GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

Groundwater Monitoring Report
Second Semiannual 2010 Sampling Event

Patchogue
Former MGP Site

Town of Brookhaven
Suffolk County, Long Island, New York
Site ID No. 1-52-182

Submitted to:
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175 East Old Country Road
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November 2010
Project 093210-2-1203

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1. Site and Adjacent Downgradient Off-Site Areas

Second Semiannual 2010 Groundwater Monitoring Event Summary

Event Date: September 8, 9, and 10, 2010

Site Phase: Semiannual groundwater monitoring.

Location: Patchogue former MGP site. See **Figure 1** for site location.

Monitoring Program:

Number of wells: A total of **14** monitoring wells are located on and adjacent to the site (see **Figure 2**).

Hydrological Data: Groundwater levels were collected from all **14** monitoring wells on September 8, 2010. Groundwater levels and calculated elevations are presented in **Table 1**. The groundwater flow direction was generally to the southeast (see **Figures 3** and **4**), consistent with the historical flow direction. During the previous semiannual sampling event, flow was slightly more easterly due to dewatering operations associated with offsite construction activities on the southeast side of Patchogue Creek. The ranges in depth-to-water and water table elevation data, as well as calculated hydraulic gradients for the shallow and deeper portions of the aquifer, were as follows:

- Depth to the water table in shallow wells ranged from **0.88** (MW-8S) to **5.81** (MW-1) feet below the well measuring point.
- Water table elevations in shallow wells ranged from **2.80** (MW-4S) to 5.42 (MW-1) feet above mean sea level (msl).
- Depth to the water table in deep wells ranged from **0.71** (MW-8D) to **4.7** (MW-4D) feet below the well measuring point.
- Water table elevations in deep wells ranged from **2.87** (MW-4D) to 4.42 (MW-2D) feet above msl.
- The calculated shallow hydraulic gradient was **0.0045** feet/foot.
- The calculated deep hydraulic gradient for was **0.0055** feet/foot.

NAPL Thickness Data: Monitoring wells were gauged for non-aqueous phase liquid (NAPL). Light non-aqueous phase liquid (LNAPL) was not observed in any of the wells during the second semiannual 2010 monitoring event. Dense non-aqueous phase liquid (DNAPL) was observed in MW-05 measuring 0.15 feet in thickness and at a trace amount in MW-06. Historically, evidence of DNAPL has only been observed in one well (MW-6), during the first semiannual monitoring event of 2009.

Chemical Data: Thirteen of **14** monitoring wells were sampled for benzene, toluene, ethylbenzene, and xylenes (BTEX) and methyl tert-butyl ether (MTBE) via Environmental Protection Agency (EPA) Method 8260, and for polycyclic aromatic hydrocarbons (PAHs) via EPA Method 8270 on September 8, 9, and 10, 2010. MW-05 was not sampled due to migrating DNAPL within the sample tubing.

The chemical data (see **Table 2**) indicate:

- Total BTEX concentrations ranged from below method detection limits (ND) in 12 of the 13 wells sampled to **27** micrograms per liter (ug/L) in shallow monitoring well MW-9S.
- Total PAH concentrations were ND in eight of the 13 wells sampled to **396** ug/L in shallow monitoring well MW-9S.
- MTBE concentrations were ND in all 13 monitoring wells sampled.

Data Trend Analysis: Generally, consistent BTEX and PAH concentrations (see historical data in **Tables 3** and **4**) have been observed in groundwater on and adjacent to the Site over the past six sampling events (March 2008, July 2008, March 2009, September 2009, March 2010, and September 2010). The sampling events in March and July 2008 were conducted by Tetra Tech EC, Inc. as part of the Remedial Investigation (RI). The subsequent sampling events in March 2009, September 2009, March 2010, and September 2010 were conducted by GEI Consultants, Inc., as part of this semiannual groundwater monitoring program.

