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**THIRD QUARTER 2006  
GROUNDWATER MONITORING**

**CENTRAL PLUME AREA  
Lodi, California**

**City of Lodi  
Lodi, California**

**7 November 2006  
Project 3923.16**

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Project 3923.16

Mr. Richard Prima  
Public Works Department  
City of Lodi  
221 West Pine Street  
Lodi, California 95240

Subject: Report of Third Quarter 2006 Groundwater Monitoring  
Central Plume Area  
Lodi, California

Dear Mr. Prima:

Treadwell & Rollo, Inc. is pleased to submit this report presenting the results of the Third Quarter 2006 Groundwater Monitoring, Central Plume Area in Lodi, California. The report has been prepared to meet the requirements of the Central Valley Regional Water Quality Control Board.

If you have any comments on this revised format or any questions, please call Carole Nuttall at (510) 874-4500 or Patrick Hubbard at (925) 381-5381.

Sincerely yours,  
TREADWELL & ROLLO, INC.



Carole Nuttall  
GIS Specialist

39231608.PBH



Patrick B. Hubbard, PG No. 4108  
Senior Associate Geologist

cc: Marie McCrink – Central Valley Regional Water Quality Control Board

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**THIRD QUARTER 2006  
GROUNDWATER MONITORING****CENTRAL PLUME AREA  
Lodi, California****1.0 INTRODUCTION**

Treadwell & Rollo, Inc. (Treadwell & Rollo) has prepared this report on behalf of the City of Lodi to present the results of the groundwater monitoring event conducted during the Third Quarter of 2006 for the Central Plume Area in Lodi, California (Figures 1 and 2). Submission of this report is a requirement of Order No. R5-2004-0043 (Required Action No. 17) issued by the Central Valley Regional Water Quality Control Board (RWQCB) on 22 April 2004 (RWQCB, 2004). This Third Quarter 2006 report includes a compilation of historical results which are presented in linear and log scale graphs in Appendix A.

**2.0 ACTIVITIES AND RESULTS**

In August and September 2006, monitoring, sampling, and analytical activities were conducted in accordance with the RWQCB-approved *Draft Groundwater Monitoring Program Work Plan for the Central Plume Area* (Treadwell & Rollo, 2005a). The activities and procedures were similar to those reported previous quarters (Treadwell & Rollo, 2005b, c, d, and 2006a, b, c). Well construction details are provided in Table 1 for monitoring wells and Appendix B for water supply wells.

**2.1 Groundwater Elevations and Flow Directions**

On 28 August 2006, Blaine Tech Services of San Jose, California measured groundwater levels in four groundwater zones (Shallow, Intermediate, Deep, and Deeper) and recorded the results on field forms (Appendix C). Treadwell & Rollo compiled the elevations into Table 2 and prepared

the plots shown in Figure 3. The Central Plume average hydraulic gradients were all in a south-southeasterly direction and ranged from 0.002 to 0.003 feet/ft.

## **2.2 Sampling and Analysis Activities and Results**

Blaine Tech Services placed passive diffusion bag (PDB) samplers in the monitoring wells on 11 August; retrieved them on 28 and 29 August; and submitted them to Curtis & Tompkins, Ltd. of Berkeley, California, a California state-certified laboratory, for analysis using EPA Test Method 8260b (Appendix D). The PDBs in well MW-21A were installed on 29 August and retrieved on 12 September. A summary of VOCs detected in groundwater samples collected from monitoring wells during the third quarter of 2006 is presented in Table 3. PCE concentrations in the Shallow, Intermediate, Deep, and Deeper zones are shown on Figures 4 through 7, respectively.

In general, the concentrations of PCE and other VOCs are similar to the concentrations during the previous quarters of 2005 and 2006 (Treadwell & Rollo, 2005b, c, d, and 2006a, b, c). However, concentrations on some wells do vary as illustrated in Appendix A; concentration trends will be discussed in the Fourth Quarter 2006 report. VOCs detected above their respective maximum contaminant level (MCL) for drinking water include PCE, TCE, cis-1,2-Dichloroethene, 1,1-Dichloroethylene, DBCP and Benzene. Treadwell & Rollo continues to monitor the presence of the petroleum compounds in monitoring wells MW-21 through MW-25.

The City of Lodi Public Works Department Water sampled groundwater from discharge line spigots at supply wells 2, 6R and 8 and submitted the samples to Twining Laboratories, Inc. of Fresno, California, a California state-certified laboratory, for analysis using EPA Test Method 524.2 (Appendix E). The analytical results are presented in Table 3.

### **2.3 Quality Assurance, Quality Control, and Data Validation**

Field quality control samples were collected and included duplicates and trip blanks. All calculated relative percent difference (RPD) values between the primary and duplicate samples ranged from 0% to 56%. The 56% RDP is slightly over the control limit of 50% for this project. This may be due to sample matrix, sampling or laboratory technique, sample heterogeneity, or method defects. However, the PCE concentrations at well MW-12 have historically fluctuated within a range, and the sample results and duplicate sample results fall within that historic range. Calculated RPDs are presented in Table 3. The trip blank samples did not contain detectable concentrations of VOCs.

Laboratory quality control was validated by a third party review (Appendix F). In general, the quality control results met the criteria for the project. The qualified laboratory data are considered acceptable for project use.

### **3.0 ADDITIONAL CENTRAL PLUME ACTIVITIES**

In the third quarter of 2006, Treadwell & Rollo continued to operate the interim soil vapor extraction system and continued to prepare plans for the dual-phase extraction system.

## REFERENCES

Regional Water Quality Control Board, Central Valley Region (RWQCB). 2004. *Cleanup and Abatement Order No. R5-2004-0043 for City of Lodi, Guild Cleaners, Inc., Estate of Dwight Alquist, Odd Fellows Hall Association of Lodi, Lodi News Sentinel, and Beckman Capital Corporation, Lodi Central Plume Area, San Joaquin County.* 22 April.

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Treadwell & Rollo, 2005b. *First Quarter 2005 Groundwater Monitoring, Central Plume Area, Lodi, California.* 14 April 2005.

