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

November 30, 1999

Project 99-2331

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

Prepared by

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1.0 INTRODUCTION

This report presents the results of fourth 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 programs have indicated elevated levels of petroleum hydrocarbons in the 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 fourth quarter of 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's 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. Three double-walled USTs replaced these tanks. 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 methyl tertiary butyl ether (MTBE) in the groundwater. The historical groundwater elevation data, total petroleum hydrocarbons as gasoline (TPHg), benzene, toluene, ethlybenzene, xylenes, (BTEX) and MTBE concentrations reported by STE and WEGE are included in Table-1 and Table-2.

In April 1999, Mr. Razi retained SOMA to conduct groundwater monitoring, risk based corrective action (RBCA), corrective action plan (CAP) and soil and groundwater remediation at the Site. The results of RBCA study indicated that the site is a high risk area, therefore, the soil and groundwater in on and off-site areas need to be remediated. The results of CAP study indicated that installation of a French Drain along with air sparging technique is a cost effective alternative for site remediation.

In late August 1999, SOMA installed a French Drain and initiated a groundwater treatment system to prevent further migration of chemically impacted

groundwater. Currently, the treatment system is completed and awaiting necessary permits for operation. It is expected that full operation will be started in early December 1999.

On November 2, 1999, HEW Drilling, a subcontractor of SOMA, drilled one boring at BART's property and converted it into a monitoring well (MW-12). Figure 2 shows the location of existing wells and monitoring well MW-12. During the drilling operation, relatively undisturbed soil samples and a grab groundwater were collected. The results of chemical analyses of the samples indicated that petroleum hydrocarbon chemicals have reached to MW-12. The soil sample collected at a depth of 15 feet (zone of water fluctuation) was found to be impacted with 480 μg/kg TPHg. The grab groundwater sample was found to be impacted with 26.8 μg/L benzene, 8.3 μg/L toluene, 250 μg/L MTBE and 1,110 μg/L TPH-g. During this monitoring event MW-12 was also monitored.

1.2 SITE HYDROGEOLOGY

Based on the results of previous investigations, groundwater was encountered at depths ranging between 10 and 11 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 are presented in Table 1. The groundwater elevation contour map based on the recent water levels measured in November 9, 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 ranges between 1.5 and 18.3 feet per 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 November 9, 1999, SOMA field crew measured depth to groundwater in the monitoring wells from the top of casings to the nearest 0.01 foot using an electrical 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 12 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. Each groundwater monitoring well was purged using a 2-inch diameter submersible pump of "ES-60 DC". Groundwater samples were collected using disposable bailers. Each groundwater sample was transferred into two 40-ml VOA vials and sealed properly to prevent developing any air bubbles within the headspace area. The groundwater samples were placed in an ice chest and delivered to Delta Environmental Laboratories of Benicia, California for analysis.

The groundwater samples were also used 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. and temperature 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 and temperature 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-phenanthroline 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 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 units 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 TPH –g, BTEX and 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. Depths to watertable are recorded in the field notes (Appendix A) and ranged between 12.5 and 14.75 feet. In comparison with the previous event the water level elevations dropped between 0.45 and 1.19 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 19 ^{0}C and 21 ^{0}C. The variation in temperature may reflect the changes in air temperature during sampling, see field notes in Appendix A. Temperature measurements allowed us 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 automatically for the recorded temperatures, see Appendix A.

Dissolved oxygen concentration in the groundwater samples ranged between 0.12 mg/L at MW-4 and 0.8 mg/L in MW-2. The low oxygen content may suggest an anaerobic biodegradation process in the groundwater system. Figure-4 shows groundwater D.O. concentration contours in groundwater. The dissolved oxygen measurement was conducted down-hole (in-situ) after purging.

Nitrate was only detected in wells MW-2, MW-4, MW-5 and MW-12 where low levels of petroleum hydrocarbons were detected. More importantly, the concentrations of dissolved oxygen in MW-2 and MW-5 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 55 mg/L. The 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 November 9, 1999.

Ferrous iron concentration in groundwater samples ranged between 0.06 and 8.9 mg/l. High concentration of ferrous iron in groundwater is a good indication of biological activities. Figure-7 shows groundwater ferrous iron concentration measured on November 9, 1999. The presence of higher ferrous iron and absence/lack of electron receptors such as nitrogen, sulfate and dissolved oxygen is indicative of an 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 6.91 and 7.8 pH units. Electrical conductivity ranged between 1,351 μs/cm and 846 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 concentrations of TPH-g were less than the detection limit of 50 μg/l in wells MW-2, MW-4, MW-5 and MW-11 and peaked at 40,000 μg/L in MW-3. Benzene concentrations were below the detection limit of 5 μg/L in wells MW-2, MW-4, MW-5, MW-7, MW-11 and MW-12 and peaked at 3,218 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 <5 μg/L in MW-2, MW-4 MW-5, MW-6, and MW-11 and 1,278 μg/L in MW-10. MTBE concentration

contours in groundwater have been shown in Figure-10.

The historical data of groundwater contamination is presented in Table 2. Overall, chemical concentrations showed a decreasing trend during the recent groundwater monitoring event in all wells but with some exceptions in wells MW-1, MW-6, MW-7 and MW-8. Increasing trends were observed in the concentrations of benzene in MW-1, xylene in MW-1 and MW-6 and MTBE in MW-1, MW-7 and MW-8. During the second quarter groundwater monitoring event in 1999, a high concentration of MTBE was reported in MW-11. However, the results of a field duplicate sample taken during the previous monitoring event and the results of current monitoring event could not verify the presence of MTBE greater than the detection limit of 5 µg/L. Therefore, the previously reported elevated MTBE concentration in MW-11 is considered an anomaly. The results of the duplicate sample of MW-10 (labeled MW-9, see field notes) during our current monitoring event confirmed that this well has been significantly impacted with MTBE.

The results of the current monitoring event confirmed our previous finding, during installation of MW-12, that petroleum hydrocarbon chemicals have reached to MW-12 (see Figure 2). During installation of MW-12 the soil sample collected at a depth of 15' (zone of water fluctuation) was contaminated with 480 µg/kg TPHg. The grab groundwater sample was found to be impacted with 26.8 µg/L benzene, 8.3 µg/L toluene, 250 µg/L MTBE and 1,110 µg/L TPHg. During the current sampling event only MTBE and TPHg with concentrations of 229 and 80 µg/L were found in this well.

4.0 CONCLUSIONS

The results of November 9, 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 have dropped since the previous groundwater monitoring event.

3. Benzene concentrations were ND in 6 out of 11 wells and peaked at 3,218 µg/L in MW-3.

4. The high concentration of MTBE that was reported in the second quarter groundwater monitoring event in MW-11 could not be verified. Therefore, the previously reported elevated MTBE concentration in MW-11 is considered an anomaly.

5. The concentration of MTBE in MW-10 showed a decreasing pattern in comparison with the previous monitoring event. However, MTBE concentrations in on-site wells did not show a consistent decreasing pattern as observed during the previous monitoring event. During the current monitoring event, three monitoring wells of MW-1, MW-7, MW-8 had lower and wells MW-3, MW-4 and MW-6 had higher concentrations of MTBE as compared with the previous monitoring event.

6. During the current sampling event MTBE and TPHg with concentrations of 229 and 80 µg/L were found in well MW-12.

7. 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.

8. Concentration of TPH-g in all groundwater monitoring wells showed a decreasing pattern and dropped to the non-detectable levels in 4 out of 11 wells.

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.