Total BTEX detections were limited to one of the 13 wells sampled (MW-09S). The total BTEX detection in MW-09S (27 ug/L) in the second semiannual September 2010 sampling event was its highest and only concentration recorded during the four prior sampling events. BTEX detections in MW-6 have decreased from a high of 57.3 ug/L in March 2008 to ND in September 2010 and have remained at or near detection levels in the

previous sampling events. Total BTEX concentrations in MW-7D have generally been low, reaching a maximum of 9 ug/L in March 2010 and ND in the subsequent September 2010 event.

Total PAH detections were limited to five of the 13 wells sampled (MW-3, MW-4D, MW-6, MW-8S and MW-9S). The total PAH detection in MW-3 (128 ug/L) in the September 2010 sampling event was the highest recorded during the historical monitoring period. Detections of PAHs in MW-4D (6 ug/L in September 2010), has generally been low and sporadic overtime, however, recorded its highest concentration during the historical monitoring period in March 2010 (39 ug/L). The total PAH detection in MW-6 (14 ug/L) decreased from 17 ug/L in March 2010 and remains well below the concentrations recorded in the March and July 2008 sampling events. The detection of PAHs in MW-8S (11 ug/L) has decreased by half from the March 2010 sampling event (22 ug/L), which was the first detection in the historical monitoring period. The total PAH detection in MW-09S (396 ug/L, in September 2010) was the highest recorded during the historical monitoring period increasing from 2 ug/L in March 2010.

MTBE was not detected in any of the 13 wells during this sampling event.

Notable decreasing trends of total BTEX and total PAHs were associated with MW-6, where concentrations have decreased significantly from the sampling events conducted as part of the RI (March and July 2008). Several wells including MW-3 (PAHs) and MW-9S (BTEX and PAHs) recorded the highest detections in the historical monitoring period; however, subsequent sampling results will determine if these increases are indicative of trends or fluctuations. The total BTEX and total PAH concentrations in the remaining wells have either been inconsistent (MW-5), or have remained at or near detection levels.

Current Plans: Continue semiannual groundwater monitoring at the Site.

Tables

Table 1
Water Level Measurements and Calculated Water Elevations
Patchogue Former MGP Site
Second Semiannual 2010 Groundwater Monitoring Event

Well ID	Date of Measurement	Time of Measurement	Total Depth of Well (ft)	Top of Well Casing (ft MSL)	Depth to Water (ft)	Water Level Elevation (ft MSL)	NAPL Observations	Comments
MW-1	9/8/2010	8:11 AM	15.33	11.23	5.81	5.42	NO	--
MW-2D	9/8/2010	8:34 AM	26.61	8.23	3.81	4.42	NO	--
MW-2S	9/8/2010	8:33 AM	14.30	8.97	4.44	4.53	NO	--
MW-3	9/8/2010	9:12 AM	10.60	5.39	2.38	3.01	NO	--
MW-4D	9/8/2010	9:15 AM	26.73	7.57	4.7	2.87	NO	--
MW-4S	9/8/2010	9:14 AM	12.34	7.74	4.94	2.8	NO	--
MW-5	9/10/2010	8:25 AM	16.65	7.93	4.09	3.84	1.5 DNAPL	--
MW-6	9/9/2010	9:00 AM	21.87	8.08	3.71	4.37	Trace DNAPL	--
MW-7D	9/8/2010	8:30 AM	28.28	8.09	4.26	3.83	NO	--
MW-7S	9/8/2010	8:28 AM	12.50	8.21	4.42	3.79	NO	--
MW-8D	9/8/2010	9:07 AM	26.29	4.77	0.71	4.06	NO	--
MW-8S	9/8/2010	9:06 AM	10.25	4.86	0.88	3.98	NO	--
MW-9D	9/8/2010	9:10 AM	23.51	4.66	1.41	3.25	NO	--
MW-9S	9/8/2010	9:10 AM	10.30	4.47	1.42	3.05	NO	--

ft = feet
MSL = mean sea level
NO = None Observed

Table 2
Summary of BTEX, MTBE, and PAH Results
Patchogue Former MGP Site
Second Semiannual 2010 Groundwater Monitoring Event