Treadwell & Rollo, 2005c. *Second Quarter 2005 Groundwater Monitoring, Central Plume Area, Lodi, California.* 11 July 2005.

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**TABLES**

**TABLE 1**  
**SUMMARY OF MONITORING WELL CONSTRUCTION DETAILS AND MONITORING FREQUENCY**

Central Plume Area  
Lodi, California

WELL	WELL DATA		AQUIFER ZONE OF SCREENED INTERVAL				MONITORING FREQUENCY		
	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Shallow (< 75 ft bgs)	Intermediate (75 - < 125 ft bgs)	Deep (125 - < 150 ft bgs)	Deeper ( $\geq$ 150 ft bgs)	Water Level Measurement	Sampling	Annual Total Samples
G-04	47.5	53.5	X				Q	Q	4
G-05	44	59	X				Q	A	1
G-06	44	55	X				--	--	--
G-07	43	55	X				Q	Q	4
G-08	54	64	X				Q	A	1
G-10	50	65	X				Q	A	1
G-11	50	65	X				Q	SA	2
G-12	50	65	X				--	--	--
G-13	52.5	68	X				Q	SA	2
G-14A	46	62	X				Q	SA	2
G-14B	102	112		X			Q	SA	2
G-14C	142	152			X		Q	SA	2
G-15A	46	61	X				Q	SA	2
G-16A	48	63	X				Q	Q	4
G-16B	115	125		X			Q	A	1
G-16C	184	194				X	Q	--	--
G-17A	50	65	X				Q	Q	4
G-18A	46	61	X				Q	Q	4
G-18B	124	134		partial (1 foot)	X		Q	A	1
G-18C	155	165				X	Q	--	--
G-19A	47	62	X				Q	SA	2
G-24A	55	70	X				Q	SA	2
G-24B	115	125		X			Q	SA	2
G-25A	90	100		X			Q	Q	4
G-25B	140	150			X		Q	Q	4
G-25C	181	192				X	Q	A	1
MW-06	47	60	X				Q	--	--
MW-08	40	55	X				Q	SA	2
MW-09	38	53	X				Q	A	1
MW-12	50	65	X				Q	Q	4
MW-13	47	62	X				Q	--	--
MW-15	48	63	X				Q	SA	2
MW-17	56	71	X				Q	Q	4
MW-18	50	65	X				Q	--	--
MW-19	58	73	X				Q	--	--
MW-21A	66	76	X	partial (1 foot)			Q	Q	4
MW-21B	92	102		X			Q	A	1
MW-21C	118	128		partial (7 feet)	X		Q	A	1
MW-22B	89	99		X			Q	Q	4
MW-22C	132	142			X		Q	Q	4
MW-23B	82	92		X			Q	Q	4
MW-23C	120	130		partial (5 feet)	X		Q	Q	4
MW-24A	60	70	X				Q	SA	2
MW-24B	95.5	105.5		X			Q	SA	2
MW-24C	114	124		X			Q	SA	2
MW-25B	86	96		X			Q	Q	4
MW-25C	148	158			partial (2 feet)	X	Q	Q	4
MW-26D	182	191				X	Q	Q	4
MW-27D	221	230				X	Q	Q	4
PCP-4	52	72	X				Q	Q	4

**Notes**

Q: Quarterly

SA: Semi-annual

A: Annual

ft bgs: feet below ground surface

**TABLE 2**  
**GROUNDWATER ELEVATION DATA**  
**28 AUGUST 2006**

**Central Plume Area  
Lodi, California**

Well ID	Groundwater Zone	Date	Time	Top of Casing Elevation	Depth to Groundwater	Groundwater Elevation
G-04	Shallow	08/28/06	11:39	45.91	48.44	-2.53
G-05	Shallow	08/28/06	11:31	47.19	49.82	-2.63
G-06	Shallow	08/28/06	11:49	47.63	49.90	-2.27
G-07	Shallow	08/28/06	11:21	47.14	49.31	-2.17
G-08	Shallow	08/28/06	11:07	47.21	49.76	-2.55
G-10	Shallow	08/28/06	10:52	46.84	49.76	-2.92
G-11	Shallow	08/28/06	--	47.19	50.92	-3.73
G-13	Shallow	08/28/06	10:25	47.96	52.85	-4.89
G-14A	Shallow	08/28/06	11:17	46.52	47.62	-1.10
G-14B	Intermediate	08/28/06	11:19	46.72	48.00	-1.28
G-14C	Deep	08/28/06	11:24	46.79	47.60	-0.81
G-15A	Shallow	08/28/06	10:59	47.62	50.21	-2.59
G-16A	Shallow	08/28/06	10:37	47.37	51.05	-3.68
G-16B	Intermediate	08/28/06	10:37	47.46	51.78	-4.32
G-16C	Deeper	08/28/06	10:31	47.33	52.10	-4.77
G-17A	Shallow	08/28/06	9:44	47.62	53.62	-6.00
G-18A	Shallow	08/28/06	9:20	47.20	51.87	-4.67
G-18B	Intermediate/Deep	08/28/06	9:17	47.07	52.18	-5.11
G-18C	Deeper	08/28/06	9:15	46.94	52.16	-5.22
G-19A	Shallow	08/28/06	9:05	46.37	50.57	-4.20
G-24A	Shallow	08/28/06	11:40	47.52	51.24	-3.72
G-24B	Intermediate	08/28/06	11:35	47.76	52.05	-4.29
G-25A	Intermediate	08/28/06	10:07	45.59	54.92	-9.33
G-25B	Deep	08/28/06	10:03	45.73	55.18	-9.45
G-25C	Deeper	08/28/06	9:59	45.85	54.94	-9.09
MW-06	Shallow	08/28/06	11:05	50.02	50.58	-0.56
MW-08	Shallow	08/28/06	8:55	45.54	47.92	-2.38
MW-09	Shallow	08/28/06	11:41	46.07	48.22	-2.15
MW-12	Shallow	08/28/06	10:15	46.64	52.68	-6.04
MW-13	Shallow	08/28/06	10:57	49.61	56.81	-7.20
MW-15	Shallow	08/28/06	9:25	43.66	54.77	-11.11
MW-17	Shallow	08/28/06	10:08	46.33	61.08	-14.75
MW-18	Shallow	08/28/06	9:32	42.82	57.93	-15.11
MW-19	Shallow	08/28/06	9:50	45.23	62.28	-17.05
MW-21A	Shallow/Intermediate	08/28/06	10:21	46.00	60.55	-14.55
MW-21B	Intermediate	08/28/06	10:25	45.92	60.48	-14.56
MW-21C	Intermediate/Deep	08/28/06	10:23	45.92	60.32	-14.40
MW-22B	Intermediate	08/28/06	9:40	43.61	58.18	-14.57
MW-22C	Deep	08/28/06	9:43	43.49	58.57	-15.08
MW-23B	Intermediate	08/28/06	9:58	46.48	62.06	-15.58
MW-23C	Intermediate/Deep	08/28/06	10:00	46.34	61.61	-15.27