TABLES

Table 1
Groundwater Elevation Data
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	MW-12
Nov-99	**83.54**	**84.48**	**83.08**	**83.75**	**84.74**	**84.02**	**84.58**	**83.60**	**82.04**	**82.09**	**81.64**
Aug.99	84.64	85.08	83.93	84.65	85.49	84.87	85.03	84.50	82.94	83.19	
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

WELL	DATE	BENZENE (µg/L)	TOLUENE (µg/L)	ETHYL-BENZENE (µg/L)	XYLENES (µg/L)	MTBE (µg/L)	TPH-g (µg/L)
MW-1	**11/9/99**	**693**	**15**	**<5**	**3,471**	**49.9**	**10,000**
	8/23/99	678	463	893	2938	37.5	19750
	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	**11/9/99**	**<5**	**<5**	**<5**	**<5**	**<5**	**<50**
	8/23/99	5.65	8.54	4.16	10.9	ND	60
	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	**11/9/99**	**3,218**	**1,319**	**<5**	**6,697**	**126**	**26,000**
	8/23/99	7484	8052	1744	9749	141	64000
	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

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)
	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
	12/2/94	19000	22000	4400	28000	NA	250000
	10/5/94	190000	740000	310000	130000	NA	3000000
MW-4	11/9/99	<5	<5	<5	<5	<5	<50
	8/23/99	497	41	54	145	6.19	660
	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	11/9/99	<5	<5	<5	<5	<5	<50
	8/23/99	ND	3.58	ND	4.04	ND	120
	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	11/9/99	1,084	130	<5	10,940	<5	40,000
	8/23/99	3806	3649	1554	7996	9.89	42000
	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

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)
	12/9/96	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	**11/9/99**	**<5**	**9.35**	**<5**	**<5**	**12.2**	**290**
	8/23/99	5	9.9	ND	ND	ND	570
	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
	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	**11/9/99**	**91.9**	**<5**	**<5**	**3,414**	**769**	**10,500**
	8/23/99	5379	2438	3001	6960	639	58000
	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	**11/9/99**	**1,134**	**20.2**	**<5**	**70.3**	**652**	**2,950**
MW-10#	**11/9/99**	**65.3**	**18.7**	**<5**	**29.2**	**1,278**	**2,580**
	8/23/99	2135	97.2	600.0	248	1800	3250
	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

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)
	12/9/96	8	2	2	7	ND	3000
MW-11	**11/9/99**	**<5**	**<5**	**<5**	**<5**	**<5**	**<50**
	8/23/99	4.2	3.61	ND	6.04	ND	170
	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
MW-12	**11/9/99**	**<5**	**<5**	**<5**	**<5**	**229**	**80**

ND Not Detected

* Abandoned in 1998

\# Duplicate sample of MW-10

TABLE 3
Analytical Results of Groundwater Biodegradation Parameters

WELL	DATE	Nitrate (mg/L)	Sulfate (mg/L)	Ferrous Iron (mg/L)	Dissolved Oxygen (mg/L)
MW-1	**11/9/99**	**0.0**	**26.0**	**5.1**	**0.2**
	8/23/99	0.0	8.0	2.67	1.4
	6/10/99	0	1	3.17	0.14
	12/30/97	<0.1	<1	3.04	0.5
MW-2	**11/9/99**	**0.9**	**55.0**	**1**	**0.8**
	8/23/99	1.0	60.0	0.62	0.7
	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	**11/9/99**	**0.0**	**0.0**	**3.5**	**0.61**
	8/23/99	0.0	0.0	3.9	0.8
	6/10/99	0	0	3.1	0.42
	6/30/98	0.1	77	0.37	2
MW-4	**11/9/99**	**0.5**	**23.0**	**0.99**	**0.12**
	8/23/99	0.5	28	0.67	0.15
	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	**11/9/99**	**2.0**	**32.0**	**0.72**	**0.27**
	8/23/99	2.4	45	1.19	0.75
	6/10/99	2.5	33.0	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	**11/9/99**	**0.0**	**0.0**	**7.0**	**0.22**
	8/23/99	0.0	9.0	3.3	0.55
	6/10/99	0.0	23.0	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	**11/9/99**	**0.0**	**25.0**	**0.99**	**0.14**
	8/23/99	0.0	20.0	1.4	0.65
	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	**11/9/99**	**0.0**	**0.0**	**8.9**	**0.38**
	8/23/99	0.0	13.0	8.2	0.2
	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	**11/9/99**	**0.0**	**12.0**	**0.37**	**0.44**
	8/23/99	0.0	9.0	0.52	0.5

TABLE 3

Analytical Results of Groundwater Biodegradation Parameters

WELL	DATE	Nitrate (mg/L)	Sulfate (mg/L)	Ferrous Iron (mg/L)	Dissolved Oxygen (mg/L)
	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	**11/9/99**	**0.0**	**21.0**	**0.06**	**0.22**
	8/23/99	0	52	0.92	0.6
	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
MW-12	**11/9/99**	**3.1**	**9**	**2.21**	**0.34**

FIGURES

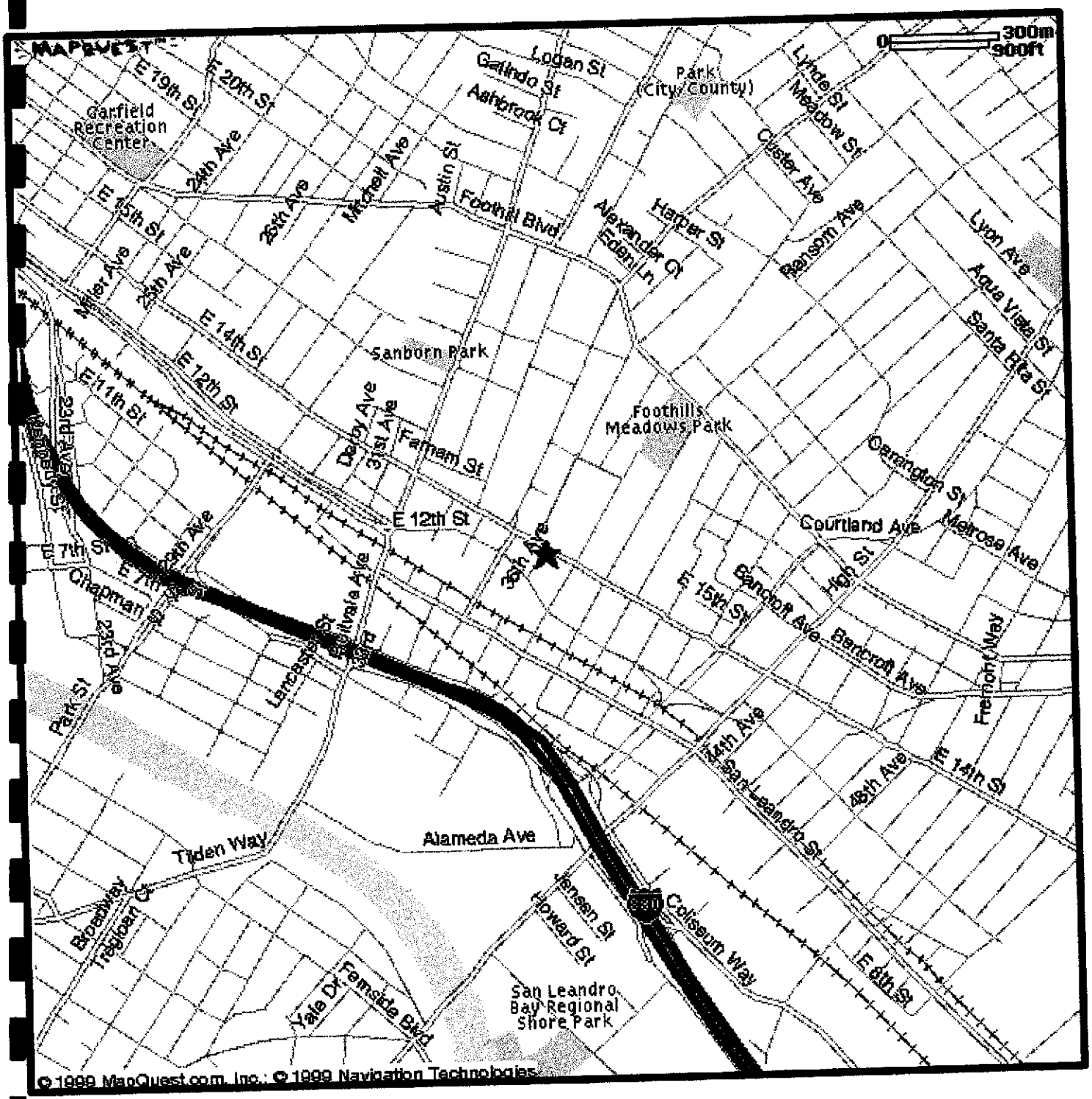

Figure 1: Site Location Map

SOMA
ENVIRONMENTAL ENGINEERING, INC.