Sample Name: / Sample Date:	NYS AWQS	MW-1 9/10/2010	MW-2S 9/9/2010	MW-2D 9/9/2010	MW-3 9/8/2010	MW-4S 9/9/2010	MW-4D 9/9/2010	MW-6 9/9/2010	MW-7S 9/10/2010	MW-7D 9/10/2010	MW-8S 9/8/2010	Duplicate of: MW-8S 9/8/2010	MW-8D 9/8/2010	MW-9S 9/8/2010	MW-9D 9/8/2010
BTEX (ug/L)															
Benzene	1	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**5 J**	10 U
Toluene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**1 J**	10 U
Ethylbenzene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**12**	10 U
Xylene, total	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**9 J**	10 U
Total BTEX	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**27**	ND
Other VOCs (ug/L)															
Methyl tert-butyl ether	10*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Non-carcinogenic PAHs (ug/L)															
Acenaphthene	20*	10 U	10 U	10 U	**16**	10 U	10 U	**2 J**	10 U	10 U	10 U	10 U	10 U	**53**	10 U
Acenaphthylene	NE	10 U	10 U	10 U	**31**	10 U	**3 J**	10 U	10 U	10 U	10 U	10 U	10 U	**41**	10 U
Anthracene	50*	10 U	10 U	10 U	**5**	10 U	10 U	**1 J**	10 U	10 U	10 U	10 U	10 U	**2 J**	10 U
Benzo[g,h,i]perylene	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	50*	10 U	10 U	10 U	**6**	10 U	10 U	**2 J**	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	50*	10 U	10 U	10 U	10 U	10 U	10 U	**2 J**	10 U	10 U	10 U	10 U	10 U	**22**	10 U
Methylnaphthalene,2-	NE	10 U	10 U	10 U	10 U	10 U	**3 J**	10 U	10 U	10 U	10 U	10 U	10 U	**10**	10 U
Naphthalene	10*	10 U	10 U	10 U	10 U	10 U	10 U	**2 J**	10 U	10 U	**11**	**10**	10 U	**230**	10 U
Phenanthrene	50*	10 U	10 U	10 U	**63**	10 U	10 U	**3 J**	10 U	10 U	10 U	10 U	10 U	**38**	10 U
Pyrene	50*	10 U	10 U	10 U	**7**	10 U	10 U	**2 J**	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carcinogenic PAHs (ug/L)															
Benz[a]anthracene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[a]pyrene	ND	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[b]fluoranthene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[k]fluoranthene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz[a,h]anthracene	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Indeno[1,2,3-cd]pyrene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Total PAHs (ug/L)															
Total PAHs	NE	ND	ND	ND	**128**	ND	**6**	**14**	ND	ND	**11**	**10**	ND	**396**	ND

Table 2
Summary of BTEX, MTBE, and PAH Results
Patchogue Former MGP Site
Second Semiannual 2010
Groundwater Monitoring Event

Notes:

ug/L - micrograms per liter or parts per billion (ppb)
BTEX - benzene, toluene, ethylbenzene, and xylenes
VOCs - volatile organic compounds
PAHs - polycyclic aromatic hydrocarbons
Total BTEX and Total PAHs are calculated using detects only
NYS AWQS - New York State Ambient Water Quality Standards and Guidance Values for GA groundwater
* indicates the value is a guidance value and not a standard

NE - not established
ND - not detected

Bolding indicates a detected concentration
Shading and bolding indicates that the detected concentration is above the NYS AWQS objective it was compared to

Validation Qualifiers:

J - estimated value
U - indicates not detected at or above the reporting limit shown

Table 3
Summary of Historical Total BTEX Results
Patchogue Former MGP Site
Seond Semiannual 2010 Groundwater Monitoring Event

