

Alameda County

FEB 24 2003

**GETTLER-RYAN INC.**

Environmental Health

1364 North McDowell Blvd. Suite B2

Petaluma, CA 94954

Phone (707) 789-3255, Fax (707) 789-3218

TRANSMITTAL

TO: Mr. Dave DeWitt DATE: February 20, 2003  
 ConocoPhillips PROJECT NO. 140175.08  
 2000 Crow Canyon Place, Suite 400 SUBJECT: Tosco (76) Station 4186  
 San Ramon, CA 94583 Livermore, California

From: Jeremy Smith

WE ARE SENDING YOU:

COPIES	DATED	DESCRIPTION
1	2/20/03	Ozone Microsparge System Annual Status Report

THESE ARE TRANSMITTED as checked below:

- For review and comment
- As Requested
- For Approval
- Approved as submitted
- Approved as noted
- Returned for corrections
- For your files
- For your use
- As noted below

COMMENTS:

Dave- Here is the System Status Report for Station 4186.

Signed: 

COPIES TO:

Ms. Eva Chu, Alameda County Environmental Health Services  
1131 Harbor Bay Parkway, Alameda, CA 94502

Ms. Carol Mahoney, Zone 7 Water Agency  
5997 Parkside Drive, Pleasanton, CA 94588



# GETTLER-RYAN Inc.

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February 20, 2003

Mr. Dave DeWitt  
ConocoPhillips  
2000 Crow Canyon Place, Suite 400  
San Ramon, CA 94583

**RE: Ozone Microsparge System Annual Status Report  
Tosco (76) Service Station No. 4186  
1771 First Street, Livermore, California**

At the request of ConocoPhillips, Gettler-Ryan Inc. (GR), has prepared this report documenting the status of operation for the year 2002 of an ozone microsparge remedial system, installed at the site to address hydrocarbon impacted groundwater (Figure 1). The remedial system was placed into operation on December 19, 2001. The system cycles ozone/air injection between the eight sparge points (Figure 2). The schedule is currently set to cycle through each point 16 times per day, for between 5 and 15 minutes per point per cycle. The schedule can be varied as part of the system evaluation process. A description of the installation and startup of the remedial system can be found in GR's report *Groundwater Monitoring Well and Ozone Microsparge System Installation Report*, dated February 6, 2002.

The primary concerns at this site are Total Petroleum Hydrocarbons as gasoline (TPHg), benzene, methyl tertiary butyl ether (MtBE), and Tert-Butyl Alcohol (TBA). Groundwater sampling began at the site in 1998 after the installation of monitoring wells U-1 through U-3. In February 2001, GR installed two offsite wells U-4 and U-5. Onsite wells U-6 and U-7 were subsequently added during the system installation activities in December 2001. The quarterly sampling event before beginning the ozone sparge system was in October 2001, while the last quarterly sampling event used in this evaluation was in December 2002. The original laboratory data reports for the quarterly events are included in the quarterly groundwater monitoring and sampling reports previously submitted under separate cover, and are not included in this report. A summary table of historical analytical results is presented in Table 1 and 2.

## **Ozone Micro Sparging**

The ozone sparge system, manufactured by KVA, was placed into operation on December 19, 2001, and is designed to cycle the ozone/oxygen injection between the 8-points. A typical injection schedule through each point is 18 times a day, for between 5 and 15 minutes per point per cycle.

In order to evaluate system effectiveness, quarterly sampling of the groundwater monitoring wells (U-1 through U-7) has been performed at the site. Groundwater samples from the wells were analyzed for TPHg by either EPA Method 8015 modified or Method 8260, benzene, toluene, ethylbenzene, and total xylenes (BTEX) and MtBE by EPA Method 8260 or Method 8021. Groundwater analytical results for the wells are presented in Table 1 and 2. Charts of groundwater concentrations over time for wells U-1, U-3, U-6, and U-7 are presented on Figures 3, 4, 5, and 6. If an analyte was reported as not detected, a value of one half the detection limit was utilized during chart preparation.

## **OBSERVATIONS**

### **Sampling Results**

GR collected quarterly groundwater samples from the wells U-1 through U-7 to monitor the progress of the system. Wells U-1, U-2, and U-3 are the only wells within the treatment area and the zone of influence of one or more sparge points.

### **TPHg**

Figures 3, 4, 5, and 6 illustrate the TPHg concentrations from quarterly sampling from select wells (U-1, U-3, U-6, and U-7) from October 2001 (U-1 and U-3) and January 2002 (U-6 and U-7) through December 2002. The TPHg concentration level reported in U-1 has historically been below detection limits. Since the system startup on December 19, 2001, U-1 has been reported to contain detectable concentrations of TPHg. However, as of the December 30, 2002 sampling event, the TPHg concentration has been reported as below detection limits again. The TPHg concentration in U-3 has shown an increase from 6,100 ppb on October 8, 2001 to 23,000 ppb on December 30, 2002. U-6 and U-7 were installed at the same time as the system, therefore they were not sampled until after the system was running at the site. The initial TPHg concentration on January 3, 2002 was 5,000 ppb in U-6 and dropped to 130 ppb on December 30, 2002. This represents a 97% decrease in concentration over the one year period. The initial TPHg concentration in U-7 on January 3, 2002 was 3,100 ppb and 4,600 ppb on December 30, 2002.

### **Benzene**

Figures 3, 4, 5, and 6 illustrate the benzene concentrations from quarterly sampling from select wells (U-1, U-3, U-6, and U-7) from October 2001 (U-1 and U-3) and January 2002 (U-6 and U-7) through December 2002. Benzene has historically not been detected in U-1. The benzene concentration reported in U-3 was 500 ppb on October 8, 2001 and on December 30, 2002, 330 ppb. This represents a decrease of 34%. The benzene concentration in U-6 has declined from 36 ppb on January 3, 2002 to below laboratory detection limits (0.50 ppb) on December 30, 2002. The

benzene concentration in U-7 has declined from 93 ppb on January 3, 2002 to 41 ppb on December 30, 2002. This represents a greater than 98% decrease in well U-6 and a 55% decrease in well U-7 over the one year period.

### **MtBE**

Figures 3, 4, 5, and 6 also illustrate the MtBE concentrations from quarterly sampling from select wells (U-1, U-3, U-6, and U-7) from October 2001 (U-1 and U-3) and January 2002 (U-6 and U-7) through December 2002. The MtBE concentration was reported at <5 ppb in U-1 on October 8, 2001 and at 90 ppb on December 30, 2002. The MtBE concentration in U-3 was reported as 22,000 ppb on October 8, 2001, and 18,000 ppb in December 30, 2002. This represents a decrease of 18%. The MtBE concentration in U-6 has been below laboratory detection limits with the exception of 0.94 ppb and 2.6 ppb on July 2, 2002 and October 1, 2002, respectively. The MtBE concentration in U-7 was reported as 130 ppb on January 3, 2001, and 34 ppb in December 30, 2002. This represents a decrease of 73%.

### **TBA**

TBA has historically been detected in well U-3 since October 20, 2000. TBA is a known daughter product of MtBE degradation. Although concentrations of TBA have historically fluctuated in well U-3, a consistent decline in concentrations has been observed since April 5, 2002. Figure 4 illustrates the TBA concentrations from October 8, 2002 through December 30, 2002.