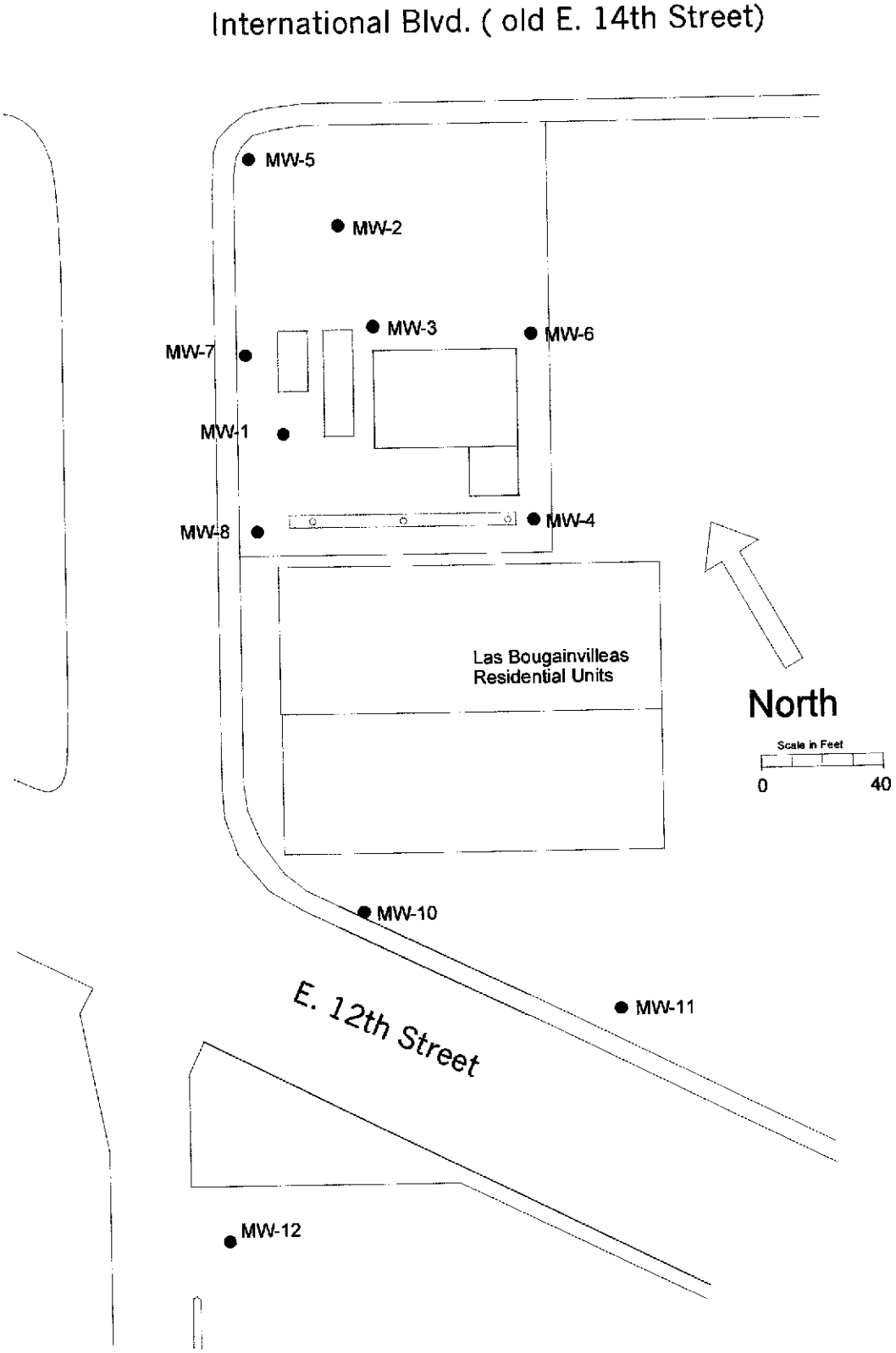

Figure 2: Location of Groundwater Monitoring Wells

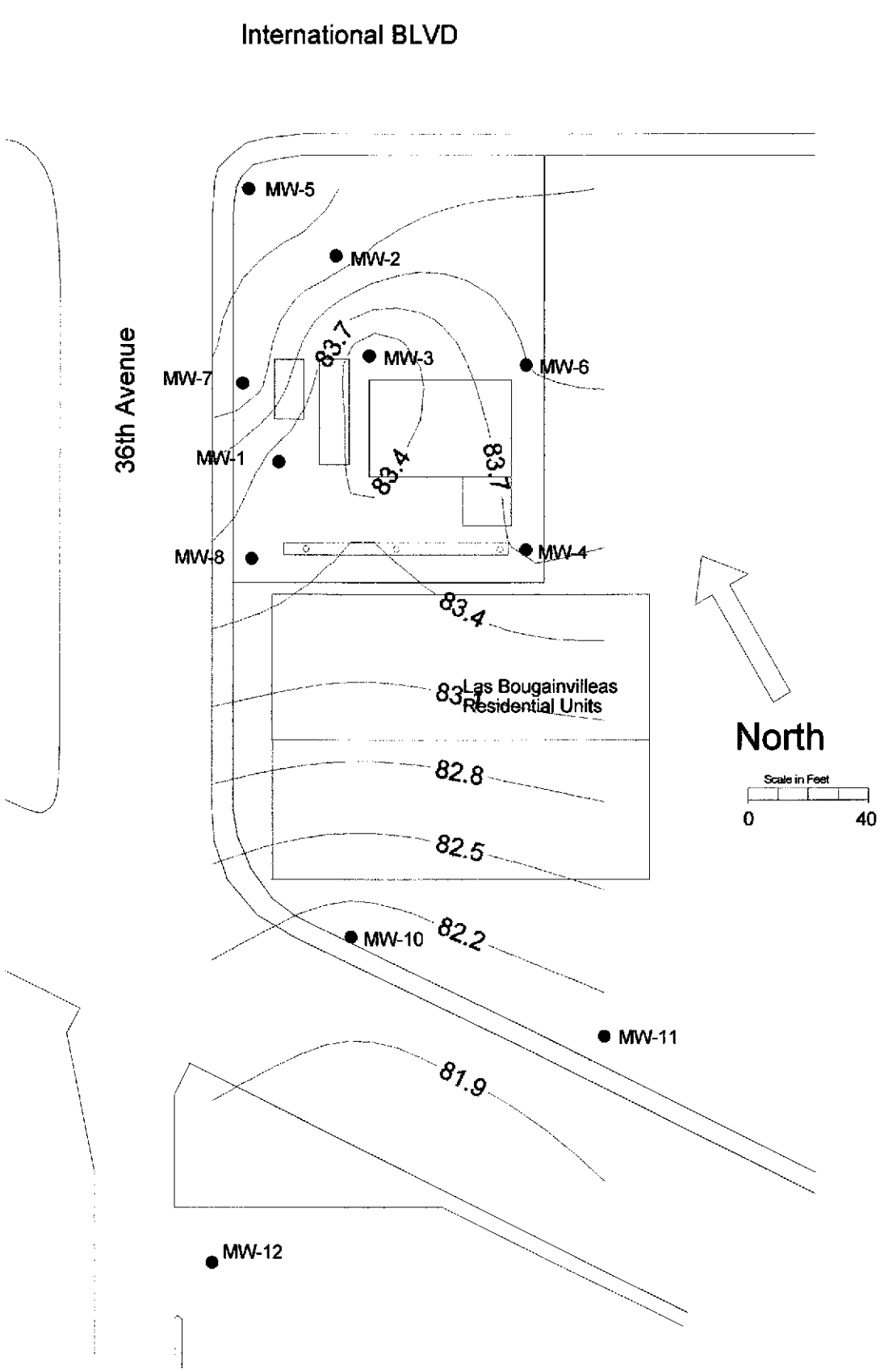

Figure 3: Groundwater Elevation Contour Map, November 9, 1999

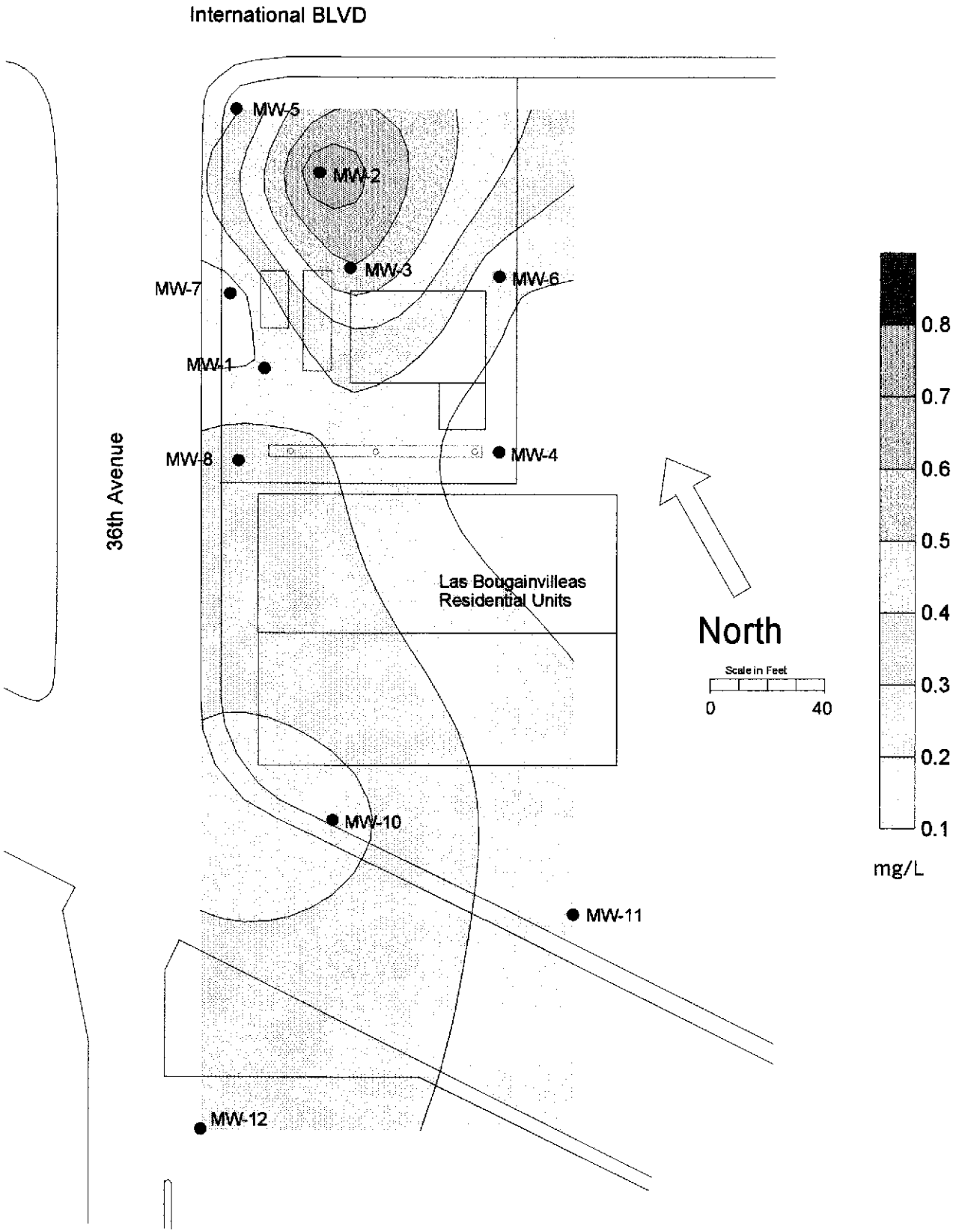

