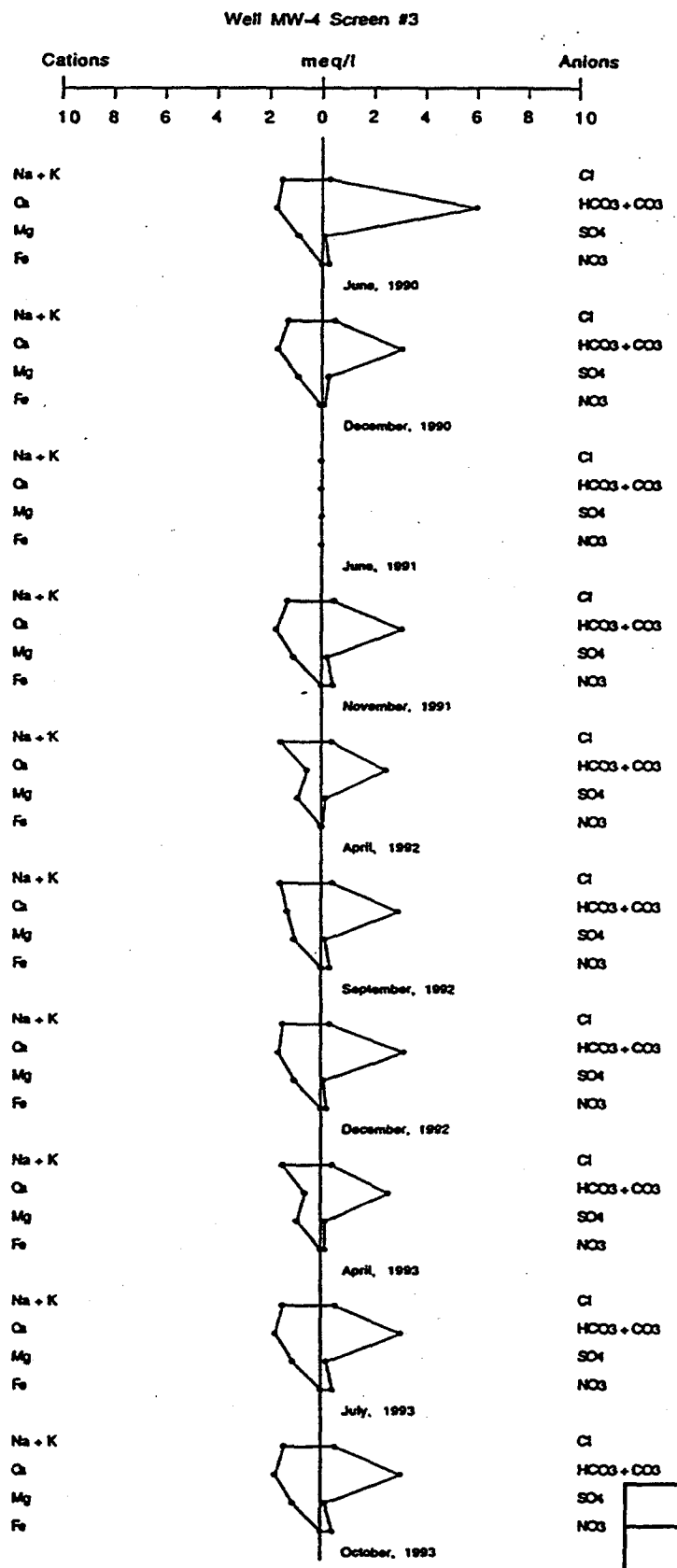


Figure C-10

Stiff Diagrams from Well MW-4 Screen #3

CLB - 52
04/12/96

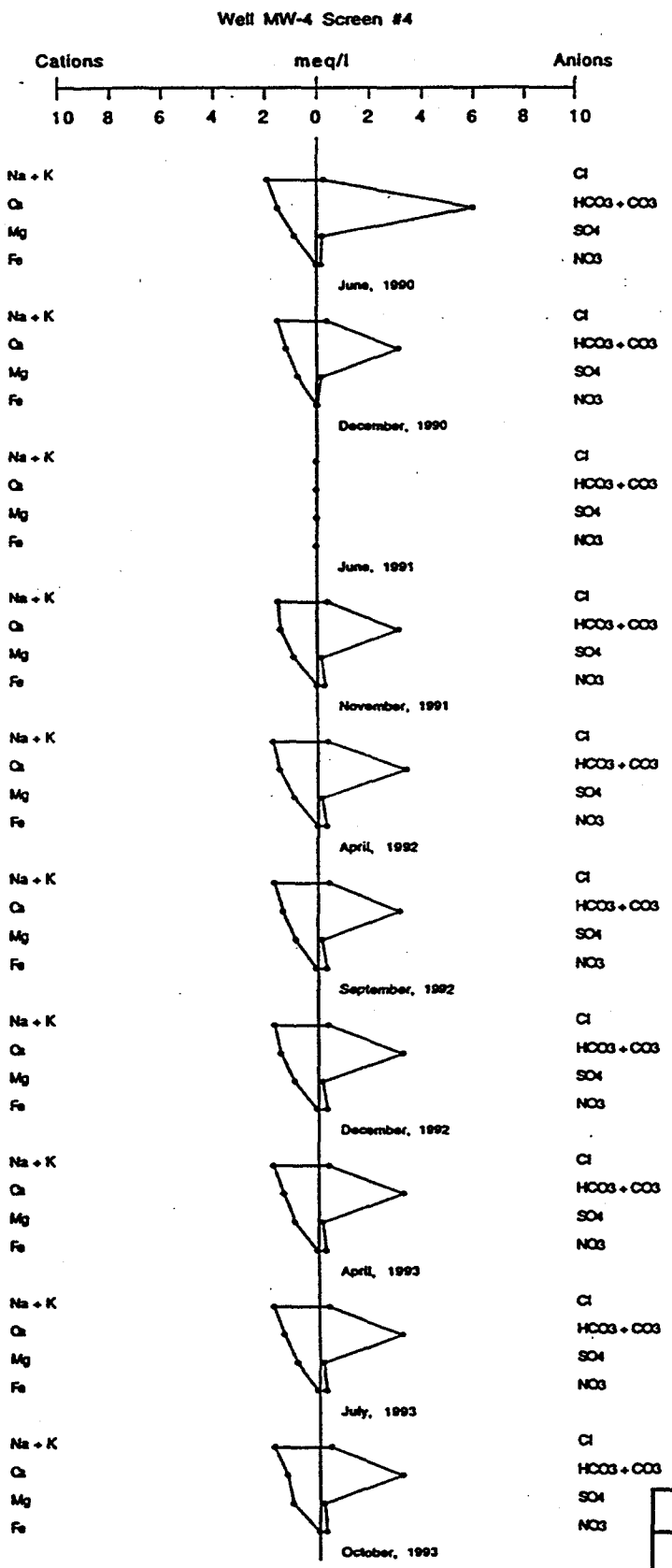


Figure C-11

Stiff Diagrams from Well MW-4 Screen #4

CLB - 53
04/12/96

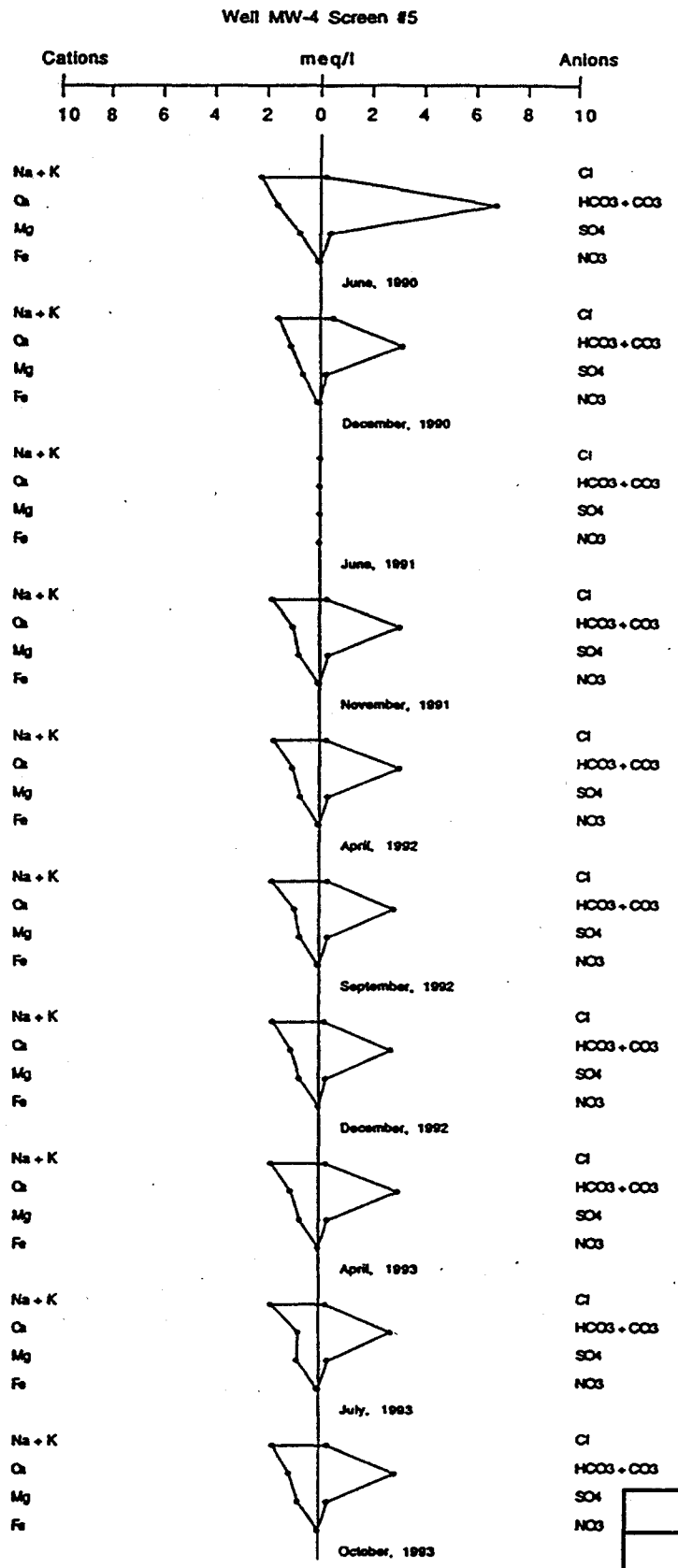


Figure C-12

Stiff Diagrams from Well MW-4 Screen #5

CLB - 54
04/12/96

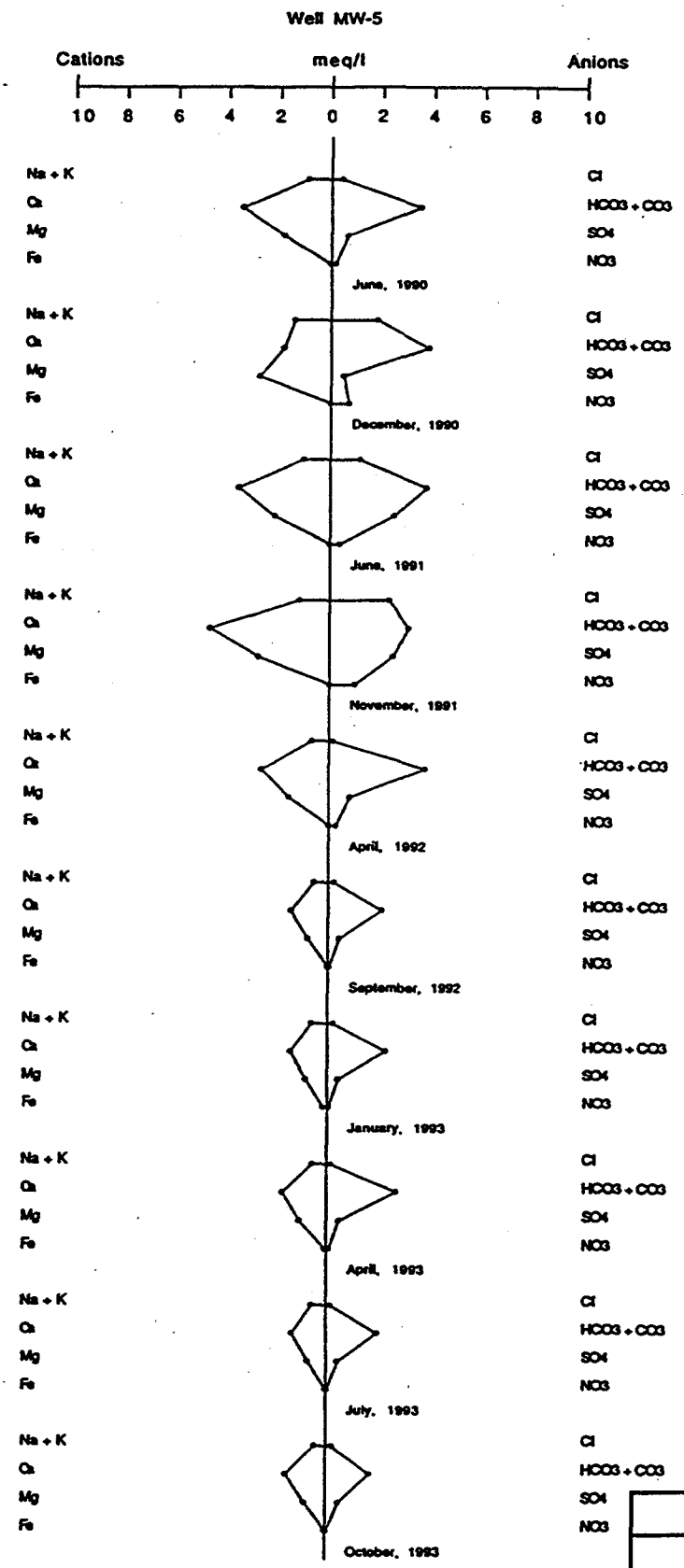


Figure C-13

Stiff Diagrams from Well MW-5

CLB - 55
04/12/96

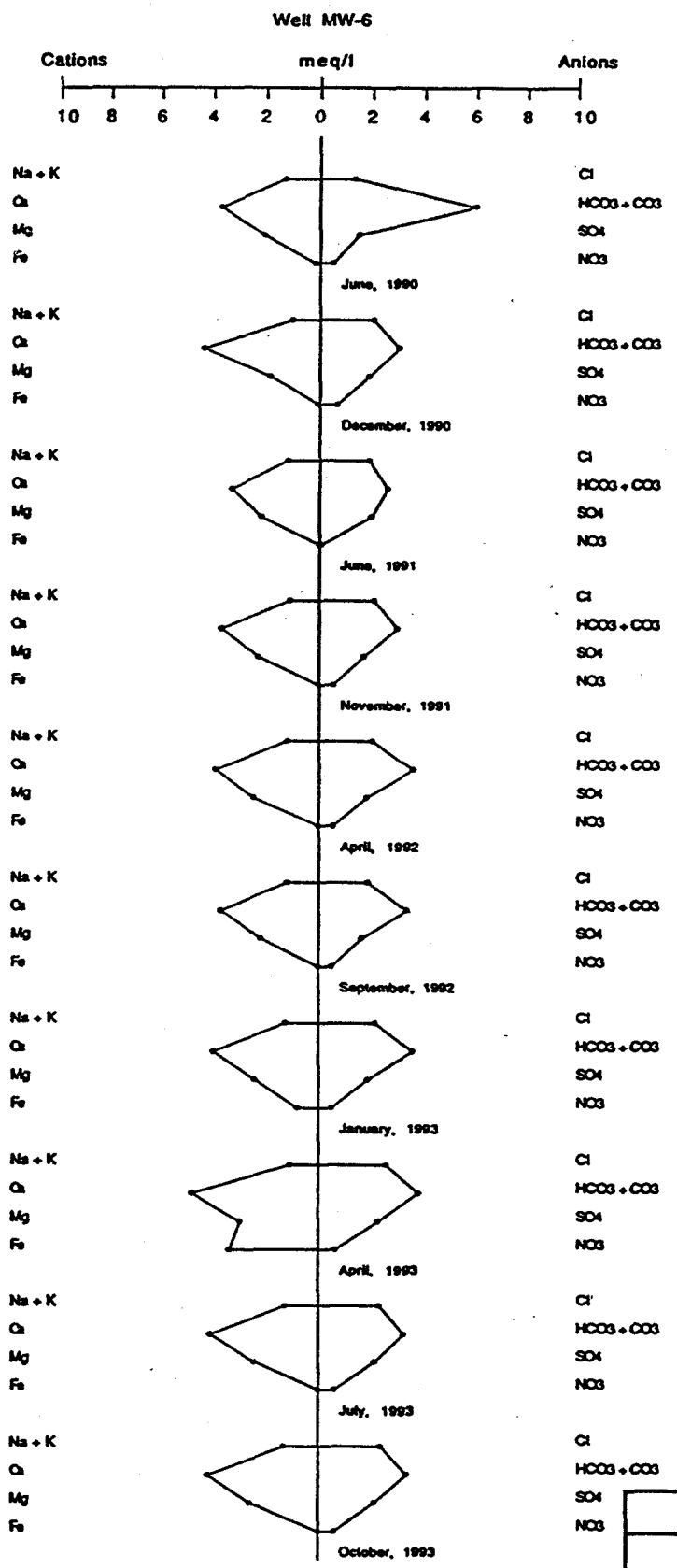


Figure C-14

Stiff Diagrams from Well MW-6

CLB - 56
04/12/96

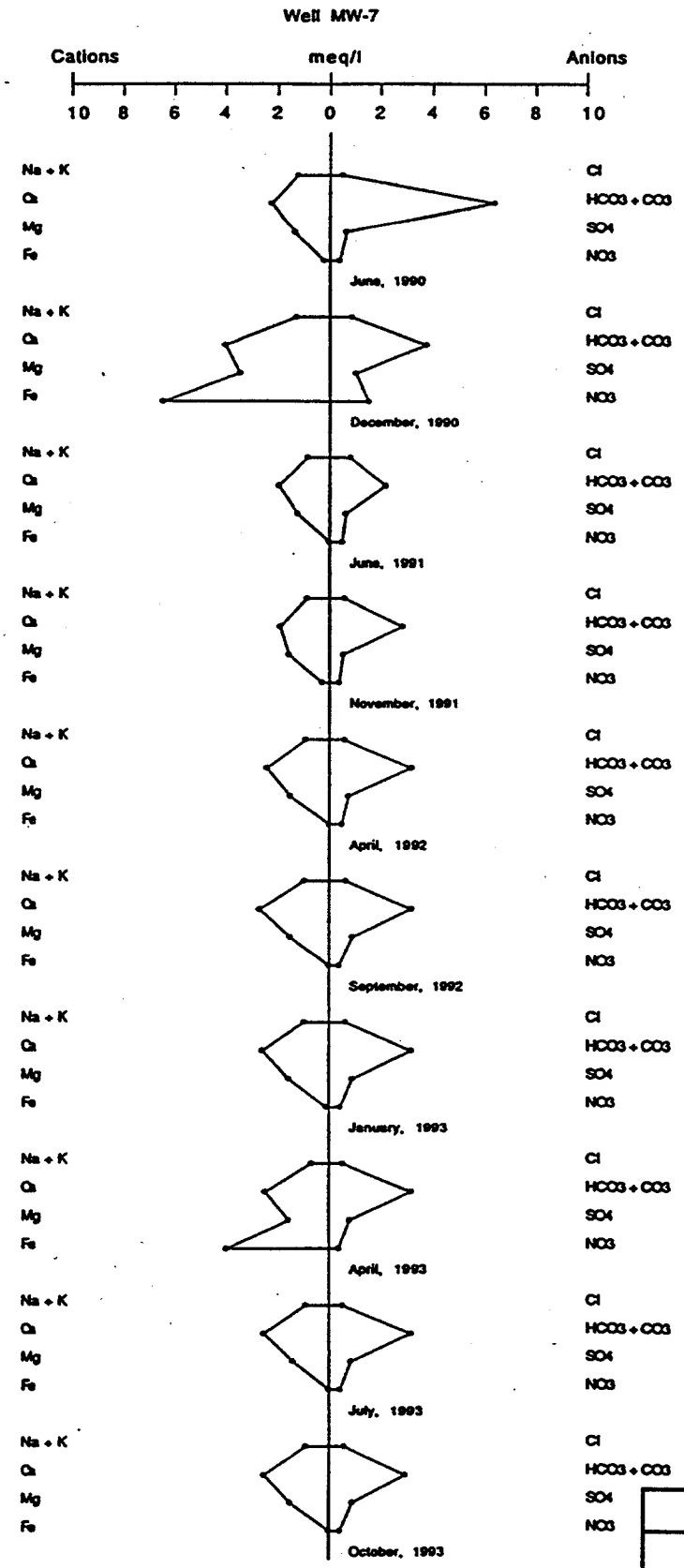


Figure C-15

Stiff Diagrams from Well MW-7

CLB - 57
04/12/96

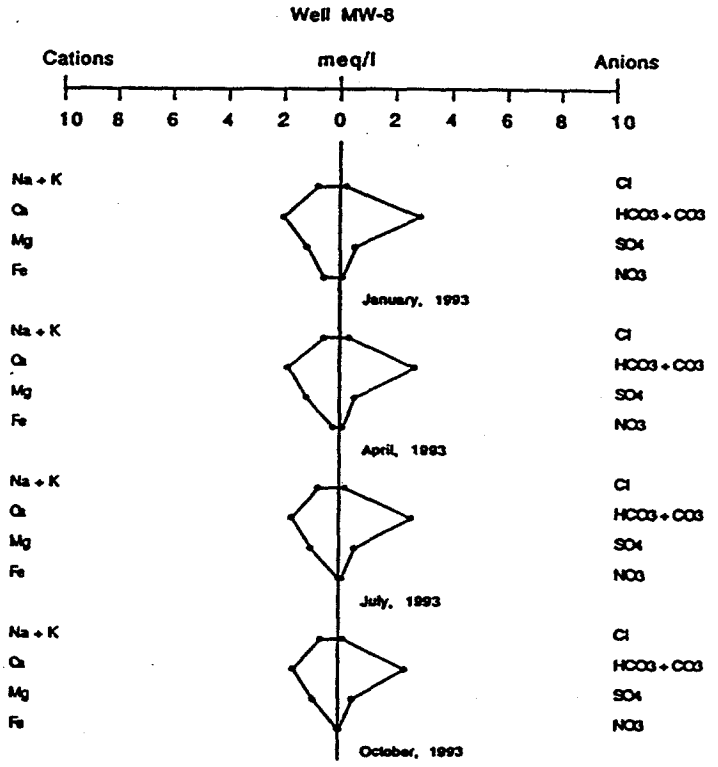


Figure C-16

Stiff Diagrams from Well MW-8

