



**GROUNDWATER MONITORING REPORT  
FOR THE OCTOBER 2003 SAMPLING EVENT  
ZILKER PARK LANDFILL PROJECT  
AUSTIN, TEXAS**

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## 1.0 INTRODUCTION

This report presents the results of groundwater sampling and analysis performed by Shaw Environmental, Inc, (Shaw) at the Zilker Park Landfill site. The groundwater monitoring was conducted under Supplemental Amendment #3 to the original professional service agreement between the City of Austin (COA) and EMCON, a subsidiary of the Shaw Group. Activities consisted of the collection and analysis of groundwater samples from on-site monitoring wells installed as part of Phase I of the Zilker Park Landfill Remediation Project (C.I.P. Project No. 480-497-0604).

### 1.1 PROJECT BACKGROUND

The Zilker Park Landfill site is the location of the former Butler Landfill. The landfill is located on the south shore of Town Lake and extends west of Mopac highway from Dry Creek eastward about 2,500 feet into Zilker Park. The Butler Landfill was operated by the COA from 1948 to 1967. Municipal waste disposed at the landfill was used to fill an old gravel pit that had been mined for sand and gravel from low terrace deposits of the Colorado River. The Edwards Limestone underlies the terrace deposits in all areas of the landfill.

The COA installed a monitoring well (MW-1) in the fill area of the landfill in 1984. During Phase I of the Zilker Park Landfill Remediation Project, an additional six (6) monitoring wells were installed at the landfill site in March 1998. Figure 1 (Appendix B) presents a monitoring well location map. In early 2003, additional fill material (i.e., soil) was added to the top of the landfill to improve surface drainage at the site. Due to additional fill, several monitoring wells were extended to match the new ground surface elevation at each location. The well extensions were completed in early October 2003 and groundwater samples were collected in late October 2003.

## 2.0 SAMPLING AND ANALYSIS PROCEDURES

On October 28 through October 30, 2003 Shaw sampling personnel collected groundwater samples from six (6) on-site monitoring wells (MW-1, MW-2, MW-3, MW-5, MW-6, and MW-7). Monitoring well (MW-4) was not sampled due to the lack of groundwater in the well. A limited volume of sample was collected from MW-1 due to the very slow groundwater recharge associated with the well. The following presents the sampling methodologies and analytical methods utilized to collect and analyze the groundwater samples.

### 2.1 LOW-FLOW GROUNDWATER SAMPLING

Prior to groundwater sampling, water levels were measured in monitoring well using a tape equipped with an electric water level sensor. Water levels were measured to the nearest 0.01 ft from the top of PVC well casing. Monitoring well gauging data are presented in Table 1. Water level data on Table 1 (Appendix A) indicate that water elevations measured in October 2003 were lower than those measured in May 1998. The water level measured in MW-1 was approximately 7 ft lower and the levels measured in MW-2 through MW-7 ranged from about 1 ft to as much as 3 ft lower.

Low-flow sampling techniques were utilized to collect groundwater samples following applicable procedures outlined in USEPA (1996) and TCEQ (1999) guidance. The objective of low-flow sampling was to purge and sample a well in a manner that minimizes stress (drawdown) to the groundwater system and, thereby, limit the introduction of suspended solids and better ensure the collection of a representative groundwater sample. The method involves sampling groundwater without disturbing the stagnant water above the pump intake by pumping the well at low flow rates while maintaining minimal drawdown of the water column within the well. A gas-driven bladder pump with dedicated bladder and tubing was placed within the screened interval of the well and the well was purged at low flow rates of less than 1 liter per minute (L/min).

During low-flow purging, The water quality indicator parameters pH, specific conductance, dissolved oxygen, oxidation-reduction potential, and temperature were measured using an in-line flow-through cell and standardized equipment. Table 2 (Appendix A) presents a summary of the field parameter measurements. Stabilization of these parameters was used to determine when formation water was accessed during purging and when sample collection was appropriate. Minimum purge volume was equivalent to at least twice the combined volumes of the pump and tubing.

Groundwater samples were placed directly into laboratory provided bottles containing appropriate preservatives, then sealed and labeled. Container and container closure material used were appropriate (i.e., polyethylene, glass) for the analyses to be performed on the samples. The containers were labeled with the sample number, date and time of collection, and preservative used.