Well No.	Total Depth (feet)	Total BTEX Concentrations (ug/L)								
		Sampling Date								
		2008		2009		2010		Min	Max	Mean
		March*	July*	March	Sept	March	Sept			
MW-1	15.2	0.00	NS	0	0	0	0	0	0	0
MW-2S	14.45	0.00	0.00	0	0	0	0	0	0	0
MW-2D	26.4	0.00	0.00	0	0	0	0	0	0	0
MW-3	10.6	0.00	0.00	0	0	0	0	0	0	0
MW-4S	12.2	3.40	0.00	0	0	0	0	0	3	1
MW-4D	26.65	0.00	0.00	0	0	0	0	0	0	0
MW-5	16.6	1,016	678	975	1,257	637	NS	637	1,257	913
MW-6	21.8	57.3	0.00	0	1	2	0	0	57	10
MW-7S	12.39	NS	0.00	0	0	0	0	0	0	0
MW-7D	28.26	NS	0.00	1	0	9	0	0	9	2
MW-8S	10.13	NS	0.00	0	0	0	0	0	0	0
MW-8D	25.23	NS	0.00	0	0	0	0	0	0	0
MW-9S	10.26	NS	0.00	0	0	0	27	0	27	5
MW-9D	23.48	NS	0.00	0	0	0	0	0	0	0

NOTES:

BTEX - benzene, toluene, ethylbenzene, and xylenes
ug/L - Micrograms per liter
NS - Not selected for sampling as part of the sampling event
* - Samples collected by Tetra Tech EC, Inc. as part of the Remedial Investigation

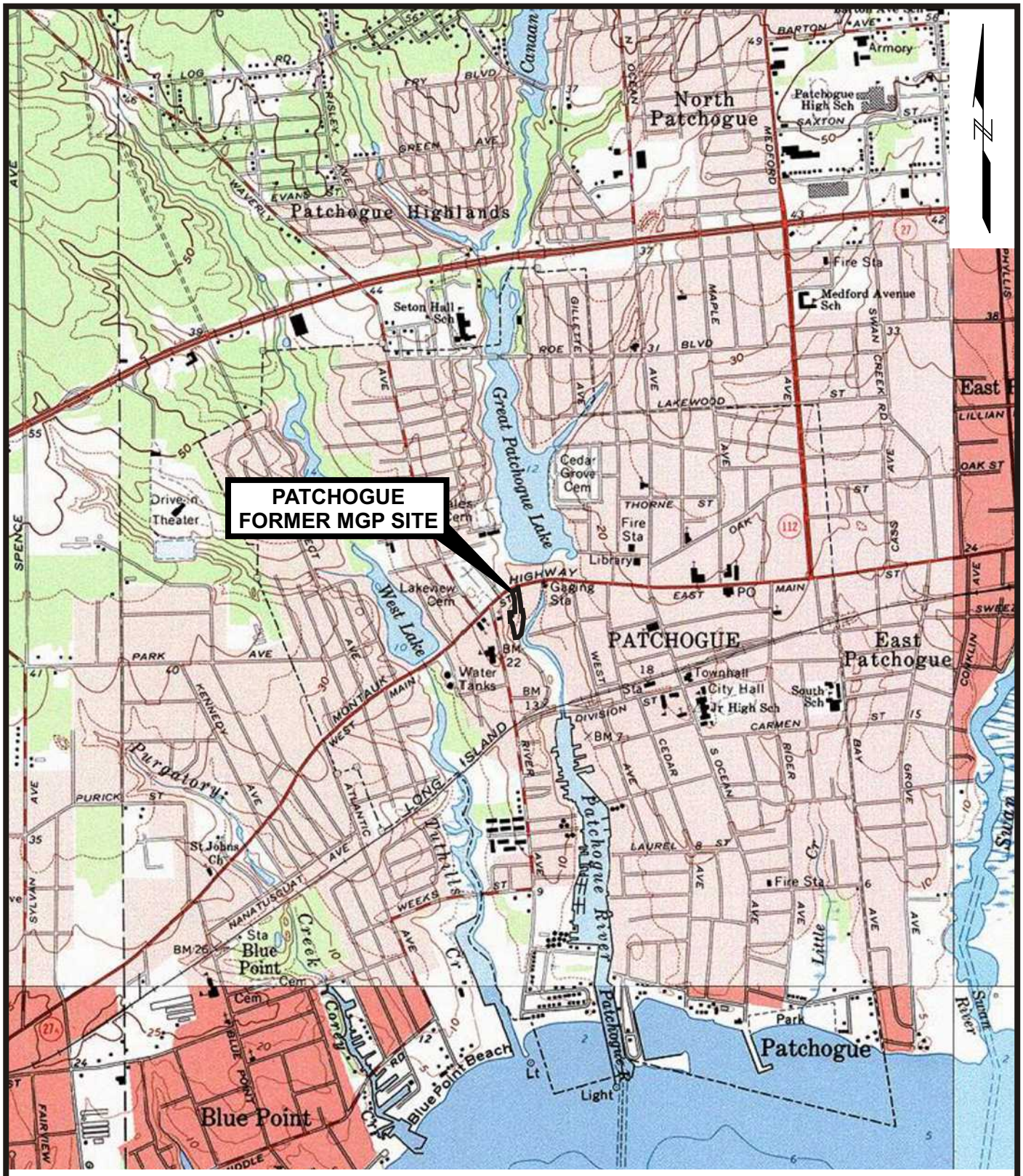
Table 4
Summary of Historical Total PAH Results
Patchogue Former MGP Site
First Semiannual 2010 Groundwater Monitoring Event