**TABLE 2**  
**GROUNDWATER ELEVATION DATA**  
**28 AUGUST 2006**

**Central Plume Area  
Lodi, California**

Well ID	Groundwater Zone	Date	Time	Top of Casing Elevation	Depth to Groundwater	Groundwater Elevation
MW-24A	Shallow	08/28/06	10:35	49.55	58.45	-8.90
MW-24B	Intermediate	08/28/06	10:37	49.41	59.10	-9.69
MW-24C	Intermediate	08/28/06	10:40	49.38	59.18	-9.80
MW-25B	Intermediate	08/28/06	9:54	47.06	53.59	-6.53
MW-25C	Deep/Deeper	08/28/06	9:50	46.97	53.64	-6.67
MW-26D	Deeper	08/28/06	11:29	46.14	49.66	-3.52
MW-27D	Deeper	08/28/06	10:05	46.63	59.72	-13.09
PCP-04	Shallow	08/28/06	10:15	47.16	61.57	-14.41

**Notes:**

Measurements are in feet.

Wells spanning multiple groundwater zones are plotted in the groundwater zone that is not struck-out.

Groundwater Zones:

Shallow zone < 75 feet bgs

Intermediate zone 75 - < 125 feet bgs

Deep zone 125 - < 150 feet bgs

Deeper zone ≥ 150 feet bgs

**TABLE 3**  
SUMMARY OF VOLATILE ORGANIC COMPOUNDS IN MONITORING WELLS AND WATER SUPPLY WELLS

Central Plume Area  
Lodi, California

Well	Groundwater Zone	Sample Depth <sup>1</sup> (feet)	Duplicate	Sample Date	Tetra-chloro-ethene	Tri-chloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,1-Dichloro-ethene	1,2-Dichloro-ethylene	1,1-Dibromo-3-chloro-propane	1,2-Dichloro-propane	1,2,3-Trichloro-propane	Chloroform	Acetone	Naphthalene	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	N-Butylbenzene	1,4-Dichlorobenzene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	MTBE	
					(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)		
California Primary MCL					5	5	6	10	5	0.5	6	0.2	5	--	0.17 <sup>2</sup>	--	--	1	150	300	1,750	1,750	--	5	--	--	13
G-04	Shallow	49.5		8/29/2006	2,100	<13	39	<13	<13	<13	<13	<13	<13	<13	<250	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13	
		49.5	DUP-2	8/29/2006	2,100	<17	48	<17	<17	<17	<17	<17	<17	<17	<330	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	
		RPD			0%	---	21%	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
G-07	Shallow	52		8/29/2006	37	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
G-11	Shallow	62		8/29/2006	13,000	<83	<83	<83	<83	<83	<83	<83	<83	<83	<1700	<83	<83	<83	<83	<83	<83	<83	<83	<83	<83		
G-13	Shallow	64.5		8/28/2006	2,100	<17	<17	<17	<17	<17	<17	<17	<17	<17	<330	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17		
G-14A	Shallow	58		8/29/2006	0.6	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-14B	Intermediate	109		8/29/2006	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-14C	Deep	149		8/29/2006	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-15A	Shallow	58		8/29/2006	150	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<25	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		
G-16A	Shallow	59.5		8/29/2006	120	0.9	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	23	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7		
		59.5	DUP-3	8/29/2006	160	1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<25	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		
		RPD			29%	36%	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			
G-17A	Shallow	62		8/28/2006	7.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-18A	Shallow	58		8/28/2006	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-19A	Shallow	59		8/28/2006	4.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<100	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
		59	DUP-4	8/28/2006	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
		RPD			8%	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			
G-24A	Shallow	67.5		8/29/2006	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-24B	Intermediate	122		8/29/2006	4.5	200	<1.3	<1.3	2.4	<1.3	52	<1.3	<1.3	<1.3	<25	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		
G-25A	Intermediate	97		8/28/2006	760	<5	<5	<5	<5	<5	<5	<5	<5	<5	<100	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
G-25B	Deep	147		8/28/2006	3.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
MW-08	Shallow	49		8/28/2006	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	55	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
MW-12	Shallow	52.5		8/28/2006	14	3.4	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
		52.5	DUP-1	8/28/2006	25	3.8	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
		RPD			56%	11%	---	---	---	---	29%	---	---	---	---	---	---	---	---	---	---	---	---	---			
MW-15	Shallow	56		8/28/2006	<0.5	<0.5</td																					