## **DISCUSSION OF RESULTS**

Initially, there were increases in petroleum hydrocarbon concentrations in the groundwater in three of the wells selected for system progress monitoring (U-1, U-3, and U-7). This is believed to be due to the desorption of hydrocarbons from soil caused by the aggressive mechanical scrubbing action of the microbubbles. In terms of overall treatment, this desorption is necessary to achieve effective, long-term treatment. However, there must be sufficient treatment capacity and downgradient containment to prevent off site migration.

The ozone treatment appears to be effective at decreasing TPHg, benzene and MtBE concentrations in the groundwater beneath the site. All three constituents have decreased in MW-6. Benzene has decreased in U-3, U-6, and U-7 over the evaluation period. MtBE has decreased by 18% and 73% in U-3 and U-7, respectively, during the evaluation period. However, some concentrations have increased, probably due to the desorption of hydrocarbons from the soil.

The other onsite wells have demonstrated reductions in hydrocarbon concentrations after the first year of treatment. Concentrations of TPHg, benzene, and MtBE in well U-2 have been reduced to

below laboratory detection limits. Well U-4 had initial increases in hydrocarbon concentrations followed by decreases during the evaluation period.

## **CONCLUSIONS AND RECOMMENDATIONS**

The results of the concentration versus time charts show that hydrocarbon concentrations have declined in some wells and increased in others during the past year of remedial system operation. Overall, the ozone sparging system is demonstrating to be successful in reducing petroleum concentrations in the groundwater at this site. This includes TPHg, benzene, MtBE, and TBA which are the compounds of primary concern. The initial increases in petroleum concentrations that have been observed, primarily in impacted soil areas, have been and are expected to be short term followed by continuous concentration decreases. It is believed that these increases are due to accelerated desorption caused by the aggressive mechanical scrubbing action of the microbubbles. Although contaminant concentrations initially increase, overall this process will accelerate the long term remediation of the site. Several of the wells have not entered the declining phase since the initial increase in concentrations was observed. GR will continue to monitor these wells to determine when the concentrations begin to decline.

During the fourth quarter of 2002, the system had several mechanical failures causing the system to run only periodically during the quarter. During monthly operation and maintenance activities, the system was not running upon arrival during September, November, and December. Between September 30 and November 15, 2002, the system ran for approximately 58 hours. The mechanical failures of the system could be inhibiting the effectiveness of the ozone system remediation process. GR installed a new compressor in January 2003 and will continue to monitor the system for mechanical failures.

Based on the presence of fine grained soils beneath the site, observed during drilling activities, GR anticipates that the completion of the remedial activities may take longer than those observed at other sites underlain by coarser sediments.

The current ozone injection addresses the dissolved impact onsite and also acts as a barrier to mitigate any continuing migration of dissolved hydrocarbons offsite. Treatment directly offsite is not feasible due to the proximity of First Street, however two offsite wells (U-4 and U-5) exist offsite downgradient across First Street and will continue to be sampled on a quarterly basis.

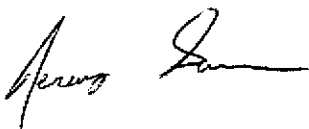
The ozone microsparge system will continue to operate for at least the next year, and the wells U-1 through U-7 will continue to be sampled on a quarterly basis. An additional annual status report will be prepared after receipt and review of the additional groundwater data.

### System Information

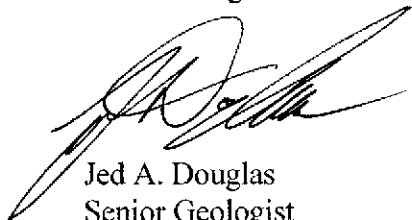
Startup Date: December 19, 2001  
Months of Operation: 12  
Number of ozone injection points: 8 (SP-1 through SP-8)  
Quarterly groundwater sampling: U-1 through U-7

If you have any questions or comments concerning the contents of the report, please feel free to contact either of us at 707.789.3255.

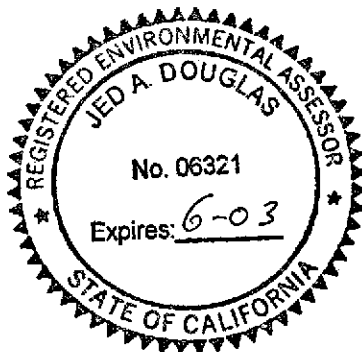
Sincerely,  
**Gettler-Ryan Inc.**



Jeremy A. Smith  
Staff Geologist



Jed A. Douglas  
Senior Geologist  
R.E.A. 06321



### Attachments:

- Table 1: Groundwater Monitoring Data and Analytical Results
- Table 2: Groundwater Analytical Results -- Oxygenate Compounds
- Figure 1: Vicinity Map
- Figure 2: Site Plan
- Figure 3: Chart of Groundwater Concentration versus Time, U-1
- Figure 4: Chart of Groundwater Concentration versus Time, U-3
- Figure 5: Chart of Groundwater Concentration versus Time, U-6
- Figure 6: Chart of Groundwater Concentration versus Time, U-7

**Table 1**  
**Groundwater Monitoring Data and Analytical Results**  
Tosco (Unocal) Service Station #4186  
1771 First Street  
Livermore, California

WELL ID/ TOC* (ft.)	DATE	DTW (ft.)	S.I. (ft.bgs)	GWE (mst)	TPH-G (ppb)	B (ppb)	T (ppb)	E (ppb)	X (ppb)	MTBE (ppb)
U-1 478.27	07/13/98	23.28	14.0-34.0	454.99	ND	ND	ND	ND	ND	ND
	10/07/98	26.43		451.84	ND	ND	ND	ND	ND	ND
	01/15/99	30.42		447.85	ND	ND	ND	ND	1.1	7.3
	04/14/99	24.21		454.06	ND	ND	ND	ND	ND	160
	07/19/99	27.10		451.17	ND	ND	ND	ND	ND	92
	10/12/99	29.40		448.87	ND	ND	ND	ND	ND	37
	01/24/00	27.90		450.37	ND	ND	ND	ND	ND	28
	04/10/00	26.16		452.11	ND	ND	0.930	ND	ND	ND
	07/17/00	28.04		450.23	ND	ND	ND	ND	ND	160
	10/02/00	28.41		449.86	ND	ND	ND	ND	ND	120
	01/08/01	28.68		449.59	ND	ND	ND	ND	ND	103
	04/03/01	25.74		452.53	ND	ND	ND	ND	ND	55.1
	07/02/01	30.67		447.60	ND	ND	ND	ND	ND	ND
NP	10/08/01	33.13		445.14	<50	<0.50	<0.50	<0.50	<0.50	<5.0
	01/03/02	27.67		450.60	160 <sup>o</sup>	<0.50	0.51	<0.50	0.69	31
	04/05/02	29.40		448.87	<50	<0.50	<0.50	<0.50	<0.50	60
	07/02/02 <sup>10</sup>	31.17		447.10	1,100	<0.50	1.7	0.73	130	35
	10/01/02 <sup>10</sup>	33.00		445.27	120	<0.50	<0.50	<0.50	8.8	28
	12/30/02 <sup>10</sup>	22.03		456.24	<50	<0.50	<0.50	<0.50	1.2	90
U-2 477.44	07/13/98	23.52	13.0-33.0	453.92	1,200	130	12	62	180	1,100
	10/07/98	25.31		452.13	ND	ND	ND	ND	ND	160
	01/15/99	30.22		447.22	ND	ND	ND	ND	ND	280
	04/14/99	24.50		452.94	ND	ND	ND	ND	ND	460
	07/19/99	28.54		448.90	ND	ND	ND	ND	ND	220
	10/12/99	30.48		446.96	ND	ND	ND	ND	ND	160
	01/24/00	24.52		452.92	ND	ND	ND	ND	ND	150
	04/10/00	23.68		453.76	ND	ND	ND	ND	ND	177
	07/17/00	28.35		449.09	ND	ND	ND	ND	ND	62.7