Well No.	Total Depth (feet)	Total PAH Concentrations (ug/L)								
		Sampling Date								
		2008		2009		2010		Min	Max	Mean
		March*	July*	March	Sept	March	Sept			
MW-1	15.2	0.00	NS	0	0	0	0	0	0	0
MW-2S	14.45	0.00	0.70	0	0	0	0	0	1	0
MW-2D	26.4	0.00	0.00	0	0	0	0	0	0	0
MW-3	10.6	0.76	0.00	0	0	0	128	0	128	21
MW-4S	12.2	0.60	7.96	0	0	0	0	0	8	1
MW-4D	26.65	4.28	0.00	0	0	39	6	0	39	8
MW-5	16.6	1,773.90	1,798.70	2,730	3,373	2,390	NS	1774	3373	2413
MW-6	21.8	214.18	154.20	0	1	17	14	0	214	67
MW-7S	12.39	NS	0.00	0	0	0	0	0	0	0
MW-7D	28.26	NS	0.47	0	0	0	0	0	0	0
MW-8S	10.13	NS	0.00	0	0	22	11	0	22	7
MW-8D	25.23	NS	0.00	0	0	0	0	0	0	0
MW-9S	10.26	NS	12.01	0	0	2	396	0	396	82
MW-9D	23.48	NS	0.00	0	0	0	0	0	0	0

NOTES:

PAH - polycyclic aromatic hydrocarbons
ug/L - Micrograms per liter
NS - Not selected for sampling as part of the sampling event
* - Samples collected by Tetra Tech EC, Inc. as part of the Remedial Investigation