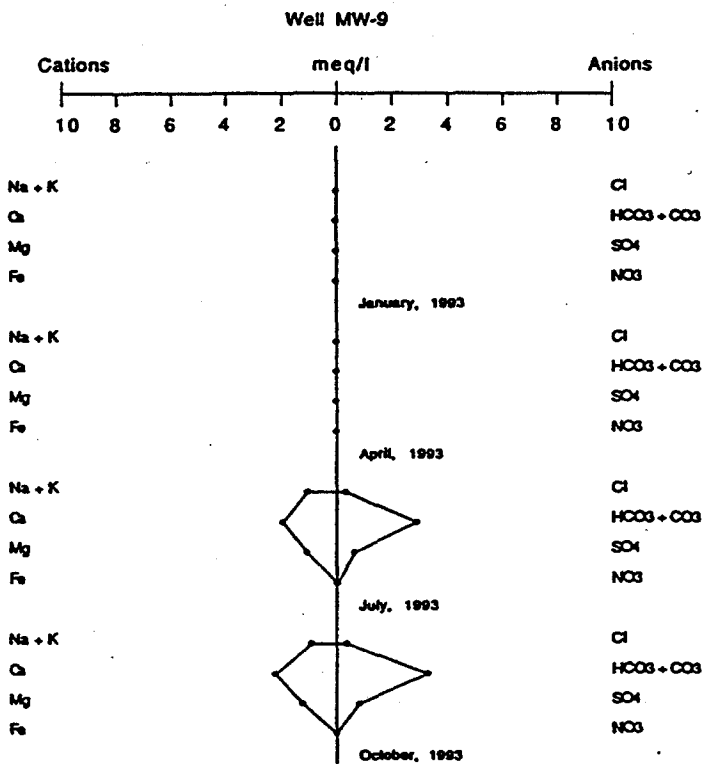


Figure C-17

Stiff Diagrams from Well MW-9

CLB - 59
04/12/96

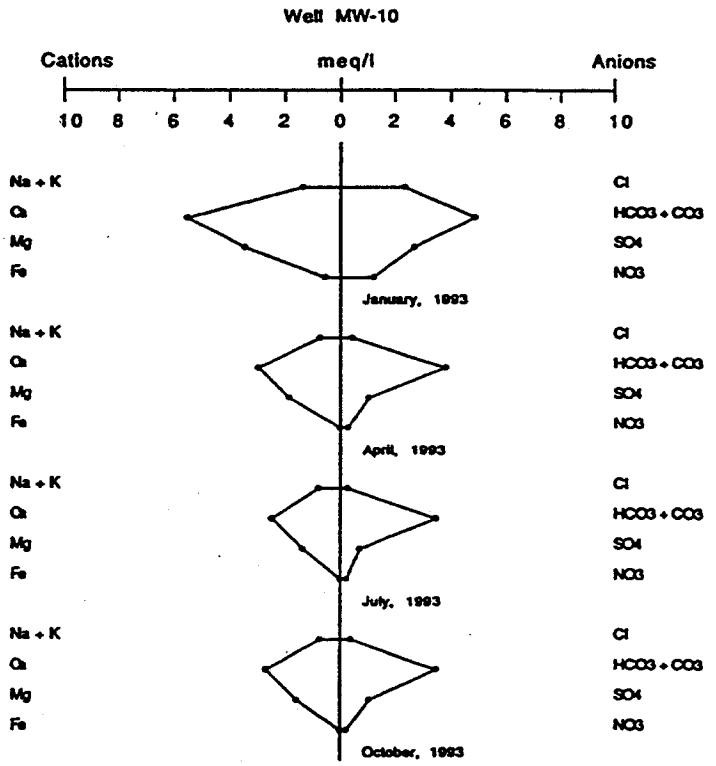


Figure C-18

Stiff Diagrams from Well MW-10

CLB - 60
04/12/96

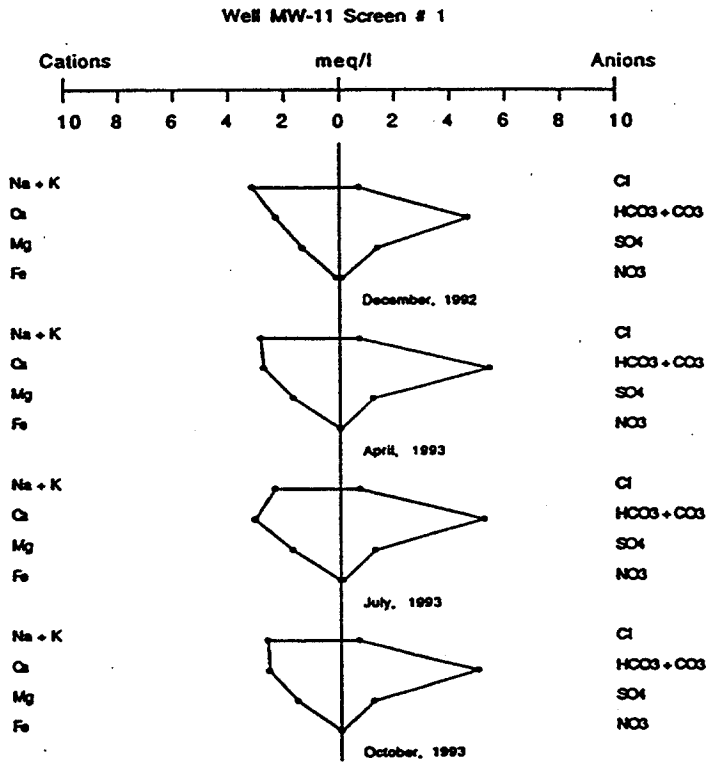


Figure C-19

Stiff Diagrams from Well MW-11 Screen #1

CLB - 61
04/12/96

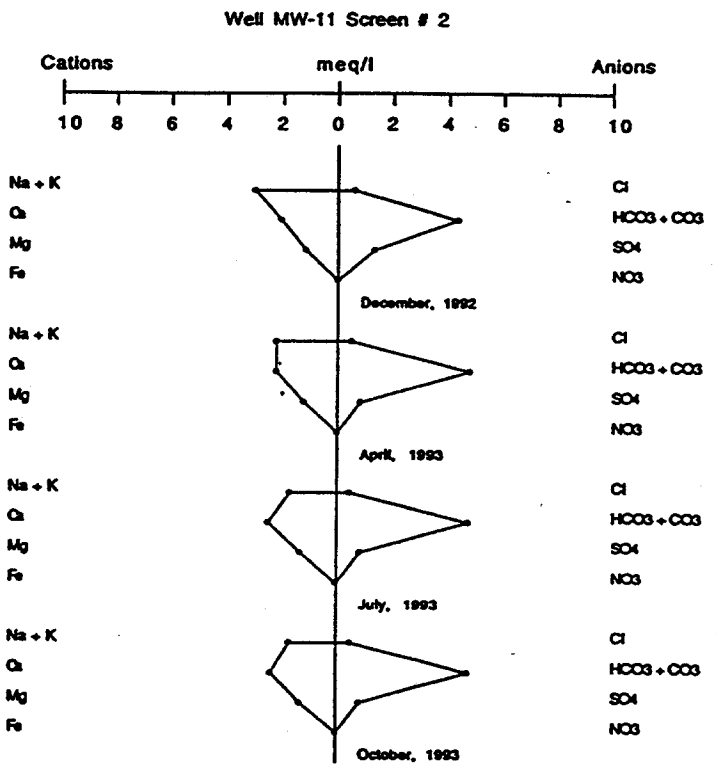


Figure C-20

Stiff Diagrams from Well MW-11 Screen #2

CLB - 62
04/12/96

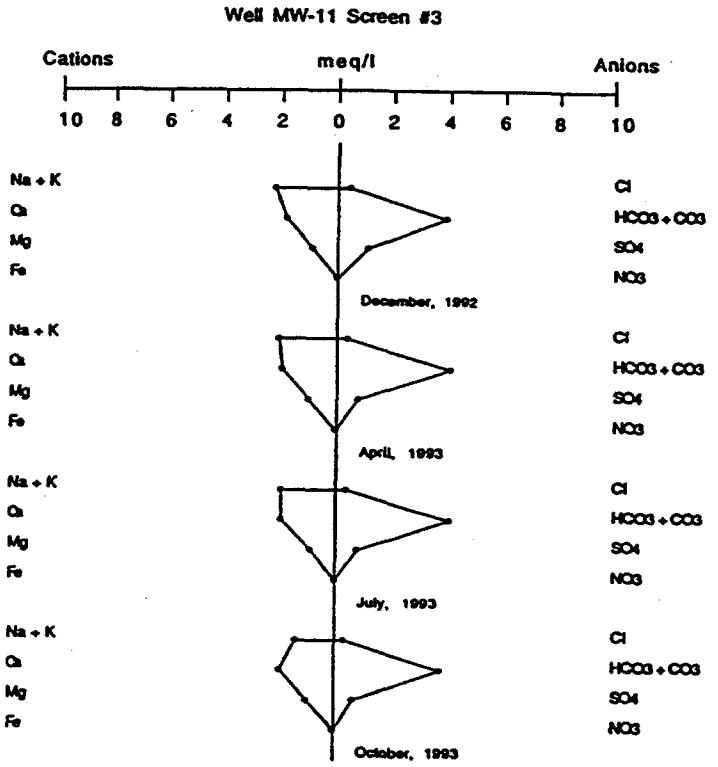


Figure C-21

Stiff Diagrams from Well MW-11 Screen #3

CLB - 63
04/12/96

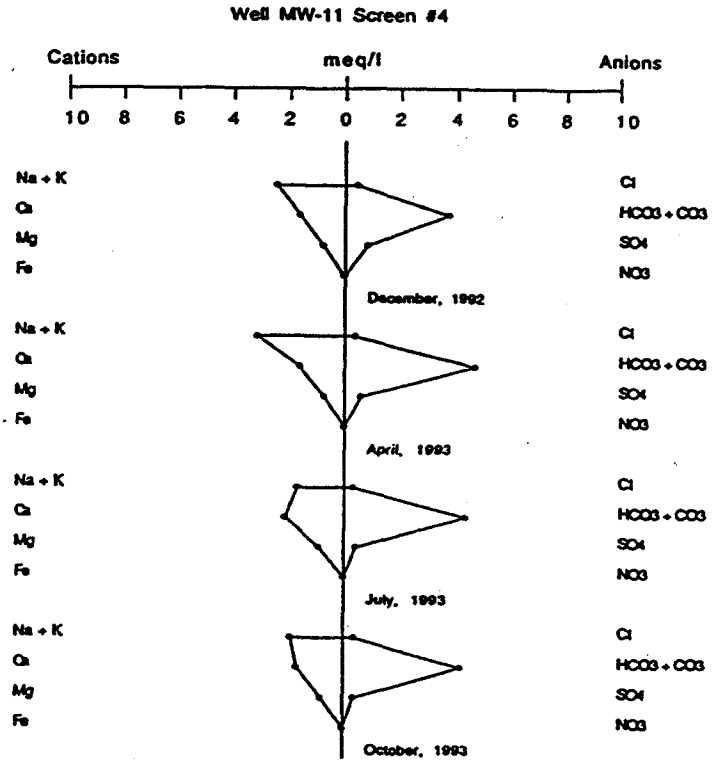


Figure C-22

Stiff Diagrams from Well MW-11 Screen #4

CLB - 64
04/12/96

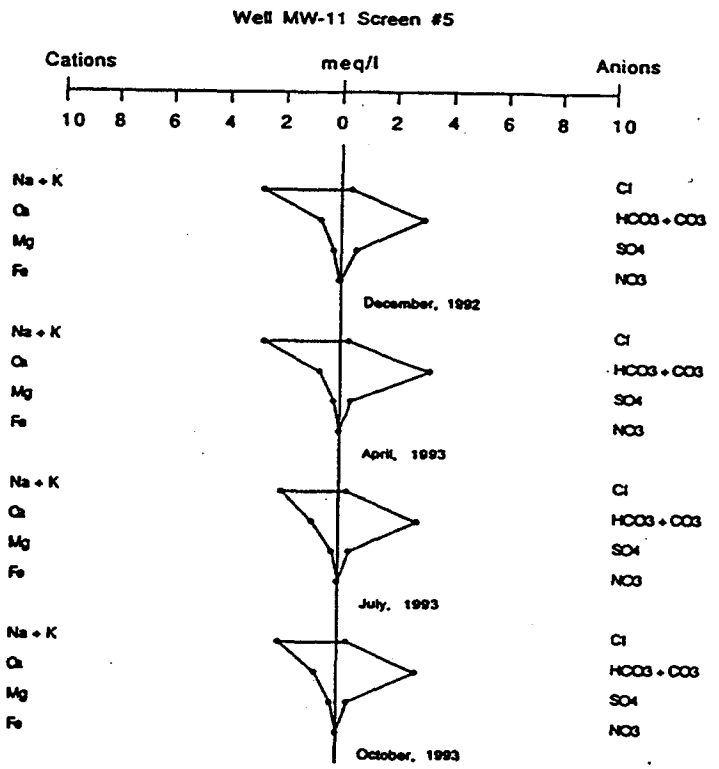
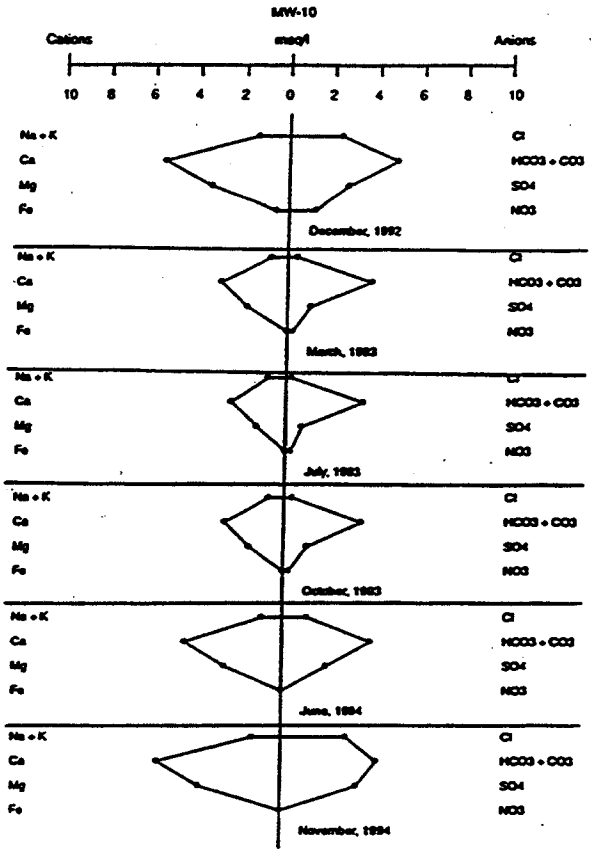