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U-2	10/02/00	28.72	13.0-33.0	448.72	ND	ND	ND	ND	ND	52
(cont)	01/08/01	29.11		448.33	ND	ND	ND	ND	ND	57.3
	04/03/01	25.95		451.49	ND	ND	ND	ND	ND	30.2
	07/02/01	29.01		448.43	ND	ND	ND	ND	ND	16
	10/08/01	30.94		446.50	<50	<0.50	<0.50	<0.50	<0.50	82
	01/03/02	27.33		450.11	260 <sup>4</sup>	7.7	11	1.7	15	42
	04/05/02	30.02		447.42	<50	<0.50	<0.50	<0.50	<0.50	25
	07/02/02 <sup>10</sup>	31.23		446.21	<50	<0.50	<0.50	<0.50	<1.0	<0.50
	10/01/02 <sup>10</sup>	32.00		445.44	<50	<0.50	0.62	<0.50	<1.0	<2.0
	<b>12/30/02<sup>10</sup></b>	<b>22.32</b>		<b>455.12</b>	<b>&lt;50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;1.0</b>	<b>&lt;2.0</b>
<b>U-3</b>										
478.46	07/13/98	23.82	14.0-34.0	454.64	70,000	3,100	5,500	2,700	16,000	7,500
	10/07/98	25.64		452.82	54,000	5,000	1,100	3,100	14,000	6,100
	01/15/99	30.92		447.54	41,000 <sup>1</sup>	3,100	ND <sup>2</sup>	1,800	3,800	15,000
	04/14/99	24.48		453.98	33,000	86	290	2,200	7,800	39,000
	07/19/99	28.46		450.00	48,000	3,900	2,500	3,600	14,000	12,000/16,000 <sup>3</sup>
	10/12/99	30.39		448.07	35,000 <sup>4</sup>	4,200	ND <sup>2</sup>	2,300	1,800	22,000/8,300 <sup>5</sup>
	01/24/00	23.43		455.03	13,000 <sup>4</sup>	260	ND <sup>2</sup>	770	3,200	53,000/42,000 <sup>3</sup>
	04/10/00	23.31		455.15	35,200 <sup>4</sup>	1,070	241	2,820	8,850	35,600/40,900 <sup>3</sup>
	07/17/00	27.53		450.93	29,000 <sup>4</sup>	3,570	525	3,180	5,660	22,500/21,000 <sup>3</sup>
	10/02/00	28.19		450.27	11,000 <sup>4</sup>	2,100	31	2,000	780	25,000/28,000 <sup>3,6</sup>
	01/08/01	29.85		448.61	33,600 <sup>4</sup>	3,060	427	3,040	4,190	24,700/30,900 <sup>3</sup>
	04/03/01	24.98		453.48	5,390 <sup>4</sup>	660	10.8	304	356	15,200/19,300 <sup>5</sup>
	07/02/01	31.35		447.11	13,000 <sup>4</sup>	1,200	58	1,300	930	25,000/26,000 <sup>3</sup>
	NP 10/08/01	32.69		445.77	6,100 <sup>4</sup>	500	<10	570	130	23,000/22,000 <sup>3</sup>
	01/03/02	23.73		454.73	9,900 <sup>4</sup>	700	130	24	1,000	14,000/12,000 <sup>3</sup>
	04/05/02	28.27		450.19	9,800	1,100	180	220	1,400	16,000/30,000 <sup>3</sup>
	07/02/02 <sup>10</sup>	29.71		448.75	<25,000	<250	<250	<250	<500	12,000
	10/01/02 <sup>10</sup>	31.18		447.28	<25,000	<250	<250	<250	<500	12,000
	<b>12/30/02<sup>10</sup></b>	<b>21.62</b>		<b>456.84</b>	<b>23,000</b>	<b>330</b>	<b>170</b>	<b>870</b>	<b>4,900</b>	<b>18,000</b>



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<b>U-4</b>										
476.93	04/03/01 <sup>7</sup>	31.63	35.0-45.0	445.30	ND	ND	ND	ND	ND	37.8/38.2 <sup>3</sup>
	07/02/01	37.96		438.97	ND	ND	ND	ND	ND	ND/5.3 <sup>3</sup>
	10/08/01	44.24		432.69	NOT SAMPLED DUE TO INSUFFICIENT WATER				--	--
	01/03/02	36.15		440.78	100 <sup>9</sup>	<0.50	<0.50	<0.50	<0.50	10/8.5 <sup>3</sup>
	04/05/02	37.64		439.29	<50	0.50	<0.50	<0.50	<0.50	4.1
	07/02/02 <sup>10</sup>	36.85		440.08	67 <sup>11</sup>	<0.50	<0.50	<0.50	<1.0	12
	10/01/02 <sup>10</sup>	38.54		438.39	<50	<0.50	<0.50	<0.50	<1.0	9.8
	<b>12/30/02<sup>10</sup></b>	<b>32.64</b>		<b>444.29</b>	<b>&lt;50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;1.0</b>	<b>25</b>
<b>U-5</b>										
476.51	04/03/01 <sup>7</sup>	31.75	37.0-47.0	444.76	ND	ND	0.728	ND	0.993	54.8/55.4 <sup>3</sup>
	07/02/01	38.68		437.83	ND	ND	ND	ND	ND	88/94 <sup>3</sup>
	NP 10/08/01	46.31		430.20	<50	<0.50	<0.50	<0.50	<0.50	37/54 <sup>3</sup>
	01/03/02	36.55		439.96	<50	<0.50	0.59	<0.50	0.91	51/53 <sup>3</sup>
	04/05/02	37.83		438.68	<50	<0.50	<0.50	<0.50	<0.50	37
	07/02/02 <sup>10</sup>	36.92		439.59	<50	<0.50	<0.50	<0.50	<1.0	43
	10/01/02	INACCESSIBLE - TRUCK PARKED OVER WELL				--	--	--	--	--
	12/30/02	INACCESSIBLE - VEHICLE PARKED OVER WELL				--	--	--	--	--
<b>U-6</b>										
478.38	01/03/02 <sup>7</sup>	33.99	--	444.39	5,000 <sup>8</sup>	36	<25	260	450	<250/<10 <sup>3</sup>
	04/05/02	36.18		442.20	1,300	16	<5.0	54	<5.0	<25
	07/02/02 <sup>10</sup>	36.33		442.05	1,100	1.4	<0.50	16	<1.0	0.94
	10/01/02 <sup>10</sup>	37.70		440.68	2,000	5.4	<0.50	62	<1.0	2.6
	<b>12/30/02<sup>10</sup></b>	<b>31.63</b>		<b>446.75</b>	<b>130</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>2.3</b>	<b>&lt;1.0</b>	<b>&lt;2.0</b>