**TABLE 3**  
SUMMARY OF VOLATILE ORGANIC COMPOUNDS IN MONITORING WELLS AND WATER SUPPLY WELLS

Central Plume Area  
Lodi, California

Well	Groundwater Zone	Sample Depth <sup>1</sup> (feet)	Duplicate	Sample Date	Tetra-chloro-ethene	Tri-chloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,1-Dichloro-ethene	1,2-Dichloro-ethylene	1,1-Dibromo-3-chloro-ethylene	1,2-Dichloro-propane	1,2,3-Trichloro-propane	Chloroform	Acetone	Naphthalene	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	N-Butylbenzene	1,4-Dichlorobenzene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	MTBE					
					(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)						
<b>California Primary MCL</b>					<b>5</b>	<b>5</b>	<b>6</b>	<b>10</b>	<b>5</b>	<b>0.5</b>	<b>6</b>	<b>0.2</b>	<b>5</b>	--	<b>0.17<sup>2</sup></b>	--	--	<b>1</b>	<b>150</b>	<b>300</b>	<b>1,750</b>	<b>1,750</b>	--	<b>5</b>	--	--	<b>13</b>				
<b>Water Supply Wells</b>																															
Well-2	--	--		8/3/2006	<0.5	<b>2.1</b>	<0.5	<0.5	<0.5	NA	<0.5	NA	<0.5	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<3					
Well-2	--	--		9/5/2006	<0.5	<b>1.6</b>	<0.5	<0.5	<0.5	NA	<0.5	NA	<0.5	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<3					
Well-6R	--	--		7/17/2006	<b>2.54</b>	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA	<1	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<3					
Well-8	--	--		7/12/2006	<b>0.67</b>	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA	<0.5	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<3					

**Notes:**

<sup>1</sup> Sample depths listed represent the depth to the top of the passive diffusion bag.

<sup>2</sup> As per RWQCB instruction, the screening level used for Chloroform for groundwater cleanup is the Preliminary Remediation Goal for Tap Water of 0.17 µg/L.

µg/L: micrograms per liter

MCL: California Department of Health Services Maximum Contaminant Level for Drinking Water

--: Not applicable

NA: Not Analyzed

**Bold:** Analytes detected above the laboratory reporting limit are shown in bold lettering.

**Bold Red:** Analytes detected above the California primary MCL are shown in bold red lettering.

RPD: Relative Percent Difference

---: Not applicable

If RPDs were above 25%, they would have been shown in bold lettering.

Groundwater Zones:

Shallow zone < 75 feet bgs

Intermediate zone 75 - < 125 feet bgs

Deep zone 125 - < 150 feet bgs

Deeper zone ≥ 150 feet bgs

bgs: below ground surface

**TABLE 3**  
SUMMARY OF VOLATILE ORGANIC COMPOUNDS IN MONITORING WELLS AND WATER SUPPLY WELLS

Central Plume Area  
Lodi, California

Well	Groundwater Zone	Sample Depth <sup>1</sup> (feet)	Duplicate	Sample Date	Tetra-chloro-ethene	Tri-chloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,1-Dichloro-ethene	1,2-Dichloro-ethylene	1,1-Dibromo-3-chloro-propane	1,2-Dichloro-propane	1,2,3-Trichloro-propane	Chloroform	Acetone	Naphthalene	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	N-Butylbenzene	1,4-Dichlorobenzene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	MTBE	
					(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)		
California Primary MCL					5	5	6	10	5	0.5	6	0.2	5	--	0.17 <sup>2</sup>	--	--	1	150	300	1,750	1,750	--	5	--	--	13
G-04	Shallow	49.5		8/29/2006	2,100	<13	39	<13	<13	<13	<13	<13	<13	<13	<250	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13	
		49.5	DUP-2	8/29/2006	2,100	<17	48	<17	<17	<17	<17	<17	<17	<17	<330	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17	
		RPD			0%	---	21%	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
G-07	Shallow	52		8/29/2006	37	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
G-11	Shallow	62		8/29/2006	13,000	<83	<83	<83	<83	<83	<83	<83	<83	<83	<1700	<83	<83	<83	<83	<83	<83	<83	<83	<83	<83		
G-13	Shallow	64.5		8/28/2006	2,100	<17	<17	<17	<17	<17	<17	<17	<17	<17	<330	<17	<17	<17	<17	<17	<17	<17	<17	<17	<17		
G-14A	Shallow	58		8/29/2006	0.6	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-14B	Intermediate	109		8/29/2006	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-14C	Deep	149		8/29/2006	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-15A	Shallow	58		8/29/2006	150	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<25	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		
G-16A	Shallow	59.5		8/29/2006	120	0.9	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	23	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7		
		59.5	DUP-3	8/29/2006	160	1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<25	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		
		RPD			29%	36%	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			
G-17A	Shallow	62		8/28/2006	7.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-18A	Shallow	58		8/28/2006	18	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-19A	Shallow	59		8/28/2006	4.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<100	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
		59	DUP-4	8/28/2006	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
		RPD			8%	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			
G-24A	Shallow	67.5		8/29/2006	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
G-24B	Intermediate	122		8/29/2006	4.5	200	<1.3	<1.3	2.4	<1.3	52	<1.3	<1.3	<1.3	<25	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		
G-25A	Intermediate	97		8/28/2006	760	<5	<5	<5	<5	<5	<5	<5	<5	<5	<100	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		
G-25B	Deep	147		8/28/2006	3.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
MW-08	Shallow	49		8/28/2006	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	55	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
MW-12	Shallow	52.5		8/28/2006	14	3.4	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
		52.5	DUP-1	8/28/2006	25	3.8	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
		RPD			56%	11%	---	---	---	---	29%	---	---	---	---	---	---	---	---	---	---	---	---	---			
MW-15	Shallow	56		8/28/2006	<0.5	<0.5</td																					

**TABLE 3**  
**SUMMARY OF VOLATILE ORGANIC COMPOUNDS IN MONITORING WELLS AND WATER SUPPLY WELLS**

Central Plume Area  
Lodi, California

Well	Groundwater Zone	Sample Depth <sup>1</sup> (feet)	Duplicate	Sample Date	Tetra-chloro-ethene	Tri-chloro-ethene	cis-1,2-Dichloro-ethene	trans-1,2-Dichloro-ethene	1,1-Dichloro-ethene	1,2-Dichloro-ethylene	1,1-Dibromo-3-chloro-ethylene	1,2-Dichloro-propane	1,2,3-Trichloro-propane	Chloroform	Acetone	Naphthalene	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	N-Butylbenzene	1,4-Dichlorobenzene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	MTBE	
					(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)		
California Primary MCL					5	5	6	10	5	0.5	6	0.2	5	--	0.17 <sup>2</sup>	--	--	1	150	300	1,750	1,750	--	5	--	--	13
<b>Water Supply Wells</b>																											
Well-2	--	--		8/3/2006	<0.5	<b>2.1</b>	<0.5	<0.5	<0.5	NA	<0.5	NA	<0.5	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<3	
Well-2	--	--		9/5/2006	<0.5	<b>1.6</b>	<0.5	<0.5	<0.5	NA	<0.5	NA	<0.5	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<3	
Well-6R	--	--		7/17/2006	<b>2.54</b>	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA	<1	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<3	
Well-8	--	--		7/12/2006	<b>0.67</b>	<0.5	<0.5	<0.5	<0.5	NA	<0.5	NA	<0.5	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<3	

**Notes:**

<sup>1</sup> Sample depths listed represent the depth to the top of the passive diffusion bag.