Sample containers were placed securely on ice in insulated coolers as the samples were collected. The samples remained in the possession of Shaw sampling personnel and were shipped directly to Certes Environmental Laboratory in Dallas, Texas at the completion of the sampling event. Chain-of-custody forms were prepared for the samples and copies of the forms are included in Appendix C.

## 2.2 SAMPLE ANALYSIS

In accordance with Supplemental Amendment #3, samples collected from the Zilker Park Landfill monitoring wells were analyzed for the suite of parameters included on the analytical laboratory reports presented in Appendix C. These included the following metallic and organic constituents.

- Volatile Organic Compounds (VOCs) using EPA Method 8260B
- Polynuclear Aromatic Hydrocarbons (PAHs) using EPA Method 827C
- Organochlorine Pesticides (OCPs) using EPA Method 8081
- Chlorinated Herbicides using EPA Method 8151
- Metals (arsenic, aluminum, barium, cadmium, chromium, iron, lead, manganese, mercury, selenium, silver, and zinc) using EPA Methods 6010B and 7470A

Samples were submitted for both total and dissolved metals analysis. Samples collected for dissolved metal analysis were filtered in the laboratory using a 10-micrometer pore size filter prior to analysis. Due to the very slow groundwater recharge and water level recovery associated with monitoring well MW-1, only enough sample volume was available for analysis of VOCs and PAHs.

### 3.0 ANALYTICAL RESULTS

A summary of the analytical results for the October 2003 sampling event is presented on Table 3 (Appendix A). Included on Table 3 is a summary of the analytical results for previous sampling events performed in October 1997 (MW-1 only) and March 1998 (MW-2 through MW-7) as part of the site assessment performed at the landfill site (EMCON, 1998). The analytical reports prepared by Certes for the October 2003 sampling event are included in Appendix C.

Analytical results for the samples collected in October 2003 were reported based on the analytical laboratory's method detection limits (MDLs) adjusted for sample-specific factors. This adjusted MDL is reported on the laboratory reports as the sample quantitation limit (SQL), as per TCEQ guidance (TRRP-13). Concentrations detected between the SQL and the reporting limit (RL) (i.e., adjusted method quantitation limit) are flagged with a "J" on the analytical report. The presence of constituents flagged with a J is certain but the concentration of such constituents is uncertain and estimated by the laboratory. Detected concentrations above the RL are quantifiable and are not flagged with a qualifier. Samples collected in October 1997 and March 1998 were reported based on the laboratory's RLs, which are higher than the SQLs, and therefore no concentrations were flagged with the J qualifier.

To evaluate the groundwater analytical data, detected concentrations were compared to the Texas Risk Reduction Program (TRRP) Tier 1 residential groundwater protective concentration levels (PCLs). The groundwater PCLs (<sup>GW</sup>GW) are based on federal primary maximum contaminant levels (MCLs) promulgated under the Safe Drinking Water Act or, if MCLs are not available for a constituent, risk-based levels based on groundwater ingestion. TRRP Tier 1 PCLs are included on Table 3 and concentrations that exceed the PCLs are highlighted on the table.

The volatile organic constituents acetone, chlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, dichlorodifluoromethane, and methylene chloride were detected at least once in the groundwater samples collected in October 2003. All detected values were well below the <sup>GW</sup>GW PCLs. Acetone and methylene chloride are commonly used by analytical laboratories and are common laboratory contaminants. In fact, acetone was detected in the laboratory method blank associated with the samples and detected levels of these constituents were estimated (i.e., J-flagged) below the RL. Detection of these constituents was likely due to laboratory contamination and these results are not representative of the groundwater.

Estimated J-flagged concentrations were detected for 1,3-Dichlorobenzene in well MW-1, 1,4-dichlorobenzene in wells MW-1, MW-6 and MW-7, and dichlorodifluoromethane in well MW-5. Chlorobenzene was detected in wells MW-1 and MW-6. Chlorobenzene was also detected at a

concentration below the PCL in a sample collected from MW-1 during the October 1997 sampling event.