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 Tosco (Unocal) Service Station #4186  
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 Livermore, California

WELL ID/ TOC* (ft.)	DATE	DTW (ft.)	S.L. (ft.bgs)	GWE (msl)	TPH-G (ppb)	B (ppb)	T (ppb)	E (ppb)	X (ppb)	MTBE (ppb)
U-7										
478.74	01/03/02 <sup>7</sup>	32.43	--	446.31	3,100 <sup>8</sup>	93	<10	35	73	140/130 <sup>3</sup>
	04/05/02	34.06		444.68	630	22	0.53	2.6	<0.50	45
	07/02/02 <sup>10</sup>	35.28		443.46	1,100	21	<0.50	6.9	<1.0	60
	10/01/02 <sup>10</sup>	37.70		441.04	1,700	11	<0.50	3.1	<1.0	25
	12/30/02 <sup>10</sup>	31.93		446.81	4,600	41	5.3	32	13	34
TRIP BLANK										
	07/13/98	--	--	--	ND	ND	ND	ND	ND	ND
	10/07/98	--		--	ND	ND	ND	ND	ND	ND
	01/15/99	--		--	ND	ND	ND	ND	ND	ND
	04/14/99	--		--	ND	ND	ND	ND	ND	ND
	07/19/99	--		--	ND	ND	ND	ND	ND	ND
	10/12/99	--		--	ND	ND	ND	ND	ND	ND
	01/24/00	--		--	ND	ND	ND	ND	ND	ND
	04/10/00	--		--	ND	ND	ND	ND	ND	ND
	07/17/00	--		--	ND	ND	ND	ND	ND	ND
	10/02/00	--		--	ND	ND	ND	ND	ND	ND
	01/08/01	--		--	ND	ND	ND	ND	ND	ND
	04/03/01	--		--	ND	ND	ND	ND	ND	ND
	07/02/01	--		--	ND	ND	ND	ND	ND	ND
	10/08/01	--		--	<50	<0.50	<0.50	<0.50	<0.50	<5.0
	01/03/02	--		--	<50	<0.50	<0.50	<0.50	<0.50	<5.0
	04/05/02	--		--	<50	<0.50	<0.50	<0.50	<0.50	<2.5
QA	07/02/02 <sup>10</sup>	--		--	<50	<0.50	<0.50	<0.50	<1.0	<0.50
	10/01/02 <sup>10</sup>	--		--	<50	<0.50	<0.50	<0.50	<1.0	<2.0
	12/30/02 <sup>10</sup>	--		--	<50	<0.50	<0.50	<0.50	<1.0	<2.0

**Table 1**  
**Groundwater Monitoring Data and Analytical Results**  
 Tosco (Unocal) Service Station #4186  
 1771 First Street  
 Livermore, California

**EXPLANATIONS:**

TOC = Top of Casing  
 (ft.) = Feet  
 DTW = Depth to Water  
 S. I. = Screen Interval  
 (ft. bgs) = Feet Below Ground Surface  
 GWE = Groundwater Elevation  
 (msl) = Mean sea level

TPH-G = Total Petroleum Hydrocarbons as Gasoline  
 B = Benzene  
 T = Toluene  
 E = Ethylbenzene  
 X = Xylenes  
 MTBE = Methyl tertiary butyl ether  
 (ppb) = Parts per billion

ND = Not Detected  
 -- = Not Measured/Not Analyzed  
 NP = No Purge  
 QA = Quality Assurance/Trip Blank

\* TOC elevations are relative to msl in feet. The benchmark used was a City of Livermore survey monument at First & "Q" Streets, (Benchmark Elevation = 469.246 feet, msl). Wells U-6 and U-7 were surveyed on January 16, 2002, using the previous benchmark.

<sup>1</sup> Laboratory report indicates gasoline and unidentified hydrocarbons C6-C12.

<sup>2</sup> Detection limit raised. Refer to analytical reports.

<sup>3</sup> MTBE by EPA Method 8260.

<sup>4</sup> Laboratory report indicates gasoline C6-C12.

<sup>5</sup> MTBE by EPA Method 8260 analyzed past EPA recommended holding time.

<sup>6</sup> Laboratory report indicates the sample was analyzed within holding time. Re-analysis for confirmation or dilution was performed past the recommend holding time.

<sup>7</sup> Well development performed.

<sup>8</sup> Laboratory report indicates weathered gasoline C6-C12.

<sup>9</sup> Laboratory report indicates unidentified hydrocarbons C6-C12.

<sup>10</sup> TPH-G, BTEX and MTBE by EPA Method 8260.

<sup>11</sup> Laboratory report indicates hydrocarbon reported in the gasoline range does not match our gasoline standard.

**Table 2**  
**Groundwater Analytical Results - Oxygenate Compounds**  
 Tosco (Unocal) Service Station #4186  
 1771 First Street  
 Livermore, California

WELL ID	DATE	ETHANOL (ppb)	TBA (ppb)	MTBE (ppb)	DIPE (ppb)	ETBE (ppb)	TAME (ppb)	1,2-DCA (ppb)	EDB (ppb)
U-1	10/02/00	--	ND	--	--	--	--	--	--
	07/02/02	--	--	35	--	--	--	--	--
	10/01/02	--	--	28	--	--	--	--	--
	12/30/02	--	--	90	--	--	--	--	--
U-2	10/02/00	--	ND	--	--	--	--	--	--
	07/02/02	--	--	<0.50	--	--	--	--	--
	10/01/02	--	--	<2.0	--	--	--	--	--
	12/30/02	--	--	<2.0	--	--	--	--	--
U-3	07/19/99	--	--	16,000	--	--	--	--	--
	10/12/1999	--	--	8,300	--	--	--	--	--
	01/24/00	--	--	42,000	--	--	--	--	--
	04/10/00	--	--	40,900	--	--	--	--	--
	07/17/00	--	--	21,000	--	--	--	--	--
	10/02/00	--	63,000	28,000	--	--	--	--	--
	01/08/01	ND <sup>1</sup>	49,300	30,900	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>
	04/03/01 <sup>2</sup>	ND <sup>1</sup>	22,200	19,300	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>
	07/02/01	ND <sup>1</sup>	27,000	26,000	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>	ND <sup>1</sup>
	10/08/01	<140,000	33,000	22,000	<290	<290	<290	<290	<290
	01/03/02	<50,000	17,000	12,000	<100	<100	<100	<100	<100
	04/05/02	<25,000	66,000	30,000	<100	<100	<100	<100	<100
	07/02/02	<13,000	47,000	12,000	<500	<250	<250	<250	<250
	10/01/02	<250,000	<50,000	12,000	<1,000	<1,000	<1,000	<1,000	<1,000
	12/30/02	<100,000	23,000	18,000	<400	<400	<400	<400	<400