<sup>2</sup> As per RWQCB instruction, the screening level used for Chloroform for groundwater cleanup is the Preliminary Remediation Goal for Tap Water of 0.17 µg/L.

µg/L: micrograms per liter

MCL: California Department of Health Services Maximum Contaminant Level for Drinking Water

--: Not applicable

NA: Not Analyzed

**Bold:** Analytes detected above the laboratory reporting limit are shown in bold lettering.

**Bold Red:** Analytes detected above the California primary MCL are shown in bold red lettering.

RPD: Relative Percent Difference

---: Not applicable

If RPDs were above 25%, they would have been shown in bold lettering.

Groundwater Zones:

Shallow zone < 75 feet bgs

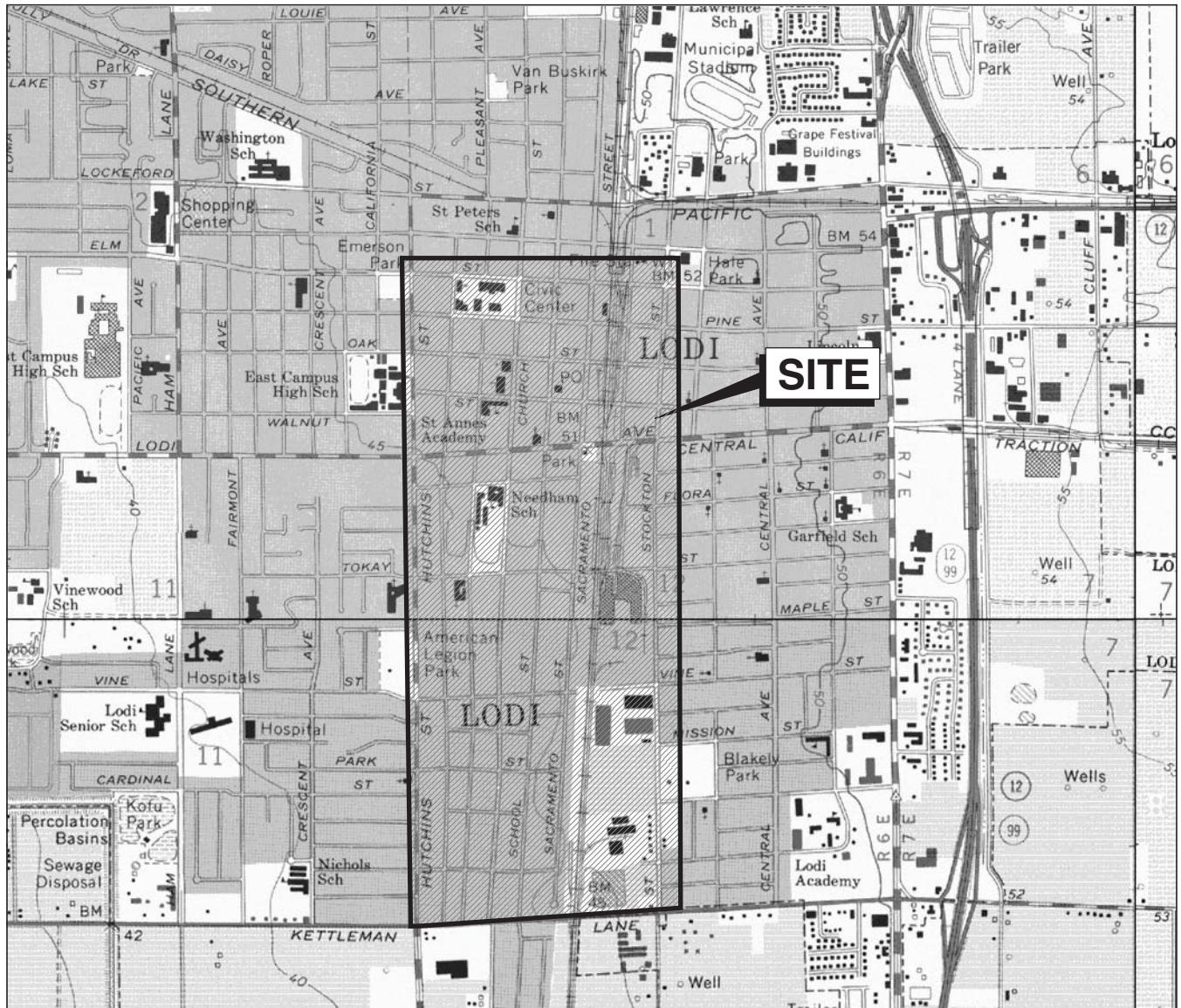
Intermediate zone 75 - < 125 feet bgs

Deep zone 125 - < 150 feet bgs

Deeper zone ≥ 150 feet bgs

bgs: below ground surface

**FIGURES**



Base map: Maptech, Inc., Terrain Navigator 2002  
San Joaquin County



No scale

**CENTRAL PLUME AREA**  
Lodi, California

**SITE LOCATION MAP**

**Treadwell&Rollo**

Date 06/05/06 | Project No. 3923.16

Figure 1



## LEGEND

- LEGEND**

  - **MW-12** Monitoring Well  
Included in Groundwater Monitoring Program
  - **G-12** Monitoring Well  
Not Included in Groundwater Monitoring Program
  - ⊕ **Well-03R** Water Supply Well
  - ⊗ **Well-03** Abandoned Water Supply Well

Note:  
Basemap source: City of Lodi Public Works.