Figure 4: Dissolved Oxygen Concentration Contour Map in Groundwater, September 9, 1999

SOMA ENVIRONMENTAL ENGINEERING, INC.

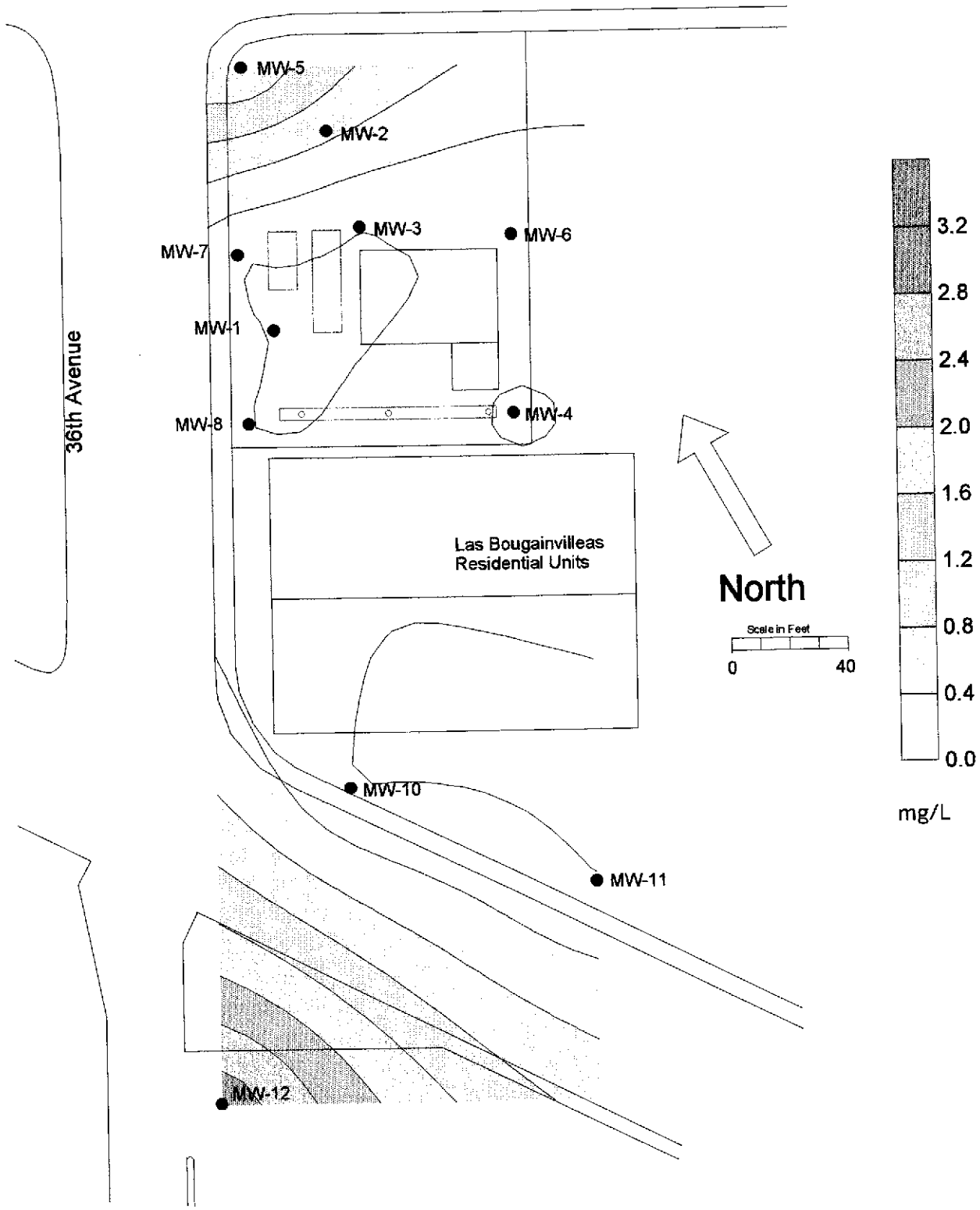

Figure 5: Nitrate Concentration Contour Map in Groundwater, November 9, 1999

ENVIRONMENTAL ENGINEERING, INC.