**Table 2**  
**Groundwater Analytical Results - Oxygenate Compounds**  
 Tosco (Unocal) Service Station #4186  
 1771 First Street  
 Livermore, California

WELL ID	DATE	ETHANOL (ppb)	TBA (ppb)	MTBE (ppb)	DIPE (ppb)	ETBE (ppb)	TAME (ppb)	1,2-DCA (ppb)	EDB (ppb)
U-4	04/03/01	ND	ND	38.2	ND	ND	ND	ND	ND
	07/02/01	ND	ND	5.3	ND	ND	ND	ND	ND
	01/03/02	<500	<20	8.5	<1.0	<1.0	<1.0	<1.0	<1.0
	07/02/02	--	--	12	--	--	--	--	--
	10/01/02	--	--	9.8	--	--	--	--	--
	12/30/02	--	--	25	--	--	--	--	--
U-5	04/03/01	ND	ND	55.4	ND	ND	ND	ND	ND
	07/02/01	ND	ND	94	ND	ND	ND	ND	ND
	10/08/01	<1,000	<100	54	<2.0	<2.0	<2.0	<2.0	<2.0
	01/03/02	<500	<20	53	<1.0	<1.0	<1.0	<1.0	<1.0
	07/02/02	--	--	43	--	--	--	--	--
	10/01/02	INACCESSIBLE - TRUCK PARKED OVER WELL				--	--	--	--
	12/30/02	INACCESSIBLE - VEHICLE PARKED OVER WELL				--	--	--	--
U-6	01/03/02	<5,000	<200	<10	<10	<10	<10	<10	<10
	07/02/02	--	--	0.94	--	--	--	--	--
	10/01/02	--	--	2.6	--	--	--	--	--
	12/30/02	--	--	<2.0	--	--	--	--	--
U-7	01/03/02	<500	30	130	<1.0	<1.0	<1.0	<1.0	<1.0
	07/02/02	--	--	60	--	--	--	--	--
	10/01/02	--	--	25	--	--	--	--	--
	12/30/02	--	--	34	--	--	--	--	--

**Table 2**  
**Groundwater Analytical Results - Oxygenate Compounds**  
Tosco (Unocal) Service Station #4186  
1771 First Street  
Livermore, California

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**EXPLANATIONS:**

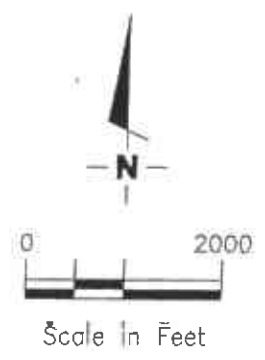
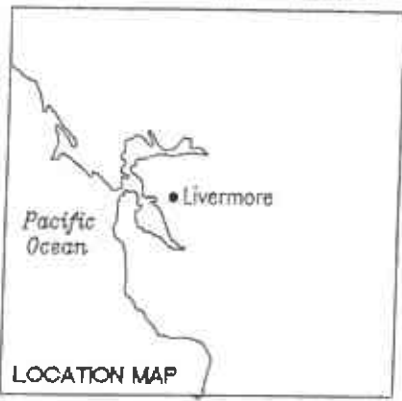
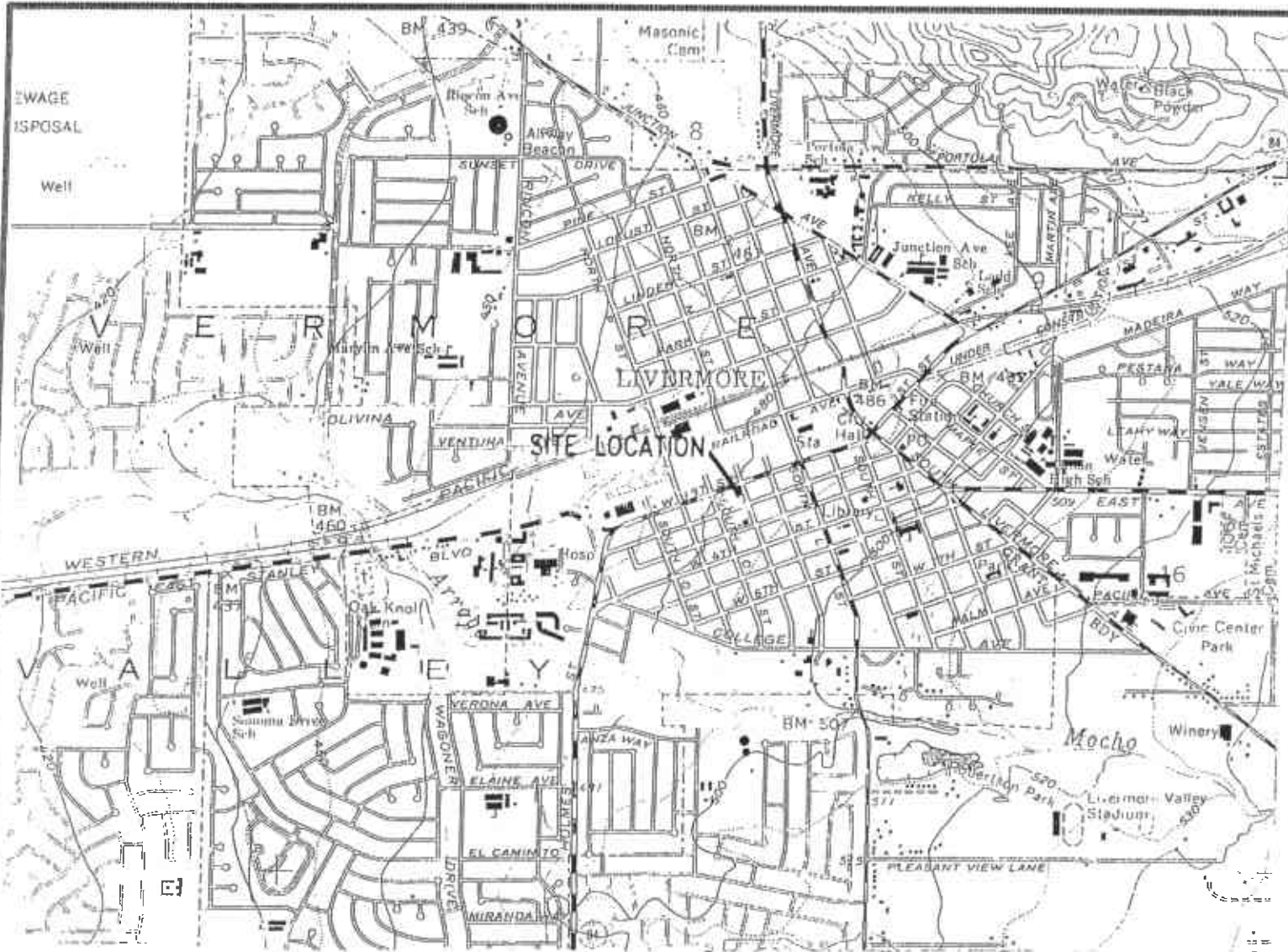
TBA = Tertiary butyl alcohol  
MTBE = Methyl tertiary butyl ether  
DIPE = Di-isopropyl ether  
ETBE = Ethyl tertiary butyl ether  
TAME = Tertiary amyl methyl ether  
EDB = 1,2-Dibromoethane  
1,2-DCA = 1,2-Dichloroethane  
(ppb) = Parts per billion  
ND = Not Detected  
-- = Not Analyzed

**ANALYTICAL METHOD:**

EPA Method 8260 for Oxygenate Compounds

<sup>1</sup> Detection limit raised. Refer to analytical reports.

