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#3337

SECOND QUARTER 1999
GROUNDWATER MONITORING REPORT
Tony's Express Auto Service
Oakland, California

June 30, 1999

Project 98-2331

Prepared for
Tony's Express Auto Service
3609 International Boulevard
Oakland, California

Prepared by

SOMA Environmental Engineering, Inc.
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July 1, 1999

Mr. Barney M. Chan
Alameda County
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Subject: Tony's Express Auto Service
3609 International Boulevard, Oakland, California
(formerly 3609 E. 14th Street)

Dear Mr. Chan:

Thank you for the letter dated June 29, 1999. Enclosed for your review are SOMA's reports entitled "Second Quarter 1999 Groundwater Monitoring" and "Corrective Action Plan" at the subject site.

Based on your approval of our RBCA and CAP reports, we will submit a technical work plan with a detailed description of the installation of the remedial system within the next couple of weeks.

Thank you for your time in reviewing these reports. If you have any questions, please call me or Bryce Scofield, Project Manager at (925) 244-6600.

Sincerely,

Mansour Sepehr, Ph.D.,P.E.
Principal Hydrogeologist

MS/jb

Enclosures

cc: Mr. Abolghassem Razi w/enclosures

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1.0 INTRODUCTION

This report presents the results of the second quarter 1999 groundwater monitoring activities conducted by SOMA Environmental Engineering, Inc. (SOMA) on behalf of Mr. Abolghassem Razi, the property owner. The project site is Tony's Express Auto Service, located at 3609 International Boulevard, Oakland, California (the "Site"), see Figure-1.

The Site is located at the intersection of 36th Avenue and International Boulevard formerly known as East 14th Street, Oakland, California, see Figure-1. It is currently used as a gasoline service station and mechanic shop. The Site is relatively flat, and the surrounding properties are primarily commercial businesses and residential housing. Figure-2 shows the location of the main building, fuel tank areas, on-site and off-site groundwater monitoring wells. Currently, the groundwater monitoring wells are being monitored on a quarterly basis. The results of the groundwater monitoring program have indicated elevated levels of petroleum hydrocarbons in groundwater beneath the Site. The source of petroleum hydrocarbons in the groundwater is believed to be the former underground storage tanks (USTs), which were used to store gasoline at the Site. This report includes the results of historical groundwater monitoring events and the results of the second quarter 1999 groundwater monitoring event.

Based on the property owner's request, the recent groundwater-monitoring event was conducted by SOMA in response to Alameda County Environmental Health Services (ACEHS) requirements.

1.1 Background

Currently, the Site is used as a gasoline service station. The environmental

investigation at the subject property started since 1992, when Mr. Razi, the property owner retained Soil Tech Engineering, Inc. (STE) of San Jose to conduct a limited subsurface investigation. The purpose of STE investigation was to determine whether or not the soil near the product lines and underground storage tanks (USTs) have been impacted with petroleum hydrocarbons.

In July 1993, STE removed one- single-walled 10,000-gallon gasoline tank and one single-walled 6,000-gallon gasoline tank along with a 550-gallon waste oil tank from the Site. These tanks were replaced by double-walled USTs. Currently, there are one-10,000 gallon double-walled gasoline tank and two-6,000 gallon double-walled gasoline tanks beneath the Site.

In December 1997, Mr. Razi retained Western Geo-Engineers (WEGE) to conduct additional investigation and perform groundwater monitoring on a quarterly basis. The results of WEGE groundwater monitoring events indicated elevated levels of petroleum hydrocarbons and MTBE in groundwater. The historical groundwater elevation data and BTEX, TPH-g and MTBE concentrations reported by STE and WEGE are included in Table-1 and Table-2.

1.2 Site Hydrogeology

Based on the results of previous investigations, groundwater was encountered at depths ranging between 7 and 14 feet beneath the Site. Figure-2 shows the location of on-site and off-site groundwater monitoring wells. The historical static water level elevations measured at different monitoring wells have been reported in the previous groundwater-monitoring reports. The groundwater elevation contour map based on the recent water levels measured in the June 1999 monitoring event is presented in Figure-3. As shown in Figure- 3, groundwater flows from the north to the south with an average gradient of 0.014 ft/ft. Based on the results of a pumping test conducted by SOMA, hydraulic conductivity of the saturated sediments range between 1.5 and 18.3 feet/day. Assuming the

effective porosity of saturated sediments to be 0.35, the groundwater flow velocity range between 22 feet and 267 feet per year.

2.0 Field Activities

Field activities were performed in accordance with the procedures and guidelines of the California Regional Water Quality Control Board, San Francisco Bay Region.

On June 10, 1999, SOMA field crew measured depth to groundwater in the monitoring wells from the top of casing to the nearest 0.01 foot using an electronic sounder. The depth to groundwater and top of casing elevation data at each groundwater monitoring well were used to calculate the groundwater elevation. A total of ten groundwater monitoring wells were monitored during this event. Table-1 presents the groundwater elevation at different groundwater monitoring well locations. Appendix A presents a summary of field sampling notes for each groundwater monitoring well.

Before sample collection, each well was purged at least three casing volumes while field readings of pH and temperature were recorded. Groundwater samples were collected using a 2-inch diameter submersible pump of "ES-60 DC". Each groundwater sample was transferred into a 40-ml VOA vial and sealed properly to prevent the developing of any air bubbles within the head-space area. The groundwater samples were placed in an ice chest and delivered to Delta Environmental Laboratories of Benecia, California for analysis.

The groundwater samples were also immediately analyzed for on-site measurements of dissolved oxygen (D.O.), ferrous iron ($Fe+^2$), nitrate-N (NO_3-N), sulfate (SO_4^{-2}), pH, temperature and electrical conductivity (EC).

D.O. was measured with a dissolved oxygen meter, YSI Model 50B (YSI

Incorporated, Yellow Springs, Ohio 45387 USA) see Appendix A for the result of field measurements. The instrument was calibrated at the Site according to a procedure provided by the manufacturer and prescribed by Taras *et.al.* (1975). Detail of the calibration and measurement procedures can be found in the instrument's handbook. The measurements were corrected for barometric pressure, temperature and salinity using correction factors provided by the user's manual see Appendix A.

In order to avoid the intrusion of oxygen in ambient air to groundwater samples, the D.O. measurement was conducted in situ (down-hole inside each monitoring well).

Fe^{+2}, NO_3-N and SO_4^{-2} were measured colorimetrically using the Hach model DR/850 colorimeter (Hach Company World Headquarters, P.O. Box 389, Loveland, Colorado 80539-0389). The Hach DR/800 Series Colorimeter is a microprocessor-controlled photometer suitable for colorimetric testing in the laboratory or the field. The required reagents for each specific test are provided in AccuVac ampuls.

Fe^{+2} was measured colorimetrically using Method 8146 (1,10-phenanthroline Method). The 1,10-phenathroline indicator in Ferrous Iron Reagent reacts with Fe^{+2} in the sample to form an orange color. The intensity of orange color is proportional to the iron concentration.

SO_4^{-2} was measured colorimetrically using Method 8051 of Sulfa Ver 4 Method. Sulfate ions in the sample react with Sulfa Ver 4 Sulfate Reagent to form insoluble barium sulfate. The amount of turbidity formed is proportional to the sulfate concentration. The Sulfa Ver 4 also contains a stabilizing agent to hold the barium sulfate in suspension.

NO_3-N was measured colorimetrically using Method 8039 or Cadmium Reduction Method. Cadmium metal in the Nitra Ver 5 Nitrate Reagent reduces nitrates present in the sample to nitrite, the nitrite ion reacts in an acidic medium with sulfanilic acid to form an intermediate diazonium salt which couples to getistic acid to form an amber-colored product. The intensity of the color is proportional to nitrate-N concentration in the sample.

Electrical conductivity, pH and temperature were measured with Hydac Model 910 pH meter. The instrument was calibrated for conductance with a standard solution of known concentration (12,000 us/cm) and for pH with 4, 7 and 10 pH unit buffer solutions. All measurements were performed according to the instruction manual provided by the manufacturer.

2.1 Laboratory Analysis

Delta Environmental Laboratories analyzed the groundwater samples. The measured constituents included total petroleum hydrocarbons as gasoline (TPH –g), benzene, toluene, ethylbenzene and xylene (BTEX) and methyl tertiary butyl ether (MTBE).

TPH-g was measured using EPA Method 5030/GCFID. EPA Method 8020 was used to measure BTEX. MTBE levels in the groundwater were measured using EPA Method 8020 and confirmed using EPA Method 8260. The results are presented in Table-2. As discussed, the groundwater parameters in connection with bio-degradation activities such as dissolved oxygen, nitrate, sulfate and ferrous iron were analyzed in the field by SOMA's field staff.

3.0 RESULTS

Table-1 presents the measured groundwater elevations at different groundwater

monitoring wells. At each groundwater monitoring well, depth to water-table and the elevation of the top of casing were used to calculate the water-table elevation.

Depths to water-table ranged between 9.95 and 10.90 feet. In comparison with the previous event the water level elevations dropped between 2 and 3.5 feet. The groundwater flow was found to flow toward the south consistent with the previous monitoring events. A groundwater elevation contour map is displayed in Figure-3. Table-1 shows historical water level elevations at different groundwater monitoring wells.

Floating products were not found in any of the wells during the current groundwater monitoring event. During the previous groundwater monitoring event also no floating product was observed.

The results of field measurements of some physical and chemical parameters of the groundwater samples are presented in Table-3. Temperature ranged between 18.1 ^{0}C and 20.1 ^{0}C. The variation in temperature may reflect the changes in air temperature during sampling, see field notes in Appendix A. Temperature measurements allowed to make corrections to pH and EC measurements using a Manual Temperature Compensation procedure described in the Hydac Model 910 pH meter manual. D.O. measurements were also corrected for the recorded temperatures, see Appendix A.

Dissolved oxygen concentration in the groundwater samples ranged between 0.1 mg/L at MW-8 and 0.61 mg/L in MW-6. The low oxygen content may suggest a strong biodegradation process in the groundwater system. Figure-4 shows groundwater D.O. concentration contours measured in-situ after purging.

Nitrate was only detected in well MW-2, MW-4 and MW-5 where low levels of

petroleum hydrocarbons were detected. More importantly, the concentrations of dissolved oxygen in these wells are generally higher than the dissolved oxygen in the other wells. This may suggest that, under the observed anaerobic condition, nitrate may have been used as a source of terminal electron acceptor by microorganisms (Lovley *et. al.*, 1994). Figure-5 shows the contour map of nitrate concentration in groundwater.

Sulfate concentration ranged between non-detect and 800 mg/L. This significant variation in sulfate concentration may reveal a strong demand by microorganisms for a source of terminal electron acceptor for oxidizing contaminant hydrocarbons (Lovley *et. al.*, 1994). Figure-6 shows groundwater sulfate concentration measured on June 10, 1999.