## CITY OF LODI Lodi, California

## **WELL LOCATIONS**

### **Central Plume Area**

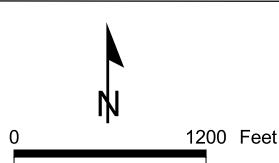
Date 11/2006 Project No. 3923.16 Figure 2

# Treadwell & Rollo



#### LEGEND

- MW-15 -11.11 Monitoring Well August 2006 Groundwater Elevation (Vertical Datum: NGVD29)
- M-11 Monitoring Well (Not Measured)
- ⊕ Well-03R Water Supply Well
- ⊗ Well-03 Abandoned Water Supply Well
- ↗ Approximate Direction of Groundwater Flow
- Groundwater Contour (Contour Interval: 2 feet)



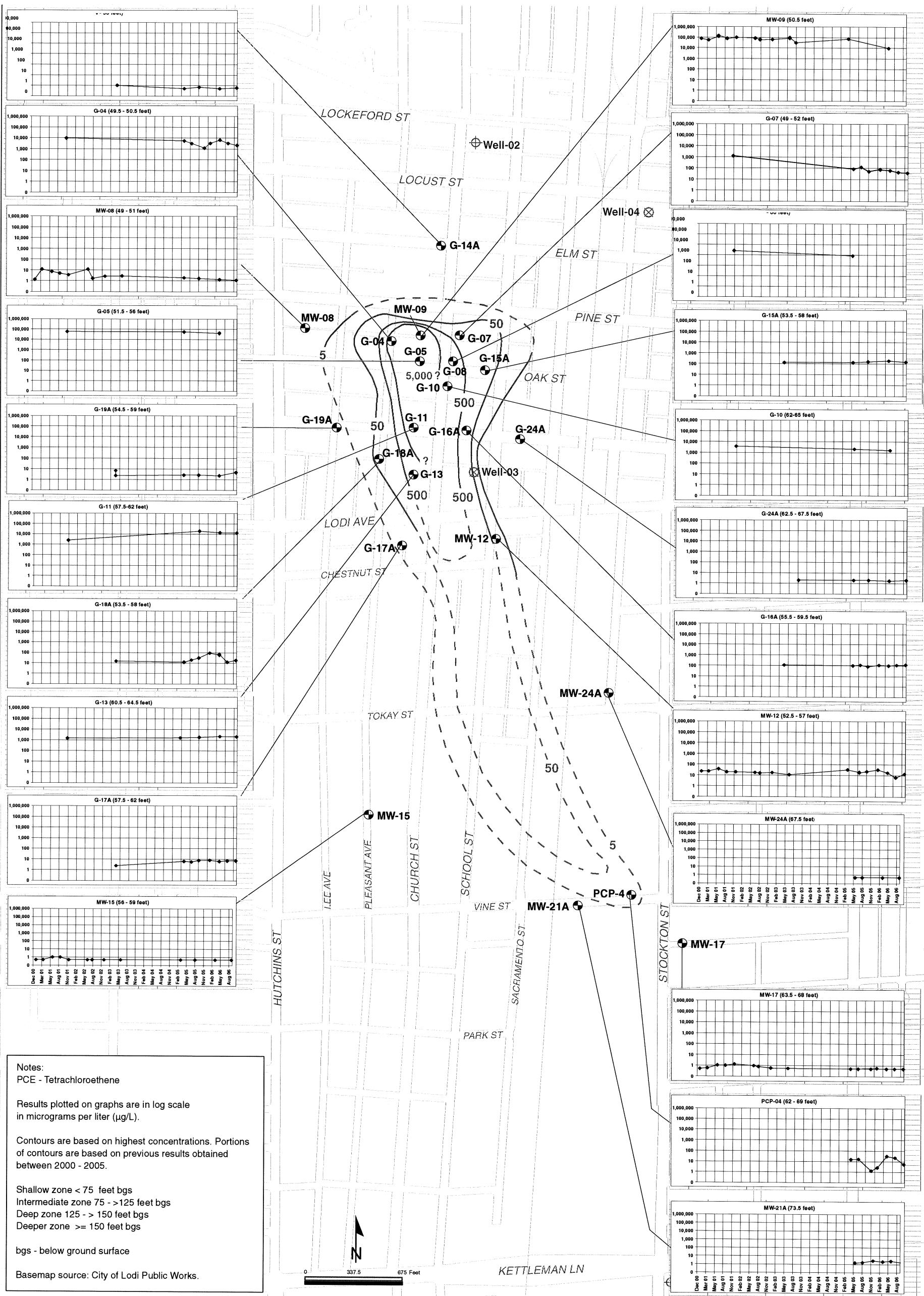
Notes:  
Groundwater elevation data collected 28 August 2006.  
Shallow zone < 75 feet bgs  
Intermediate zone 75 - >125 feet bgs  
Deep zone 125 - > 150 feet bgs  
Deeper zone >= 150 feet bgs  
bgs - below ground surface  
Basemap source: City of Lodi Public Works.

**CITY OF LODI**  
**Lodi, California**

#### CENTRAL PLUME THIRD QUARTER 2006 GROUNDWATER ELEVATION MAPS

Date 11/2006 Project No. 3923.16 Figure 3

**Treadwell & Rollo**



Notes:  
PCE - Tetrachloroethene

Results plotted on graphs are in log scale in micrograms per liter ( $\mu\text{g/L}$ ).

Contours are based on highest concentrations. Portions of contours are based on previous results obtained between 2000 - 2005.

- Shallow zone < 75 feet bgs
- Intermediate zone 75 - >125 feet bgs
- Deep zone 125 - > 150 feet bgs
- Deeper zone >= 150 feet bgs

bgs - below ground surface

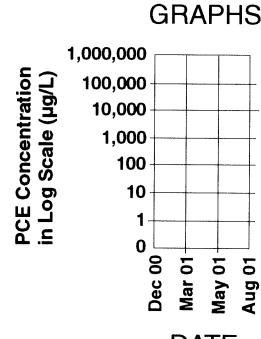
Basemap source: City of Lodi Public Works.