PAHs and chlorinated pesticides and herbicides were not detected in any ground water sample collected from the on-site monitoring wells during the October 2003, March 1998, or October 1997 sampling events.

The metals aluminum, arsenic, barium, cadmium, chromium, iron, lead, manganese, selenium, silver, and zinc were detected at least once in samples collected during the October 2003 sampling event. In general, total concentrations were slightly higher than dissolved concentrations, although they were relatively close to one another. All metal concentrations detected in October 2003 were much lower than the concentrations reported for the October 1997 and March 1998 sampling events. This is likely due to the different sample collection procedures utilized during the sampling events. In October 1997 and March 1998, well purging and groundwater sample collection was performed using hand bailers. Observations made during these sampling events indicated that the samples were visibly turbid and contained a high percentage of suspended solids. Purging and sampling during the October 2003 event was accomplished using a bladder pump and low-flow techniques. This procedure substantially reduced the amount of suspended solids in the groundwater samples, as indicated by the close relationship of total and dissolved concentrations. Therefore, groundwater samples collected using low-flow methodology more closely represent natural groundwater.

Total and dissolved arsenic concentrations were detected above the PCL of 0.01 mg/l in wells MW-5 and MW-7 and total arsenic in well MW-3 during the October 2003 sampling event. Total manganese was also detected above the PCL of 1.1 mg/l in MW-5. All other detected total and dissolved concentrations were below the PCLs. Several total metals were detected above PCLs in samples collected in October 1997 and March 1998. As previously discussed, these concentrations are believed to be affected by the high suspended solid content of the samples and are not as representative of natural groundwater beneath the site.



#### 4.0 SUMMARY AND CONCLUSIONS

The following conclusions are based on the findings of the groundwater monitoring event conducted at the Zilker Park Landfill in October 2003.

- Water level data indicate that water elevations measured in October 2003 were lower than those measured in May 1998. The water level measured in MW-1 was approximately 7 ft lower and the levels measured in MW-2 through MW-7 ranged from about 1 ft to as much as 3 ft lower.
- Estimated J-flagged concentrations were detected below <sup>GW</sup>GW PCLs in groundwater samples collected in October 2003 for the volatile organic constituents 1,3-Dichlorobenzene in well MW-1, 1,4-dichlorobenzene in wells MW-1, MW-6 and MW-7, and dichlorodifluoromethane in well MW-5. Chlorobenzene was detected in wells MW-1 and MW-6. Chlorobenzene was detected at a concentration below the PCL in a sample collected from MW-1 during the October 1997 sampling event.
- Low-level detection of acetone and methylene chloride was likely due to laboratory contamination and these results are not representative of natural groundwater.
- PAHs and chlorinated pesticides and herbicides were not detected in any ground water sample collected from the on-site monitoring wells during the October 2003, March 1998, or October 1997 sampling events.
- The metals aluminum, arsenic, barium, cadmium, chromium, iron, lead, manganese, selenium, silver, and zinc were detected at least once in samples collected during the October 2003 sampling event.
- Detected metal concentrations for samples collected in October 1997, March 1998, and October 2003 indicated that low-flow sampling techniques utilized during the October 2003 sampling event substantially reduced the amount of suspended solids in the groundwater samples and produced groundwater samples that more closely represent natural groundwater.
- Total and dissolved arsenic concentrations were detected above the PCL of 0.01 mg/l in wells MW-5 and MW-7 and total arsenic in well MW-3 during the October 2003 sampling event. Total manganese was also detected above the PCL of 1.1 mg/l in MW-5. All other detected total and dissolved concentrations were below the PCLs.

- Total metals were detected above PCLs in several samples collected in October 1997 and March 1998. These concentrations are believed to be affected by the high suspended solid content of the samples and are not representative of natural groundwater beneath the site.

## 5.0 REFERENCES

EMCON. 1997. Zilker Park Landfill Project, Phase I, Task 1 – Preliminary Site Assessment, Austin, Texas. EMCON Project No. 62786-002.001.

\_\_\_\_\_. 1998. Zilker Park Landfill Project, Phase I, Task 5 – Site Assessment Report, Austin, Texas. EMCON Project No. 62786-002.001.