Figure C-23

Stiff Diagrams from Well MW-11 Screen #5

CLB - 65
04/12/96

FIGURE 3

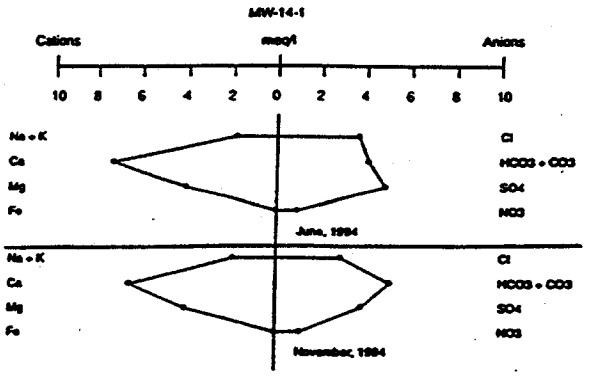


Stiff Diagrams
for
MW-10

FOSTER WHEELER ENVIRONMENTAL CORPORATION

CLB - 6
04/12/9

FIGURE 4

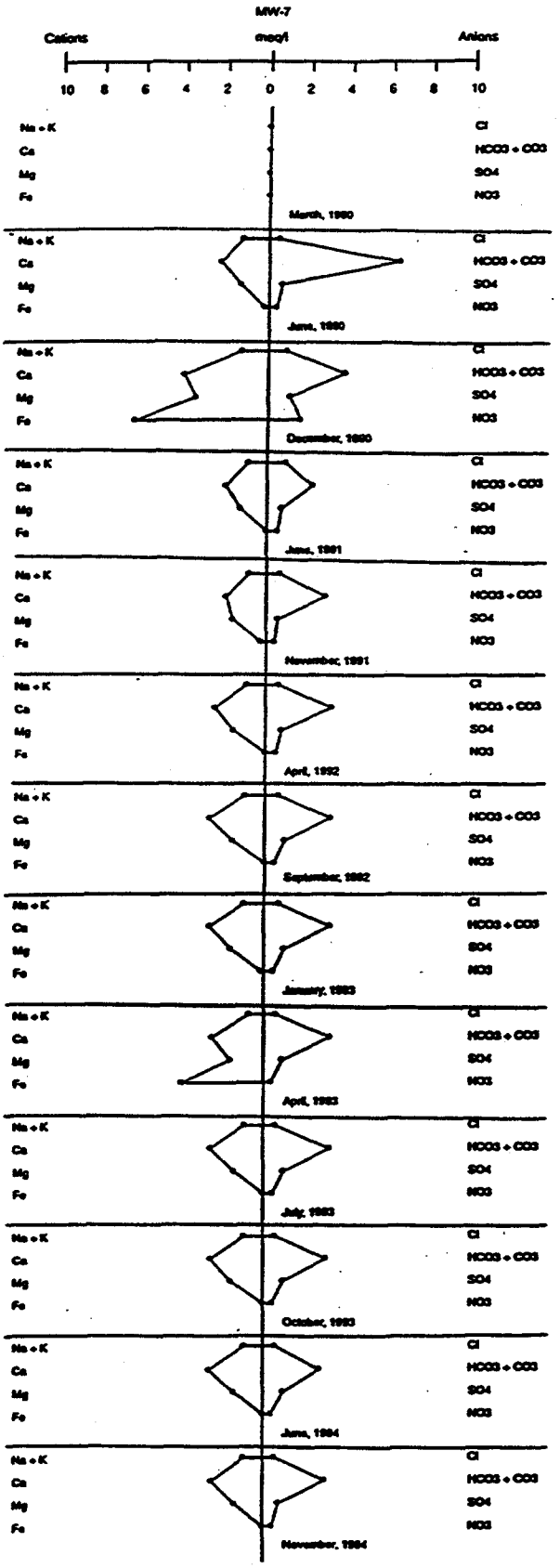


Stiff Diagrams
for
MW-14-1

FOSTER WHEELER ENVIRONMENTAL CORPORATION

CLB - 67
04/12/96

FIGURE 2

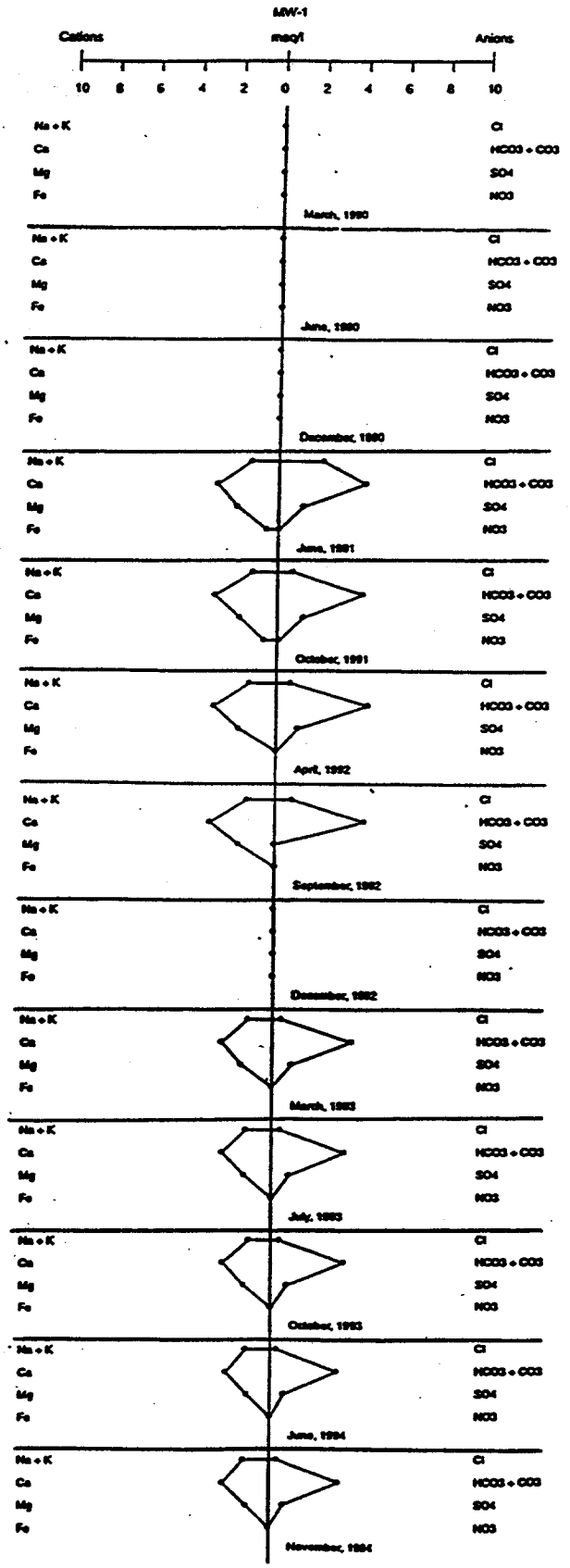


Stiff Diagrams
for
MW-7

FOSTER WHEELER ENVIRONMENTAL CORPORATION

CLB - 68
04/12/96

FIGURE 1

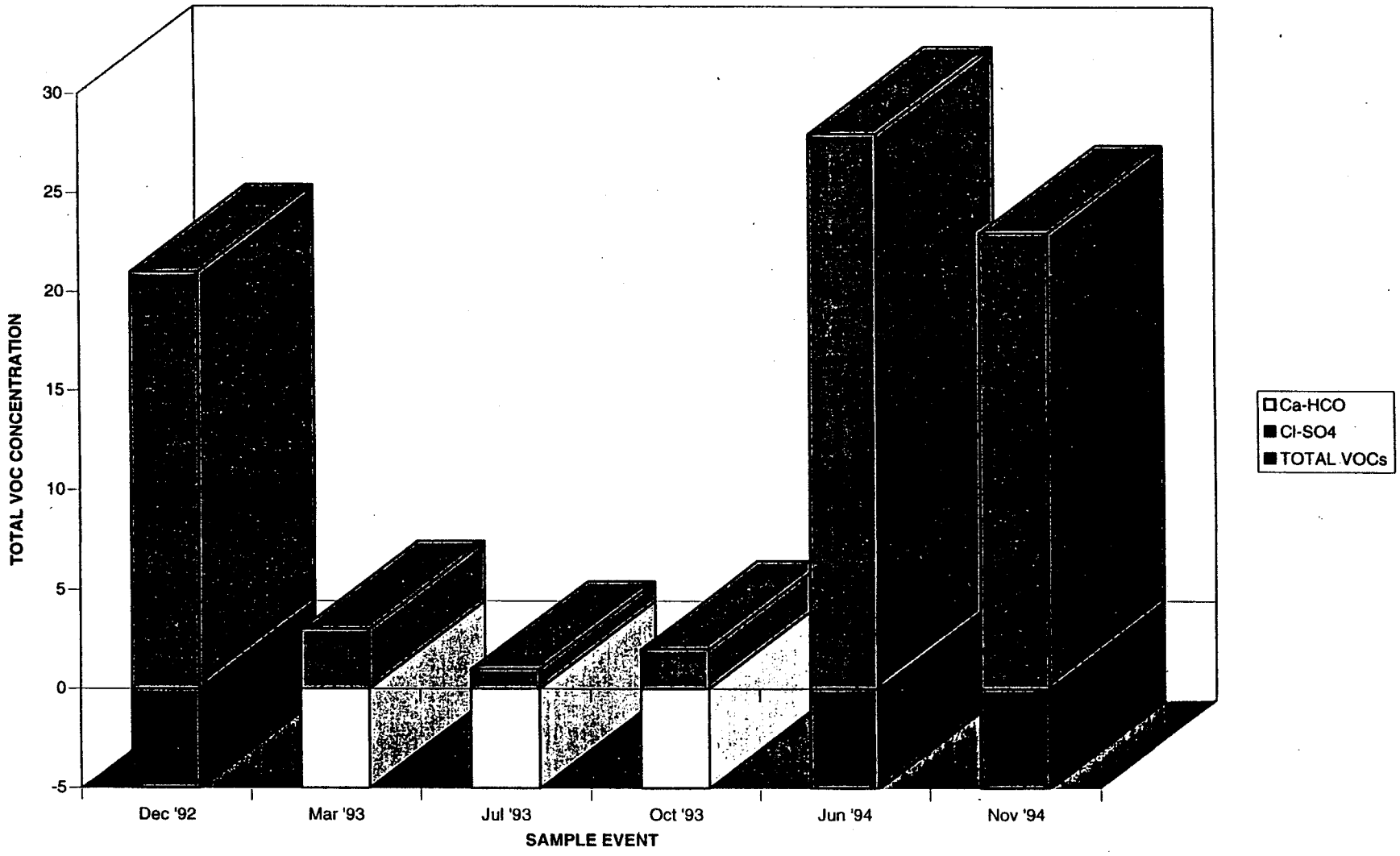


Stiff Diagrams
for
MW-1

CLB - 69
04/12/96

FOSTER WHEELER ENVIRONMENTAL CORPORATION

WATER TYPE AND VOC TOTAL CONCENTRATIONS



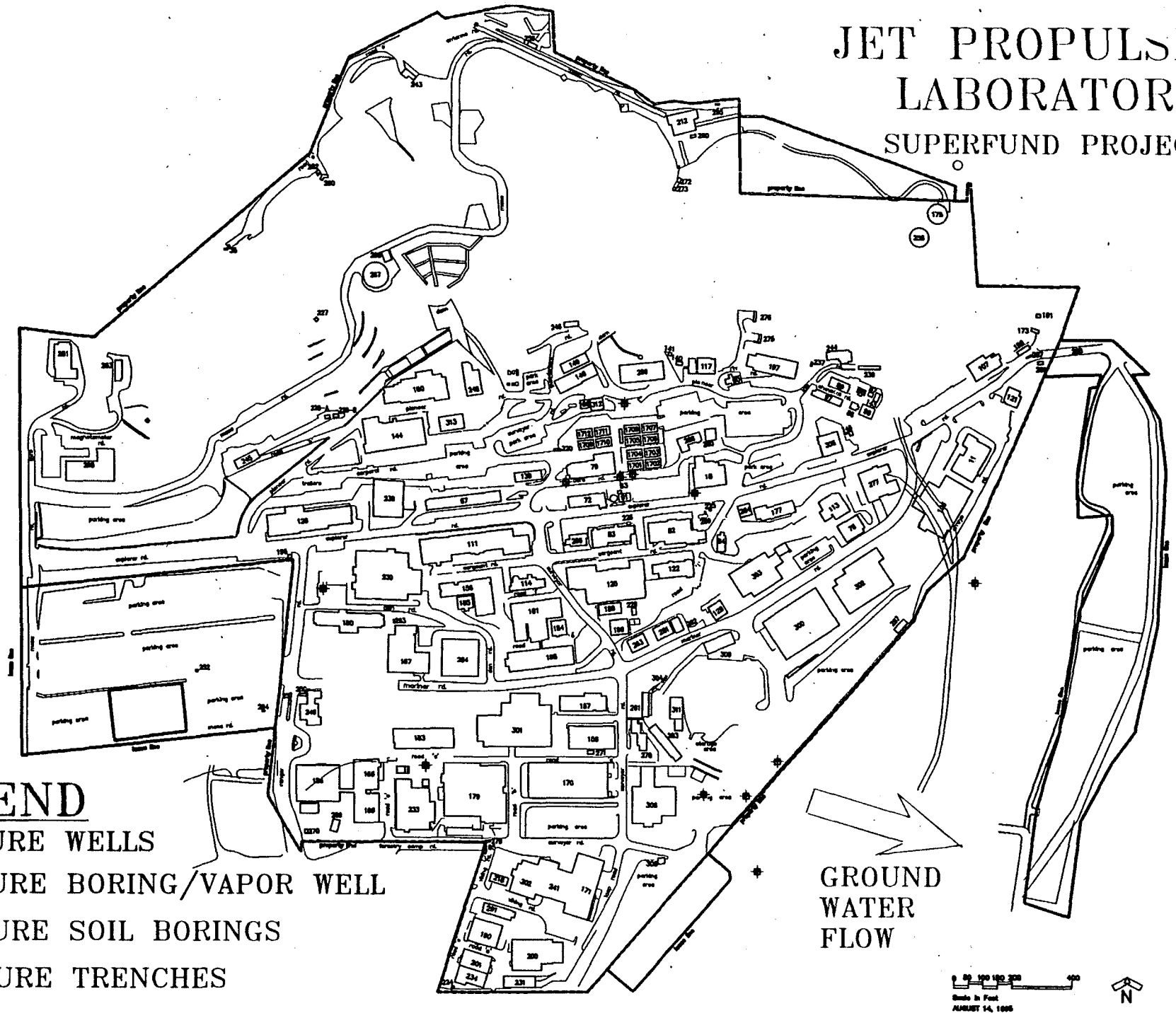
JPL

FUTURE ON-SITE INVESTIGATIVE EFFORTS

- 3 ADDITIONAL MULTIPORT WELLS
- ADDITIONAL SOIL BORINGS / VAPOR WELLS
- LIMITED INVESTIGATION IN THE ARROYO SECO (2 trenches)

JET PROPULSION LABORATORY

SUPERFUND PROJECT



LEGEND

- FUTURE WELLS
- FUTURE BORING/VAPOR WELL
- FUTURE SOIL BORINGS
- FUTURE TRENCHES

CLB - 74
04/12/96

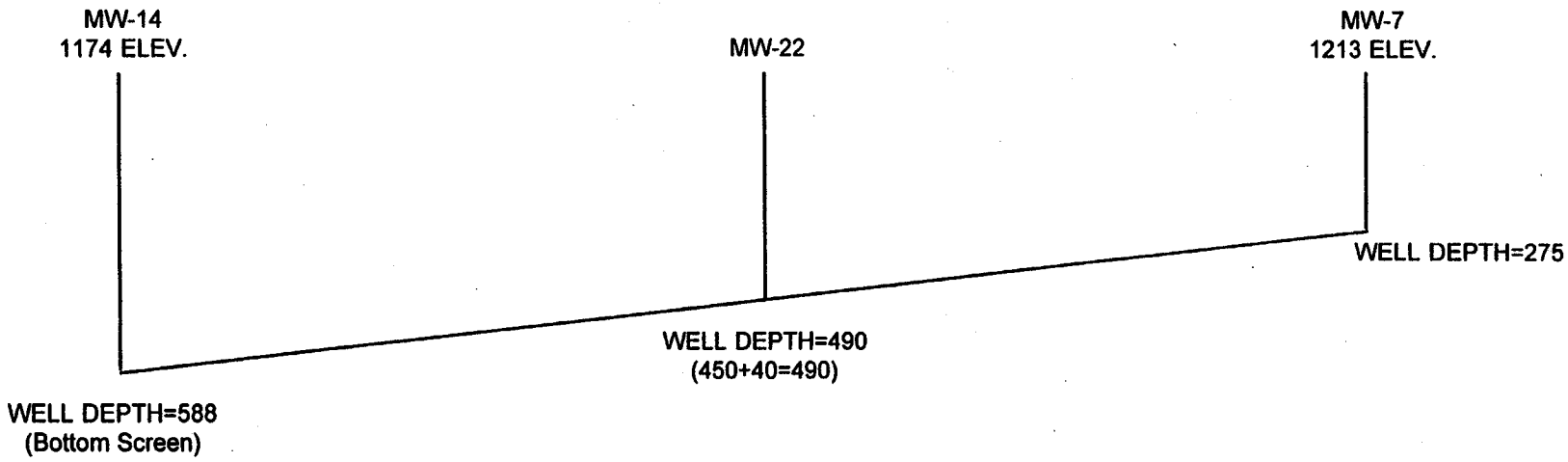
JPL

PROPOSAL FOR THREE ADDITIONAL WELLS IN OU-1

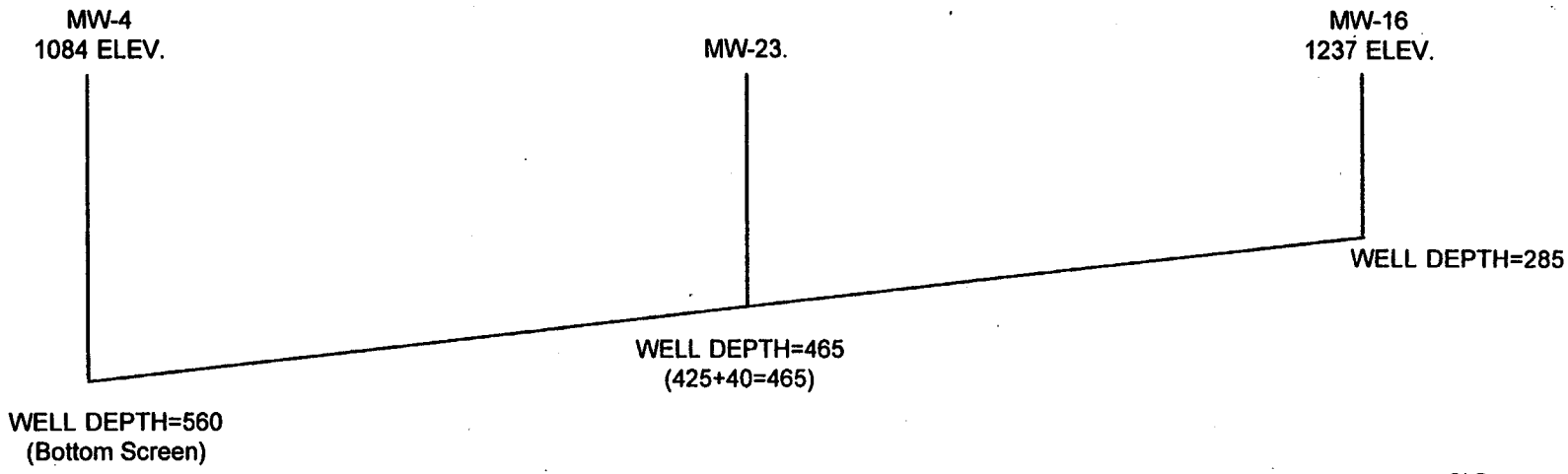
- PROPOSED THREE WELLS AT LOCATIONS INDICATED ON THE MAP
  - DESIGNATE AS WELLS MW-22, MW-23, AND MW-24
- MW-22
  - LOCATED BETWEEN MW-7 AND MW-14
  - DRILLED 490' BGS
    - BASED ON ATTACHED DIAGRAM
    - 3 SCREENS SPACED ACCORDING TO FORMATION CONDITIONS
- MW-23
  - LOCATED BETWEEN MW-16 AND MW-10
  - DRILLED 465' BGS
    - BASED ON ATTACHED DIAGRAM
    - 3 SCREENS SPACED ACCORDING TO FORMATION CONDITIONS
- MW-24
  - LOCATED AS SHOWN ON MAP
  - USED TO DETERMINE POSSIBLE MAXIMUM DEPTH CONSIDERATIONS