Ferrous iron concentration in the groundwater samples ranged between 0.61 and 5.16 mg/l. A high concentration of ferrous iron in the groundwater is a good indication of biological activities. Figure-7 shows the groundwater ferrous iron concentration measured June 10, 1999. The presence of higher ferrous iron and absence/lack of electron receptors such as nitrogen, sulfate and dissolved oxygen is indicative of aerobic biodegradation beneath the Site. Due to the presence of low levels of dissolved oxygen as well as the nutrients such as nitrates and sulfate, generation of methane gas from petroleum hydrocarbon seems likely.

The pH measurements ranged between 6.42 and 6.59 pH units. Electrical conductivity ranged between 507 µs/cm and 966 µs/cm. The unit of electrical conductivity is Siemens (s) or micro-Siemens (µs) in the SI system. In the past, these units have been known as millimhos and micromhos.

The results of chemical analyses are shown in Table 2. The concentration of TPH-g ranged between 270 µg/L MW-5, and 39,500 µg/L in MW-8. Benzene

concentrations ranged between 3.55 µg/L in MW-5 and 8,245 µg/L in MW-3. TPH-g and benzene concentration contours in groundwater have been shown in Figures 8 and 9 respectively. MTBE concentrations ranged between non-detect (ND, at detection limit of 5 µg/L) in MW-2, MW-5, and MW-6 and 1,291 µg/L in MW-11. MTBE concentration contours in the groundwater have been shown in Figure- 10.

The historical data of groundwater contamination is presented in Table 2. Overall, chemical concentrations show an increasing trend during the recent groundwater monitoring event in MW-1, MW-3, MW-4, MW-8 and MW-11. The concentration of MTBE in MW-11 has been dramatically increased since the previous sampling event. The higher chemical concentration can be attributed to using a different analytical laboratory. In the past, WEGE had retained North State Environmental of south San Francisco to analyze groundwater samples. Delta Environmental Laboratories were retained to analyze groundwater samples for this event.

I don't agree.

The presence of elevated levels of MTBE in MW-11 located in the off-site area will be verified in the next sampling event by collecting duplicate samples from this well.

Based on our current approved work plan, SOMA is planning to conduct additional off-site investigations to delineate the extent of groundwater contamination at the southern end of property. According to our work plan an additional groundwater monitoring well will be drilled across East 12th Street at the BART property after acquisition of proper permits/access from the BART authority.

4.0 Conclusion

The results of the June 10, 1999 groundwater-monitoring event are summarized as follows:

1. Groundwater elevation data at the Site indicate a groundwater flow gradient in a general southerly direction, which is consistent with the previous monitoring events.
2. The groundwater elevations were dropped significantly since the previous groundwater monitoring event.
3. Benzene concentrations ranged between 3.55 µg/L in MW-5 and 8,245 µg/L in MW-3. Overall benzene and TPH-g concentrations showed an increasing trend in most of groundwater monitoring wells.
4. MTBE concentration showed a decreasing pattern except in MW-8 and MW-11. The concentration of MTBE in MW-11 showed a dramatic increase (from 8 µg/L to 1,291µg/L).
5. Due to the presence of low levels of dissolved oxygen as well as the nutrients such as nitrates and sulfate, generation of methane gas from petroleum hydrocarbon seems likely.

5.0 Report Limitations

This report is the summary of work done by SOMA including observations and descriptions of the Site conditions. It includes the analytical results produced by Delta Environmental Laboratories as well as the data summaries produced by the previous environmental consultants. The number and location of the wells were selected to provide the required information, but may not be completely representative of the entire site conditions. All conclusions and recommendations are based on the results of laboratory analysis. Conclusions beyond those

specifically stated in this document should not be inferred from this report.

SOMA warrants that the services provided were done in accordance with the generally accepted practices in the environmental engineering and consulting field at the time of this sampling.

6.0 References

Soil Tech Engineering, Quarterly Groundwater Monitoring Reports, from 1995, until July 1997

Western Geo-Engineers, Quarterly Groundwater Monitoring and Sampling Reports from Fourth Quarter 1997 until First Quarter of 1999.

Taras, M.J.; Greenberg, A.E.; Hoak, R.D.; and Rand, A.E. 1975. Standard methods for the examination of water and wastewater. American Public Health Association, Washington, D.C.

Lovley, D.R.; Chapell, F.H.; Woodward, J.C. 1994. Use of dissolved H_2 concentration to determine distribution of microbialy catalyzed redox reactions in anoxic groundwater. Environmental Science & Technology. Vol,28, No. 7:1205-1210.

FIGURES

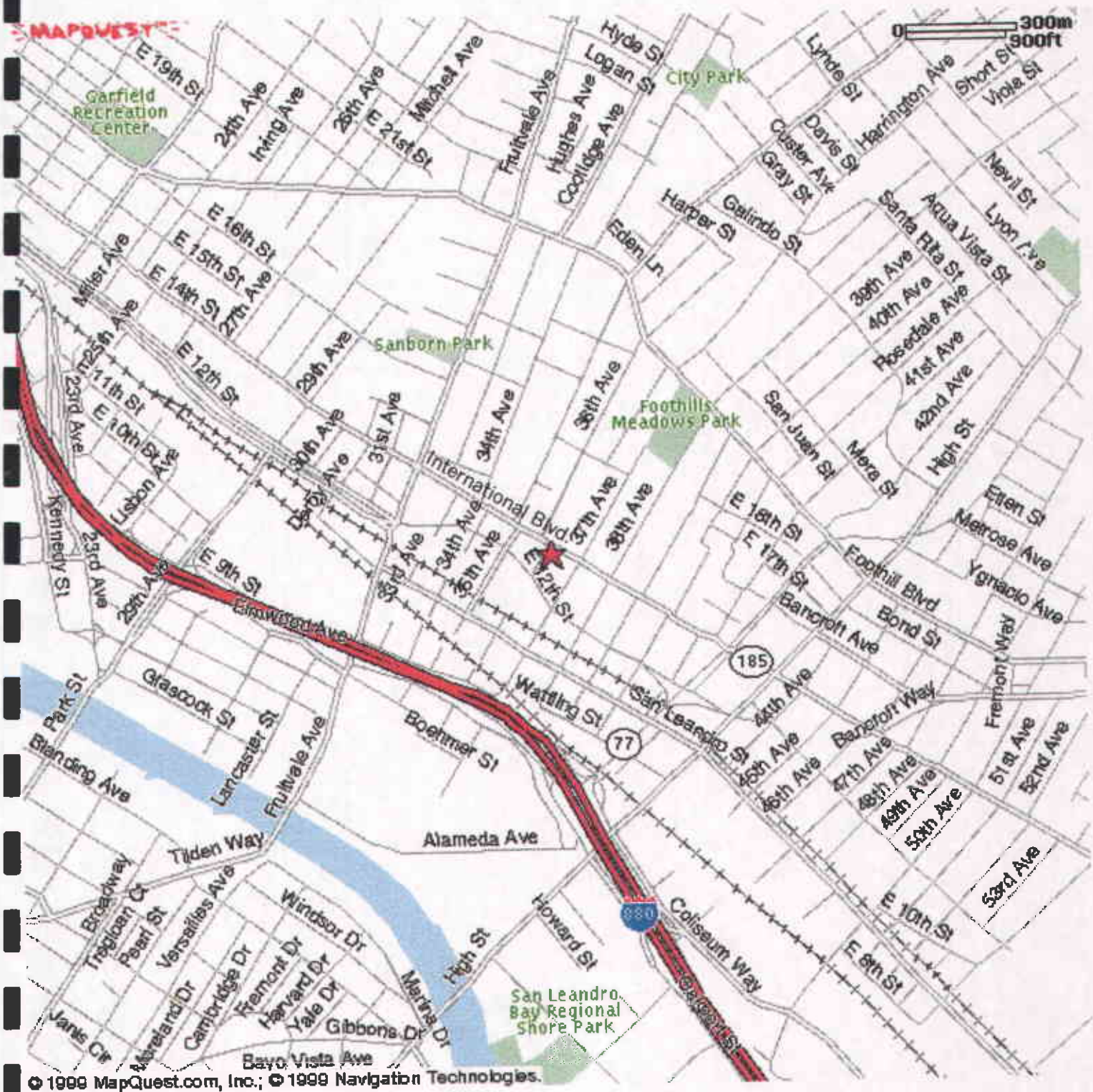

Figure 1: Site Location Map

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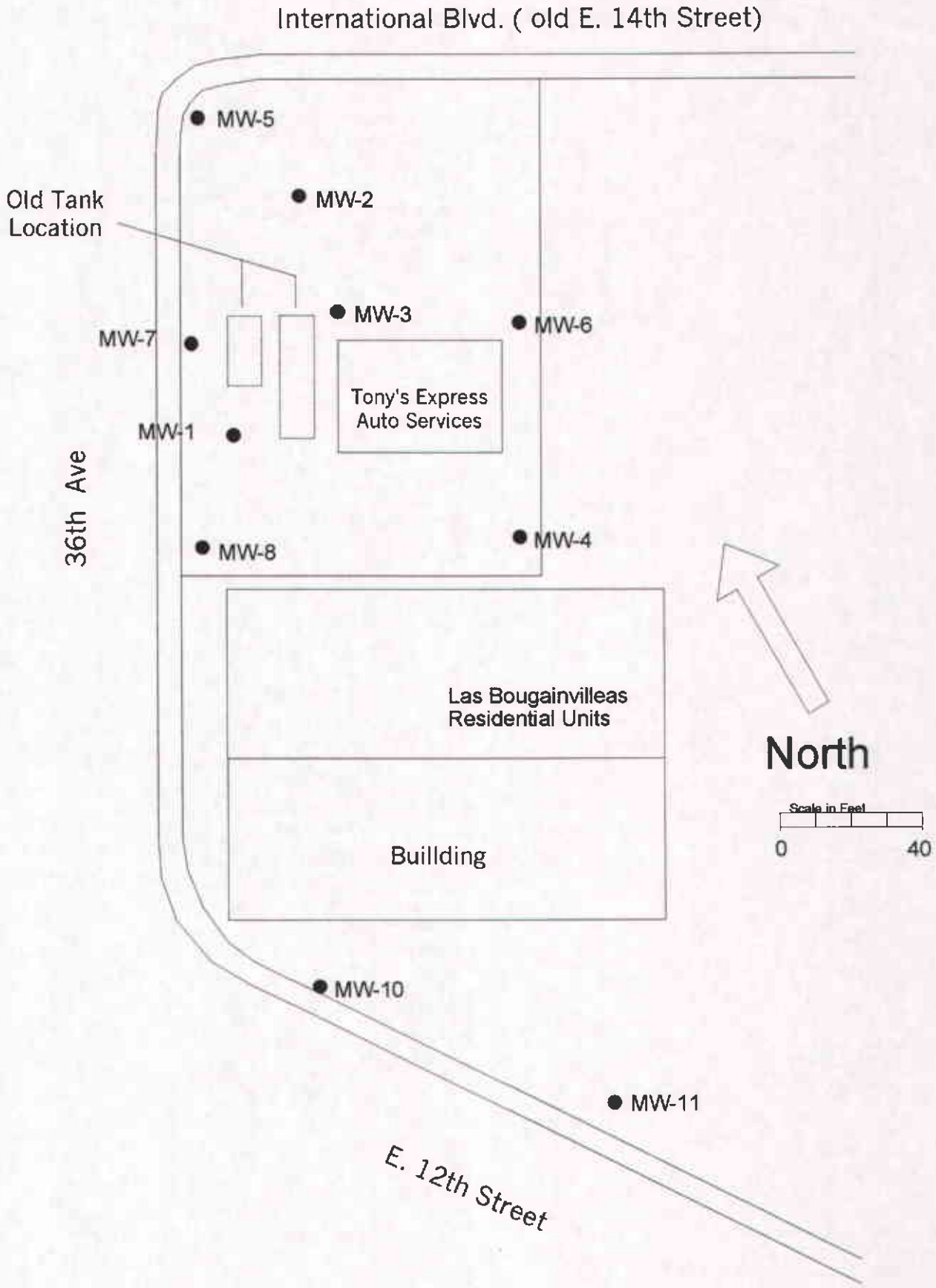