Texas Commission on Environmental Quality (TCEQ). 1999. Guidelines for Low-Flow Purging and Sampling of Groundwater Monitor Wells. TCEQ Voluntary Cleanup Program (VCP) Guidance, October 1999.

United States Environmental Protection Agency (USEPA). 1996. Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. EPA/540/S-95/504, April 1996.

## APPENDIX A

### TABLES

**TABLE 1**

**Well Gauging Data for Zilker Park Landfill Monitoring Wells**

Well ID No.	TOC Elevation (ft msl)	New TOC Elevation (ft msl) <sup>(1)</sup>	Depth to Groundwater (ft) <sup>(2)</sup>		Groundwater Elevation (ft msl)	
			May 98	Oct 03	May 98	Oct 03
MW-1	451.0	---	10.60	17.79	440.40	433.21
MW-2	465.7	---	34.71	35.71	430.99	429.99
MW-3	457.6	460.4	26.73	32.62	430.87	427.78
MW-4	464.0	466.4	31.85	Dry	432.15	---
MW-5	457.0	---	26.20	28.72	430.80	428.28
MW-6	454.2	---	25.15	26.00	429.05	428.20
MW-7	455.1	457.8	26.63	30.89	428.47	426.91

TOC = Top of PVC well casing

<sup>(1)</sup> Monitoring wells extended and constructed with new above-ground (stickup) completion.

<sup>(2)</sup> Measured from TOC.

**TABLE 1**

**Well Gauging Data for Zilker Park Landfill Monitoring Wells**

Well ID No.	TOC Elevation (ft msl)	New TOC Elevation (ft msl) <sup>(1)</sup>	Depth to Groundwater (ft) <sup>(2)</sup>		Groundwater Elevation (ft msl)	
			May 98	Oct 03	May 98	Oct 03
MW-1	451.0	---	10.60	17.79	440.40	433.21
MW-2	465.7	---	34.71	35.71	430.99	429.99
MW-3	457.6	460.4	26.73	32.62	430.87	427.78
MW-4	464.0	466.4	31.85	35.40	432.15	431.00
MW-5	457.0	---	26.20	28.72	430.80	428.28
MW-6	454.2	---	25.15	26.00	429.05	428.20
MW-7	455.1	457.8	26.63	30.89	428.47	426.91

decrease in WL

7.19

1.00

3.09

1.15

2.52

0.85

1.56

TOC = Top of PVC well casing

<sup>(1)</sup> Monitoring wells extended and constructed with new above-ground (stickup) completion.

<sup>(2)</sup> Measured from TOC.

**TABLE 2**  
**Summary of Field Water Quality Indicator Parameters**  
**Recorded for Zilker Park Landfill Monitoring Wells**

Well ID No.	Date	Temperature (degree C)	Specific Conductance (uS/cm)	pH	ORP (mV)	DO (mg/l)
MW-1	10/30/03	23.56	2.503	6.29	-112.1	0.38
MW-2	10/29/03	22.83	1.191	6.53	135.0	2.36
MW-3	10/28/03	22.29	0.953	6.72	-82.0	0.95
MW-4	10/28/03	na	na	na	na	na
MW-5	10/29/03	23.42	1.533	6.38	-122.1	0.34
MW-6	10/30/03	23.56	1.366	6.54	-103.2	0.37
MW-7	10/28/03	25.77	1.523	6.58	-118.7	0.42