Figures



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

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SCALE, FEET

PATCHOGUE FORMER MGP SITE
VILLAGE OF PATCHOGUE
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SITE LOCATION MAP

November 2010 Figure 1

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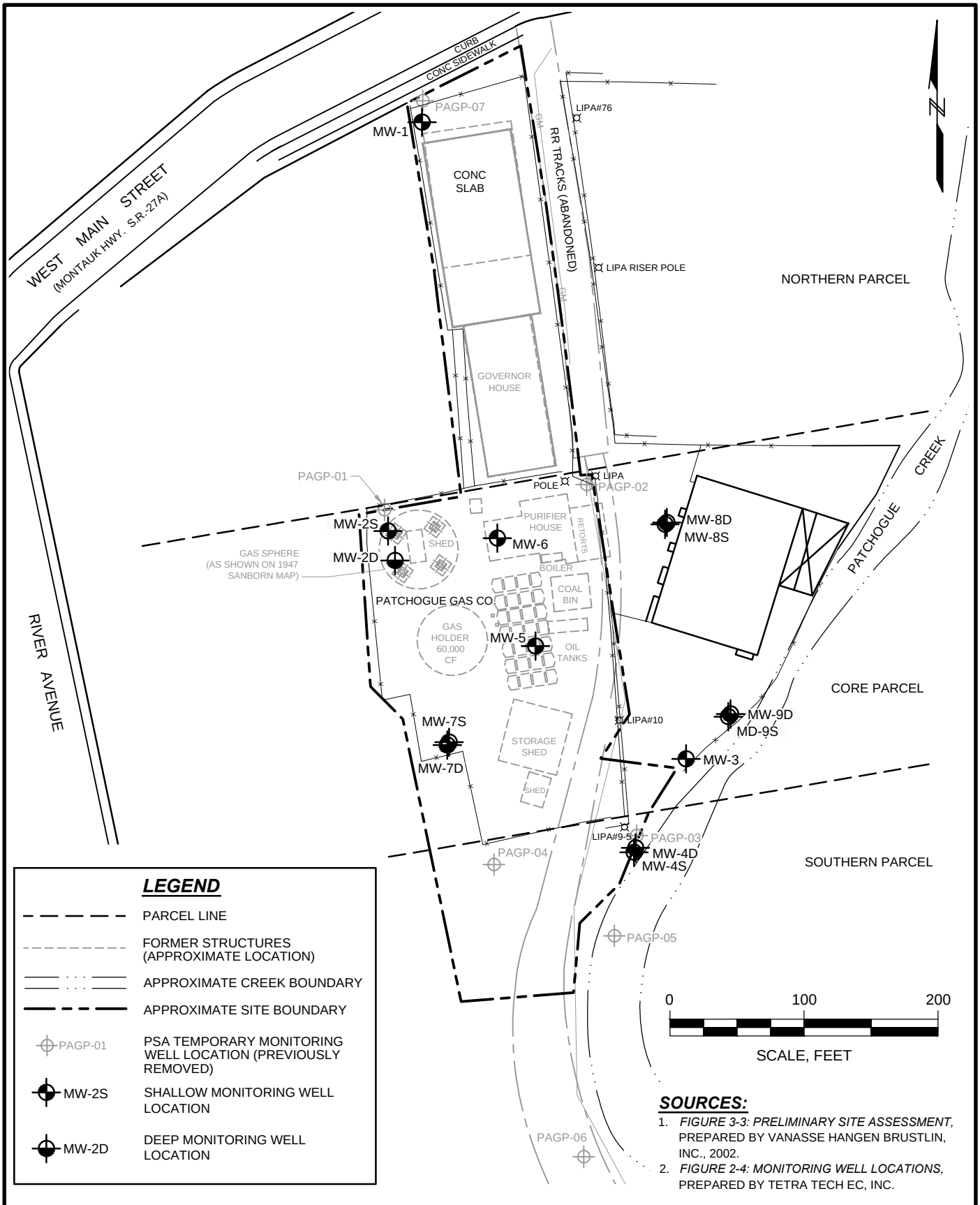

SOURCES:

1. *FIGURE 3-3: PRELIMINARY SITE ASSESSMENT,* PREPARED BY VANASSE HANGEN BRUSTLIN, INC., 2002.
2. *FIGURE 2-4: MONITORING WELL LOCATIONS,* PREPARED BY TETRA TECH EC, INC.