Figure 2: Location of Groundwater Monitoring Wells

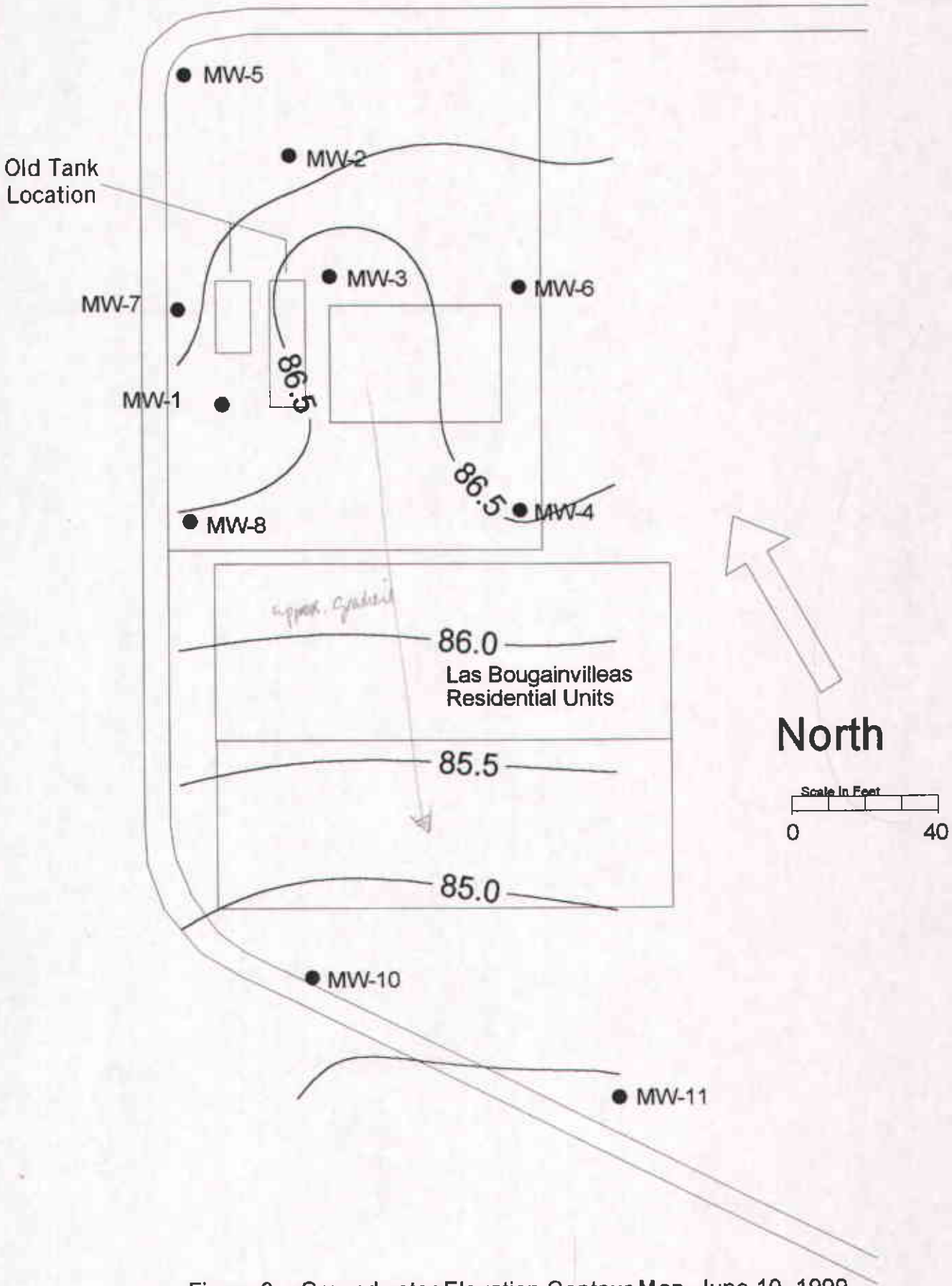

Figure 3: Groundwater Elevation Contour Map, June 10, 1999

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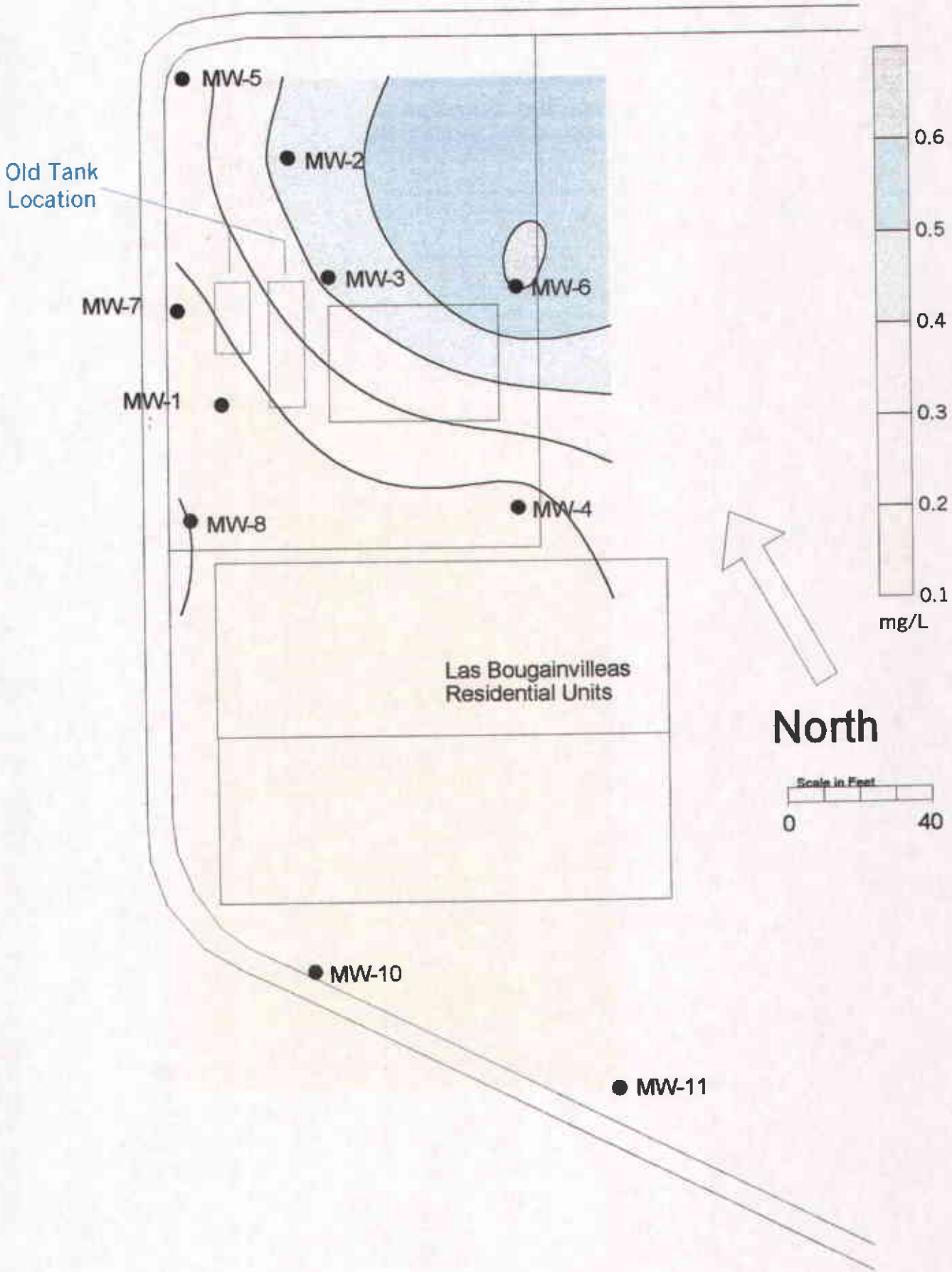