WELL DEPTH DETERMINATION DIAGRAM

MW-22 DEPTH DETERMINATION



MW-23 DEPTH DETERMINATION



CLB - 76
04/12/96

JPL

PROPOSAL FOR ADDITIONAL SOIL WORK - OU-2

- FOUR SOIL BORINGS COMPLETED AS VAPOR WELLS ADDRESSING CONCERNS BY DTSC AND LARWQCB
  - LOCATIONS SHOWN ON MAP
  - VOLATILE AND NON-VOLATILE ANALYSES PLANNED
- THREE ADDITIONAL SOIL BORINGS
  - ADDRESSING CONCERNS EXPRESSED BY DTSC
  - LOCATIONS ON MAP
  - VOLATILE AND NON-VOLATILE ANALYSES PLANNED
- TWO TRENCHES IN THE ARROYO SECO
  - ADDRESSES CONCERNS OF DTSC
  - VOLATILE AND NON-VOLATILE ANALYSES PLANNED

JPL

ADDITIONAL CONSIDERATIONS

- UPGRADIENT PUBLIC SUPPLY WELLS CONTAMINATED WITH PCE AND TCE
  - PCE NOT PRESENT AT JPL SITE IN SIGNIFICANT CONCENTRATIONS
- LA CANADA-FLINTRIDGE IS NON-SEWERED IN MANY AREAS
  - COMMON PRACTICE TO CLEAN PIPES BY POURING SOLVENT DOWN DRAIN
  - OTHER DISCHARGES LIKELY
- PUBLIC WELLS DOWN GRADIENT FROM JPL ARE ALREADY BEING TREATED TO ELIMINATE IMMEDIATE RISK
  - PASADENA
  - LINCOLN AVENUE
  - SHOULD BE VIEWED AS AN INTERIM REMEDIAL ACTION
    - HEALTH RISK IS ELIMINATED

JPL

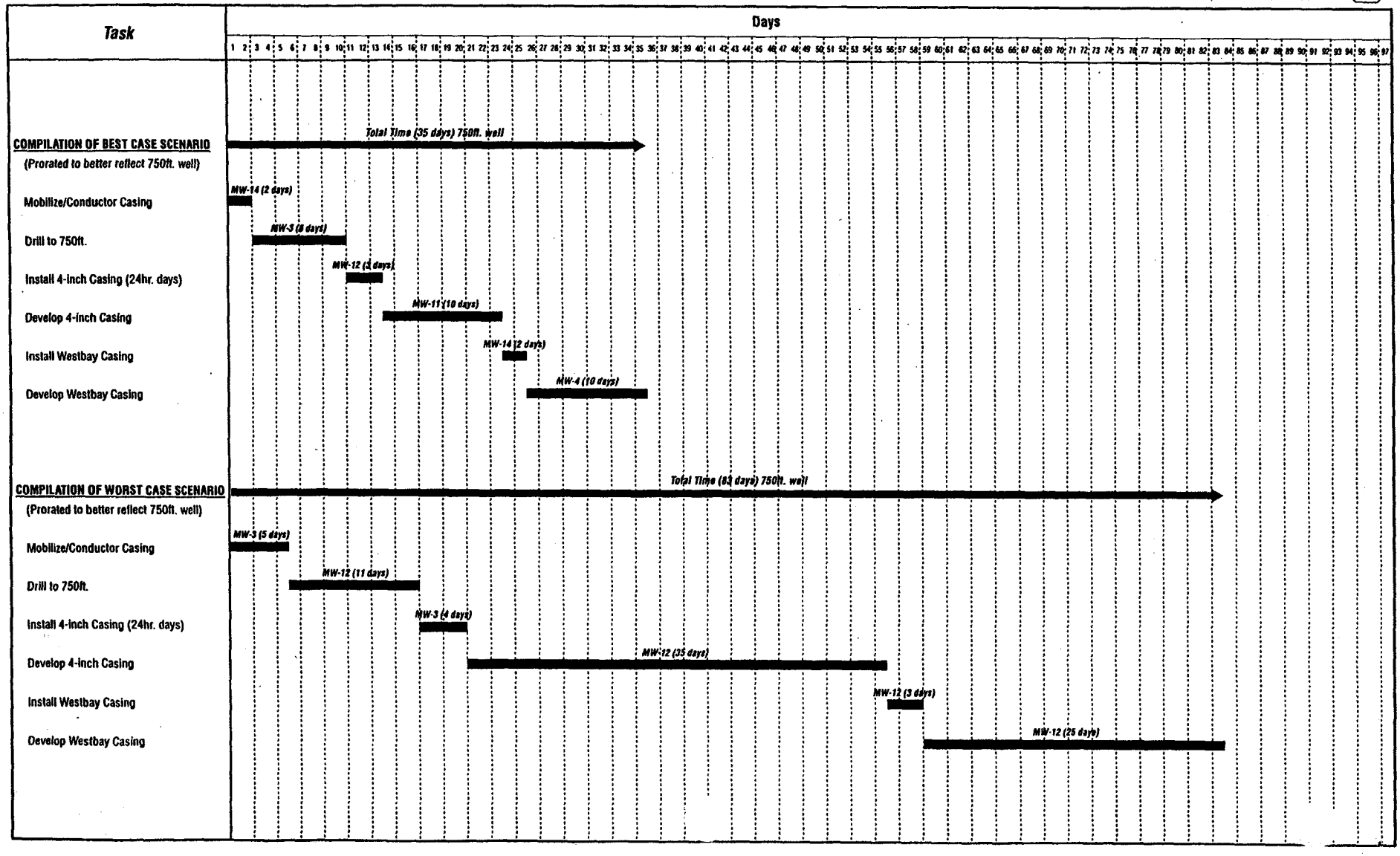
SCHEDULE CONSIDERATIONS

- EXAMPLES FOLLOWING SHOW BEST AND WORST CASES FROM PREVIOUS FIELD WORK
  - NASA CHOSE TIME ON SCHEDULE AS A "REASONABLE AVERAGE"
    - NEITHER BEST NOR WORST CASE

- ALSO SHOWN ARE REPORT WRITING TIMES
  - SCHEDULE REFLECTS MORE TIME DUE TO SIGNIFICANTLY INCREASED COMPLEXITY OF REPORTS TO BE PUBLISHED

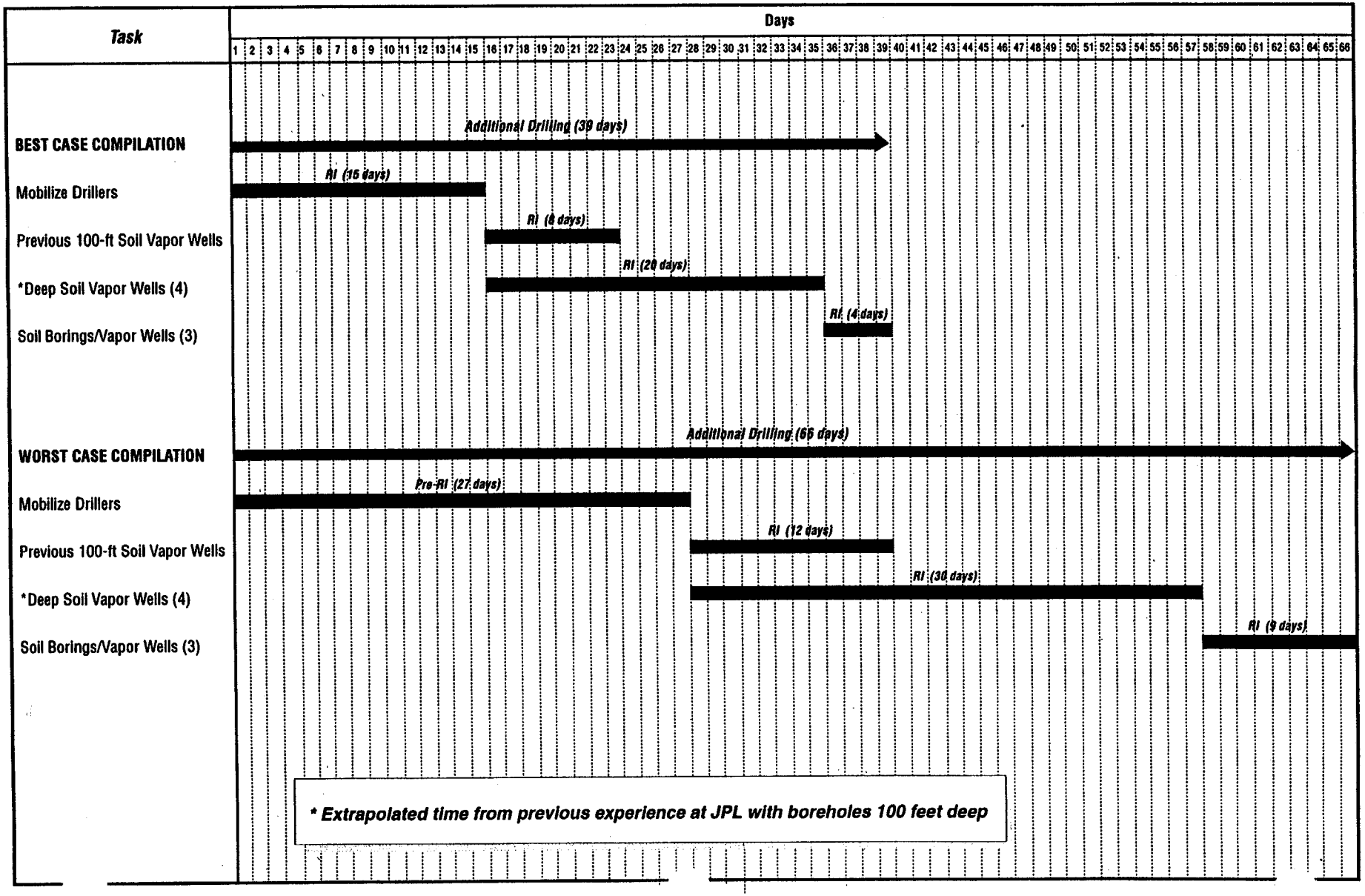
FOSTER WHEELER ENVIRONMENTAL CORPORATION

Periods of Performance for Previous JPL Deep Groundwater Well Installations



FOSTER WHEELER ENVIRONMENTAL CORPORATION

Estimated Periods of Performance for Drilling Based on Past Experience at JPL



Approximate Time Required to Complete Previous JPL Reports/Plans

FOSTER WHEELER
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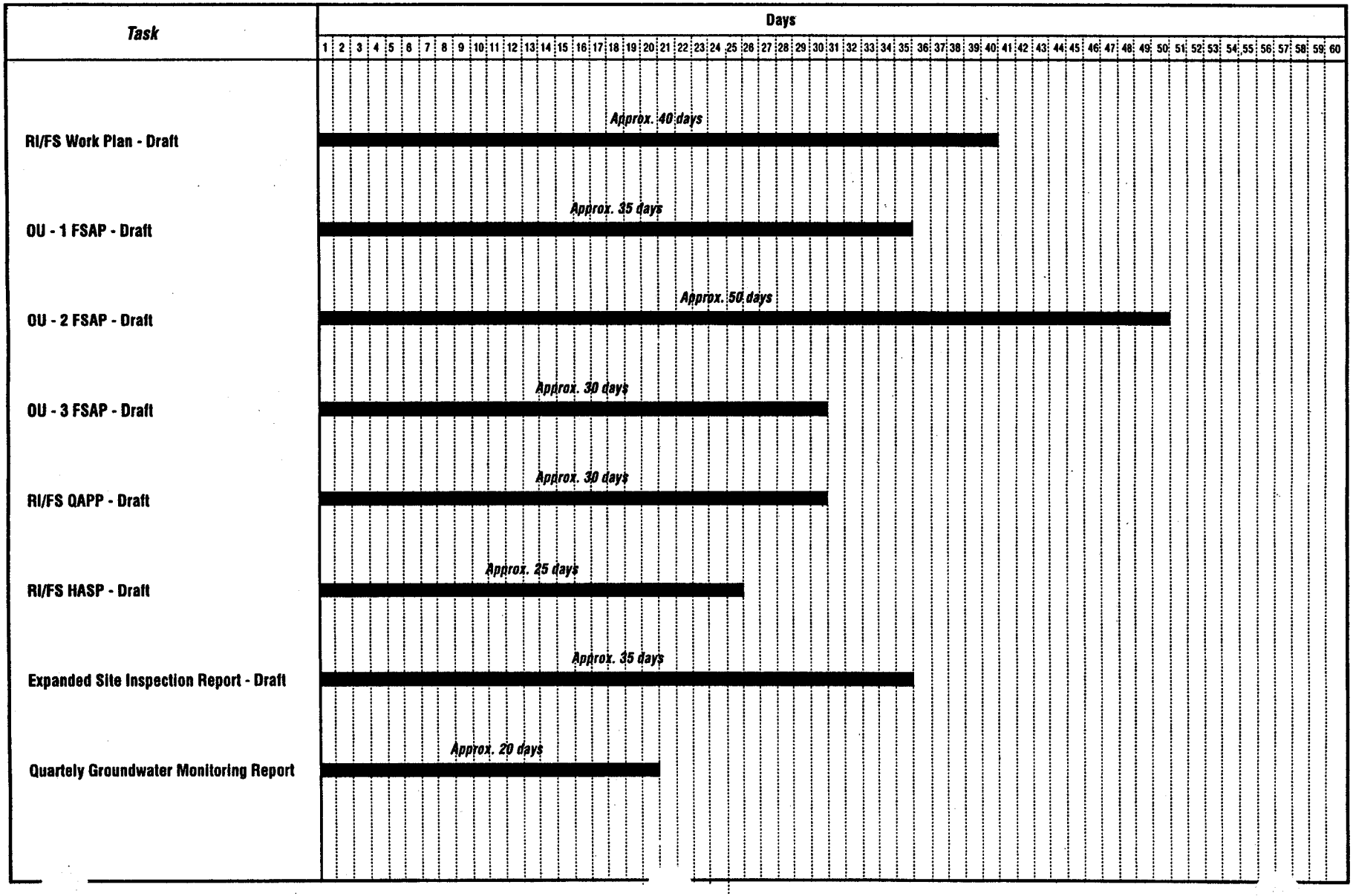
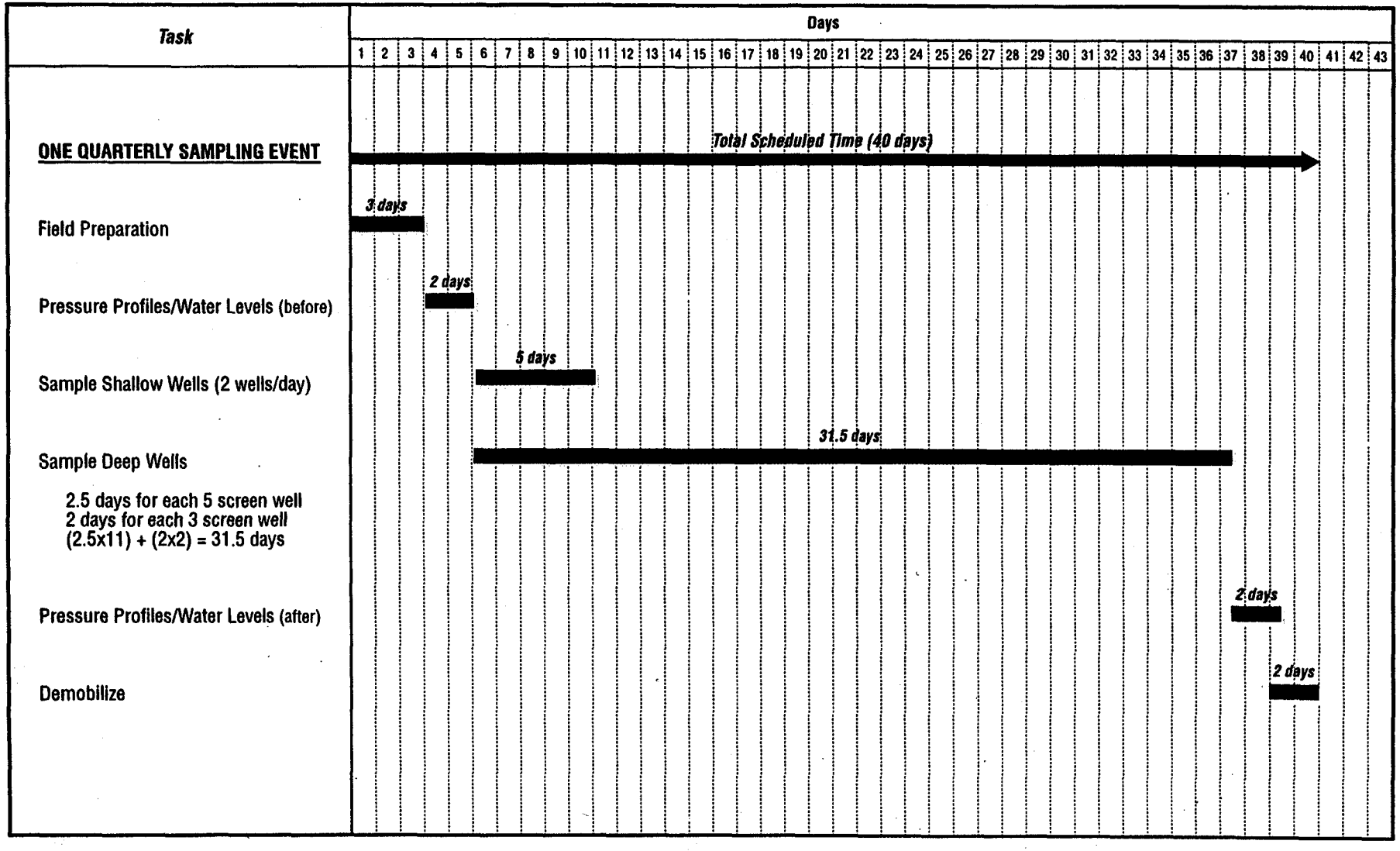
CORPORATION