<sup>2</sup> Laboratory report indicates this sample was analyzed outside of the EPA recommended holding time.



Base Map: USGS Topographic Map



**Gettler - Ryan Inc.**

6747 Sierra Ct., Suite J (925) 551-7555  
 Dublin, CA 94568

VICINITY MAP  
 Tosco 76 Service Station No. 4186  
 1771 First Street  
 Livermore, California

FIGURE

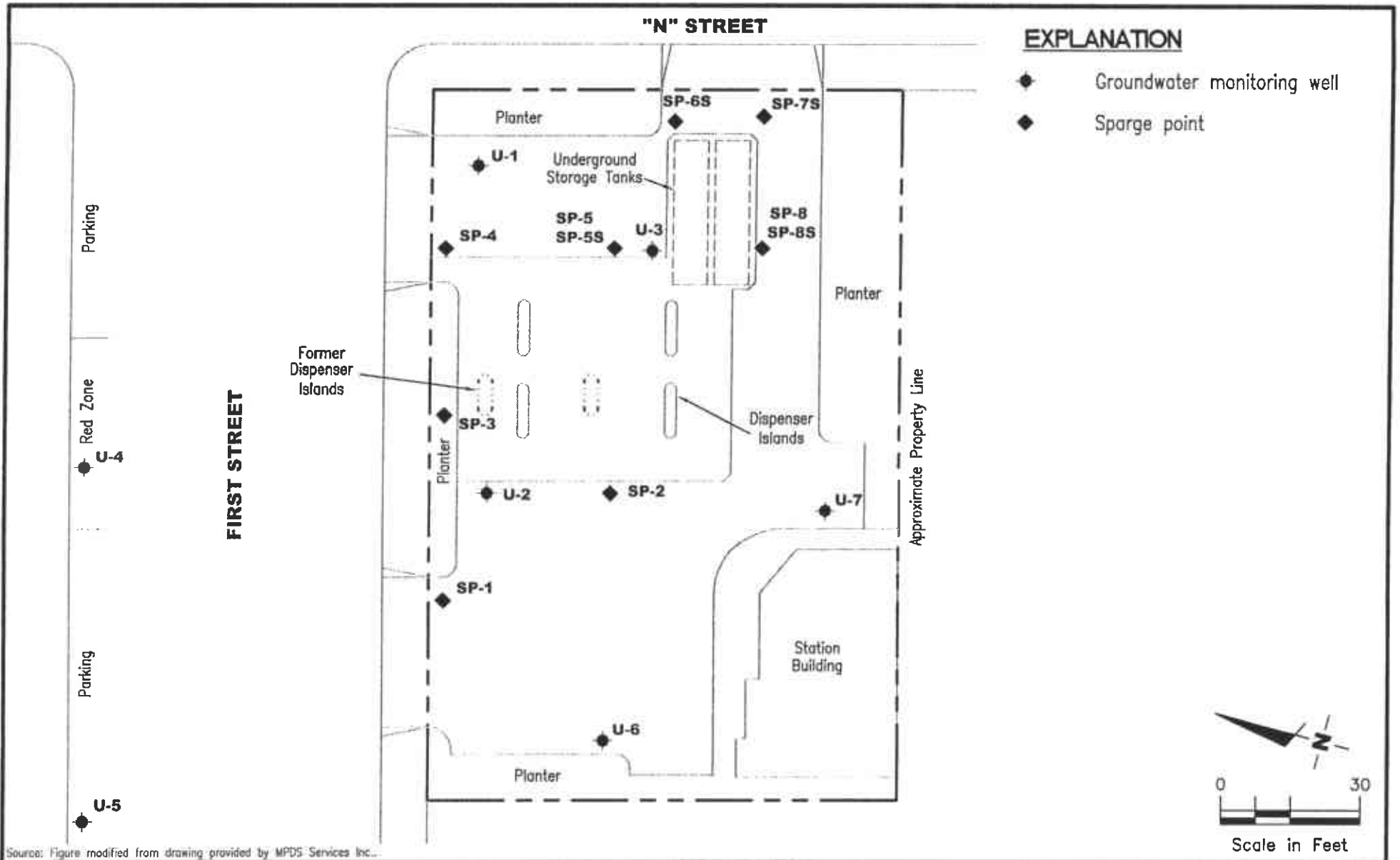
**1**

JOB NUMBER  
 140175