Figure 4: Dissolved Oxygen Contour Map in Groundwater, June 10, 1999

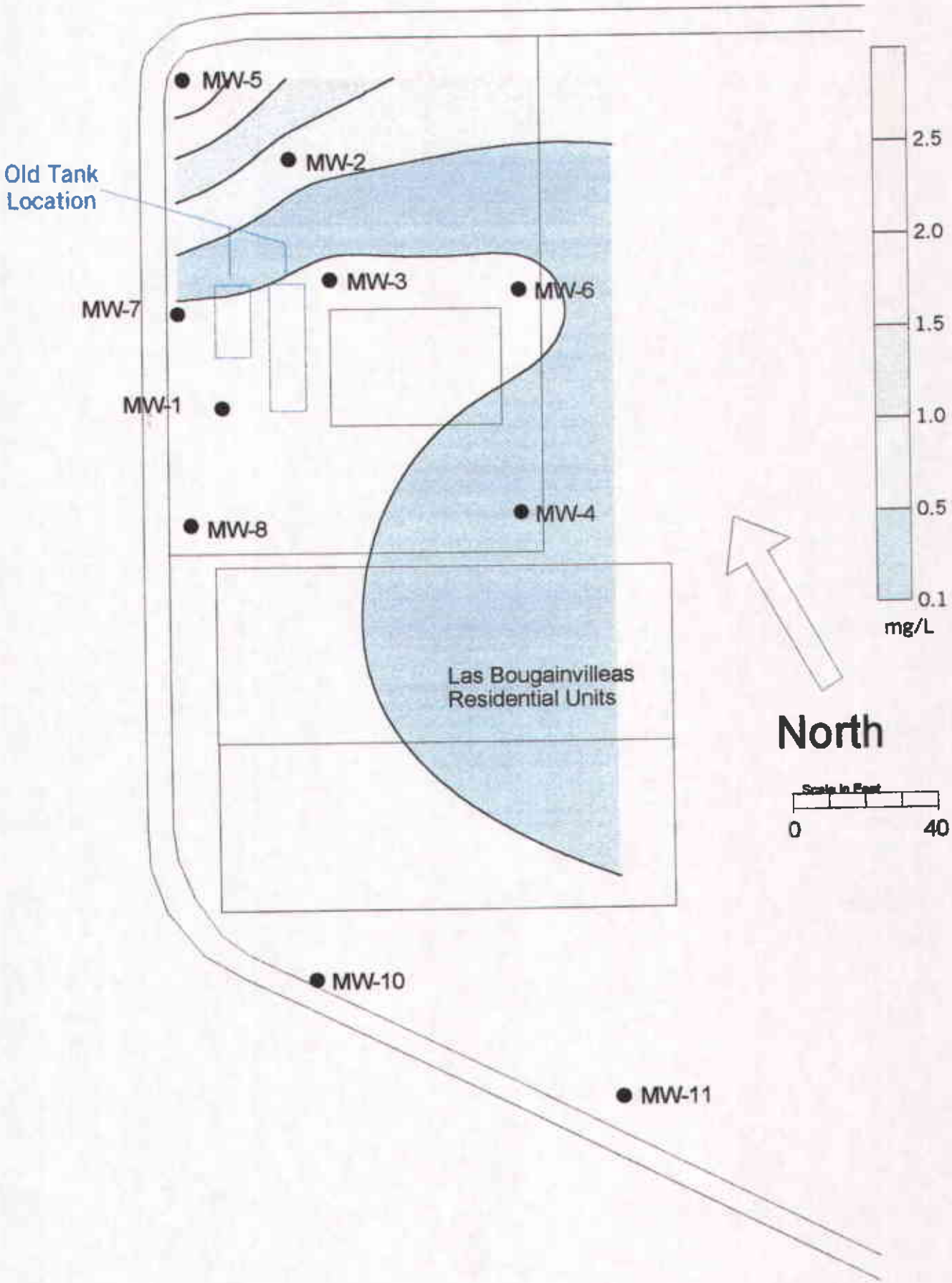

Figure 5: Nitrate Contour Mapin Groundwater, June 10, 1999

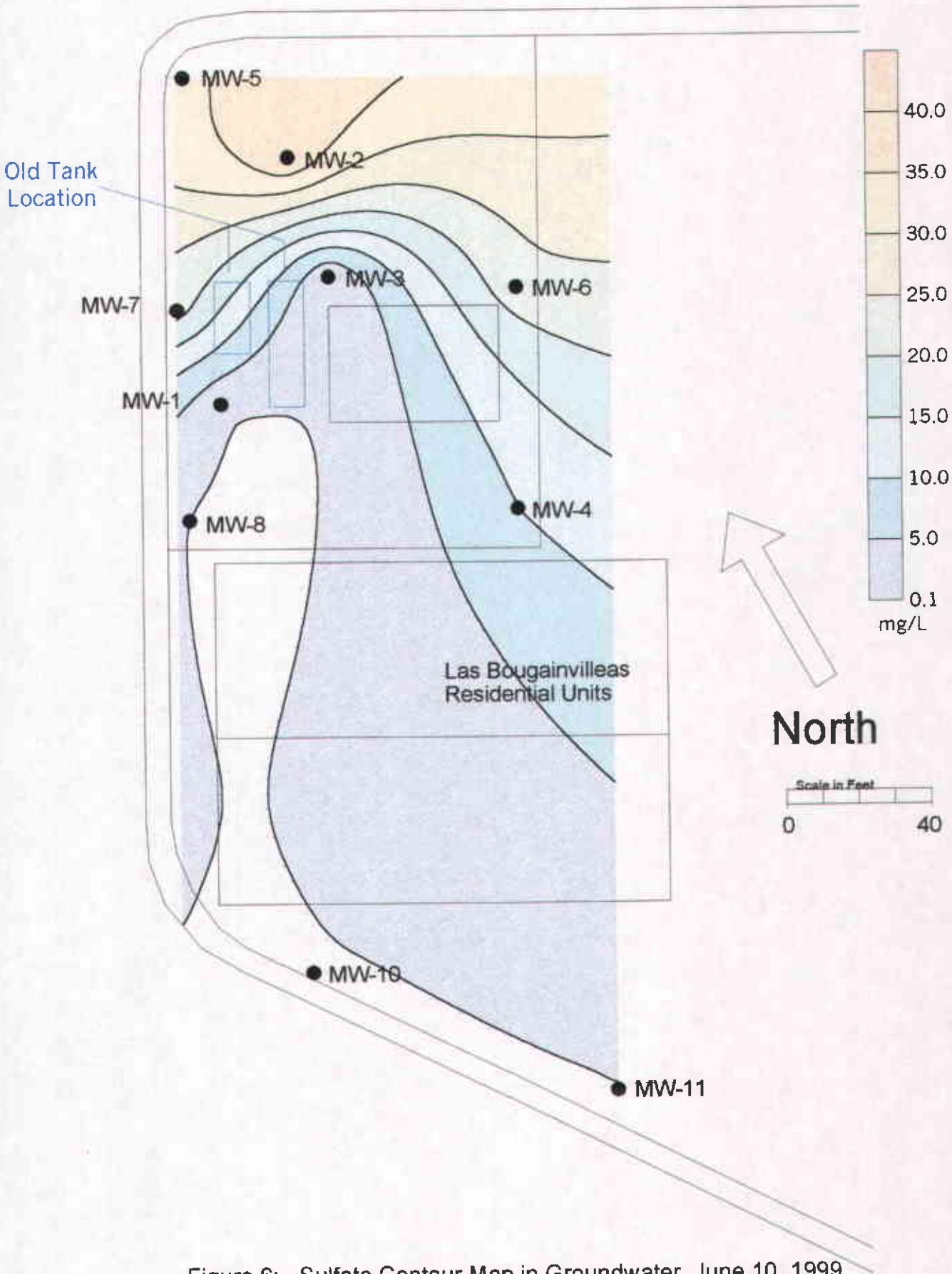

Figure 6: Sulfate Contour Map in Groundwater, June 10, 1999

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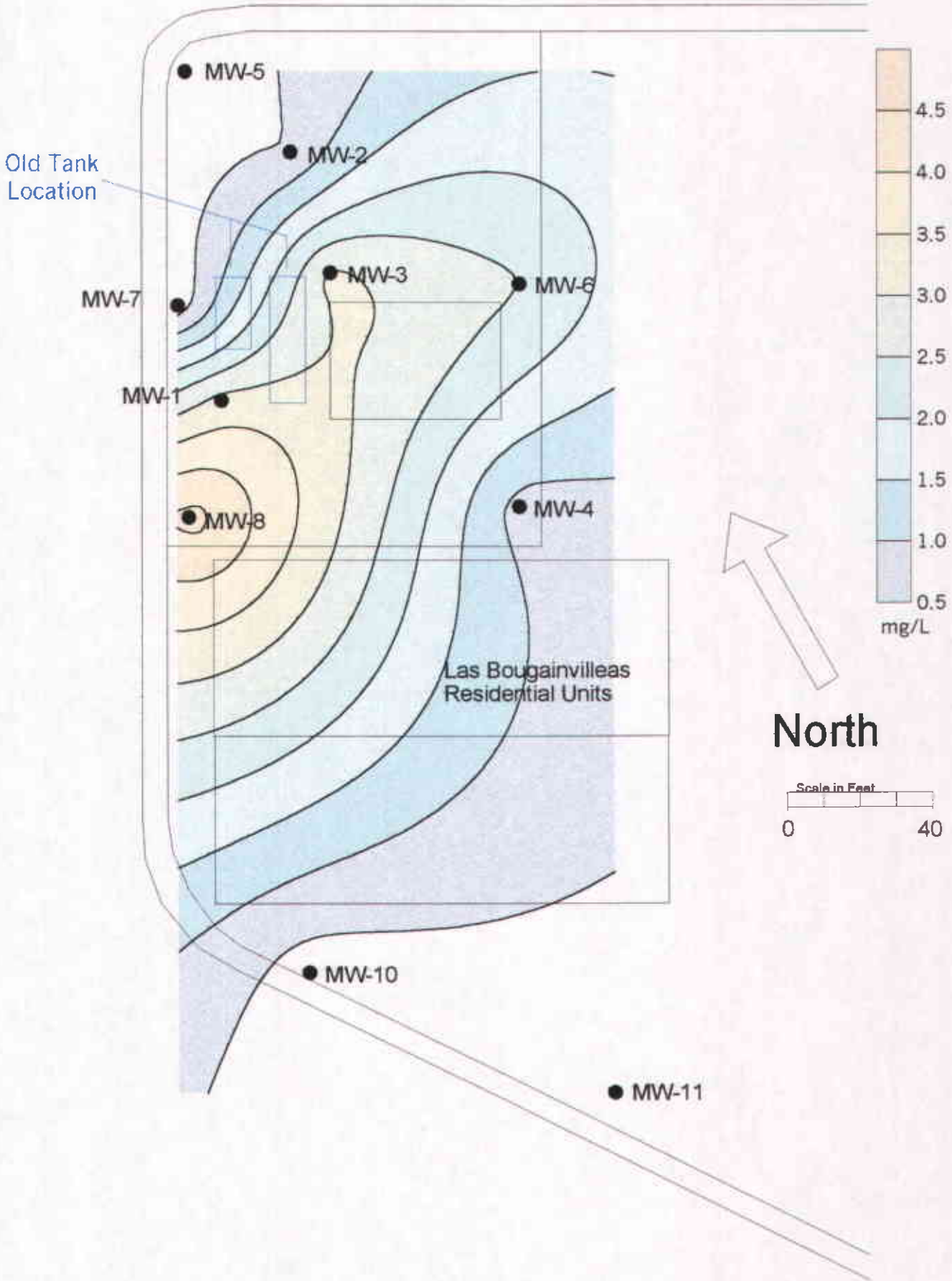