## **LEGEND**

- MW-12 Shallow Monitoring Well
  - Well-02 Water Supply Well
  - ⊗ Well-03 Abandoned Water Supply Well

— 50 —

Contour of PCE Concentration  
in Groundwater (Dashed where inferred)  
[Concentration in  $\mu\text{g/l}$ ]



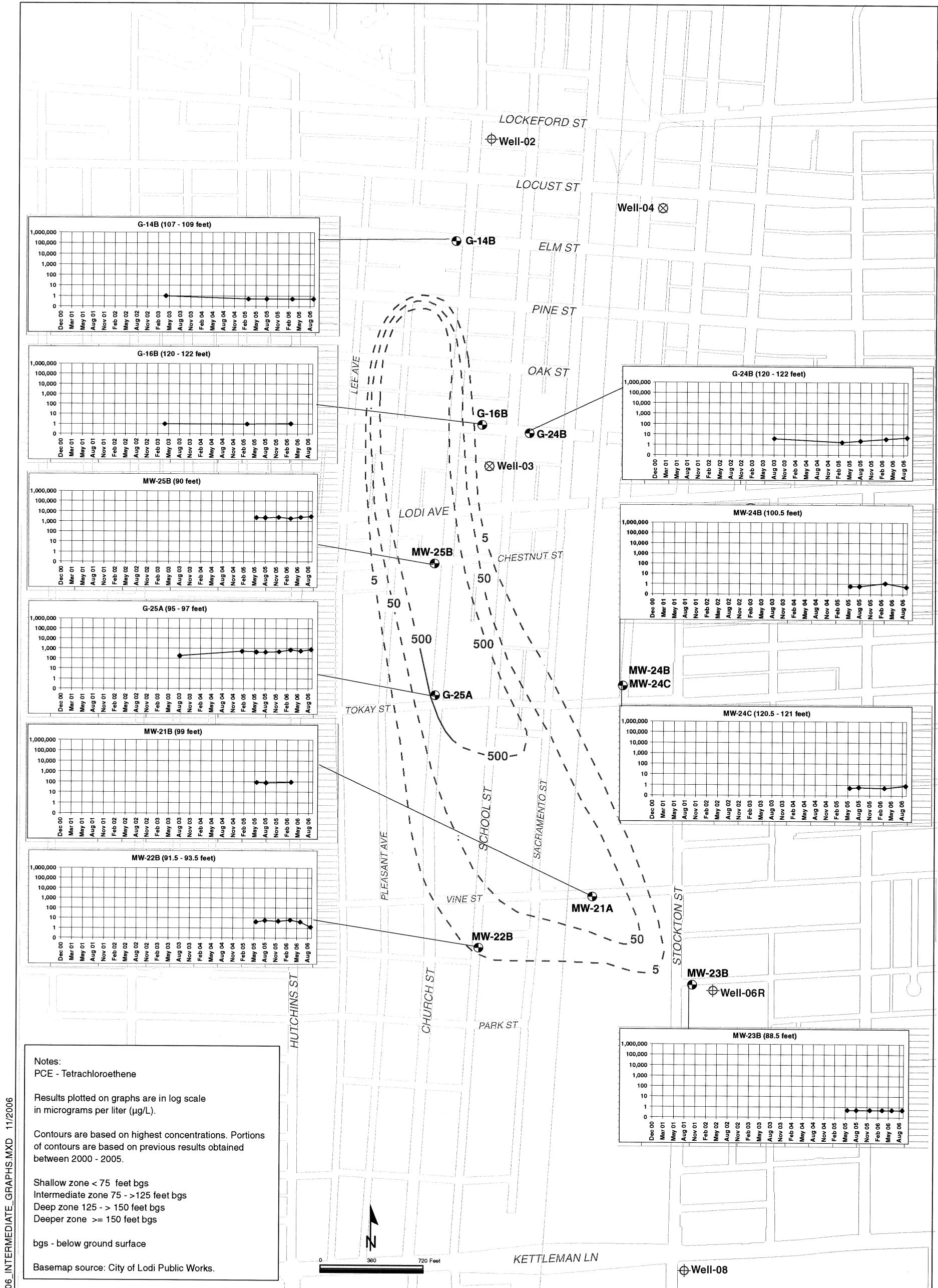
# **CITY OF LODI**

## **Lodi, California**

**CENTRAL PLUME  
SHALLOW ZONE  
HISTORICAL PCE CONCENTRATION MAP  
THROUGH THIRD QUARTER 2006**

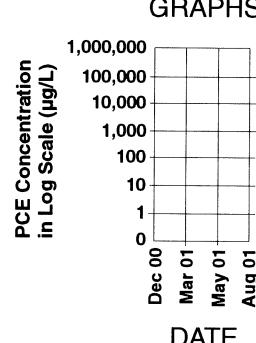
Date 11/2006 Project No. 3923.16 Figure 4

# Treadwell & Rollo



#### LEGEND

- MW-21A Intermediate Monitoring Well
- Well-02 Water Supply Well
- ✖ Well-03 Abandoned Water Supply Well
- Contour of PCE Concentration in Groundwater (Dashed where inferred)
- [Concentration in  $\mu\text{g}/\text{L}$ ]
- 50 —



**CITY OF LODI**  
**Lodi, California**

**CENTRAL PLUME**  
**INTERMEDIATE ZONE**  
**HISTORICAL PCE CONCENTRATION MAP**  
**THROUGH THIRD QUARTER 2006**

Date 11/2006 Project No. 3923.16 Figure 5

**Treadwell & Rollo**

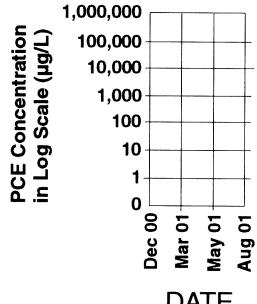


## LEGEND

- LEGEND**

  - **MW-21C** Deep Monitoring Well
  - Well-02 Water Supply Well
  - ⊗ Well-03 Abandoned Water Supply Well
  - Contour of PCE Concentration  
in Groundwater (Dashed where inferred)
  - 50 — [Concentration in ug/l]