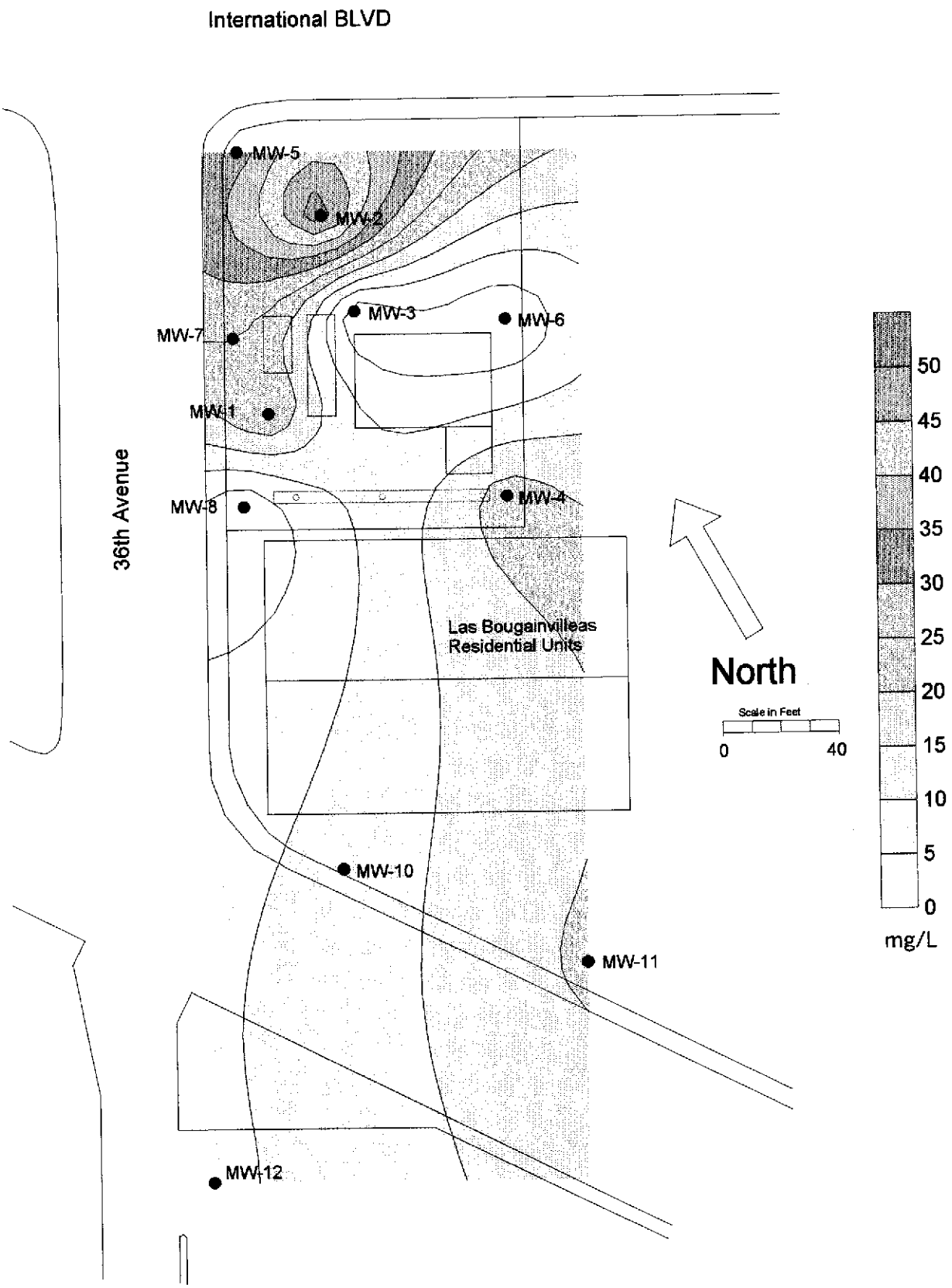

Figure 6: Sulfate Concentration Contour Map in Groundwater, November 9, 1999

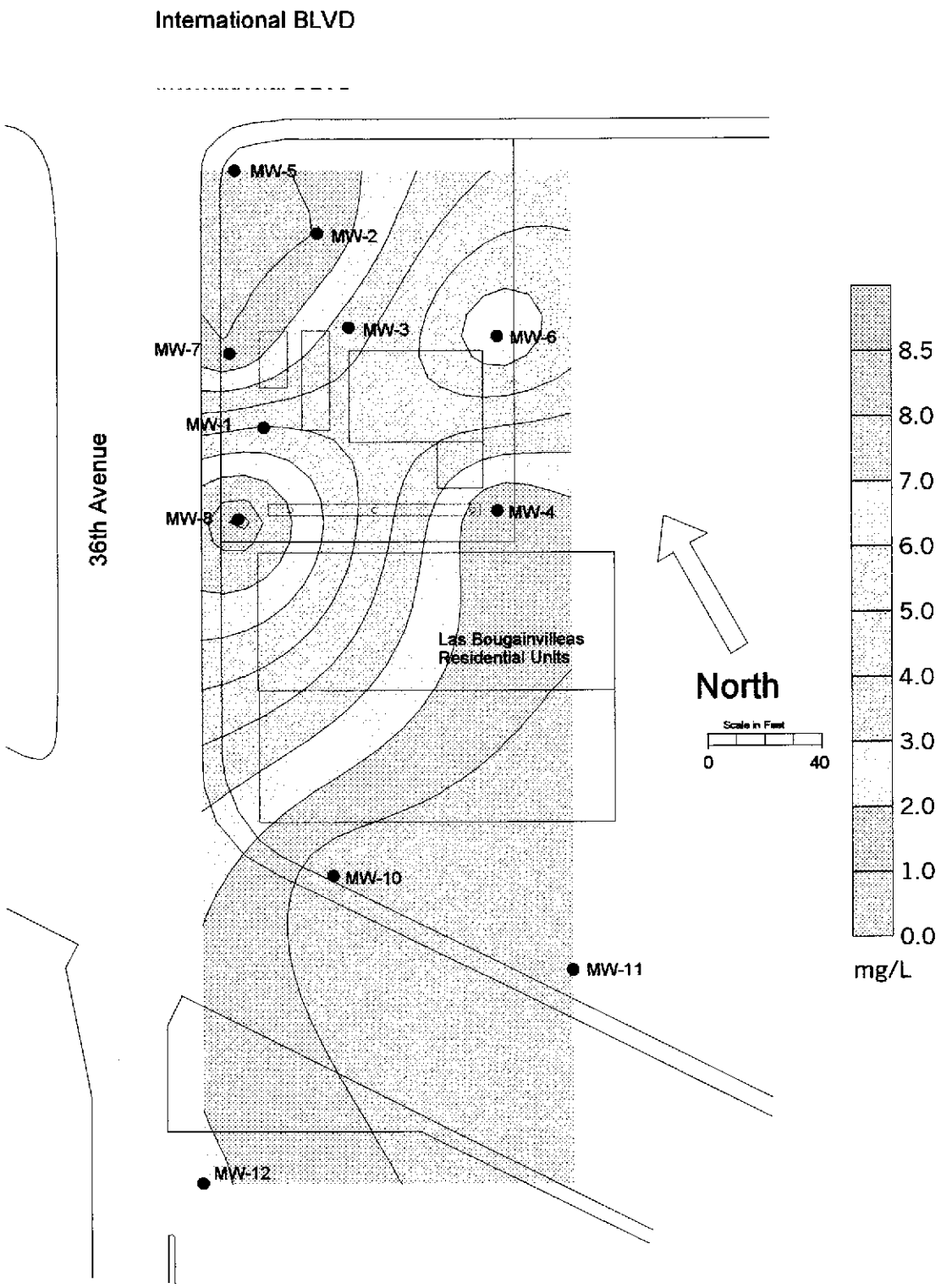

Figure 7: Ferrous Iron Concentration Contour Map in Groundwater, November 9, 1999