JPL - Groundwater Sampling Schedule Breakdown

FOSTER WHEELER
ENVIRONMENTAL
CORPORATION



JPL

SCHEDULE COLORS LEGEND

Summary Schedule For Operable Units 1, 2 & 3

Denotes Operable Units 1&3 Related Tasks

Denotes Operable Unit 2 Related Tasks

Denotes Project Wide Summary Tasks

Individual Operable Unit's Schedules

Denotes Required Agency Review Times or Other Required Time Periods

Denotes Required Time For Fulfilling NASA/JPL Contractual Requirements

Denotes Granted NASA/JPL Review Times Or Other Granted Time Periods

Denotes "Critical Path" Summary Tasks

Denotes All Other Tasks

CURRENT FIGURES
1998

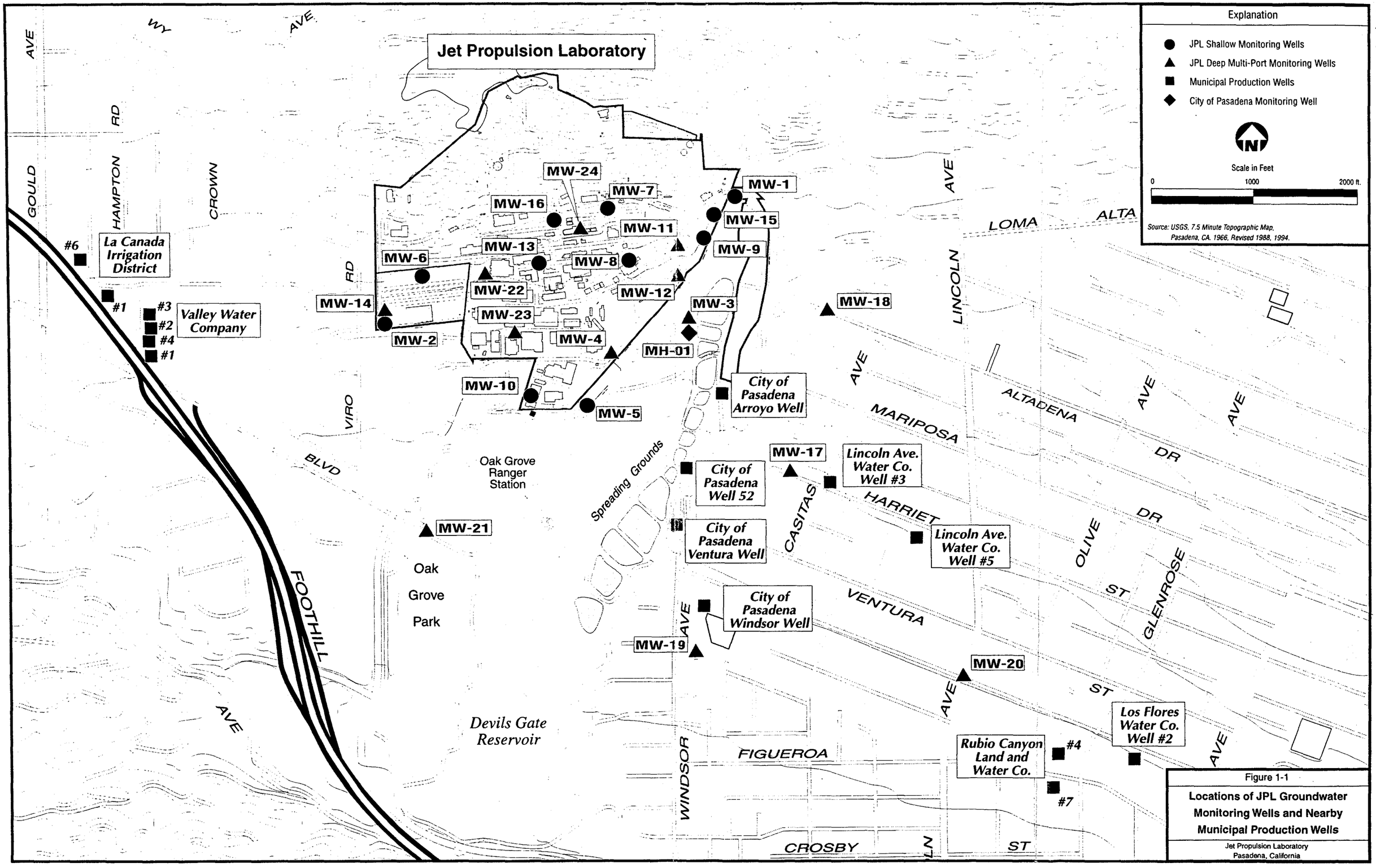


Figure 1-1

Locations of JPL Groundwater Monitoring Wells and Nearby Municipal Production Wells

Jet Propulsion Laboratory
Pasadena, California

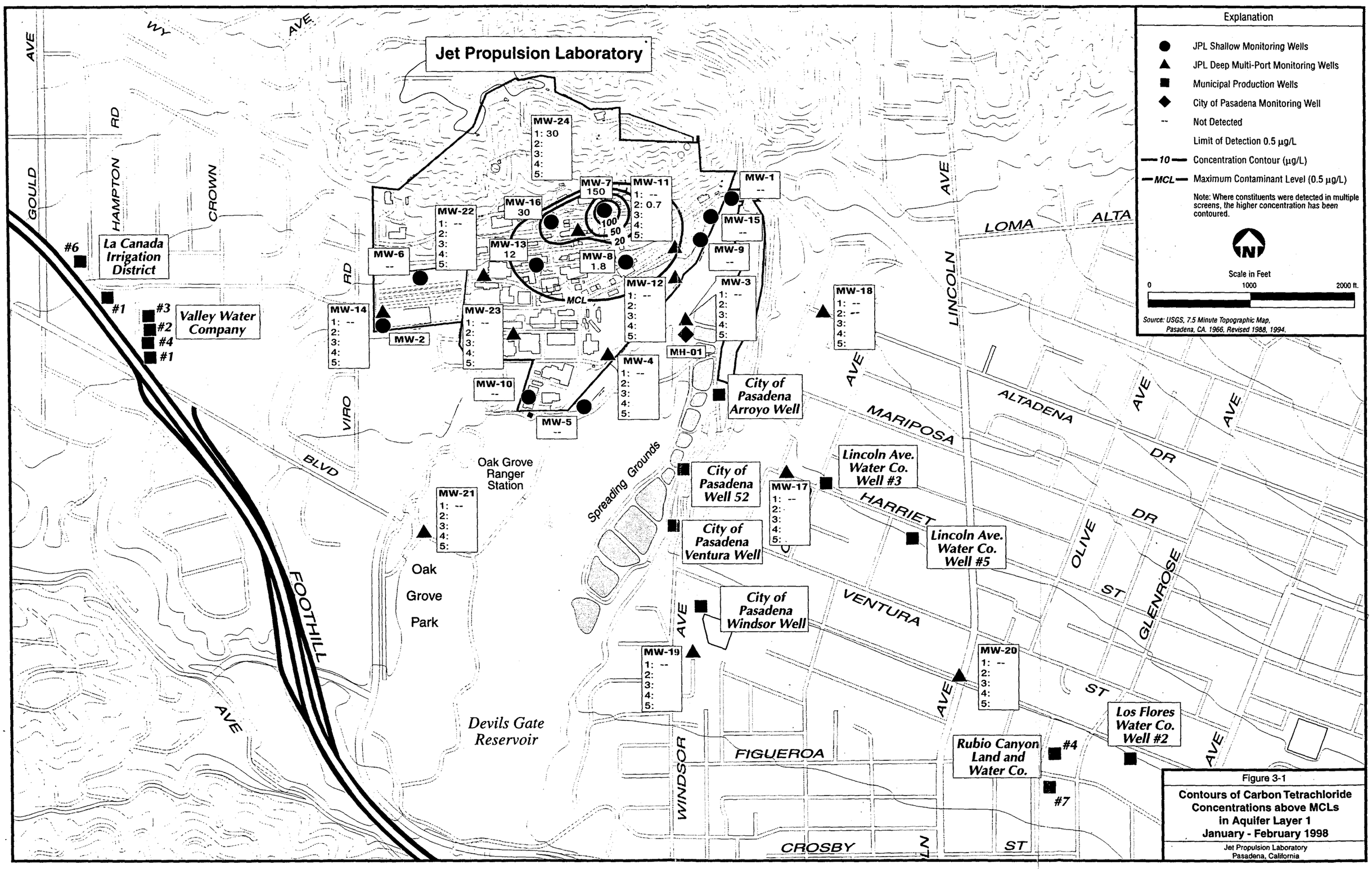


Figure 3-1

Contours of Carbon Tetrachloride Concentrations above MCLs in Aquifer Layer 1 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

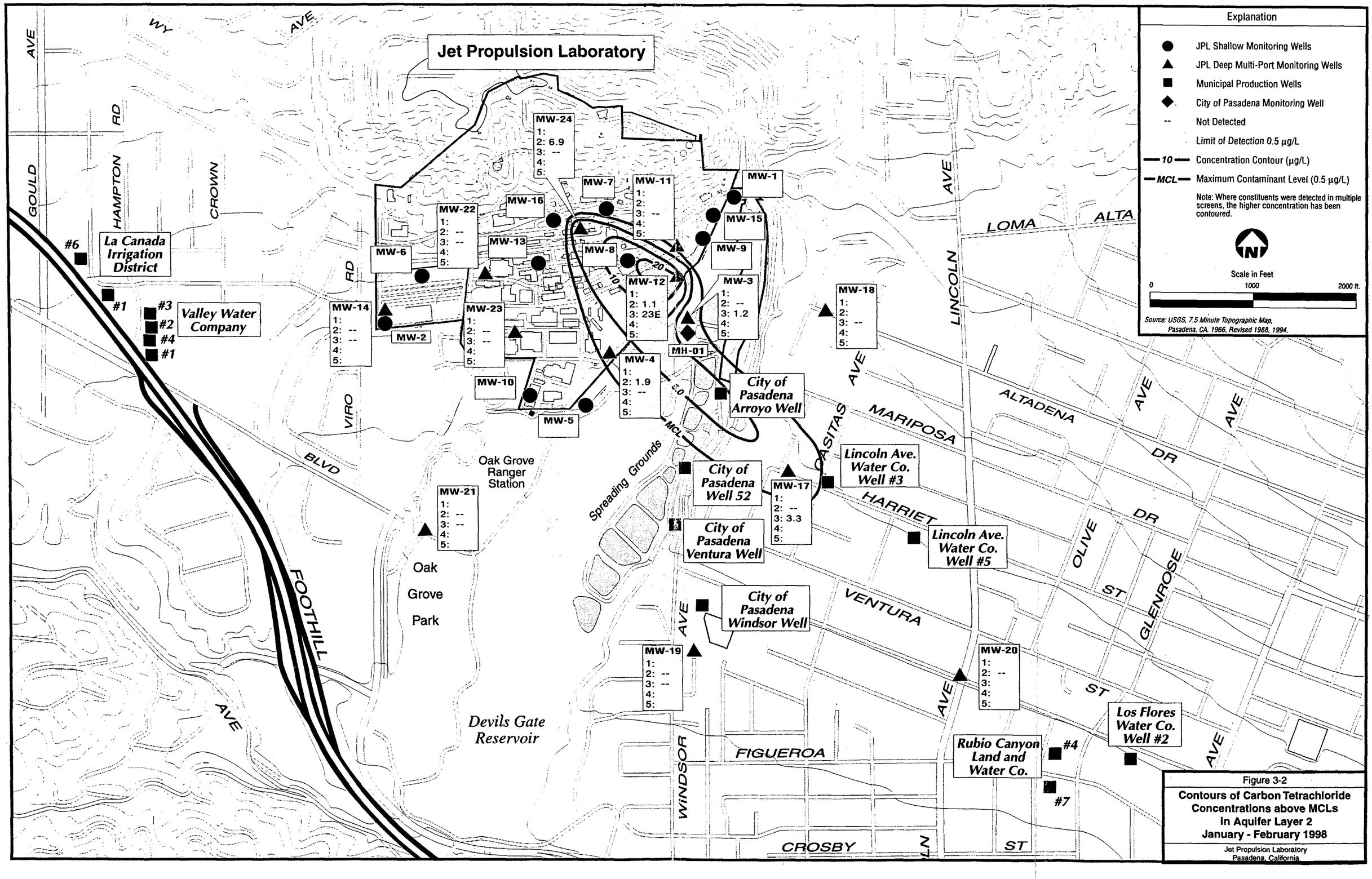


Figure 3-2

Contours of Carbon Tetrachloride Concentrations above MCLs in Aquifer Layer 2 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

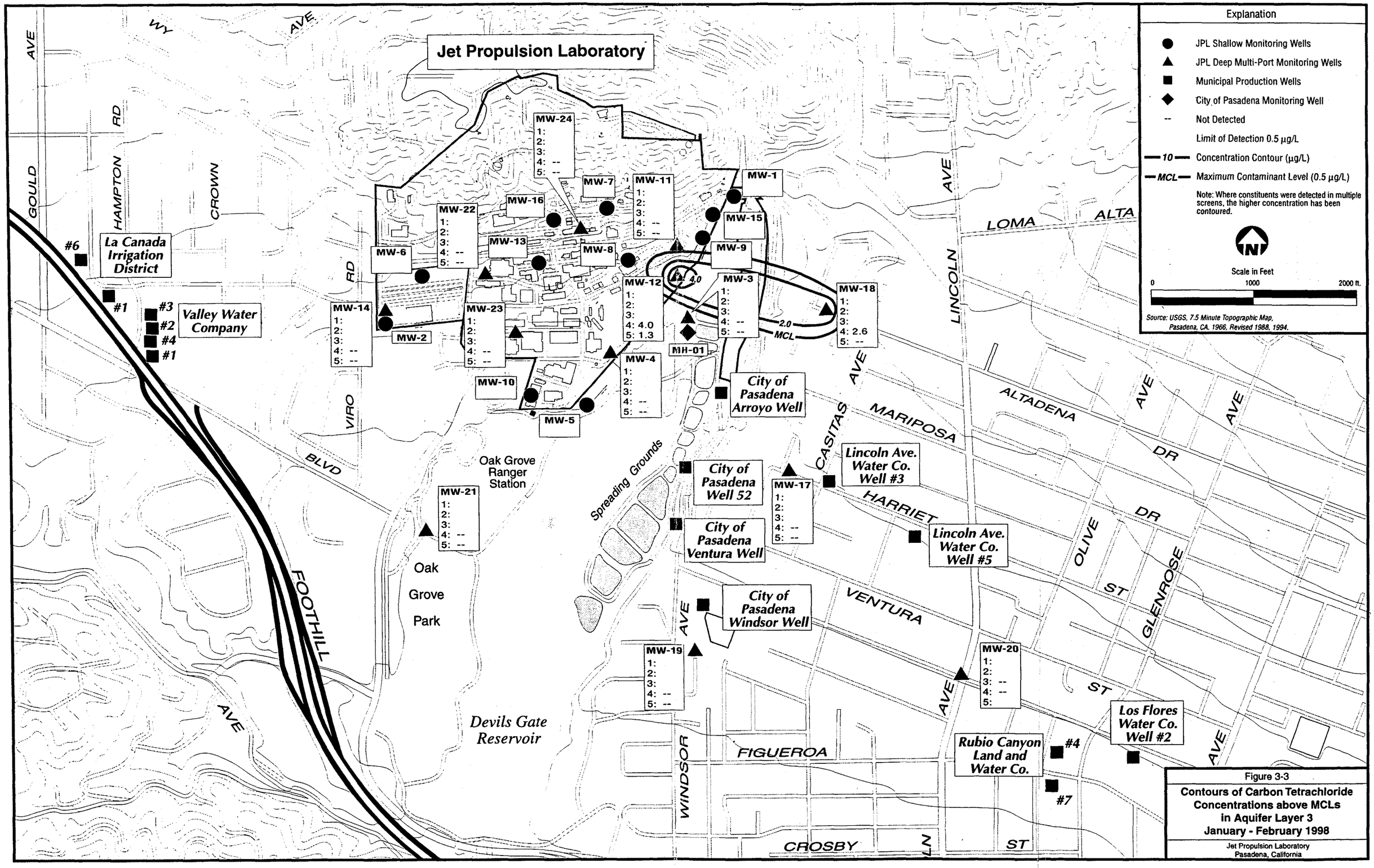


Figure 3-3

Contours of Carbon Tetrachloride Concentrations above MCLs in Aquifer Layer 3 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

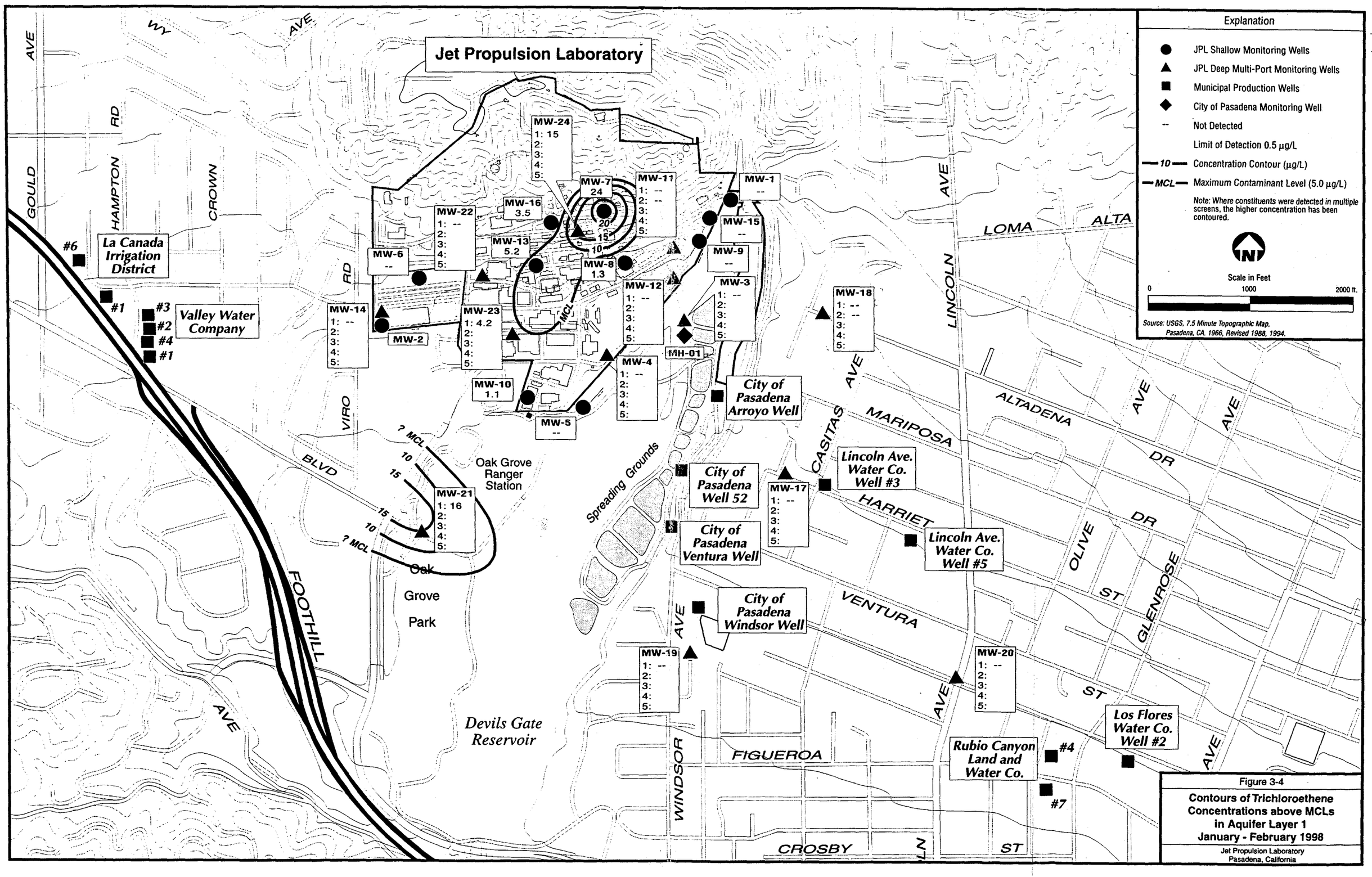


Figure 3-4

Contours of Trichloroethene Concentrations above MCLs in Aquifer Layer 1 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