Figure 7: Ferrous Iron Contour Map in Groundwater, June 10, 1999

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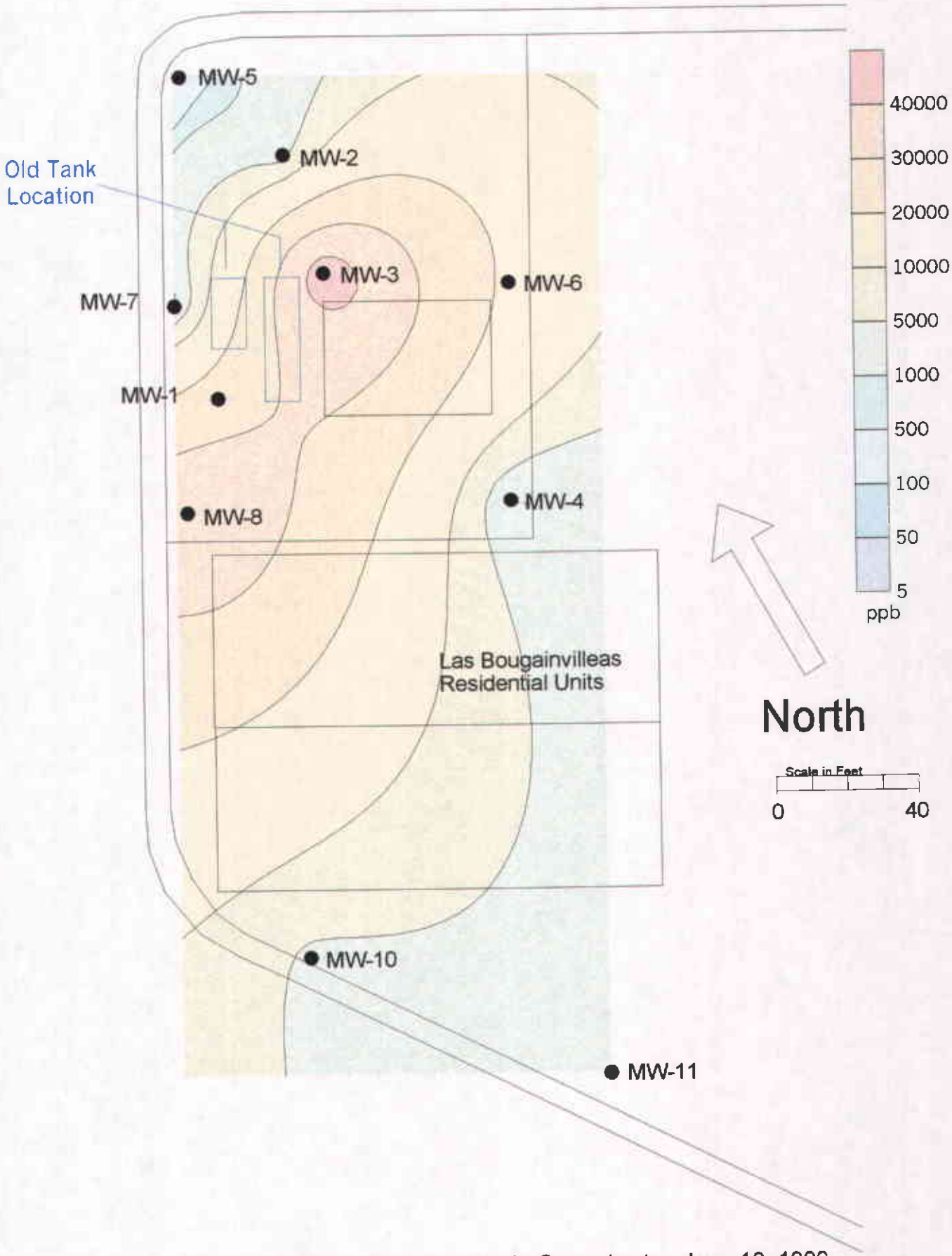

Figure 8: TPH-g Contour Map in Groundwater, June 10, 1999

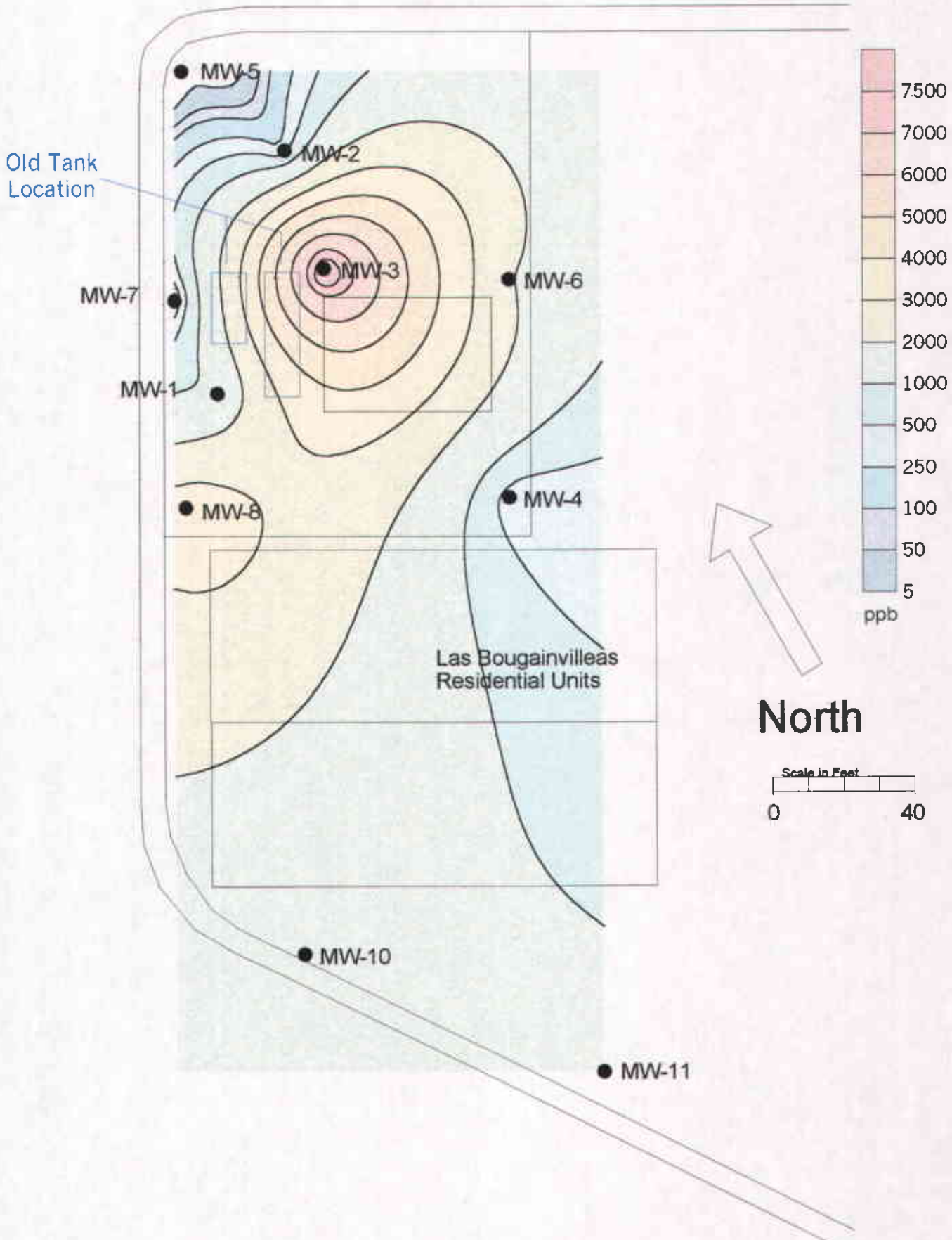

Figure 9: Benzene Contour Map in Groundwater, June 10, 1999

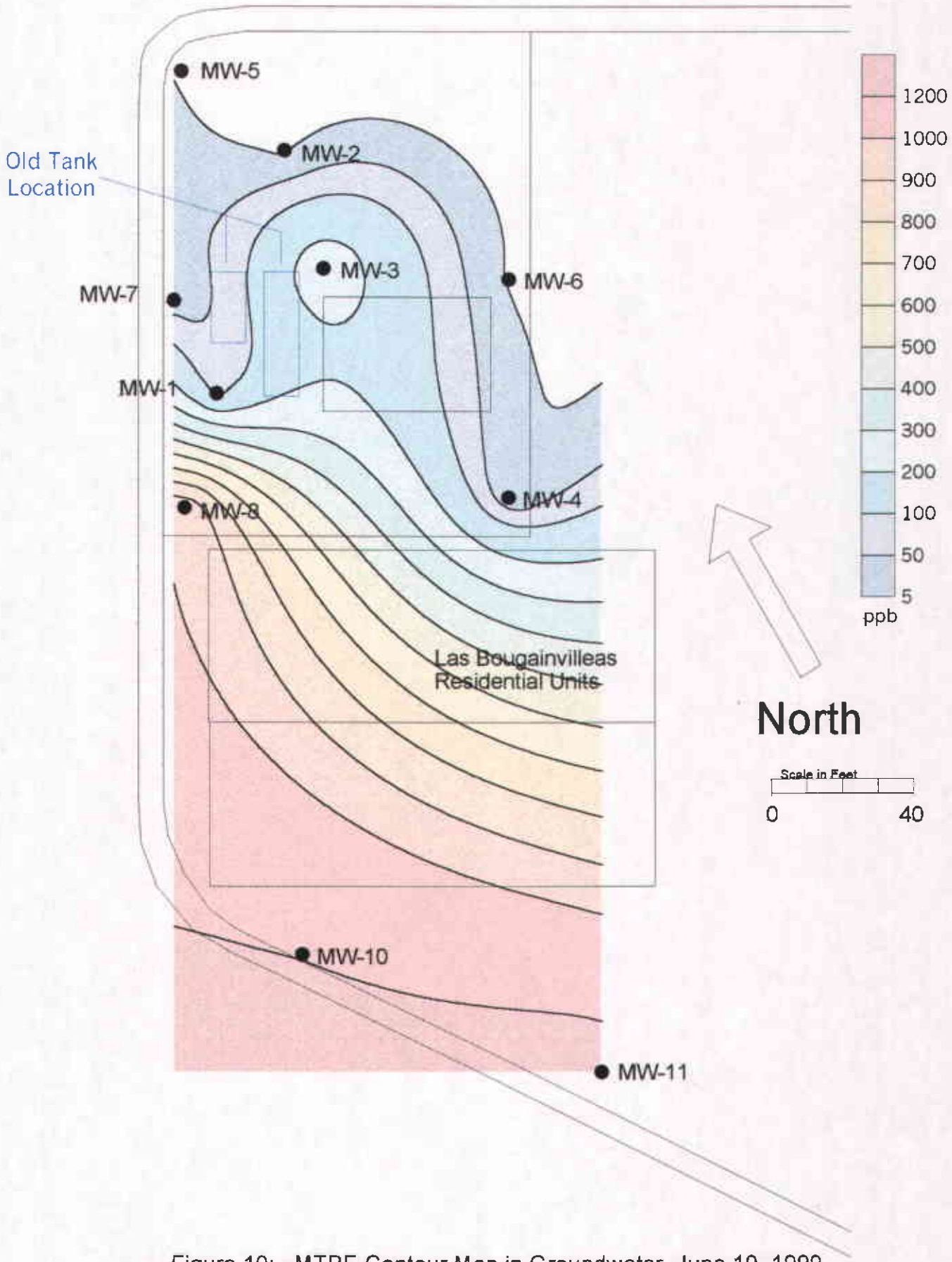

Figure 10: MTBE Contour Map in Groundwater, June 10, 1999

TABLES

Table 1
Water Level Elevations
Tony's Express
Oakland, California

Date	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-10	MW-11
Jun.99	**86.89**	**87.34**	**85.98**	**86.55**	**87.54**	**86.87**	**87.13**	**86.45**	**84.59**	**84.44**
Mar.99	88.08	90.98	89.34	89.39	91.31	90.37	90.83	89.67	87.24	87.13
Dec.98	86.89	87.64	86.23	86.72	87.84	87.17	87.31	86.50	84.35	84.36
Sep.98	84.41	85.00	83.10	84.21	85.22	84.67	84.74	84.23	82.61	82.70
Dec.97	88.69	89.54		88.42	89.89	89.47	89.18	88.30	85.76	85.54
Apr.97	86.85	87.18	86.05	86.62	87.69	87.01	84.88	84.30	84.47	84.47
Dec.96	86.32	86.91	85.76	86.27	87.56	86.73	86.86	86.12	84.10	83.95
Apr.96	89.70	90.45	89.02	89.50	90.80	90.01	90.08	89.27		
Jan.96	87.92	88.65	87.23	87.74	89.01	88.22	88.26	87.46		
Oct.95	84.70	85.16	84.87		85.47	84.83	84.88	84.39		
Jun.95	88.46	88.99	87.53							
Mar.95	89.92	90.90	89.09							
Dec.94	88.67	89.98	87.99							
Oct.94	82.60	83.22	81.99							