REVIEWED BY

DATE  
 4/00

REVISED DATE



**GETTLER - RYAN INC.**  
 6747 Sierra Ct., Suite J  
 Dublin, CA 94568 (925) 551-7555

**SITE PLAN**  
 Tosco (76) Service Station No. 4186  
 1771 First Street  
 Livermore, California

FIGURE

2

PROJECT NUMBER  
 140175

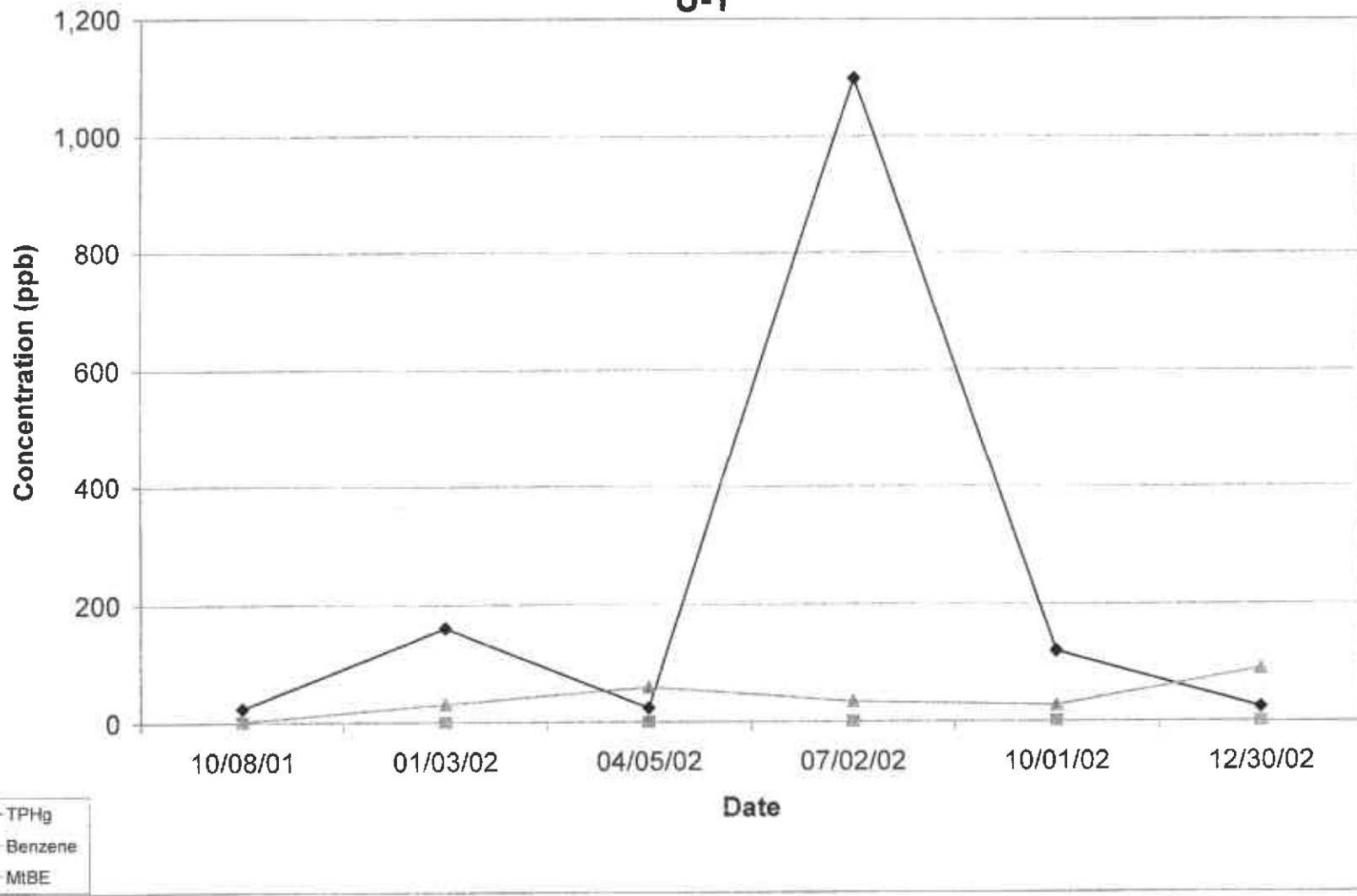
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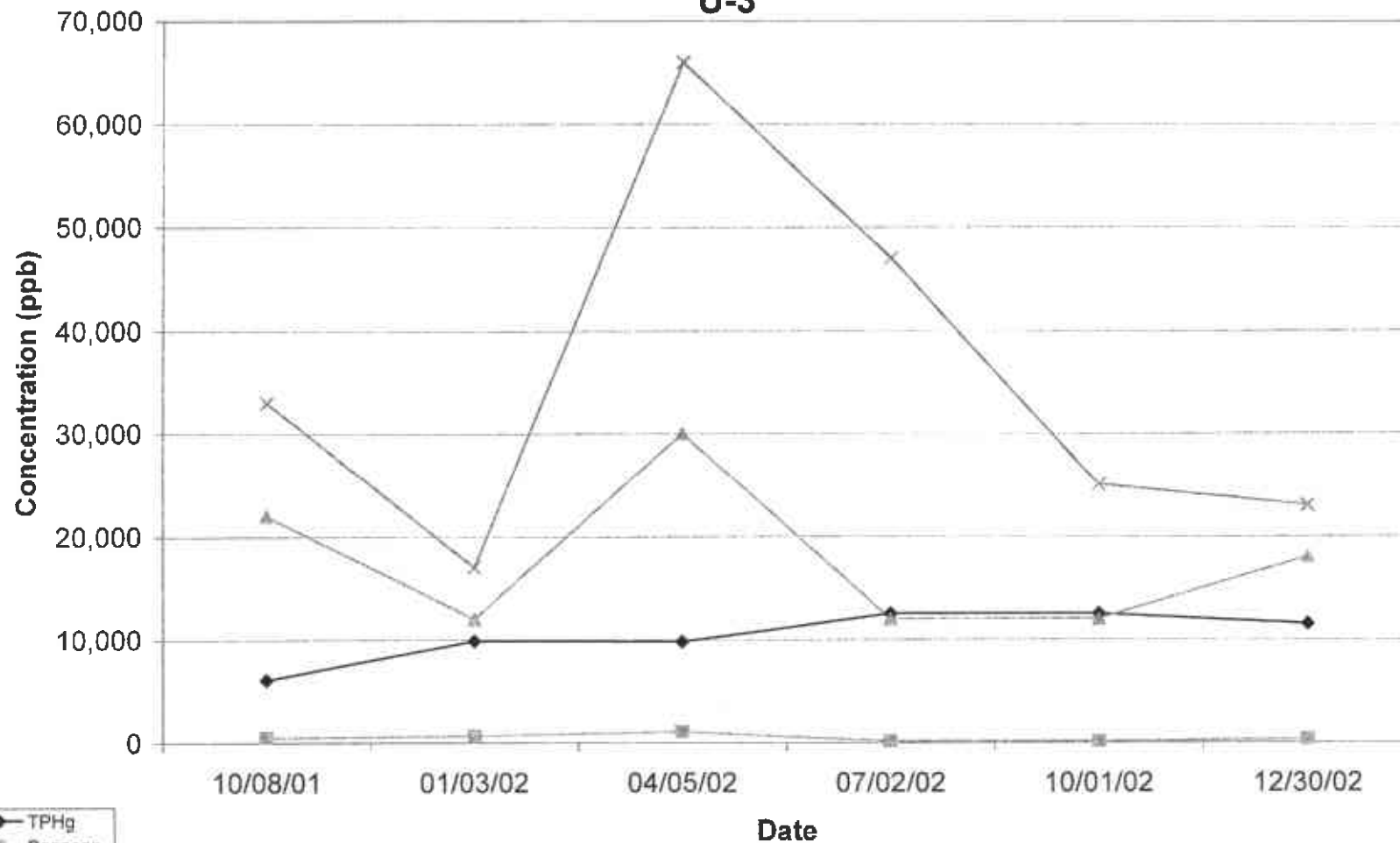
REVISED DATE