na = Not measured

**TABLE 3**  
**Summary of Analytical Results for Zilker Park Landfill Groundwater Samples**

Chemical Constituents (mg/l)	TRRP GW PCL	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6		MW-7	
		Oct 1997	Oct 2003	Mar 1998	Oct 2003	Mar 1998	Oct 2003	Mar 1998	Oct 2003	Mar 1998	Oct 2003	Mar 1998	Oct 2003	Mar 1998	Oct 2003
<b><u>VOCS</u></b>															
Acetone	2.4	<0.100	<b>0.00735JB</b>	<0.100	<0.00371	<0.100	<0.00371	<0.100	na	<0.100	<0.00371	<0.100	<b>0.00383JB</b>	<0.100	<b>0.00669JB</b>
Chlorobenzene	0.1	<b>0.010</b>	<b>0.00568</b>	<0.005	<0.00059	<0.005	<0.00059	<0.005	na	<0.005	<0.00059	<0.005	<b>0.0152</b>	<0.005	<0.00059
1,3-Dichlorobenzene	0.73	<0.005	<b>0.00118J</b>	<0.005	<0.00166	<0.005	<0.00166	<0.005	na	<0.005	<0.00166	<0.005	<0.00166	<0.005	<0.00166
1,4-Dichlorobenzene	0.075	na	<b>0.00115J</b>	<0.005	<0.00067	<0.005	<0.00067	<0.005	na	<0.005	<0.00067	<0.005	<b>0.00286J</b>	<0.005	<b>0.00123J</b>
Dichlorodifluoromethane	4.9	na	<0.00122	na	<0.00122	na	<0.00122	na	na	na	<b>0.00149J</b>	na	<0.00122	na	<0.00122
Methylene Chloride	0.005	<0.005	<b>0.00146J</b>	<0.005	<b>0.00160J</b>	<0.005	<b>0.00156J</b>	<0.005	na	<0.005	<b>0.00177J</b>	<0.005	<b>0.00131J</b>	<0.005	<b>0.00171J</b>
<b><u>PAHs</u></b>															
	---	ND	ND	ND	ND	ND	ND	ND	na	ND	ND	ND	ND	ND	ND
<b><u>Pesticides</u></b>															
	---	ND	na	ND	ND	ND	ND	ND	na	ND	ND	ND	ND	ND	ND
<b><u>Herbicides</u></b>															
	---	ND	na	ND	ND	ND	ND	ND	na	ND	ND	ND	ND	ND	ND
<b><u>Metals</u></b>															
Aluminum, total	240	<b>0.037</b>	na	<b>219</b>	<b>5.20</b>	<b>34.7</b>	<b>0.952</b>	<b>4.12</b>	na	<b>145</b>	<b>0.277</b>	<b>98.6</b>	<b>0.331</b>	<b>186</b>	<b>1.60</b>
dissolved		na	na	na	<b>4.53</b>	na	<b>0.788</b>	na	na	na	<b>0.186</b>	na	<b>0.323</b>	na	<b>0.691</b>
Arsenic, total	0.01	<0.030	na	<b>0.078</b>	<0.0024	<b>0.088</b>	<b>0.0114</b>	<0.030	na	<b>0.150</b>	<b>0.0401</b>	<b>0.031</b>	<b>0.00620J</b>	<b>0.073</b>	<b>0.0246</b>
dissolved		na	na	na	<0.0024	na	<b>0.0090J</b>	na	na	na	<b>0.0281J</b>	na	<b>0.0052J</b>	na	<b>0.0139</b>
Barium, total	2.0	<b>0.69</b>	na	<b>2.59</b>	<b>0.122</b>	<b>0.650</b>	<b>0.133</b>	<b>0.200</b>	na	<b>2.25</b>	<b>0.399</b>	<b>1.27</b>	<b>0.400</b>	<b>1.39</b>	<b>0.316</b>