## GRAPHS



# CITY OF LODI

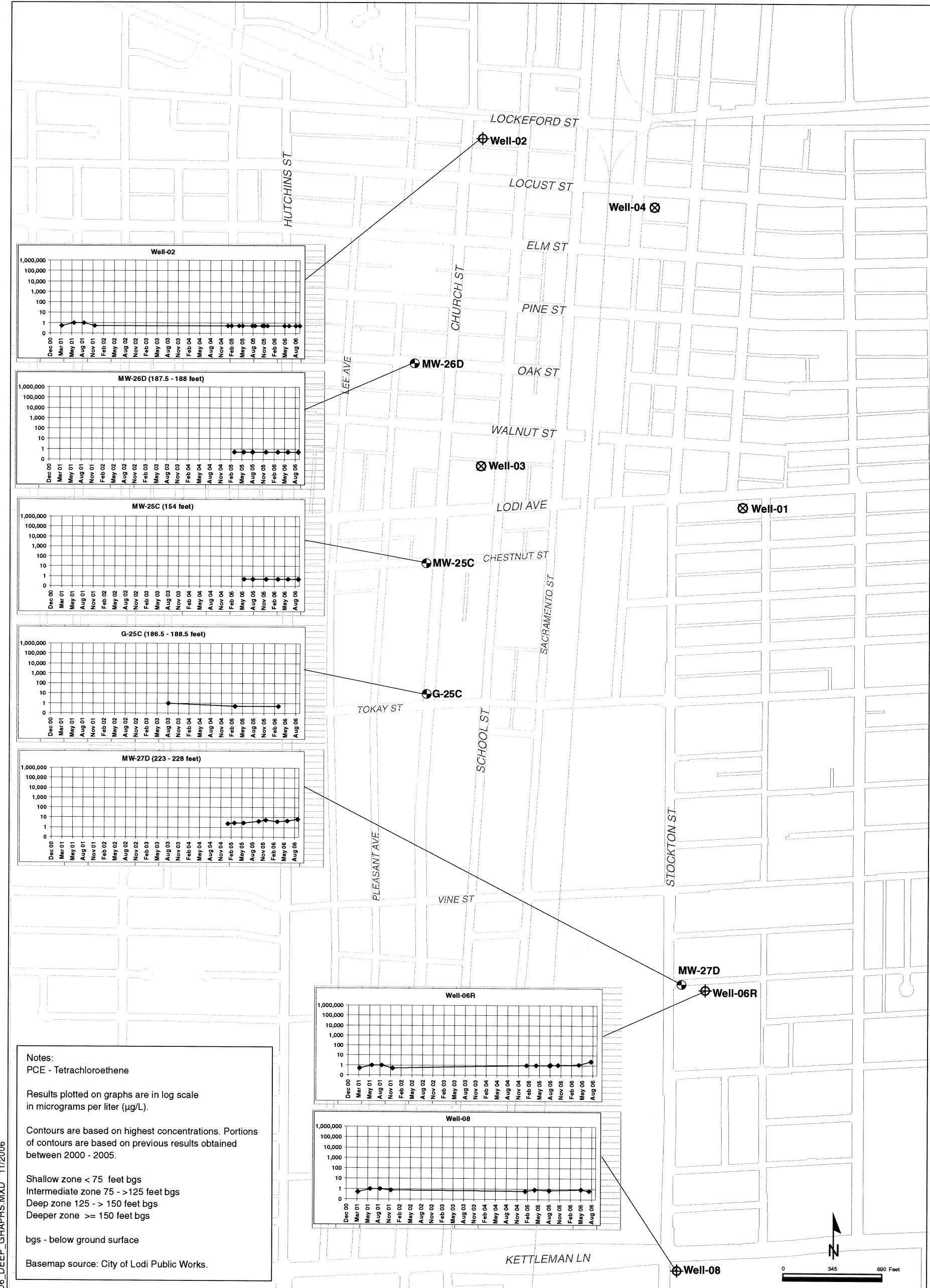
## Lodi, California

## **CENTRAL PLUME DEEP ZONE**

## **HISTORICAL PCE CONCENTRATION MAP THROUGH THIRD QUARTER 2006**

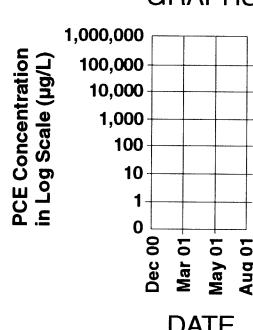
Date 11/2006 Project No. 3923.16 Figure 6

# Treadwell & Rollo



#### LEGEND

- MW-27D Deeper Monitoring Well
  - Well-02 Water Supply Well
  - ✖ Well-03 Abandoned Water Supply Well
  - Contour of PCE Concentration in Groundwater (Dashed where inferred)
  - [Concentration in  $\mu\text{g}/\text{L}$ ]
- 50 —



**CITY OF LODI**  
**Lodi, California**

**CENTRAL PLUME  
DEEPER ZONE**  
**HISTORICAL PCE CONCENTRATION MAP  
THROUGH THIRD QUARTER 2006**

Date 11/2006 Project No. 3923.16 Figure 7

**Treadwell & Rollo**

**APPENDIX A (CD ROM)**  
**Historical PCE, TCE, and DBCP Concentration Graphs**

**APPENDIX B (CD ROM)**  
**Summary of Water Supply Well Construction Details**

**APPENDIX C (CD ROM)**  
**Well Monitoring Data Sheets**

**APPENDIX D (CD ROM)**  
**Analytical Reports and Chain-of-Custody Forms**

**APPENDIX E (CD ROM)**  
**Analytical Reports – Water Supply Wells**

**APPENDIX F (CD ROM)**  
**Data Validation**