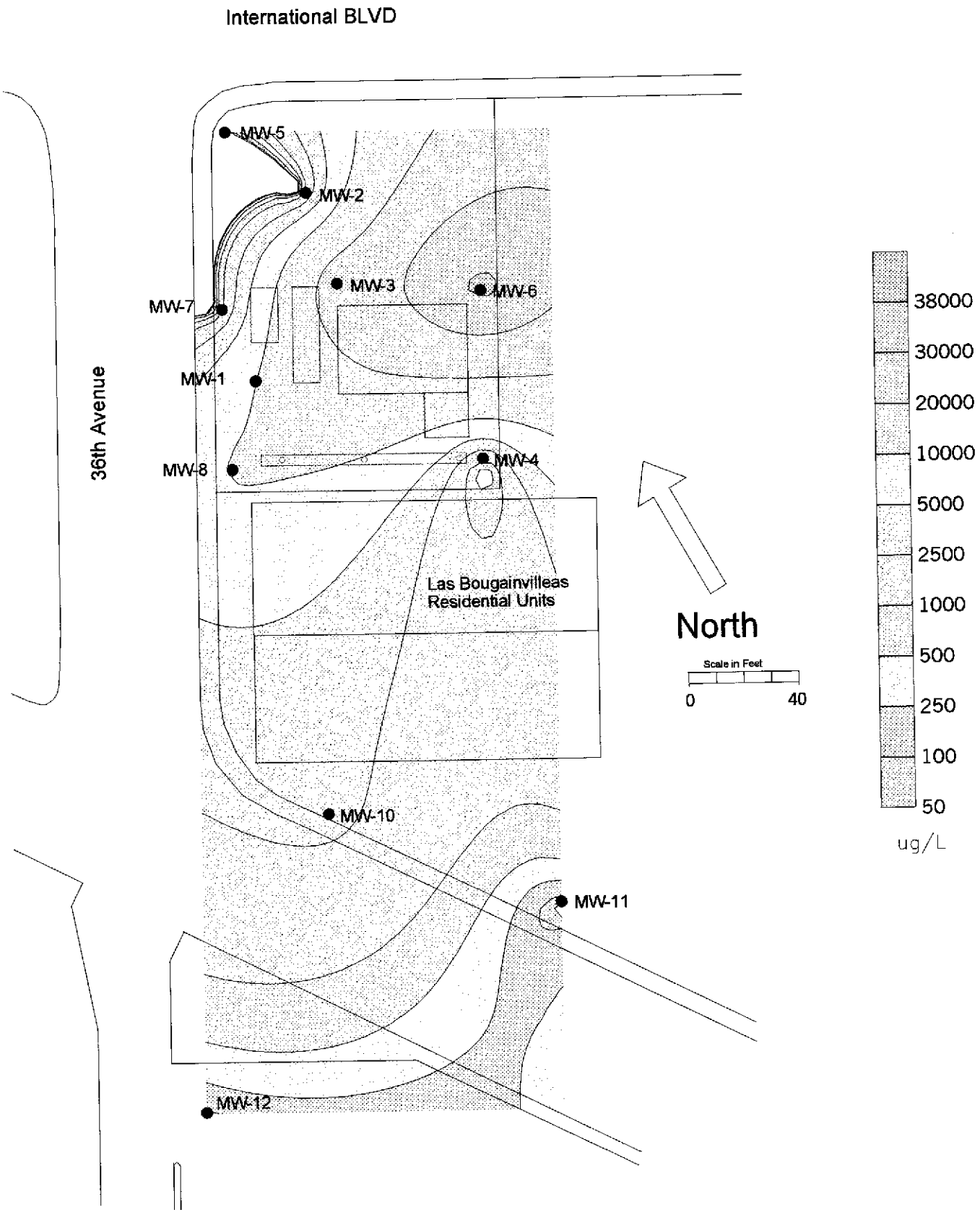

Figure 8: TPH-g Concentration Contour Map in Groundwater, November 9, 1999

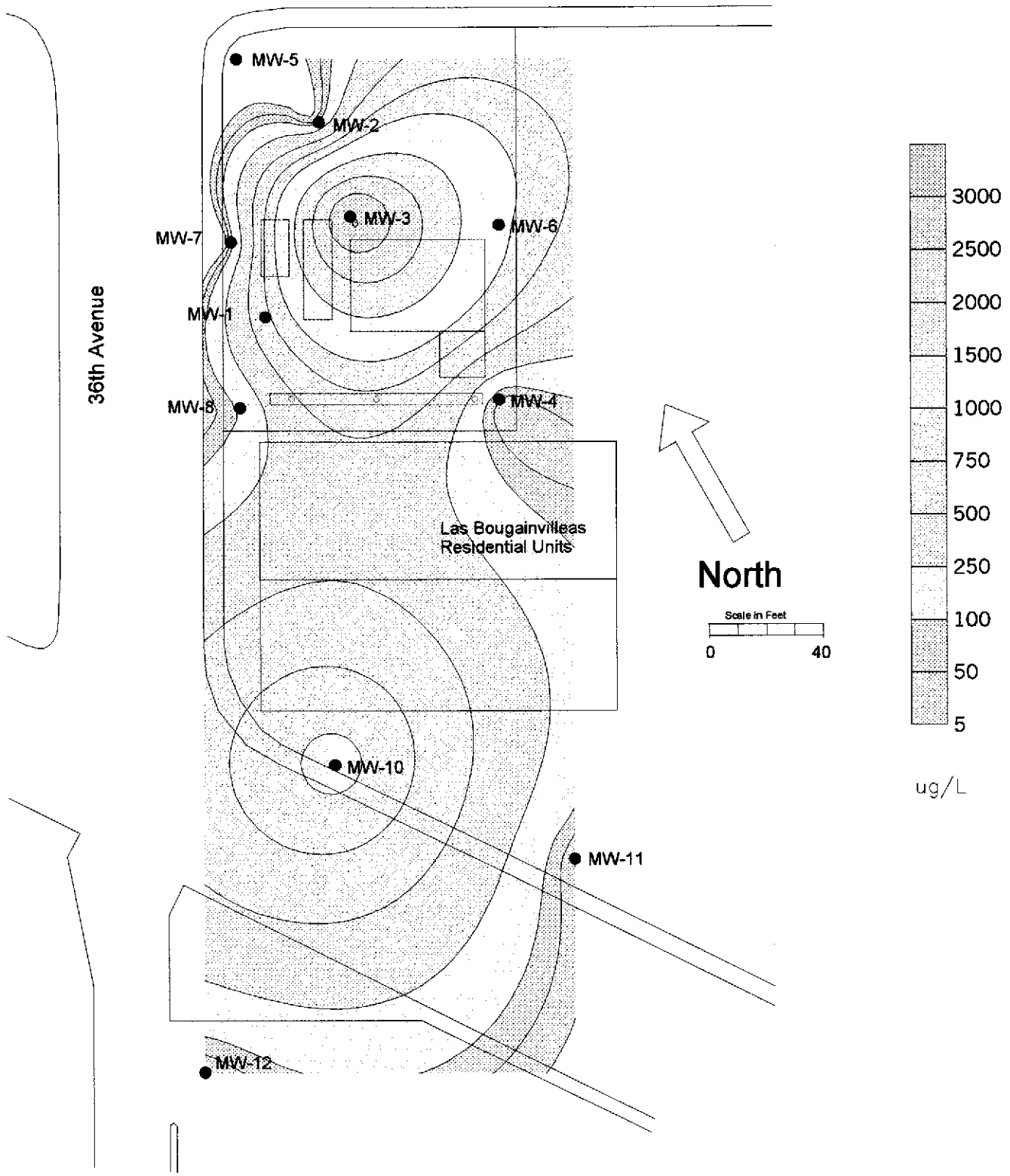

Figure 9: Benzene Concentration Contour Map in Groundwater, November 9, 1999

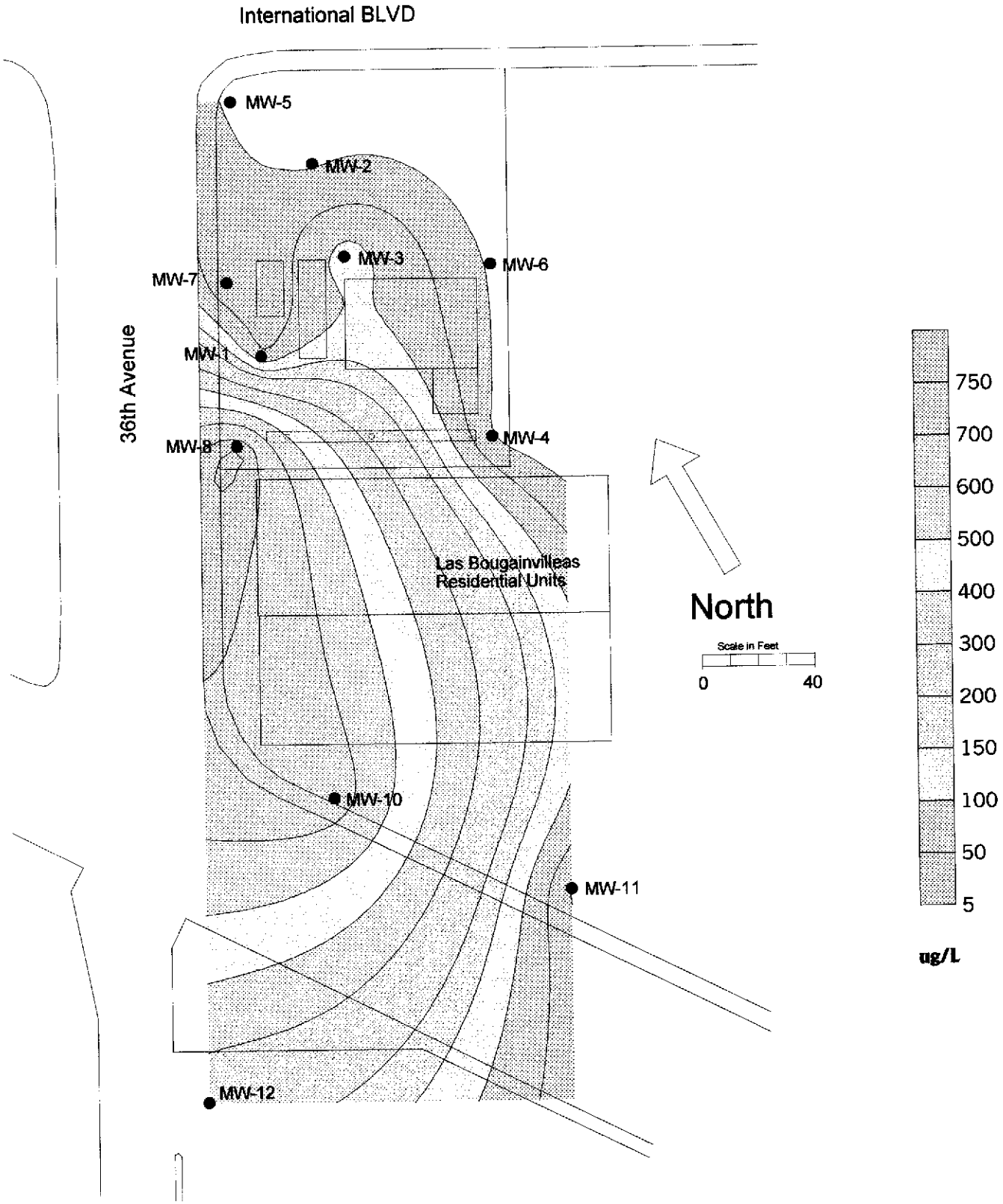

Figure 10: MTBE Concentration Contour Map in Groundwater, November 9, 1999

ENVIRONMENTAL ENGINEERING, INC.

APPENDIX A

FIELD NOTES, LABORATORY REPORTS AND CHAIN OF CUSTODY FORMS

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-1
Casing Diameter: 2"
Depth of Well: 29.7
Elevation of the Casing: 97.99
Depth to Water Table: 14.45
Elevation of Water Table: 83.54
Height of Water: 15.25
Purged Volume: 8.8 Gallons

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

Purging Method: Bailer ☐ Pump ☑

Sampling Method: Bailer ☑ Pump ☐

Sheen: Yes ☐ No ☑ Describe

Odor: Yes ☑ No ☐ Describe slight Petroleum odor

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
12:30		0.2	>3.3	0.0	26.0	6.92	19.8	1215
			5.1					

ml 10 → 100 ml
D.F = 10
Reading 0.5

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-2
Casing Diameter: 4"
Depth of Well: 30.0
Elevation of the Casing: 98.58
Depth to Water Table: 14.1
Elevation of Water Table: 84.48
Height of Water: 15.9
Purged Volume: 32.00 Gallons

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

Purging Method: Bailer ☐ Pump ☑
Sampling Method: Bailer ☑ Pump ☐

Sheen: Yes ☐ No ☑ Describe
Odor: Yes ☑ No ☐ Describe Slight Petroleum odor

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
1:30		0.8	1.0	0.9	55	6.98	20.8	1015