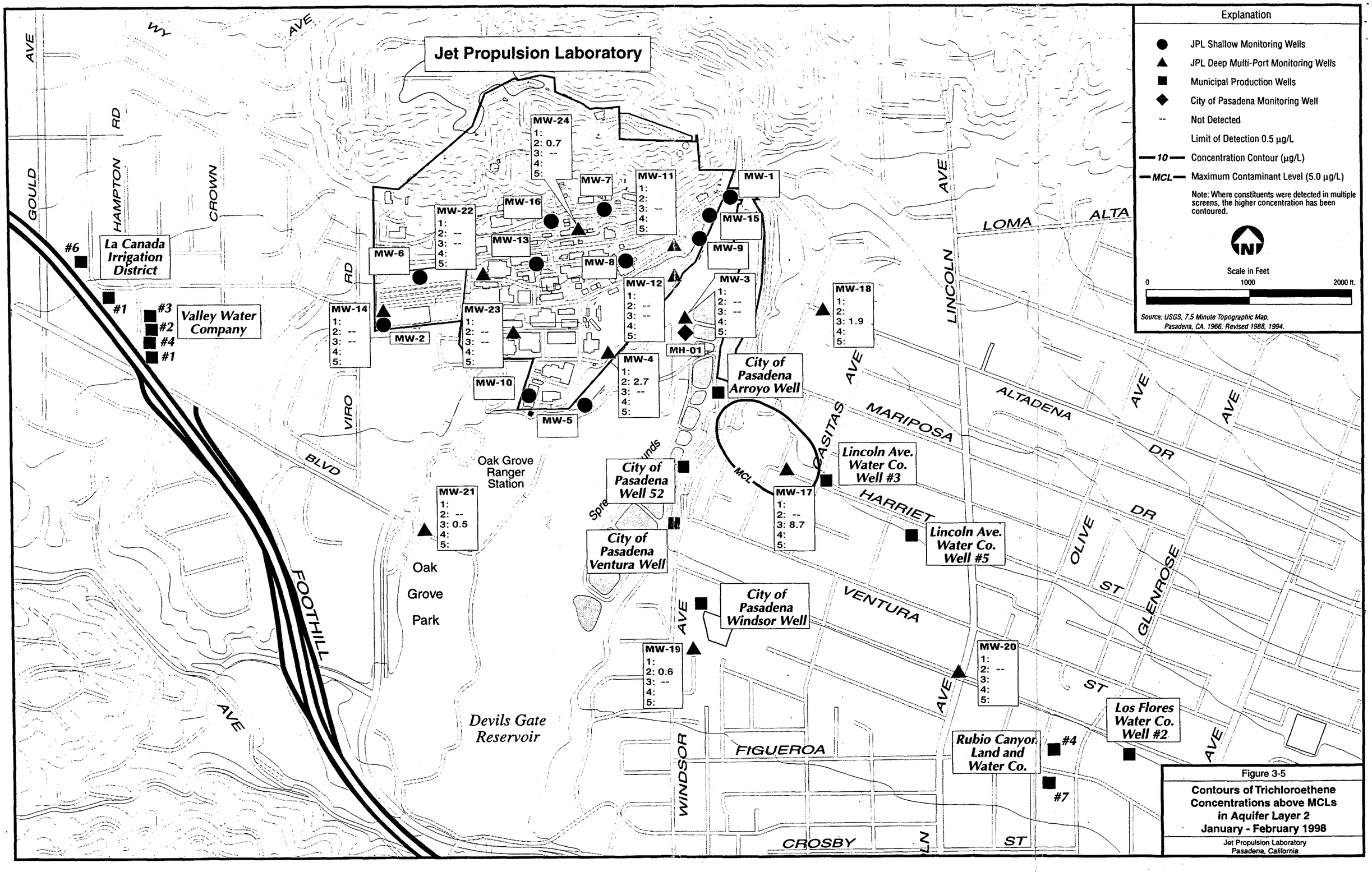


Figure 3-5

Contours of Trichloroethene Concentrations above MCLs in Aquifer Layer 2 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

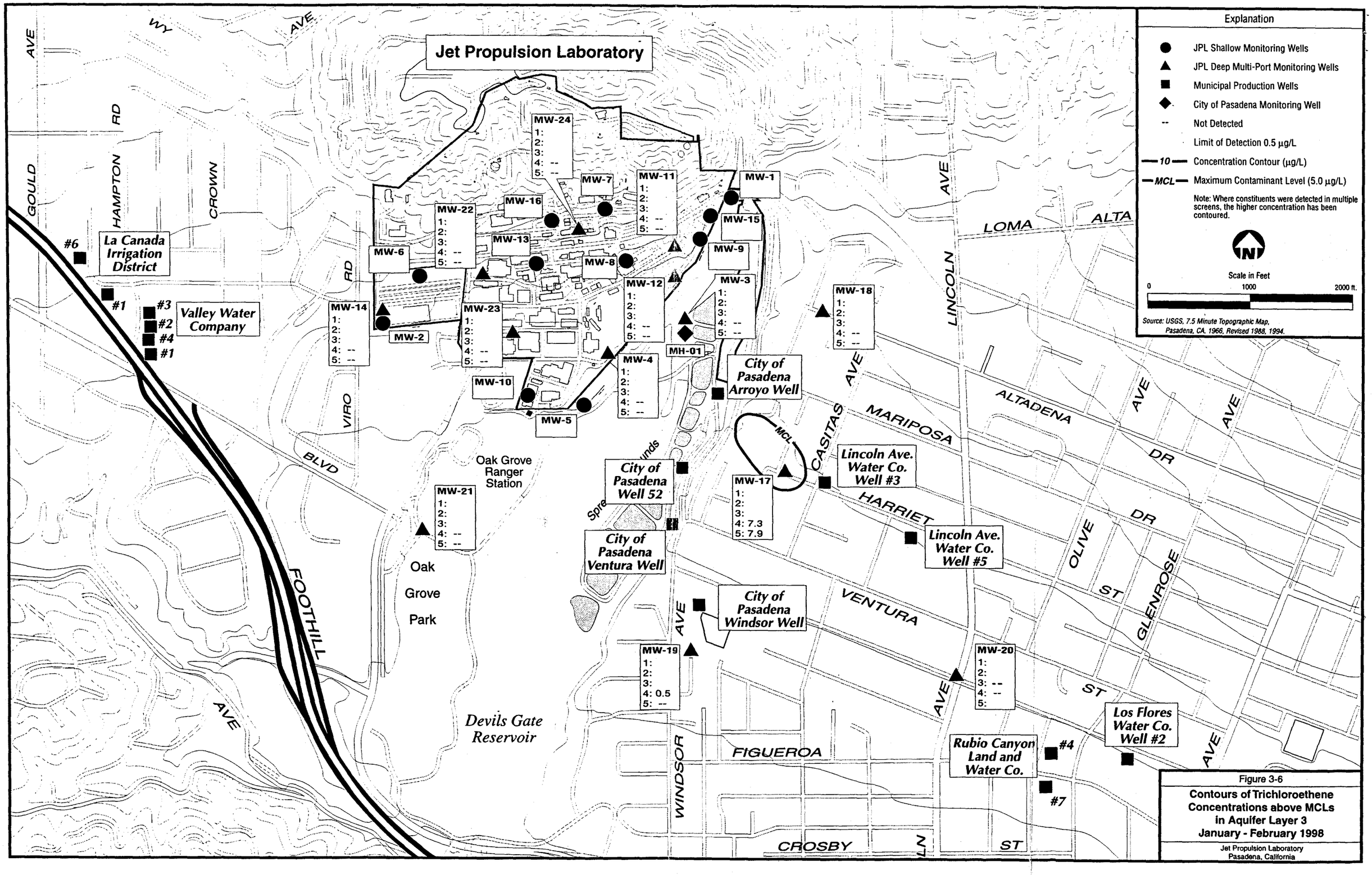


Figure 3-6

Contours of Trichloroethene Concentrations above MCLs in Aquifer Layer 3 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

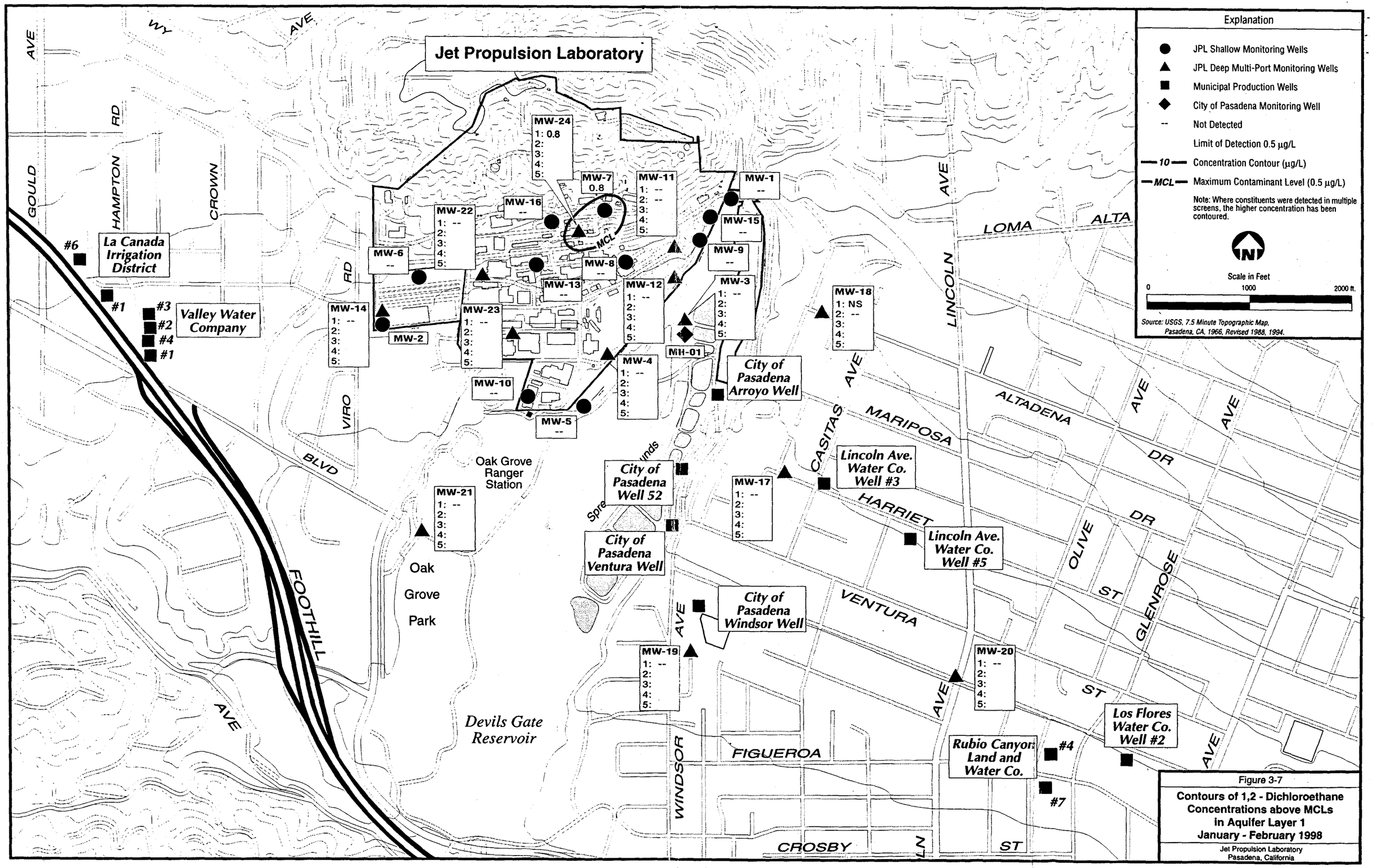


Figure 3-7

Contours of 1,2 - Dichloroethane Concentrations above MCLs in Aquifer Layer 1 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

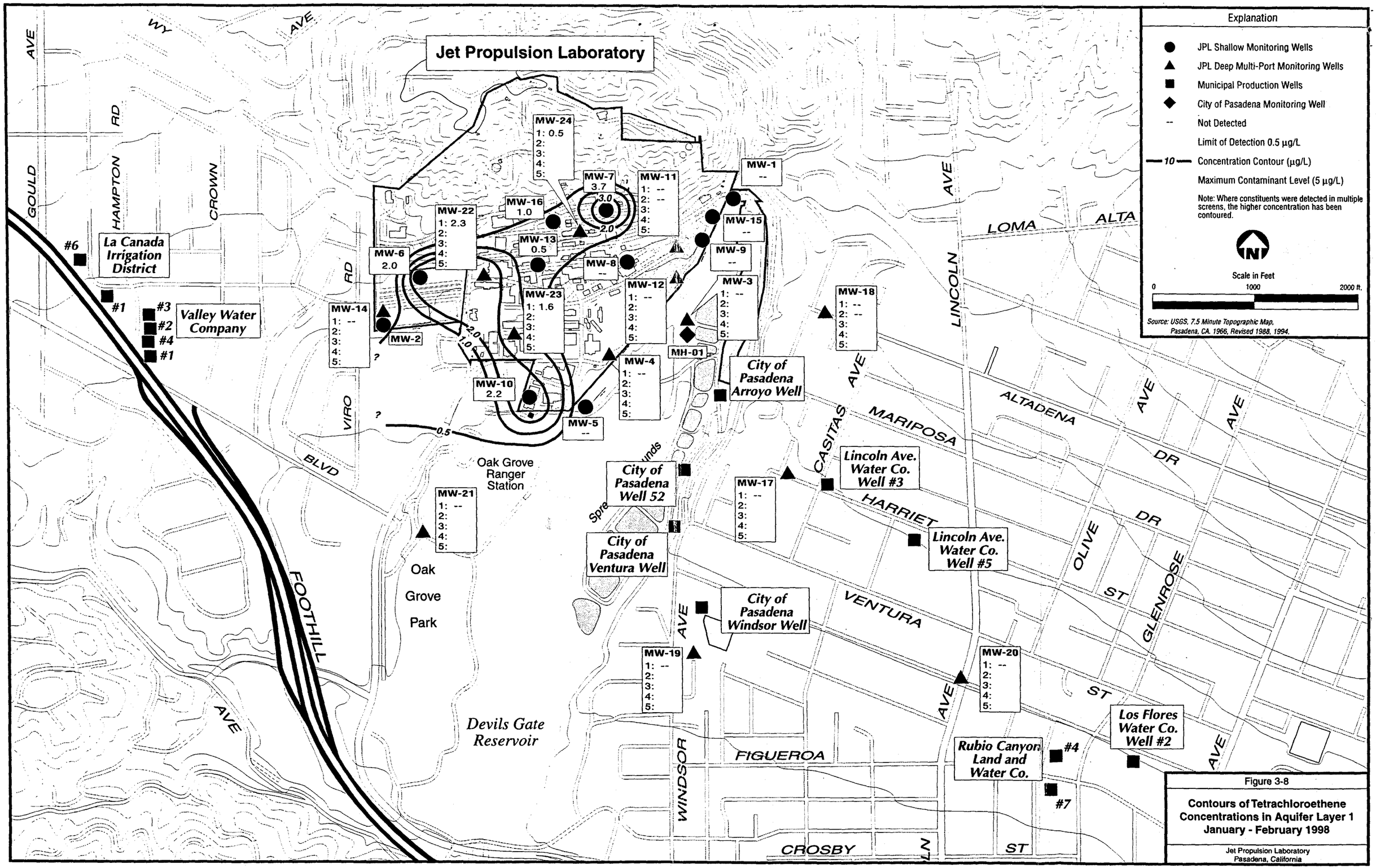


Figure 3-8

Contours of Tetrachloroethene Concentrations in Aquifer Layer 1 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

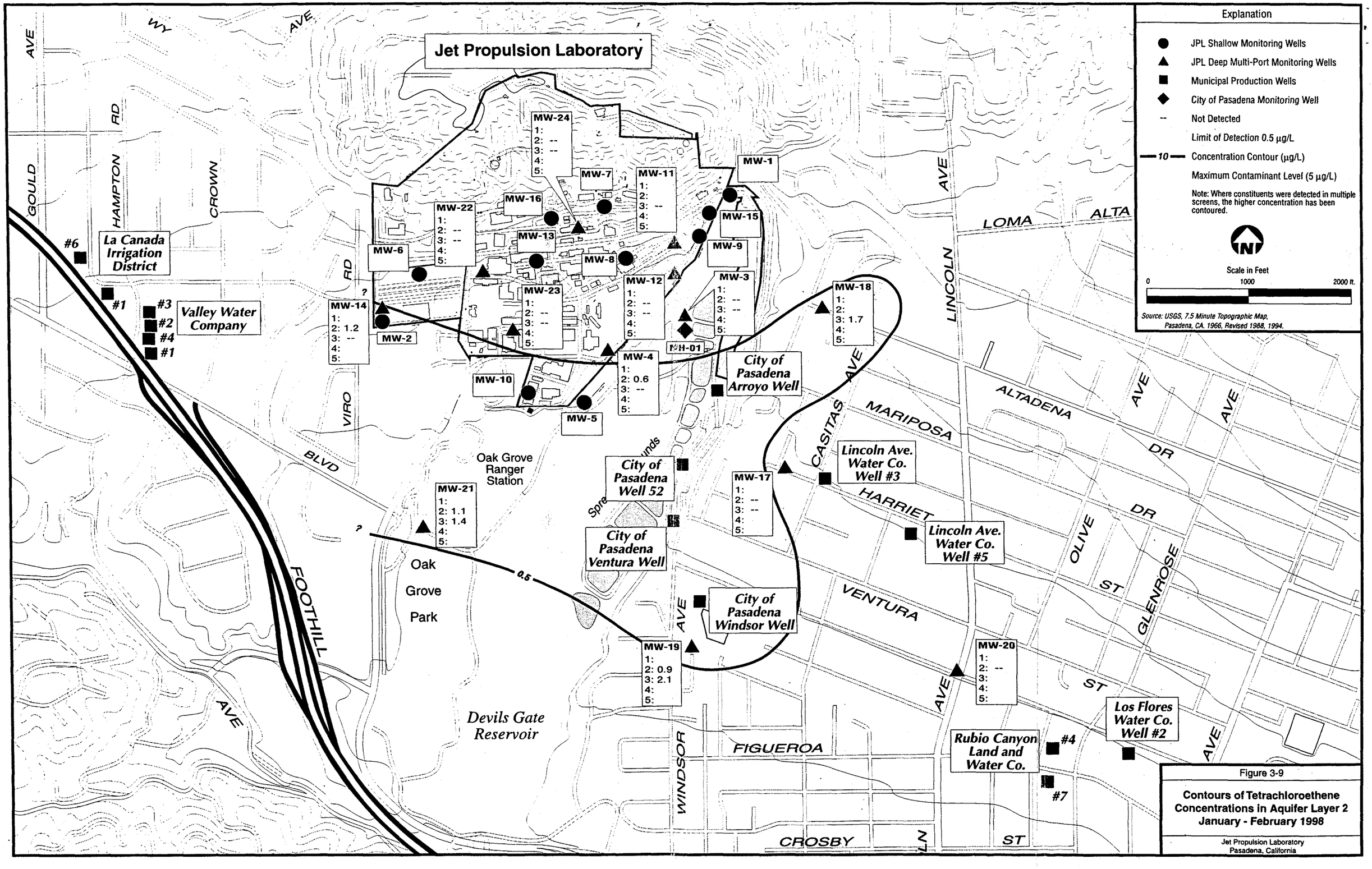


Figure 3-9

Contours of Tetrachloroethene Concentrations in Aquifer Layer 2 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