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MONITORING WELL LOCATIONS

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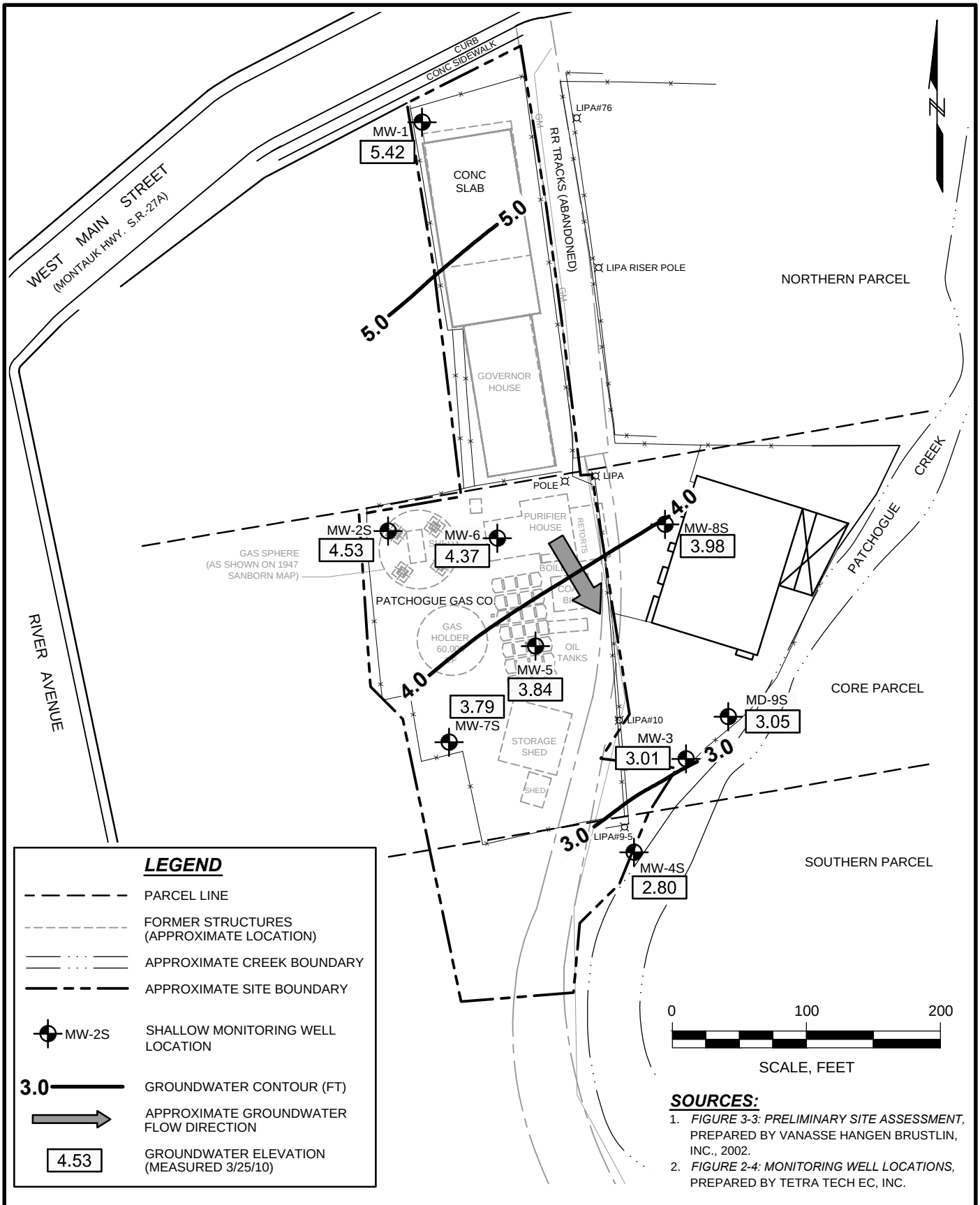

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2. *FIGURE 2-4: MONITORING WELL LOCATIONS,* PREPARED BY TETRA TECH EC, INC.

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SHALLOW GROUNDWATER CONTOUR MAP