dissolved		na	na	na	<b>0.116</b>	na	<b>0.138</b>	na	na	na	<b>0.343</b>	na	<b>0.366</b>	na	<b>0.25</b>
Cadmium, total	0.005	<0.005	na	<b>0.006</b>	<0.0004	<0.005	<0.0004	<0.005	na	<b>0.006</b>	<0.0004	<0.005	<0.0004	<0.005	<0.0004
dissolved		na	na	na	<0.0004	na	<0.0004	na	na	na	<0.0004	na	<0.0004	na	<0.0004
Chromium, total	0.1	<0.005	na	<b>0.210</b>	<b>0.0062</b>	<b>0.037</b>	<b>0.0012J</b>	<b>0.008</b>	na	<b>0.220</b>	<b>0.00070J</b>	<b>0.130</b>	<b>0.0012J</b>	<b>0.160</b>	<b>0.0025J</b>
dissolved		na	na	na	<b>0.0051J</b>	na	<b>0.0014J</b>	na	na	na	<0.0005	na	0.0012J	na	<b>0.0433</b>
Iron, total	---	<b>14.2</b>	na	<b>273</b>	<b>5.15</b>	<b>62.6</b>	<b>4.85</b>	<b>5.98</b>	na	<b>281</b>	<b>16.3</b>	<b>112</b>	<b>4.73</b>	<b>220</b>	<b>9.87</b>
dissolved		na	na	na	<b>3.50</b>	na	<b>3.48</b>	na	na	na	<b>10.9</b>	na	<b>3.61</b>	na	<b>3.62</b>
Lead, total	0.015	<0.015	na	<b>0.270</b>	<0.00271	<0.015	<0.00271	<0.015	na	<b>0.200</b>	<0.00271	<b>0.120</b>	<0.00271	<b>0.150</b>	<0.00271
dissolved		na	na	na	<b>0.0034J</b>	na	<0.00271	na	na	na	<0.00271	na	<0.00271	na	<0.00271
Manganese, total	1.1	<b>0.39</b>	na	<b>8.04</b>	<b>0.0605</b>	<b>3.96</b>	<b>0.297</b>	<b>0.460</b>	na	<b>7.75</b>	<b>1.64</b>	<b>2.06</b>	<b>0.288</b>	<b>5.23</b>	<b>0.968</b>
dissolved		na	na	na	<b>0.0415</b>	na	<b>0.297</b>	na	na	na	<b>0.288</b>	na	<b>0.288</b>	na	<b>0.906</b>
Mercury, total	0.002	<0.0005	na	<b>0.0013</b>	<0.000028	<0.0005	<0.000028	<0.0005	na	<0.0005	<0.000028	<0.0005	<0.000028	<0.0005	<0.000028
dissolved		na	na	na	<0.000028	na	<0.000028	na	na	na	<0.000028	na	<0.000028	na	<0.000028
Selenium, total	0.05	<0.040	na	<0.040	<0.0047	<0.040	<0.0047	<0.040	na	<0.040	<0.0047	<0.040	<0.0047	<0.040	<b>0.0048J</b>
dissolved		na	na	na	<0.0047	na	<0.0047	na	na	na	<0.0047	na	<0.0047	na	<0.0047
Silver, total	0.12	<0.010	na	<0.010	<0.00083	<0.010	<b>0.0015J</b>	<0.010	na	<0.010	<b>0.00090J</b>	<0.010	<b>0.0014J</b>	<0.010	<b>0.0012J</b>
dissolved		na	na	na	<b>0.0014J</b>	na	<b>0.0012J</b>	na	na	na	<b>0.0015J</b>	na	<b>0.00150J</b>	na	<b>0.00090J</b>
Zinc, total	7.3	<b>0.099</b>	na	<b>0.950</b>	<0.0004	<b>0.140</b>	<b>0.0058J</b>	<0.050	na	<b>0.560</b>	<0.0004	<b>0.340</b>	<0.0004	<b>0.550</b>	<0.0004
dissolved		na	na	na	<0.0004	na	<b>0.0006J</b>	na	na	na	<0.0004	na	<0.0004	na	<0.0004