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-3
Casing Diameter: 4"
Depth of Well: 29.75
Elevation of the Casing: 97.78
Depth to Water Table: 14.7
Elevation of Water Table: 83.08
Height of Water: 15.05
Purged Volume: 30.0

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

Purging Method: Bailer ☐ Pump ☑

Sampling Method: Bailer ☑ Pump ☐

Sheen: Yes ☐ No ☑ Describe

Odor: Yes ☑ No ☐ Describe Strong Petroleum odor.

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
		0.61	>3.3	0.0	0.0	6.96	20.3	1351
			3.5					

10 → 100
D.F. 10
Reading
0.35

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-4
Casing Diameter: 2"
Depth of Well: 24.34
Elevation of the Casing: 97.85
Depth to Water Table: 14.1
Elevation of Water Table: 83.75
Height of Water: 10.24
Purged Volume: 6.0 Gallons

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

Purging Method: Bailer ☐ Pump ☑

Sampling Method: Bailer ☑ Pump ☐

Sheen: Yes ☐ No ☑ Describe

Odor: Yes ☑ No ☐ Describe slight petroleum odor

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
11:45		0.12	0.99	0.5	23.0	6.96	20.0	993

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-5
Casing Diameter: 2"
Depth of Well: 26.08
Elevation of the Casing: 99.04
Depth to Water Table: 14.3
Elevation of Water Table: 84.74
Height of Water: 11.78
Purged Volume: 600 Gallons

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

Purging Method: Bailer ☐ Pump ☑

Sampling Method: Bailer ☑ Pump ☐

Sheen: Yes ☐ No ☑ Describe

Odor: Yes ☑ No ☐ Describe Slight petroleum odor.