TABLE 2
Groundwater Chemical Data

8260 for 6/10/99

WELL	DATE	BENZENE (µg/L)	TOLUENE (µg/L)	ETHYL BENZENE (µg/L)	XYLENES (µg/L)	MTBE (µg/L)	TPH-g (µg/L)
MW-1	**6/10/99**	**1110**	**1460**	**1330**	**5265**	**77**	**25000**
	3/16/99	480	860	850	3000	190	17000
	12/16/98	2500	2400	2300	9500	160	65000
	12/30/97	2300	2100	1400	5100	NA	27000
	4/10/97	NA	NA	NA	NA	NA	NA
	12/9/96	NA	NA	NA	NA	NA	NA
	4/3/96	98	120	63	170	NA	31000
	1/3/96	71	73	50	120	NA	30000
	10/2/95	140	130	140	390	NA	59000
	6/5/95	950	650	570	150	NA	21000
	3/6/95	190	160	150	490	NA	32000
	12/2/94	3800	6600	2300	11000	NA	80000
	10/5/94	24000	21000	2600	15000	NA	320000
MW-2	**6/10/99**	**290**	**428**	**211**	**744**	**ND**	**3500**
	3/16/99	730	830	610	1900	55	7600
	12/16/98	1400	1600	880	9500	<5	26000
	9/29/98	290	180	160	360	<0.5	29000
	6/30/98	2000	2000	1300	4300	NA	25000
	12/30/97	4900	4900	1600	7000	NA	35000
	4/10/97	150	110	37	0.12	ND	53000
	12/9/96	11	7	2	14	ND	6200
	4/3/96	0.1	92	44	13	NA	27000
	1/3/96	160	130	93	240	NA	46000
	10/2/95	160	130	93	240	NA	46000
	6/5/95	220	330	350	660	NA	8000
	3/6/95	3	3	3	1	NA	490
	12/2/94	1700	2200	1200	3600	NA	42000
	10/5/94	17000	19000	570	10000	NA	260000
MW-3	**6/10/99**	**8245**	**6425**	**1015**	**7173**	**274**	**46000**
	3/16/99	4100	6400	1000	6100	470	45000
	12/16/98	5700	3900	1200	6300	410	51000
	9/29/98	35000	8800	2600	1400	450	83000
	6/30/98	2000	1900	900	4600	NA	3300
	4/10/97	130	120	38	120	ND	54000
	12/9/96	320	280	90	250	ND	54000
	4/3/96	310	260	89	280	NA	70000
	1/3/96	510	410	210	650	NA	150000
	10/2/95	510	410	210	65	NA	150000
	6/5/95	20000	42000	5800	36000	NA	350000
	3/6/95	20000	42000	5800	36000	NA	350000

TABLE 2
Groundwater Chemical Data

WELL	DATE	BENZENE (µg/L)	TOLUENE (µg/L)	ETHYL BENZENE (µg/L)	XYLENES (µg/L)	MTBE (µg/L)	TPH-g (µg/L)
	12/2/94	19000	22000	4400	28000	NA	250000
	10/5/94	190000	740000	310000	130000	NA	3000000
MW-4	**6/10/99**	**298**	**44.3**	**18.5**	**63.7**	**13.3**	**1000**
	3/16/99	200	35	19	56	11	600
	12/16/98	590	33	28	94	24	1400
	9/29/98	910	77	68	200	18	6200
	6/30/98	780	160	54	200	NA	1700
	12/30/97	410	270	100	1500	NA	2300
	4/10/97	ND	ND	ND	ND	ND	ND
	12/9/96	14	6	4	12	ND	4000
	4/3/96	12	8	5	14	NA	1900
	1/3/96	230	110	10	29	NA	9300
	10/2/95	23	11	10	29	NA	9300
MW-5	**6/10/99**	**3.55**	**2.84**	**6.01**	**3.52**	**ND**	**270**
	3/16/99	3	0.6	16	2	9.5	650
	12/16/98	1	0.6	ND	2	ND	1400
	9/29/98	2	1	3	3	<.5	270
	6/30/98	<5	<5	15	<10	NA	400
	12/30/97	82	66	59	160	NA	790
	4/10/97	NA	NA	NA	NA	NA	NA
	12/9/96	NA	NA	NA	NA	NA	NA
	4/3/96	1	1	5	4	NA	780
	1/3/96	1	1	4	5	NA	1500
	10/2/95	1	1	4	5	NA	1500
MW-6	**6/10/99**	**2060**	**1650**	**735**	**3170**	**ND**	**18500**
	3/16/99	3900	4300	1600	7000	180	37000
	12/16/98	3800	4600	1400	6400	360	54000
	6/30/98	3100	4300	1300	4900	NA	28000
	4/10/97	60	70	24	71	ND	29000
	12/9/96	480	450	160	460	ND	57000
	4/3/96	140	110	62	170	NA	48000
	1/3/96	350	310	200	610	NA	120000
	10/2/95	350	310	200	610	NA	120000
MW-7	**6/10/99**	**2.97**	**6.91**	**4.07**	**2.92**	**26.3**	**320**
	3/16/99	3	0.7	1	1	62	300
	12/16/98	5	10	5	20	160	990
	9/29/98	1	0.6	1	2	68	1800
	6/30/98	4	<5	9	<10	NA	620

TABLE 2
Groundwater Chemical Data

WELL	DATE	BENZENE (µg/L)	TOLUENE (µg/L)	ETHYL BENZENE (µg/L)	XYLENES (µg/L)	MTBE (µg/L)	TPH-g (µg/L)
	12/30/97	130	98	75	200	NA	1400
	4/10/97	NA	NA	NA	NA	NA	NA
	12/9/96	NA	NA	NA	NA	NA	NA
	4/3/96	2	3	5	7	NA	1900
	1/3/96	9	12	17	45	NA	3300
	10/2/95	10	12	17	NA	3300	NA
MW-8	**6/10/99**	**3610**	**1635**	**2175**	**5913**	**988**	**39500**
	3/16/99	1800	470	2000	2000	820	22000
	12/16/98	6300	1700	2200	4400	1300	61000
	6/30/98	4600	2800	3500	7300	NA	54000
	12/30/97	6000	1600	2100	4700	NA	28000
	4/10/97	86	55	50	100	ND	24000
	12/9/96	88	43	44	80	ND	27000
	4/3/96	250	170	140	330	NA	58000
	1/3/96	310	250	180	480	NA	94000
	10/2/95	310	250	180	480	NA	94000
MW-9	6/30/98	3700	60	980	420	NA	8900
MW-10	**6/10/99**	**1168**	**34**	**264**	**154**	**1195**	**4200**
	3/16/99	15	28	420	250	2800	4100
	12/16/98	3800	51	790	420	1800	8700
	9/29/98	5400	66	970	620	2600	9900
	12/30/97	5300	76	1100	780	NA	10000
	4/10/97	21	9	3	3	ND	1000
	12/9/96	8	2	2	7	ND	3000
MW-11	**6/10/99**	**1240**	**34.5**	**290**	**159**	**1291**	**4600**
	3/16/99	30	6	53	84	8	710
	12/16/98	27	4	25	33	>0.5	650
	9/29/98	7	0.6	4	9	22	170
	6/30/98	45	24	71	100	NA	1100
	12/30/97	66	97	59	190	NA	710
	4/10/97	ND	ND	ND	ND	ND	ND

TABLE 3
Groundwater Chemical Data

WELL	DATE	Nitrate (mg/L)	Sulfate (mg/L)	Ferrous Iron (mg/L)	Dissolved Oxygen (mg/L)
MW-1	**6/10/99**	**0**	**1**	**3.17**	**0.14**
	12/30/97	<0.1	<1	3.04	0.5
MW-2	**6/10/99**	**0.7**	**40**	**0.55**	**0.44**
	6/30/98	<0.1	14	0.5	3.2
	12/30/97	<0.1	<1	3.35	<0.1
MW-3	**6/10/99**	**0**	**0**	**3.1**	**0.42**
	6/30/98	0.1	77	0.37	2
MW-4	**6/10/99**	**0.4**	**10**	**0.81**	**0.15**
	6/30/98	0.9	7	0.93	1.3
	12/30/97	4.5	42	0.39	<0.1
MW-5	**6/10/99**	**2.5**	**33**	**0.34**	**0.25**
	6/30/98	1.6	6	0.5	0.6
	12/30/97	**0.3**	**18**	**0.94**	**<0.1**
MW-6	**6/10/99**	**0**	**23**	**2.52**	**0.61**
	6/30/98	0.7	4	0.4	2.5
	12/30/97	<0.1	5	0.3	<0.1
MW-7	**6/10/99**	**0**	**22**	**0.19**	**0.15**
	6/30/98	0.5	4	0.78	1
	12/30/97	0.2	32	0.23	1.2
MW-8	**6/10/99**	**0**	**0**	**4.7**	**0.1**
	6/30/98	<0.1	3	2.82	1.3
	12/30/97	0.1	<1	3.35	2.5
MW-10	**6/10/99**	**0**	**0**	**0.25**	**0.2**
	6/30/98	<0.1	<1	0.38	0.9
	12/30/97	0.3	<1	2.21	<0.1
MW-11	**6/10/99**	**0**	**0**	**0.28**	**0.19**
	6/30/98	1.2	6	0.15	2.2
	12/30/97	3.5	35	0.32	<0.1