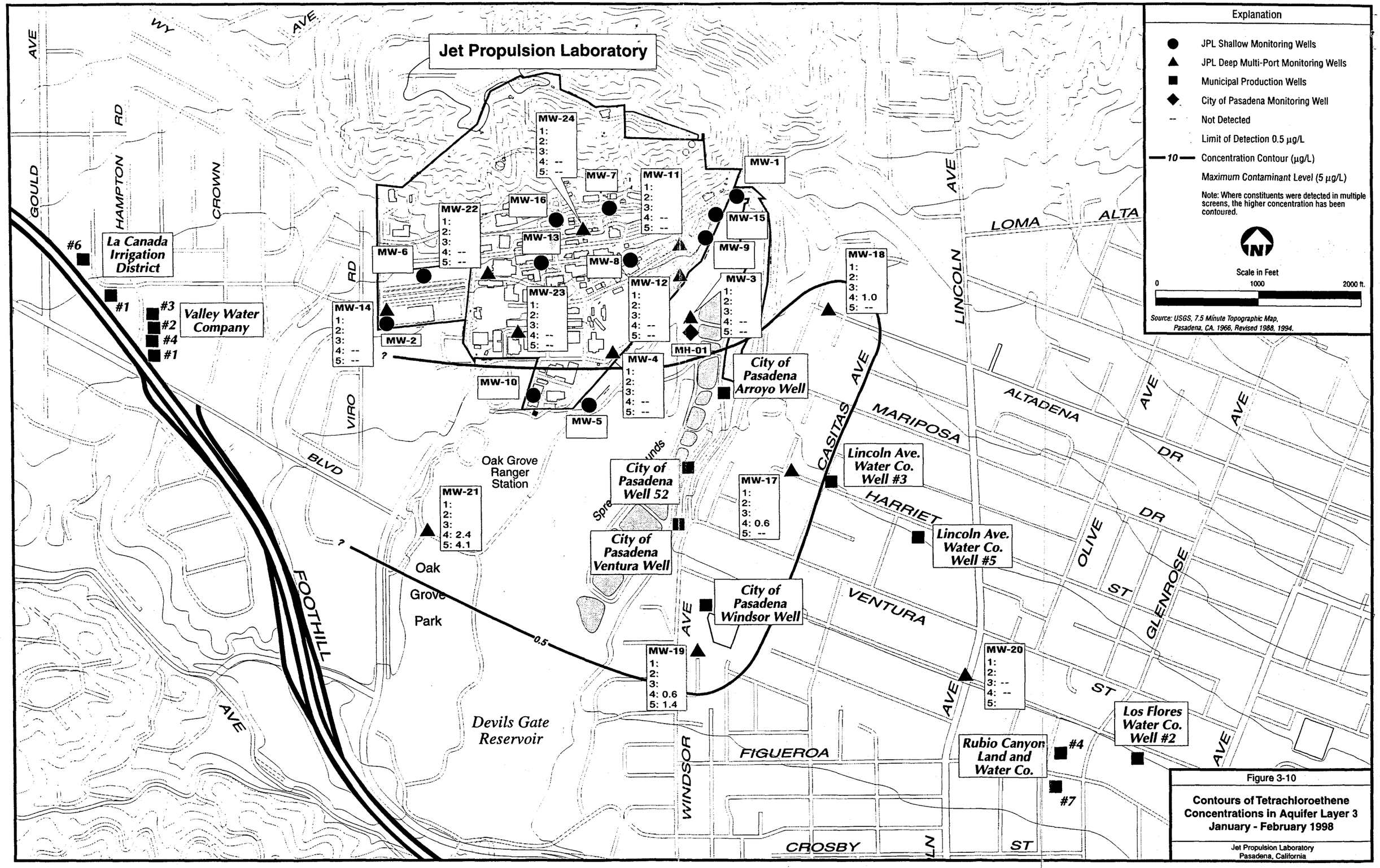


Figure 3-10

Contours of Tetrachloroethene Concentrations in Aquifer Layer 3 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

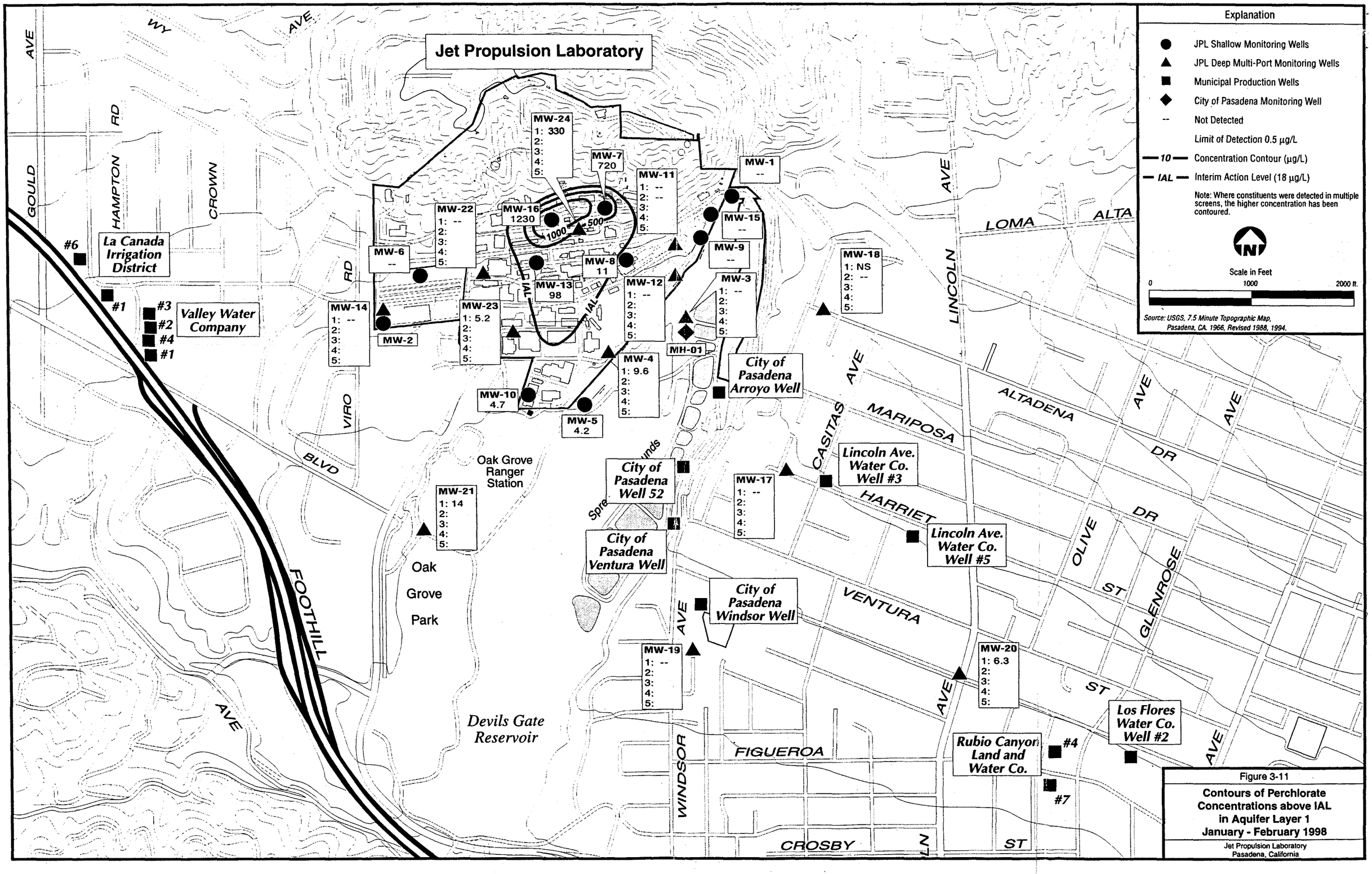


Figure 3-11

Contours of Perchlorate Concentrations above IAL in Aquifer Layer 1 January - February 1998

Jet Propulsion Laboratory
Pasadena, California

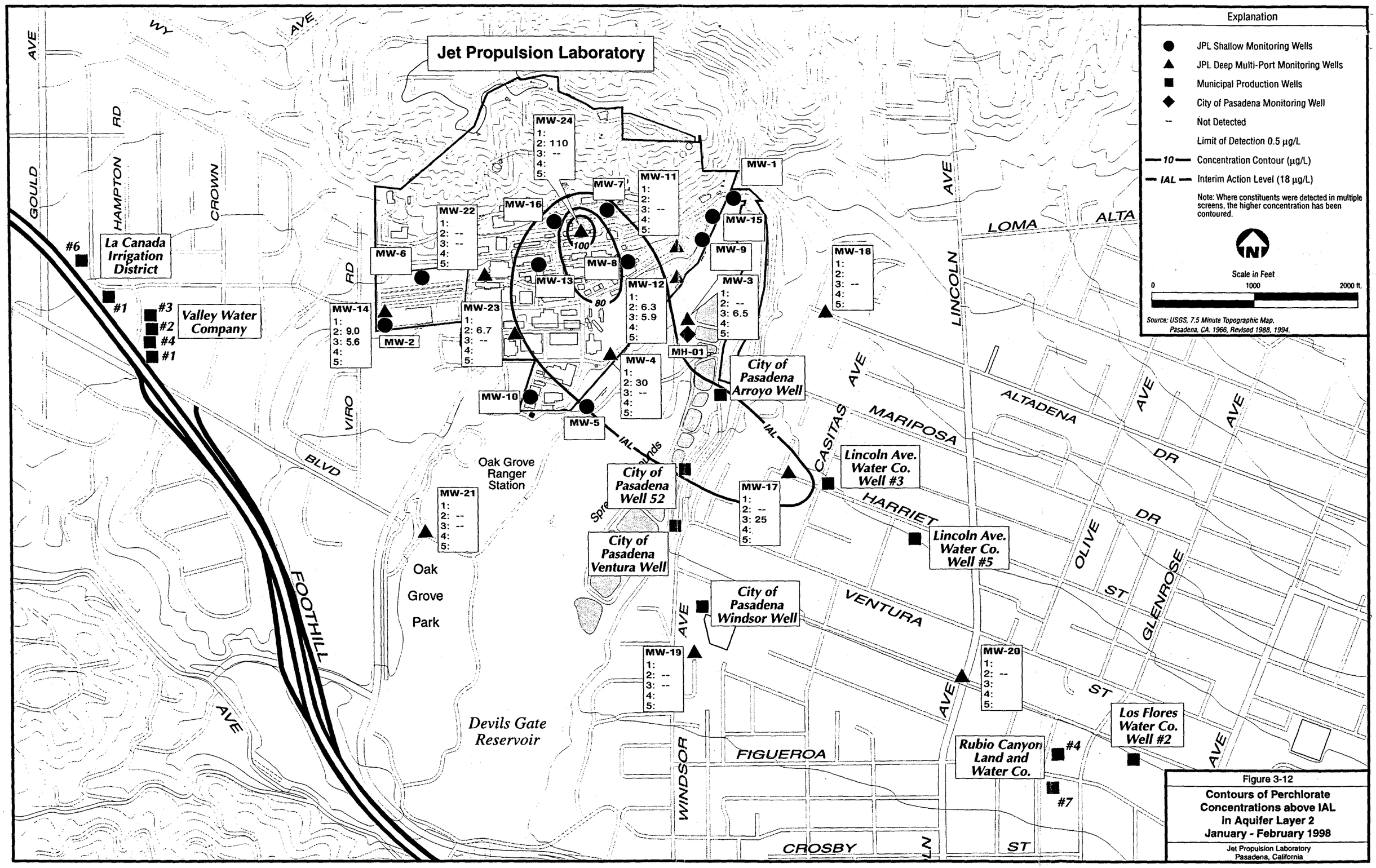
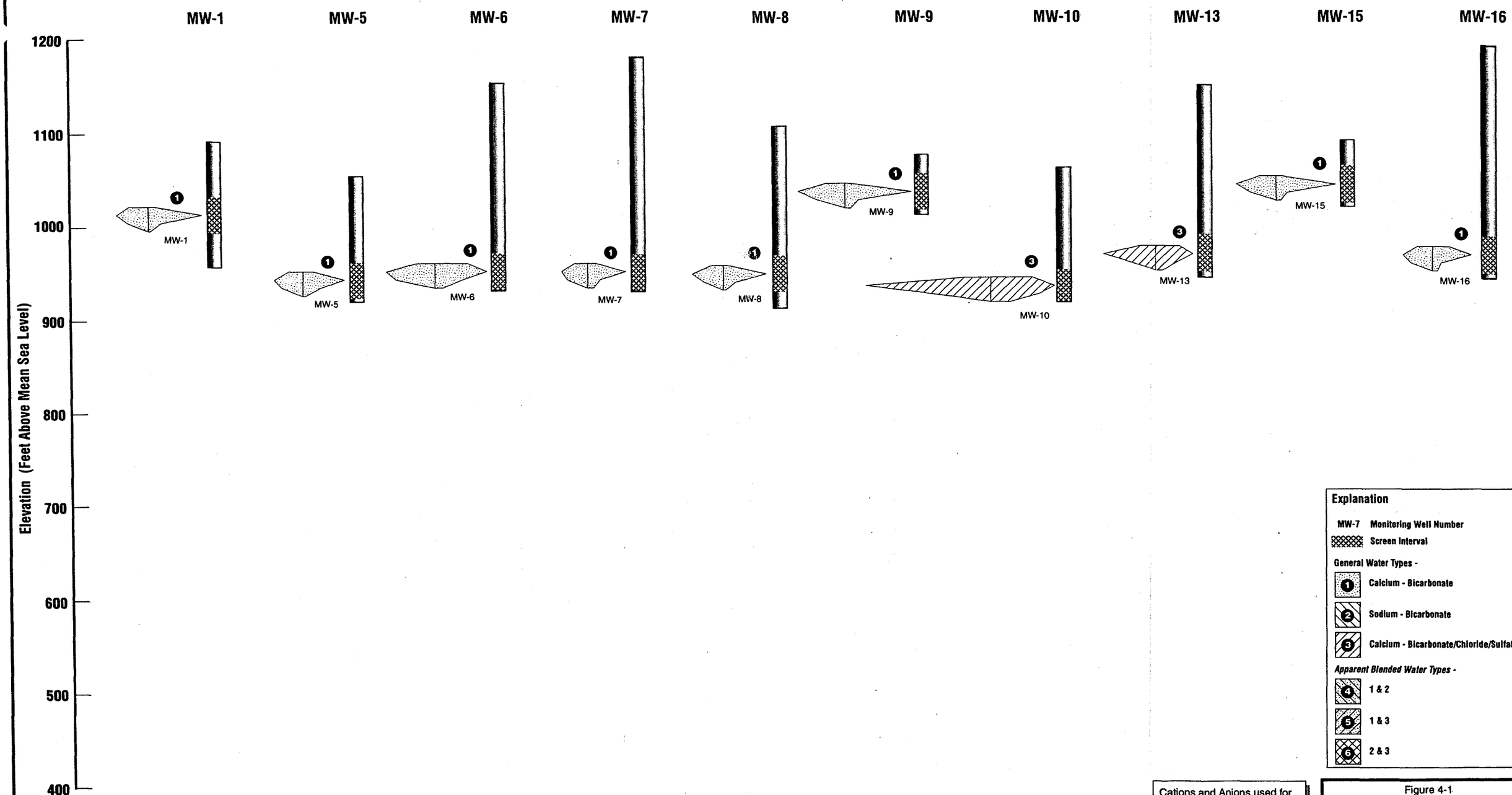


Figure 3-12
Contours of Perchlorate Concentrations above IAL in Aquifer Layer 2
January - February 1998
Jet Propulsion Laboratory
Pasadena, California