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
12:30		0.27	0.72	2.0	32.0	6.91	21.0	1,127

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-6
Casing Diameter: 2"
Depth of Well: 24.45
Elevation of the Casing: 98.77
Depth to Water Table: 14.75
Elevation of Water Table: 8402
Height of Water: 9.70
Purged Volume: 5.00 Gallons

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

Purging Method: Bailer ☐ Pump ☐

Sampling Method: Bailer ☐ Pump ☐

Sheen: Yes ☑ No ☐ Describe Rainbow sheen

Odor: Yes ☑ No ☐ Describe Strong Petroleum odor

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
12:50		0.22	>3.3	0.0	0.0	6.91	20.03	1,187
			7.0					

ml 10 → 100 ml
D.F 10
Reading 0.7

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-7
Casing Diameter: 2"
Depth of Well: 24.60
Elevation of the Casing: 97.83
Depth to Water Table: 13.25
Elevation of Water Table: 8458
Height of Water: 11.35
Purged Volume: 6.00 Gallons

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

Purging Method: Bailer ☐ Pump ☑

Sampling Method: Bailer ☑ Pump ☐

Sheen: Yes ☐ No ☑ Describe

Odor: Yes ☑ No ☐ Describe Slight petroleum odor

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
11:10		0.14	0.99	0.0	25	7.8	20.4	899

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-8
Casing Diameter: 2"
Depth of Well: 26.34
Elevation of the Casing: 97.25
Depth to Water Table: 13.65
Elevation of Water Table: 83.60
Height of Water: 12.69
Purged Volume: 6.5 Gallons

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

Purging Method: Bailer ☐ Pump ☐

Sampling Method: Bailer ☐ Pump ☐

Sheen: Yes ☐ No ☐ Describe

Odor: Yes ☐ No ☐ Describe

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
11:30		0.38	>3.3	0.0	0.0	6.97	19.0	1347
			8.9					

10 → 100
D.F 10
Reading
0.89

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-10
Casing Diameter: 2"
Depth of Well: 24.35
Elevation of the Casing: 94.54
Depth to Water Table: 12.5
Elevation of Water Table: 82.04
Height of Water: 12.85
Purged Volume: 6.50 Gallons

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

MW-9 is Duplicate Sample of MW-10

Purging Method: Bailer ☐ Pump ☑

Sampling Method: Bailer ☑ Pump ☐

Sheen: Yes ☐ No ☑ Describe

Odor: Yes ☐ No ☑ Describe

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
2:00		0.44	0.37	0.0	12.0	6.93	20.8	1165

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-11
Casing Diameter: 2"
Depth of Well: 24.30
Elevation of the Casing: 95.94
Depth to Water Table: 13.85
Elevation of Water Table: 82.09
Height of Water: 10.45
Purged Volume: 5.50 Gallons

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

Purging Method: Bailer ☐ Pump ☑

Sampling Method: Bailer ☑ Pump ☐

Sheen: Yes ☐ No ☑ Describe

Odor: Yes ☐ No ☑ Describe

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
2130		0.22	0.06	0.0	21.0	6.99	19.4	948

ENVIRONMENTAL ENGINEERING, INC

Well NO: MW-12
Casing Diameter: 4"
Depth of Well: 30.0
Elevation of the Casing: 94.84
Depth to Water Table: 13.2
Elevation of Water Table: 81.64
Height of Water: 16.8
Purged Volume: 33.0 Gallons

Project NO: 2331
Address: 3609 International Blvd
Oakland, CA
Date: 11/9/99
Sampler: Naser Pakrou
Bryce Scofield

Purging Method: Bailer ☐ Pump ☑

Sampling Method: Bailer ☑ Pump ☐

Sheen: Yes ☐ No ☑ Describe

Odor: Yes ☐ No ☑ Describe

Field Measurements

Time	Vol	D.O.	Fe^{+2}	NO_3^--N	SO_4^{+2}	pH	Temp	E.C.
	L	mg/L	mg/L	mg/L	mg/L		°C	us/cm
2:50		0.34	2.21	3.1	9.0	7.17	21.1	1,167

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

DELTA ENVIRONMENTAL LABORATORIES, Ltd

Soma

2680 Bishop Dr., Ste 203
San Ramon, CA 94583

Client Project ID:
2331
3609 International Blvd.
Oakland, CA

Ref.:	R4533400
Method	5030 GCFID/ 8020
Sampled:	11/10/99
Received:	11/11/99
Matrix:	Water
Analyzed:	11/16-19/99
Reported:	11/22/99
Units:	ug/L

Attention : Dr. M. Sepehr

Laboratory Results for BTEX , MTBE & TPH-G Analysis

Sample	Benzene	Toluene	Ethylbenzene	Total-Xylene	MTBE	TPH-Gas
MW-1	693	15	ND	3471	49.9*	10000
MW-2	ND	ND	ND	ND	ND	ND
MW-3	3218	1319	ND	6697	126*	26000
MW-4	ND	ND	ND	ND	ND	ND
MW-5	ND	ND	ND	ND	ND	ND
MW-6	1084	130	ND	10940	ND*	40000
MW-7	ND	9.35	ND	ND	12.2*	290
MW-8	91.9	ND	ND	3414	769*	10500
MW-9	65.3	18.7	ND	29.2	1278*	2580
MW-10	1134	20.2	ND	70.3	652*	2950
MW-11	ND	ND	ND	ND	ND	ND
MW-12	ND	ND	ND	ND	229*	80
Det.Limits	5 ug/L	5 ug/L	5 ug/L	5 ug/L	5 ug/L	50 ug/L
Method	8020	8020	8020	8020	8260	5030/GCFID

* The roult for MTBE is confirmed by GC/MS, 8260.

Delta Environmental Laboratories

Hossein KhoshKhoo, Ph.D.,
Laboratory Director/ President

685 Stone Road #11 & 12 • Benicia, CA 94510 • (707) 747-6081 • (800) 747 6082 • Fax (707) 747 6082

Delta Environmental Laboratories

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: SAME
Client Name
Address
City
Telephone 925 2446600 Fax: 925 2446601
SAMPLER (signature) Nasa Pariva
Turnaround Time Standard

Project Name Proj. 2331
Analysis Requested
LAB ID ~~3609 International~~ Blvd. Oakland.
Ref # CA.

4533
(1/2)

Special Instructions::

#	Sample ID	Date	Time	Matrix	No. of containers	pH	Temperature	TPHg, BTEX, MTBE	Comments
1	MW-1	11/10	10:50	Water				✓	8020/8260 MTBE Peaks Confirm
2	MW-2	11/10	9:30	✓				✓	with 8260 for
3	MW-3	11/10	1:10	✓				✓	all Samples
4	MW-4	11/10	11:45	✓				✓	
5	MW-5	11/10	12:30	✓				✓	
6	MW-6	11/10	12:50	✓				✓	
7	MW-7	11/10	11:50	✓				✓	
8	MW-8	11/10	11:30	✓				✓	
9	MW-9	11/10	2:10	✓				✓	
10	MW-10	11/10	2:0	✓				✓	

Relinquished by:	Date 11/11	1)	Have all samples received been stored on ice? Y
Received By:	Date 11/11/99	2)	Did any VOA samples received have any head space? NO
Relinquished by:	Date	3)	Were samples in appropriate containers and packaged properly? Y
Received By:	Date	4)	Were samples received in good condition? YES

For Lab Use Only:

Delta Environmental Laboratories

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: DOMF
Client Name
Address
City
Telephone 9252446600 Fax: 9252446601
SAMPLER (signature)
Turnaround Time Standard

Project Name Proj 2331
369 Interstate
LAB ID BL Oakland
Ref # CA.

4533

2/2

Analysis Requested

#	Sample ID	Date	Time	Matrix	No. of containers	pH	Temperature	TPHg-BTEX-MTBE	Comments
11	MW-11	11/10	12:36					✓	8029/8260
12	MW-12	11/10	12:50					✓	MTBE Peaks Confirm
									with 8260 for
									all Samples

Special Instructions:

Relinquished by: Date 11/11
Received By: Date 11/11/99
Relinquished by: Date
Received By: Date

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? Yes

For Lab Use Only: