GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

Groundwater Monitoring Report
First 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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1. Site and Adjacent Downgradient Off-Site Areas

First Semiannual 2010 Groundwater Monitoring Event Summary

Event Date: March 9, 2010 to March 15, 2010, and March 25, 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 March 25, 2010. Groundwater levels and calculated elevations are presented in **Table 1**. The groundwater flow direction was generally to the southeast (see **Figures 3 & 4**); however, the flow was slightly more easterly in Q1 2010 in comparison to the historical flow direction due to dewatering operations associated with off-site 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 **5.55** (MW-8S) to **8.66** (MW-4S) feet below the well measuring point.
- Water table elevations in shallow wells ranged from **-2.70** (MW-9S) to **3.74** (MW-1) feet above mean sea level (MSL).
- Depth to the water table in deep wells ranged from **5.28** (MW-8D) to **8.69** (MW-4D) feet below the well measuring point.
- Water table elevations in deep wells ranged from **-2.93** (MW-9D) to **1.92** (MW-2D) feet above mean sea level (MSL).
- The calculated shallow hydraulic gradient was **0.0095** feet/foot.
- The calculated deep hydraulic gradient for was **0.0013** feet/foot.

NAPL Thickness Data: Monitoring wells were gauged for non-aqueous phase liquid (NAPL). Light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL) were not observed in any of the wells during the first semiannual 2010 monitoring event. Historically, evidence of DNAPL has only been observed in one well (MW-6), during the first semiannual monitoring event of 2009.

Chemical Data: All **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 March 9 to March 15, 2010.

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

- Total BTEX concentrations ranged from below method detection limits (ND) in 11 of the 14 wells sampled to **637** micrograms per liter (ug/L) in shallow monitoring well MW-5.
- Total PAH concentrations were ND in 9 of the 14 wells sampled to **2,390** ug/L in shallow monitoring well MW-5.
- MTBE concentrations ranged from ND in 12 of the 14 wells sampled to **3** ug/L in deep monitoring well MW-4D.

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 five sampling events (March 2008, July 2008, March 2009, September 2009 and March 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, and March 2010 were conducted by GEI Consultants, Inc., as part of this semiannual groundwater monitoring program.

Total BTEX detections were limited to 3 of the 14 wells sampled (MW-5, MW-6 and MW-7D). The total BTEX detection in MW-5 (637 ug/L) in the first semiannual/March 2010 sampling event was lower than the concentrations recorded during the four prior sampling events (1,016 ug/L, 678 ug/L, 975 ug/L, and 1,257) and is the lowest value recorded during the historical monitoring period. BTEX detections in MW-6 have decreased from a high of 57.3 ug/L in March 2008 to ND in July 2008 and have remained at or near detection levels in the subsequent sampling events. Total BTEX concentrations in MW-7D have generally been low, reaching a

maximum of 9 ug/L in March 2010.

Total PAH detections were limited to 5 of the 14 wells sampled (MW-4D, MW-5, MW-6, MW-8S and MW-9S). Similar to total BTEX, the PAH detection in MW-5 (2,390 ug/L) in the first semiannual/March 2010 sampling event was lower than the two prior sampling events (2,730 ug/L and 3,373 ug/L). Detections of PAHs in MW-4D (39 ug/L), and MW-9S (2 ug/L) have generally been low and sporadic; however, the March 2010 concentration in MW-4D was the highest recorded during the historical monitoring period. The total PAH detection in MW-6 (17 ug/L) has increased over the past three sampling events, but remains well below the concentrations recorded in the March and July 2008 sampling events. The detection of PAHs in MW-8S (22 ug/L) in the first semiannual/March 2010 sampling event was the first detection in the historical monitoring period.

MTBE was detected at concentrations below the reportable detection limit (RDL) in two wells, MW-4D (3 ug/L) and MW-9D (1 ug/L), during this sampling event.

Notable decreasing trends of total BTEX and total PAHs were limited to 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-4D (PAHs), MW-7D (BTEX) and MW-8S (PAHs) recorded the highest detections in the historical monitoring period; however, subsequent sampling results will determine if these increases are actual trends or typical fluctuations. The total BTEX and total PAH concentrations in the remaining wells with historical detections have either been inconsistent (MW-5), or have remained at or near detection levels.

Current Plans: Continue semiannual groundwater monitoring at site.