Cations and Anions used for Stiff Diagrams

Na+K	Cl
Ca	HCO_3+CO_3
Mg	SO_4
Fe	NO_3

Figure 4-1

Stiff Diagrams for On-Site JPL Shallow Monitoring Wells January - February, 1998

Jet Propulsion Laboratory
Pasadena, California

1672.0233

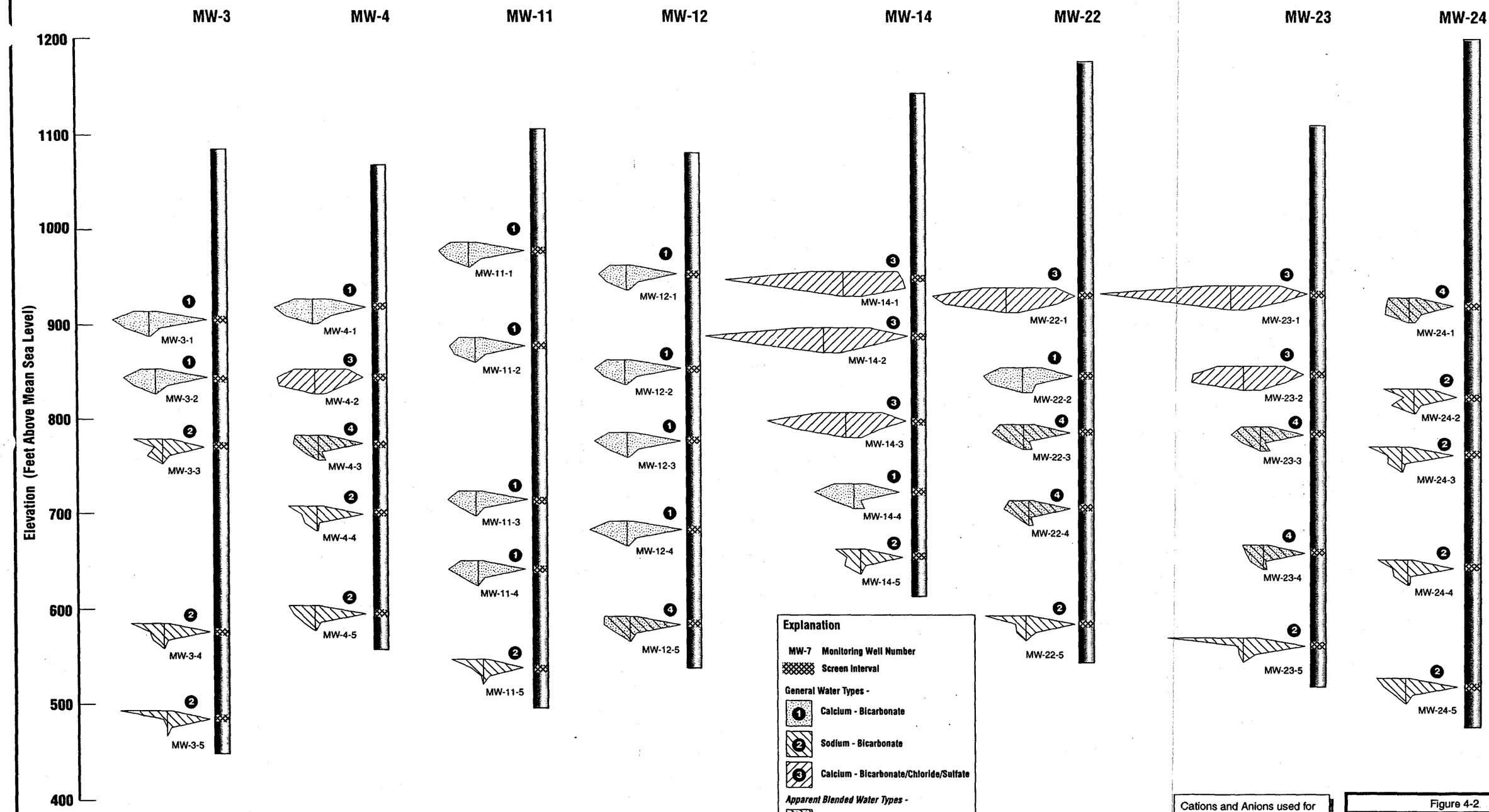


Figure 4-2

Stiff Diagrams for On-Site JPL Deep Monitoring Wells
January - February, 1998

Jet Propulsion Laboratory
Pasadena, California

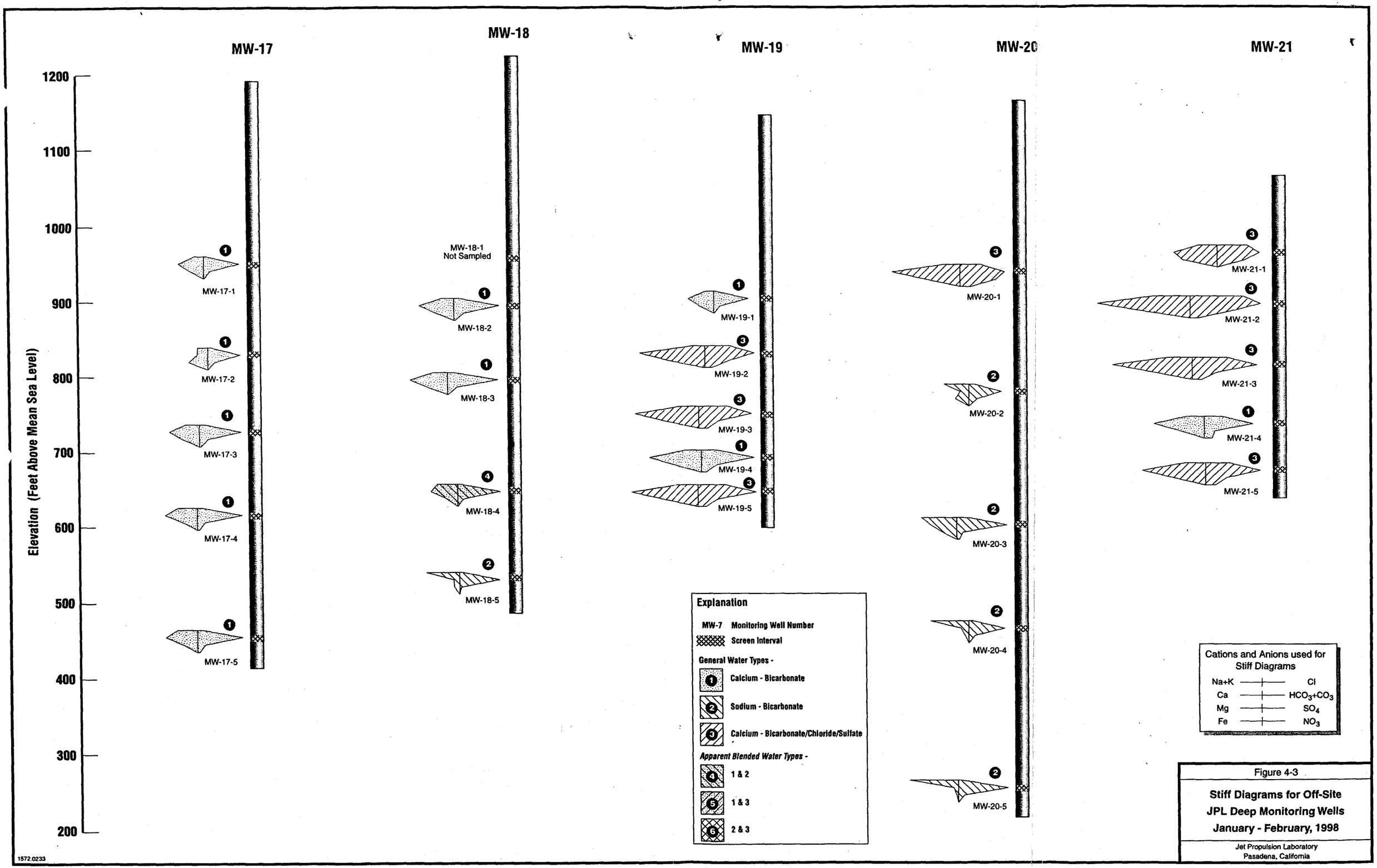


Figure 4-3

Stiff Diagrams for Off-Site JPL Deep Monitoring Wells January - February, 1998

Jet Propulsion Laboratory
Pasadena, California

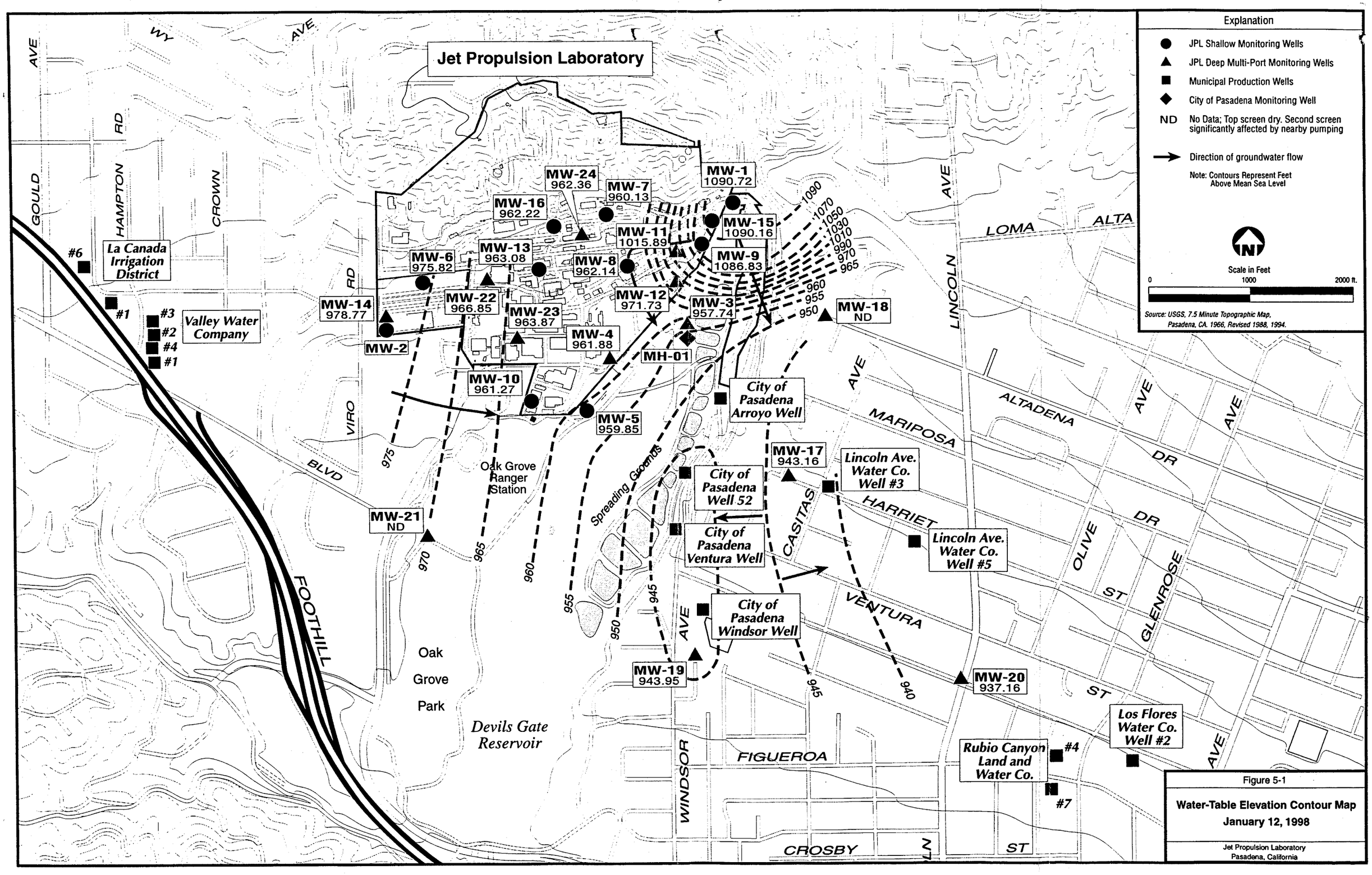


Figure 5-1

Water-Table Elevation Contour Map
January 12, 1998

Jet Propulsion Laboratory
Pasadena, California

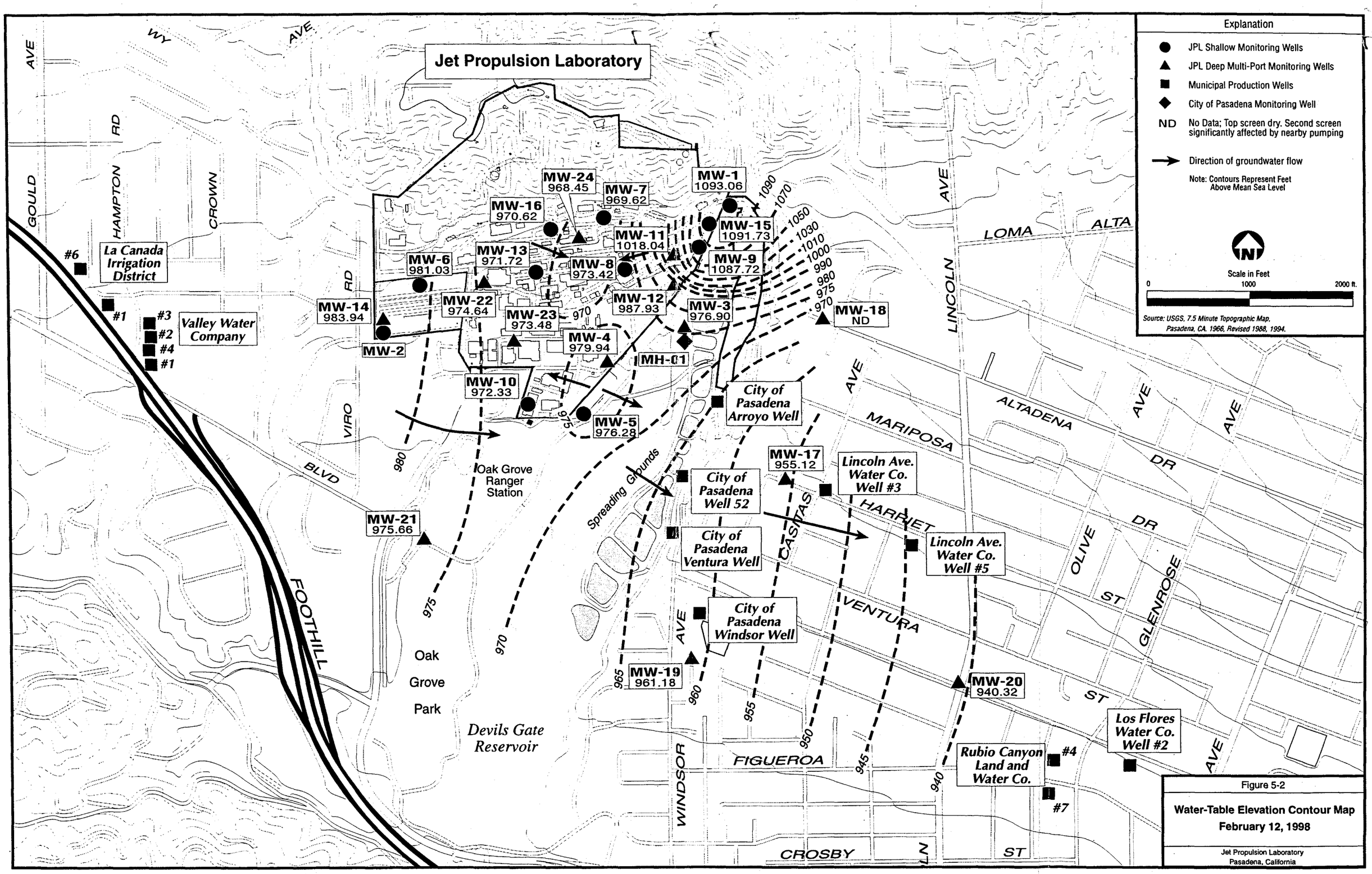
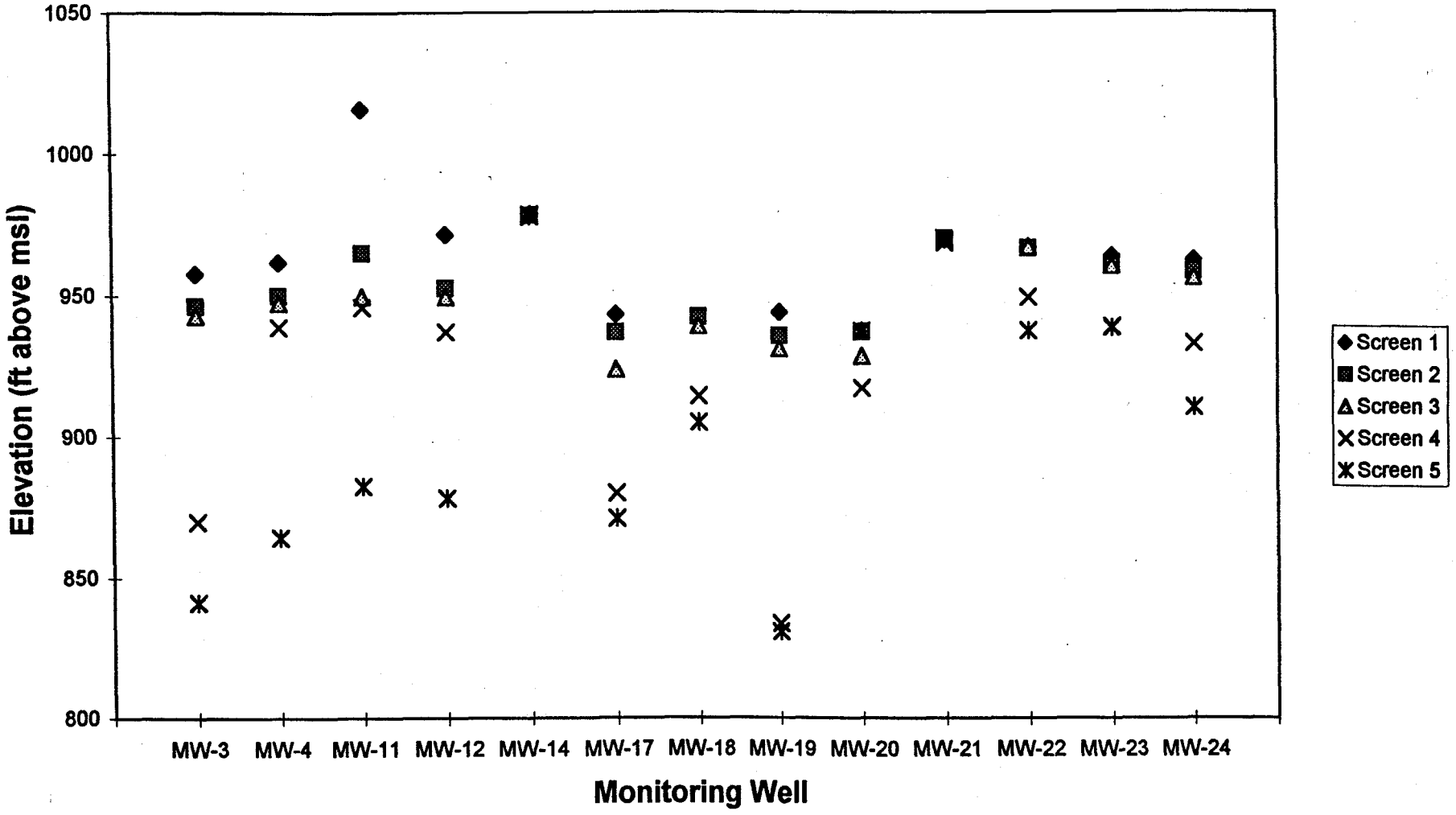


Figure 5-2

Water-Table Elevation Contour Map
February 12, 1998

Jet Propulsion Laboratory
Pasadena, California



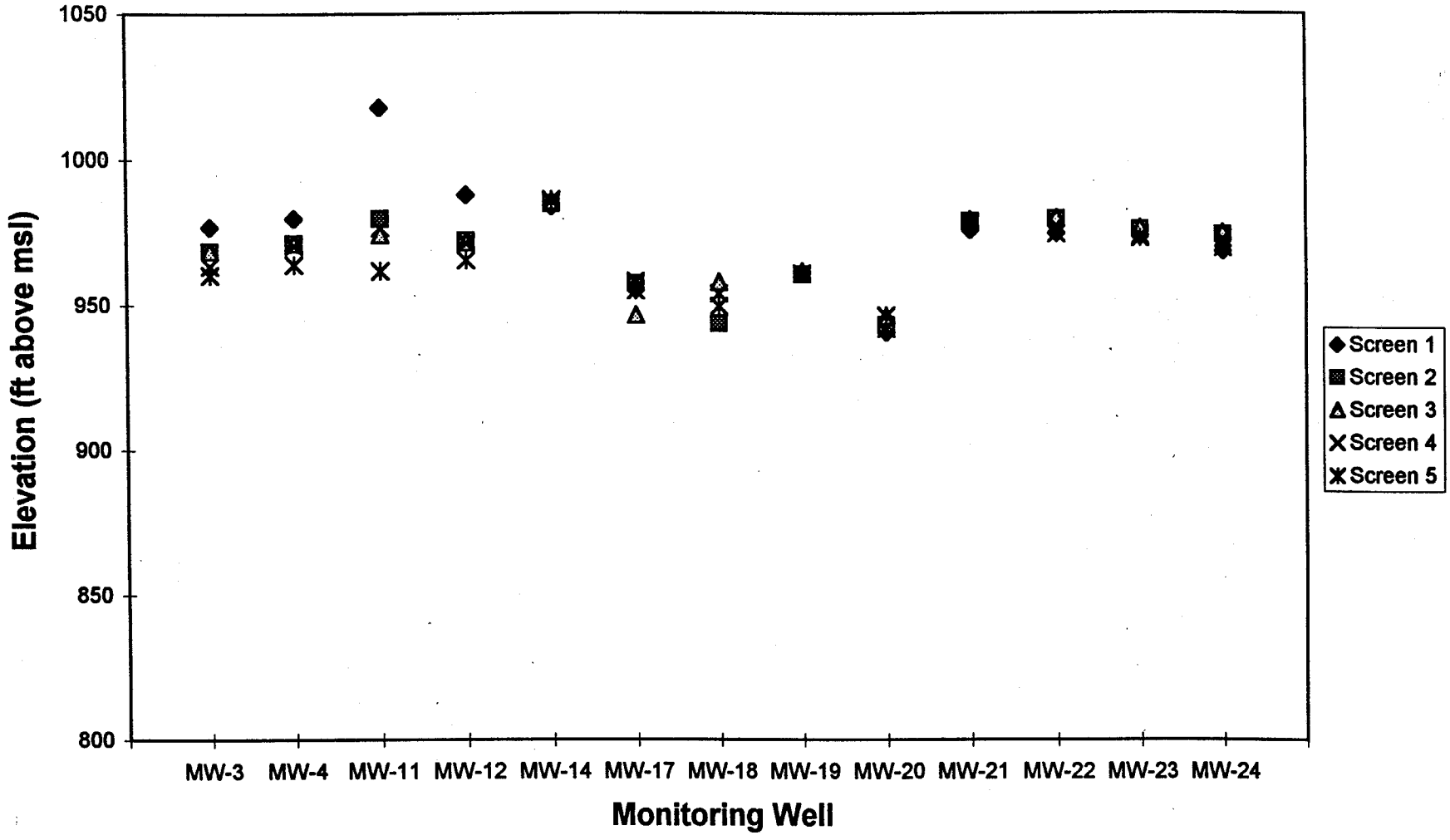
Note: Water levels were below screen 1 for MW-18 and 21.

Figure 5-3

PIEZOMETRIC WATER LEVELS FROM DEEP (MP) WELLS

January 12, 1998

Jet Propulsion Laboratory
Pasadena, California



Note: Water level was below screen 1 for MW-18.

Figure 5-4

PIEZOMETRIC WATER LEVELS FROM DEEP (MP) WELLS

February 12, 1998

Jet Propulsion Laboratory
Pasadena, California