**Figure 3 - Tosco Station No. 4186, Livermore, CA  
Groundwater Concentration Versus Time  
U-1**

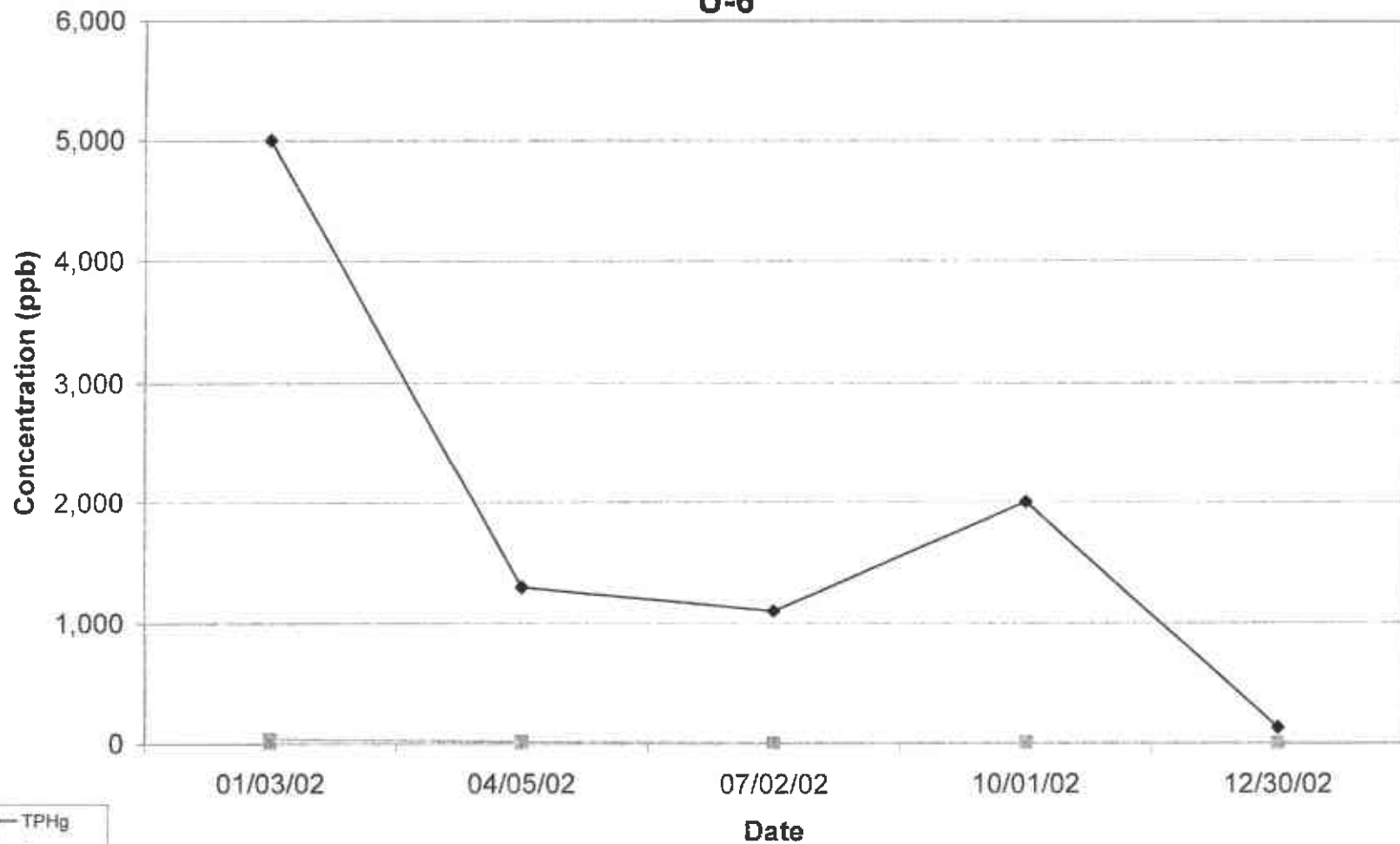


**Figure 4 - Tosco Station No. 4186, Livermore, CA  
Groundwater Concentration Versus Time  
U-3**



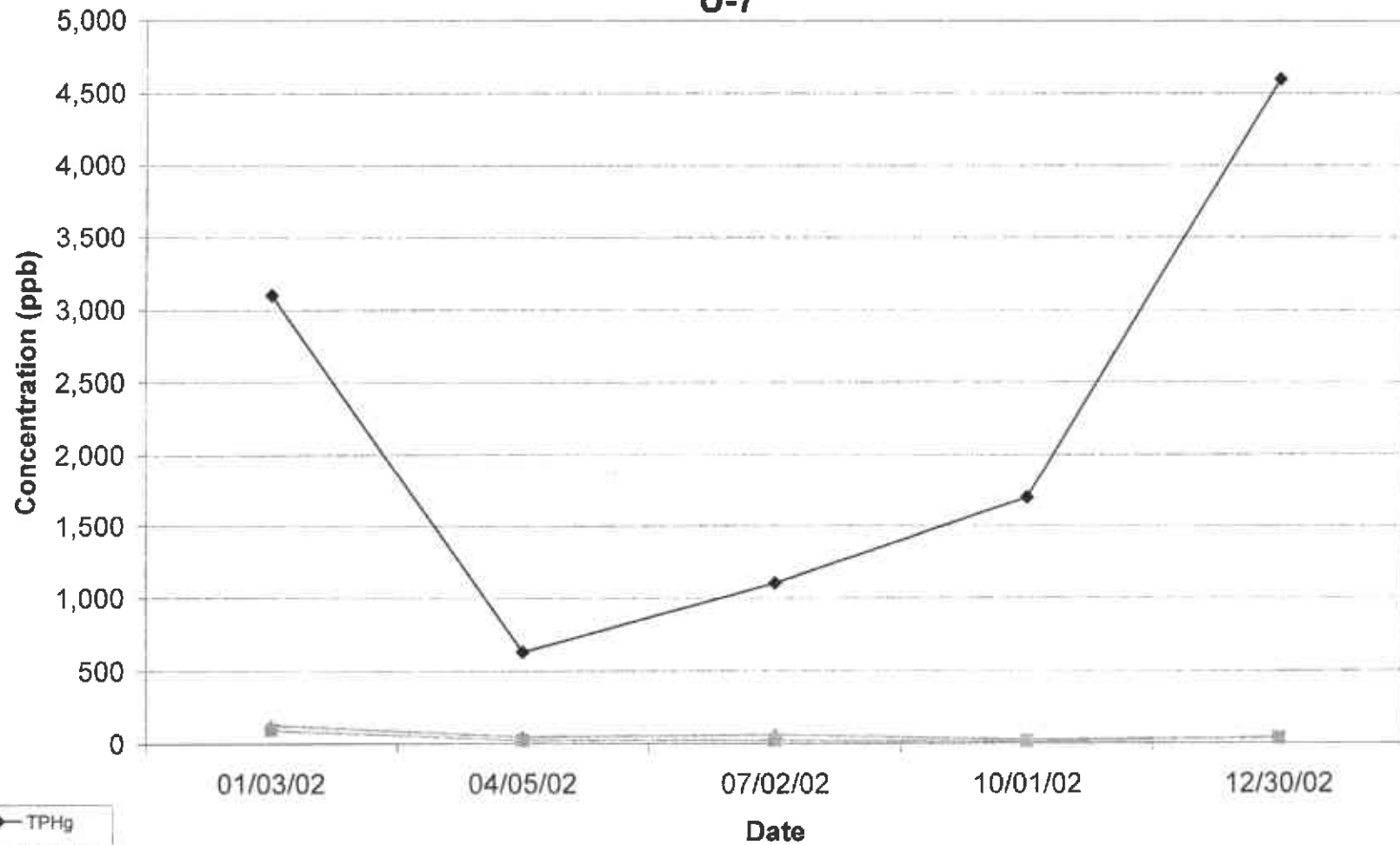
◆ TPHg  
■ Benzene  
▲ MIBE  
× TBA

**Figure 5 - Tosco Station No. 4186, Livermore, CA  
Groundwater Concentration Versus Time  
U-6**



◆ TPHg  
— Benzene  
— MIBE

**Figure 6 - Tosco Station No. 4186, Livermore, CA  
Groundwater Concentration Versus Time  
U-7**



◆ TPHg  
■ Benzene  
▲ MIBE