Notes:

na = Not analyzed

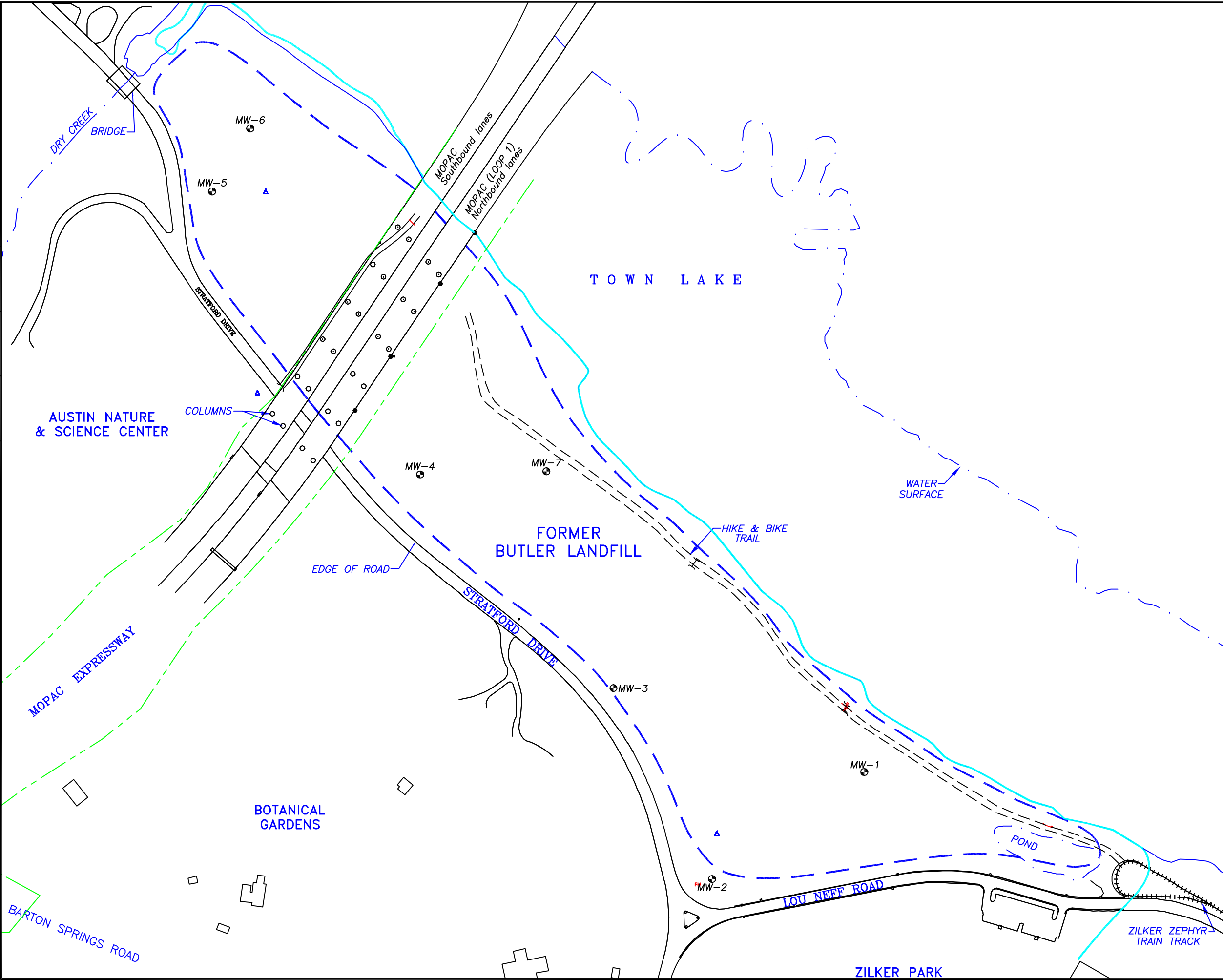
     = Detected concentration is above TRRP<sup>GW</sup> PCL



## APPENDIX B

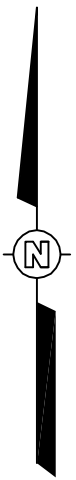
### FIGURES

OFFICE Austin, Texas  
 DRAWN BY TFR 12/11/2003  
 CHECKED BY MR 12/11/2003  
 APPROVED BY JM 12/11/2003  
 DRAWING NUMBER zilker/mr.dwg



**LEGEND**

- HIKE & BIKE TRAIL
- ++++ ZILKER ZEPHYR TRAIN TRACK
- PROPERTY LINE
- BOUNDARY OF EDWARDS AQUIFER RECHARGE ZONE
- APPROXIMATE FILL BOUNDARY
- TX DOT SOIL BORING
- ⊙ MONITORING WELL LOCATION



0 200 400  
 APPROXIMATE SCALE IN FEET

**Shaw** 8501 North Mopac Expressway  
 Suite 320  
 Austin, Texas 78759  
 (512) 928-8051  
 fax(512) 928-0077

FIGURE 1

**MONITORING WELL LOCATION MAP**

CITY OF AUSTIN  
 ZILKER LANDFILL REMEDIATION

APPENDIX C  
ANALYICAL LABORATORY REPORTS