APPENDIX A

FIELD NOTES, LABORATORY REPORTS AND CHAIN OF CUSTODY FORMS

ENVIRONMENTAL ENGINEERING, INC

PROJECT NO: 2330
DATE: 6/10
DEPTH OF WELL: 29.7
DEPTH TO WATER: 11.1
HEIGHT OF WATER: 18.6
CASING DIAMETER: 2"
PURGED VOLUME: 10 G

WELL NO: MW-1
SAMPLER: Naser Parrow
Bryce Scofield

PURGING METHOD: BAILER ☐ PUMP ☑

SAMPLING METHOD: BAILER ☑ PUMP ☐

SHEEN: YES ☐ NO ☑ DESCRIBE----------
ODOR: YES ☑ NO ☐ DESCRIBE: Slight

Did not dry during purging

FIELD MEASUREMENTS

TIME	VOL.	D.O.	Fe^{+2}	Redox	NO_3-N	SO_4^{-2}	pH	TEMP	E.C.
	L	mg/L	mg/L	mv	mg/L	mg/L	unit	°C	µs/cm
9125		0.14	3.17		0.0	1.0	6.48	19.3	866

ENVIRONMENTAL ENGINEERING, INC

PROJECT NO: 2330
DATE: 6/10/99
DEPTH OF WELL: 30.0
DEPTH TO WATER: 11.24
HEIGHT OF WATER: 18.76
CASING DIAMETER: 4"
PURGED VOLUME: 37G

WELL NO: MW-2
SAMPLER: Naser Parkou
Bryce Scofield

PURGING METHOD: BAILER ☐ PUMP ☑

SAMPLING METHOD: BAILER ☑ PUMP ☐

SHEEN: YES ☐ NO ☑ DESCRIBE----------
ODOR: YES ☑ NO ☐ DESCRIBE slight.

FIELD MEASUREMENTS

TIME	VOL.	D.O.	Fe^{+2}	Redox	NO_3-N	SO_4^{-2}	pH	TEMP	E.C.
	L	mg/L	mg/L	mv	mg/L	mg/L	unit	°C	µs/cm
12:20		0.44 *	0.55		0.7	40.0 **	6.95	20.1	711

* oxygenated by air sparging 1998

** Ammonium Sulphate was added 1998

ENVIRONMENTAL ENGINEERING, INC

PROJECT NO:----------

DATE:----6/10/99----------

DEPTH OF WELL:----29.75----

DEPTH TO WATER:----11.80----

HEIGHT OF WATER:----17.95----

CASING DIAMETER:----4"----

PURGED VOLUME:----35 G----

WELL NO:--MW-3--

SAMPLER:--Naser Pakroo
Bryce Scofield

PURGING METHOD: BAILER ☉ PUMP ☑

SAMPLING METHOD: BAILER ☑ PUMP ☐

SHEEN: YES ☐ NO ☑ DESCRIBE----------

ODOR: YES ☑ NO ☐ DESCRIBE----Strong----

Did not dry during Purging

FIELD MEASUREMENTS

TIME	VOL.	D.O.	Fe^{+2}	Redox	NO_3-N	SO_4^{-2}	pH	TEMP	E.C.
	L	mg/L	mg/L	mv	mg/L	mg/L	unit	°C	µs/cm
1.00		*0.42	3.1		0.0	0.0	6.48	19.3	926
			Limit						

* oxygenated by air sparging 1998

D.F
10 → 100
10

Reading 0.31 X 10 = 3.1

ENVIRONMENTAL ENGINEERING, INC

PROJECT NO: 1330 WELL NO: MW-4

DATE: 6/10/99 SAMPLER:

DEPTH OF WELL: 24.34

DEPTH TO WATER: 11.30

HEIGHT OF WATER: 13.04

CASING DIAMETER: 2"

PURGED VOLUME: 7.06

PURGING METHOD: BAILER [•] PUMP [✓]

SAMPLING METHOD: BAILER [✓] PUMP [ ]

SHEEN: YES [ ] NO [✓] DESCRIBE----------

ODOR: YES [✓] NO [ ] DESCRIBE---slight

Did not dry during purging

FIELD MEASUREMENTS

TIME	VOL.	D.O.	Fe^{+2}	Redox	NO_3-N	SO_4^{-2}	pH	TEMP	E.C.
	L	mg/L	mg/L	mv	mg/L	mg/L	unit	^0C	µs/cm
10:40		0.15	0.81		0.40	10.0	6.51	18.2	656

ENVIRONMENTAL ENGINEERING, INC

PROJECT NO: 2330 WELL NO: MW-5

DATE: 6/10/99 SAMPLER:

DEPTH OF WELL: 26.88

DEPTH TO WATER: 11.55

HEIGHT OF WATER: 14.43

CASING DIAMETER: 2"

PURGED VOLUME: 7.06

PURGING METHOD: BAILER ☐ PUMP ☑

SAMPLING METHOD: BAILER ☑ PUMP ☐

SHEEN: YES ☐ NO ☑ DESCRIBE:

ODOR: YES ☑ NO ☐ DESCRIBE: slight

Did not dry during Purging

FIELD MEASUREMENTS

TIME	VOL.	D.O.	Fe^{+2}	Redox	NO_3-N	SO_4^{-2}	pH	TEMP	E.C.
	L	mg/L	mg/L	mv	mg/L	mg/L	unit	°C	µs/cm
11:50		0.25	0.34		2.5	33.0	6.59	19.7	668

ENVIRONMENTAL ENGINEERING, INC

PROJECT NO: 2330
DATE: 6/10/99
DEPTH OF WELL: 24.54
DEPTH TO WATER: ~~10~~ 11.90
HEIGHT OF WATER: ~~12.64~~
CASING DIAMETER: 2"
PURGED VOLUME: ~~6.5~~

WELL NO: MW-6
SAMPLER: Naser Pakrou
Bryce Scofield

PURGING METHOD: BAILER ☐ PUMP ☑

SAMPLING METHOD: BAILER ☑ PUMP ☐

SHEEN: YES ☐ NO ☑ DESCRIBE----------
ODOR: YES ☑ NO ☐ DESCRIBE Slight

Did not dry during Purging

FIELD MEASUREMENTS

TIME	VOL.	D.O.	Fe^{+2}	Redox	NO_3-N	SO_4^{-2}	pH	TEMP	E.C.
	L	mg/L	mg/L	mv	mg/L	mg/L	unit	°C	µs/cm
2:0		0.61	2.52		0.0	23.0	6.52	19.1	687

ENVIRONMENTAL ENGINEERING, INC

PROJECT NO: 2330
DATE: 6/10/99
DEPTH OF WELL: 24.60
DEPTH TO WATER: 10.70
HEIGHT OF WATER: 13.90
CASING DIAMETER: 2"
PURGED VOLUME: 7.6

WELL NO: MW-7
SAMPLER: Naser Pakiou
Bryce Scofield

PURGING METHOD: BAILER ☐ PUMP ☑

SAMPLING METHOD: BAILER ☑ PUMP ☐

SHEEN: YES ☐ NO ☑ DESCRIBE----------
ODOR: YES ☑ NO ☐ DESCRIBE---Slight---

Did not dry during Purging

FIELD MEASUREMENTS

TIME	VOL.	D.O.	Fe^{+2}	Redox	NO_3-N	SO_4^{-2}	pH	TEMP	E.C.
	L	mg/L	mg/L	mv	mg/L	mg/L	unit	°C	µs/cm
11:30		0.15	0.19		0.0	22.0	6.42	19.4	507

ENVIRONMENTAL ENGINEERING, INC

PROJECT NO: 2330
DATE: 6/10/99
DEPTH OF WELL: 26.34
DEPTH TO WATER: ~~10.80~~
HEIGHT OF WATER: ~~15.54~~
CASING DIAMETER: 2"
PURGED VOLUME: ~~8.06~~

WELL NO: MW-8
SAMPLER: Naser Pakrou
Bryce Scofield

PURGING METHOD: BAILER ☐ PUMP ☑

SAMPLING METHOD: BAILER ☑ PUMP ☐

SHEEN: YES ☐ NO ☑ DESCRIBE----------
ODOR: YES ☑ NO ☐ DESCRIBE: Slight

Did not dry during purging

FIELD MEASUREMENTS

TIME	VOL.	D.O.	Fe^{+2}	Redox	NO_3-N	SO_4^{-2}	pH	TEMP	E.C.
	L	mg/L	mg/L	mv	mg/L	mg/L	unit	°C	µs/cm
9:50		0.10	3.3		0.0	0.0	6.42	19.0	966
			limit 4.70						

Dilution for Fe

20 $\xrightarrow{D.F}{5}$ 100

0.94 × 5 = 4.70 mg/L

ENVIRONMENTAL ENGINEERING, INC

PROJECT NO: 2330
DATE: 6/10/99
DEPTH OF WELL: 24.35
DEPTH TO WATER: 9.95
HEIGHT OF WATER: 14.40
CASING DIAMETER: 2"
PURGED VOLUME: 7.0 G

WELL NO: MW-10
SAMPLER: Naser Parrou
Bryce Scofield

PURGING METHOD: BAILER ☐ PUMP ☑

SAMPLING METHOD: BAILER ☑ PUMP ☐

SHEEN: YES ☐ NO ☑ DESCRIBE----------
ODOR: YES ☐ NO ☑ DESCRIBE----------

Did not dry during Purging

FIELD MEASUREMENTS

TIME	VOL.	D.O.	Fe^{+2}	Redox	NO_3-N	SO_4^{-2}	pH	TEMP	E.C.
	L	mg/L	mg/L	mv	mg/L	mg/L	unit	°C	µs/cm
~~2:50~~		0.2	0.25		0.0	0.0	6.59	19.4	690
2:30									

ENVIRONMENTAL ENGINEERING, INC

PROJECT NO: 2330
DATE: 6/10/99
DEPTH OF WELL: 24.30
DEPTH TO WATER: 11.50
HEIGHT OF WATER: 12.80
CASING DIAMETER: 2"
PURGED VOLUME: 6.56

WELL NO: MW-11
SAMPLER: Nasser Pakrou
Bryce Scofield

PURGING METHOD: BAILER ☐ PUMP ☑

SAMPLING METHOD: BAILER ☑ PUMP ☐

SHEEN: YES ☐ NO ☑ DESCRIBE----------
ODOR: YES ☐ NO ☑ DESCRIBE----------

Did not dry during Purging

FIELD MEASUREMENTS

TIME	VOL.	D.O.	Fe^{+2}	Redox	NO_3-N	SO_4^{-2}	pH	TEMP	E.C.
	L	mg/L	mg/L	mv	mg/L	mg/L	unit	^0C	µs/cm
2:40		0.19	0.28		0.9	0.0	6.64	18.1	565
Repeated		304=				0.0			

WATER • WASTE WATER • HAZARDOUS WASTE • FUEL • AIR • SOIL

DELTA ENVIRONMENTAL LABORATORIES, Ltd

SOMA
2680 Bishop Drive, Suite 203
San Ramon, CA 94583

Attention: Dr. M Sepehr

Ref.:	R4166400
Method	5030 GCFID/ 8020
Sampled:	6/10/99
Received:	6/11/99
Matrix:	Water
Analyzed:	6/17-23/99
Reported:	6/23/99
Units:	ug/L
Analyst	DS

Laboratory Results for TPH + BTEX + MTBE Analysis

Analyte	EPA Method	Detection Limit ug/L	Results Sample ID			
			MW-01	MW-02	MW-03	MW-04
BTEX						
Benzene	8020	0.5	1110	290	8245	298
Toluene	8020	0.5	1460	428	8425	44.3
Ethylbenzene	8020	0.5	1330	211	1015	18.5
Total-Xylene	8020	0.5	5265	744	7173	63.7
MTBE	8020 *	5	1915	64.6	1255	78.2
MTBE	8260	5	77.0	ND	274	13.3
TPH-g	5030/GCFID	50	25000	3500	46000	1000

ND:Not Detected(<MDL)
* The results of MTBE by 8020 represent hydrocarbons within the MTBE range, So the results reported from EPA 8260 should be used to evaluate MTBE contamination level.