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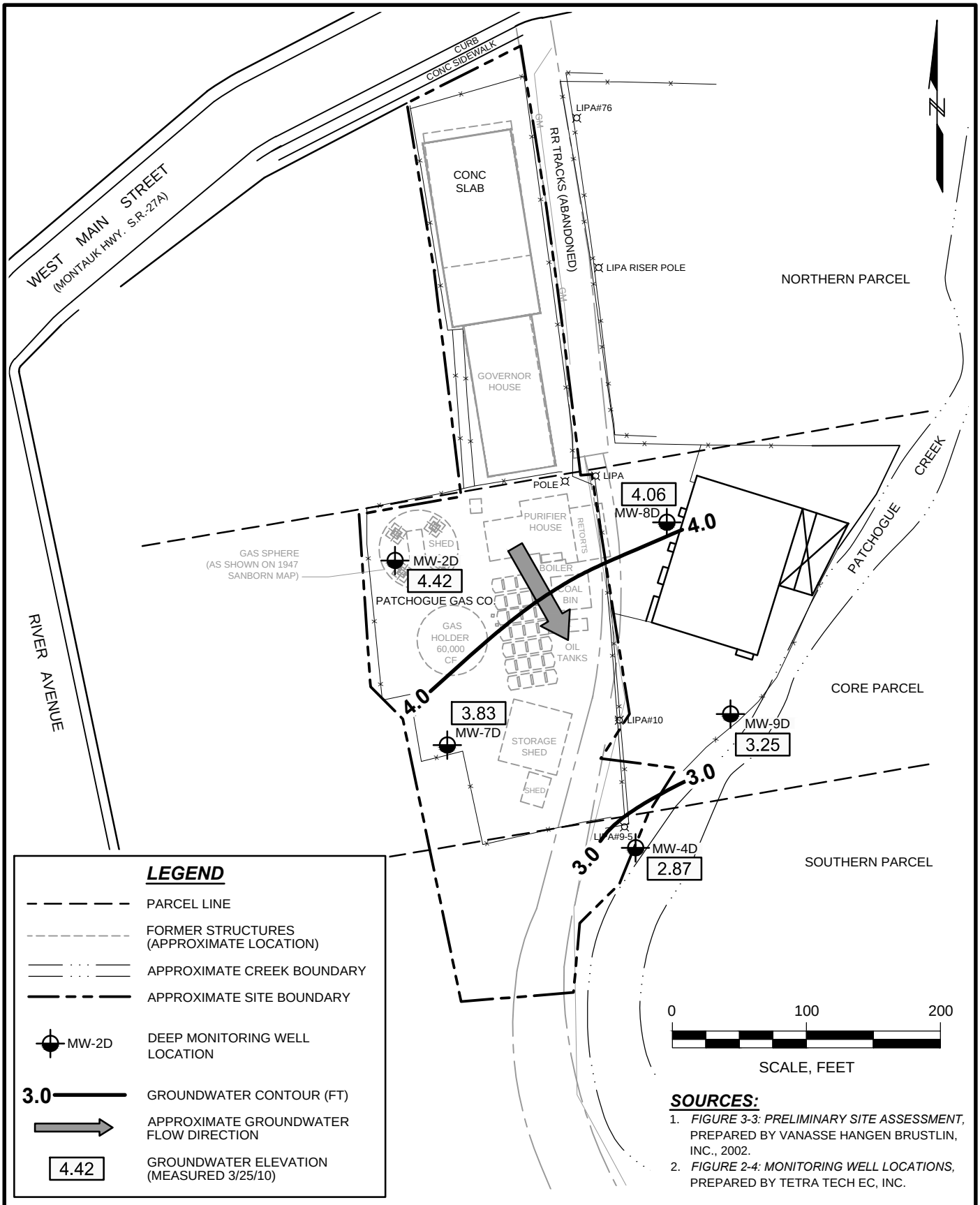

LEGEND

- PARCEL LINE
- FORMER STRUCTURES (APPROXIMATE LOCATION)
- APPROXIMATE CREEK BOUNDARY
- APPROXIMATE SITE BOUNDARY
- MW-2D — DEEP MONITORING WELL LOCATION
- 3.0 — GROUNDWATER CONTOUR (FT)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- 4.42 — GROUNDWATER ELEVATION (MEASURED 3/25/10)

SOURCES:

1. *FIGURE 3-3: PRELIMINARY SITE ASSESSMENT,* PREPARED BY VANASSE HANGEN BRUSTLIN, INC., 2002.
2. *FIGURE 2-4: MONITORING WELL LOCATIONS,* PREPARED BY TETRA TECH EC, INC.

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DEEP GROUNDWATER CONTOUR MAP

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