Delta Environmental Laboratories

Hossein Khosh Khoo, Ph.D.

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DELTA ENVIRONMENTAL LABORATORIES, Ltd

SOMA
2680 Bishop Drive, Suite 203
San Ramon, CA 94583

Attention: Dr. M Sepehr

Ref.:	R4166401
Method	5030 GCFID/ 8020
Sampled:	6/10/99
Received:	6/11/99
Matrix:	Water
Analyzed:	6/17-23/99
Reported:	6/23/99
Units:	ug/L
Analyst	DS

Laboratory Results for TPH + BTEX + MTBE Analysis

Analyte	EPA Method	Detection Limit ug/L	Results Sample ID			
			MW-05	MW-06	MW-07	MW-08
BTEX						
Benzene	8020	0.5	3.55	2060	2.97	3610
Toluene	8020	0.5	2.84	1650	6.91	1635
Ethylbenzene	8020	0.5	6.01	735	4.07	2175
Total-Xylene	8020	0.5	3.52	3170	2.92	5913
MTBE	8020 *	5	26.6	1500	28.4	4075
MTBE	8260	5	ND	ND	26.3	988
TPH-g	5030/GCFID	50	270	18500	320	39500

ND:Not Detected(<MDL)
* The results of MTBE by 8020 represent hydrocarbons within the MTBE range, So the results reported from EPA 8260 should be used to evaluate MTBE contamination level.

Delta Environmental Laboratories

Hossein Khosh Khoo, Ph.D.

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DELTA ENVIRONMENTAL LABORATORIES, Ltd

SOMA
2680 Bishop Drive, Suite 203
San Ramon, CA 94583

Ref.:	R4166402
Method	5030 GCFID/ 8020
Sampled:	6/10/99
Received:	6/11/996
Matrix:	Water
Analyzed:	6/17-23/99
Reported:	6/23/99
Units:	ug/L
Analyst	DS

Attention: Dr. M Sepehr

Laboratory Results for TPH + BTEX + MTBE Analysis

Analyte	EPA Method	Detection Limit ug/L	Results Sample ID	
			MW-10	MW-11
BTEX				
Benzene	8020	0.5	1168	1240
Toluene	8020	0.5	34.0	34.5
Ethylbenzene	8020	0.5	284	280
Total-Xylene	8020	0.5	164	159
MTBE	8020 *	5	1468	1585
MTBE	8260	5	1195	1291
TPH-g	5030/GCFID	50	4200	4500

ND:Not Detected(<MDL)
* The results of MTBE by 8020 represent hydrocarbons within the MTBE range, So the results reported from EPA 8260 should be used to evaluate MTBE contamination level.

Delta Environmental Laboratories

Hossein Khosh Khoo, Ph.D.

Chain of Custody (COC) Form

685 Stone Road #11 & 12
Benicia, Ca. 94510
(707) 747-6081, 800-747-6082 FAX (707) 747-6082

Results to:
Client Name SOMA
Address 2680 Bishop Drive, Suite 203
City San Ramon, CA 94583
Telephone 925 244-6600 Fax: 925 244 6601
SAMPLER (signature) Naser Pakiou
Turnaround Time Normal

Project Name
LAB ID 4166
Ref #

Analysis Requested

Special Instructions:

#	Sample ID	Date	Time	Matrix	No. of containers	pH	Temperature	TPHD	BTEX	MTBE 8020/8260	Comments
1	MW-01	6/10	9:25	water	2			✓	✓	✓	Run 8020, Confirm Peaks
2	MW-02	6/10	2:20	"	6			✓	✓	✓	with 8260
3	MW-03	6/10	1:0	"	6			✓	✓	✓	"
4	MW-04	6/10	10:40	"	6			✓	✓	✓	"
5	MW-05	6/10	11:50	"	6			✓	✓	✓	"
6	MW-06	6/10	2:0	"	6			✓	✓	✓	"
7	MW-07	6/10	11:30	"	6			✓	✓	✓	"
8	MW-08	6/10	9:50	"	6			✓	✓	✓	"
9	MW-10	6/10	2:30	"	6			✓	✓	✓	"
10	MW-11	6/10	2:40	"	6			✓	✓	✓	

Relinquished by: Naser Pakiou Date 6/11/99
Received By: Date
Relinquished by: Date
Received By: Date 6/11/99

1) Have all samples received been stored on ice? Y
2) Did any VOA samples received have any head space? N
3) Were samples in appropriate containers and packaged properly? Y
4) Were samples received in good condition? Y

For Lab Use Only:

EI

1 800 648 - 9355

EI - Concord

510 686 - 9474

OXYGEN SOLUBILITY AND CALIBRATION VALUE TABLES

TABLE A — Solubility of Oxygen in mg/L in Water Exposed to Air at 760 mm Hg Pressure

Solubility ↑

Temp °C	Chlorinity: 0 Salinity: 0	5.0 9.0	10.0 18.1	15.0 27.1	20.0 36.1	25.0 45.2
0.0	14.62	13.73	12.89	12.10	11.36	10.66
1.0	14.22	13.36	12.55	11.78	11.07	10.39
2.0	13.83	13.00	12.22	11.48	10.79	10.14
3.0	13.46	12.66	11.91	11.20	10.53	9.90
4.0	13.11	12.34	11.61	10.92	10.27	9.66
5.0	12.77	12.02	11.32	10.66	10.03	9.44
6.0	12.45	11.73	11.05	10.40	9.80	9.23
7.0	12.14	11.44	10.78	10.16	9.58	9.02
8.0	11.84	11.17	10.53	9.93	9.36	8.83
9.0	11.56	10.91	10.29	9.71	9.16	8.64
10.0	11.29	10.66	10.06	9.49	8.96	8.45
11.0	11.03	10.42	9.84	9.29	8.77	8.28
12.0	10.78	10.18	9.62	9.09	8.59	8.11
13.0	10.54	9.96	9.42	8.90	8.41	7.95
14.0	10.31	9.75	9.22	8.72	8.24	7.79
15.0	10.08	9.54	9.03	8.54	8.08	7.64
16.0	9.87	9.34	8.84	8.37	7.92	7.50
17.0	9.67	9.15	8.67	8.21	7.77	7.36
18.0	9.47	8.97	8.50	8.05	7.62	7.22
19.0	9.28	8.79	8.33	7.90	7.48	7.09
20.0	9.09	8.62	8.17	7.75	7.35	6.96
21.0	8.92	8.46	8.02	7.61	7.21	6.84
22.0	8.74	8.30	7.87	7.47	7.09	6.72
23.0	8.58	8.14	7.73	7.34	6.96	6.61
24.0	8.42	7.99	7.59	7.21	6.84	6.50
25.0	8.26	7.85	7.46	7.08	6.73	6.39
26.0	8.11	7.71	7.33	6.96	6.62	6.29
27.0	7.97	7.58	7.20	6.85	6.51	6.18
28.0	7.83	7.44	7.08	6.73	6.40	6.09
29.0	7.69	7.32	6.96	6.62	6.30	5.99
30.0	7.56	7.19	6.85	6.51	6.20	5.90
31.0	7.43	7.07	6.73	6.41	6.10	5.81
32.0	7.31	6.96	6.62	6.31	6.01	5.72
33.0	7.18	6.84	6.52	6.21	5.91	5.63
34.0	7.07	6.73	6.42	6.11	5.82	5.55
35.0	6.95	6.62	6.31	6.02	5.73	5.46
36.0	6.84	6.52	6.22	5.93	5.65	5.38
37.0	6.73	6.42	6.12	5.84	5.56	5.31
38.0	6.62	6.32	6.03	5.75	5.48	5.23
39.0	6.52	6.22	5.93	5.66	5.40	5.15
40.0	6.41	6.12	5.84	5.58	5.32	5.08
41.0	6.31	6.03	5.75	5.49	5.24	5.01
42.0	6.21	5.93	5.67	5.41	5.17	4.93
43.0	6.12	5.84	5.58	5.33	5.09	4.86
44.0	6.02	5.75	5.50	5.25	5.02	4.79
45.0	5.93	5.67	5.41	5.17	4.94	4.72

TABLE B — Calibration Values for Various Atmospheric Pressures and Altitudes

PRESSURE		ALTITUDE			CORRECTION
in. Hg	mm Hg	kPa	Feet	m	FACTOR (%)
30.23	768	102.3	-276	-84	101
29.92	760	101.3	0	0	100
29.61	752	100.3	278	85	99
29.33	745	99.3	558	170	98
29.02	737	98.3	841	256	97
28.74	730	97.3	1126	343	96
28.43	722	96.3	1413	431	95
28.11	714	95.2	1703	519	94
27.83	707	94.2	1995	608	93
27.52	699	93.2	2290	698	92
27.24	692	92.2	2587	789	91
26.93	684	91.2	2887	880	90
26.61	676	90.2	3190	972	89
26.34	669	89.2	3496	1066	88
26.02	661	88.2	3804	1160	87
25.75	654	87.1	4115	1254	86
25.43	646	86.1	4430	1350	85
25.12	638	85.1	4747	1447	84
24.84	631	84.1	5067	1544	83
24.53	623	83.1	5391	1643	82
24.25	616	82.1	5717	1743	81
23.94	608	81.1	6047	1843	80
23.62	600	80.0	6381	1945	79
23.35	593	79.0	6717	2047	78
23.03	585	78.0	7058	2151	77
22.76	578	77.0	7401	2256	76
22.44	570	76.0	7749	2362	75
22.13	562	75.0	8100	2469	74
21.85	555	74.0	8455	2577	73
21.54	547	73.0	8815	2687	72
21.26	540	71.9	9178	2797	71
20.94	532	70.9	9545	2909	70
20.63	524	69.9	9917	3023	69
20.35	517	68.9	10293	3137	68
20.04	509	67.9	10673	3253	67
19.76	502	66.9	11058	3371	66