Tables

Table 1
Water Level Measurements and Calculated Water Elevations
Patchogue Former MGP Site
First 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	3/25/2010	0931	15.33	11.23	7.49	3.74	NO	--
MW-2D	3/25/2010	0855	26.61	8.23	6.31	1.92	NO	--
MW-2S	3/25/2010	0856	14.30	8.97	6.91	2.06	NO	--
MW-3	3/25/2010	0915	10.60	5.39	7.40	-2.01	NO	--
MW-4D	3/25/2010	0919	26.73	7.57	8.69	-1.12	NO	--
MW-4S	3/25/2010	0918	12.34	7.74	8.66	-0.92	NO	--
MW-5	3/25/2010	0850	16.65	7.93	7.65	0.28	NO	--
MW-6	3/25/2010	0859	21.87	8.08	6.73	1.35	NO	--
MW-7D	3/25/2010	0853	28.28	8.09	7.19	0.90	NO	--
MW-7S	3/25/2010	0852	12.50	8.21	7.29	0.92	NO	--
MW-8D	3/25/2010	0907	26.29	4.77	5.28	-0.51	NO	--
MW-8S	3/25/2010	0906	10.25	4.86	5.55	-0.69	NO	--
MW-9D	3/25/2010	0912	23.51	4.66	7.59	-2.93	NO	--
MW-9S	3/25/2010	0912	10.30	4.47	7.17	-2.70	NO	--

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

Note: The observed 3-4' drop in depth to water measurements is likely due to dewatering occuring at a construction site located on the southeast side of the creek. The water is being pumped into the creek.

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

Sample Name: / Sample Date:	NYS AWQS	MW-1 3/15/2010	Duplicate of: MW-1 3/15/2010	MW-2S 3/9/2010	MW-2D 3/9/2010	MW-3 3/15/2010	MW-4S 3/12/2010	MW-4D 3/12/2010	MW-5 3/15/2010	MW-6 3/9/2010	MW-7S 3/9/2010	MW-7D 3/9/2010	MW-8D 3/12/2010	MW-8S 3/12/2010	MW-9S 3/12/2010	MW-9D 3/12/2010
BTEX (ug/L)																
Benzene	1	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**35**	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Toluene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**42**	10 U	10 U	**9 J**	10 U	10 U	10 U	10 U
Ethylbenzene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**260**	**2 J**	10 U	10 U	10 U	10 U	10 U	10 U
Xylene, total	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**300**	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Total BTEX	NE	ND	ND	ND	ND	ND	ND	ND	**637**	**2**	ND	**9**	ND	ND	ND	ND
Other VOCs (ug/L)																
Methyl tert-butyl ether	10*	10 U	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 U	**1 J**
Non-carcinogenic PAHs (ug/L)																
Acenaphthene	20*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**160 J**	**4 J**	10 U	10 U	10 U	10 U	**2 J**	10 U
Acenaphthylene	NE	10 U	10 U	10 U	10 U	10 U	10 U	**1 J**	**2 J**	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene	50*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**11**	**1 J**	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[g,h,i]perylene	NE	10 U	10 U	10 U	10 U	10 U	10 U	**4 J**	10 U	10 U	10 U	10 U	10 U	**2 J**	10 U	10 U
Fluoranthene	50*	10 U	10 U	10 U	10 U	10 U	10 U	**3 J**	**7**	**2 J**	10 U	10 U	10 U	**3 J**	10 U	10 U
Fluorene	50*	10 U	10 U	10 U	10 U	10 U	10 U	**1 J**	**46**	**5**	10 U	10 U	10 U	10 U	10 U	10 U
Methylnaphthalene,2-	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**190 J**	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	10*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**1,900**	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Phenanthrene	50*	10 U	10 U	10 U	10 U	10 U	10 U	**2 J**	**67**	**3 J**	10 U	10 U	10 U	**2 J**	10 U	10 U
Pyrene	50*	10 U	10 U	10 U	10 U	10 U	10 U	**3 J**	**7**	**2 J**	10 U	10 U	10 U	**4 J**	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	**3 J**	10 U	10 U	10 U	10 U	10 U	**3 J**	10 U	10 U
Benzo[a]pyrene	ND	10 U	10 U	10 U	10 U	10 U	10 U	**3 J**	10 U	10 U	10 U	10 U	10 U	**2 J**	10 U	10 U
Benzo[b]fluoranthene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	**6 J**	10 U	10 U	10 U	10 U	10 U	**2 J**	10 U	10 U
Benzo[k]fluoranthene	0.002*	10 U	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 U	10 U
Chrysene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	**5**	10 U	10 U	10 U	10 U	10 U	**3 J**	10 U	10 U
Dibenz[a,h]anthracene	NE	10 U	10 U	10 U	10 U	10 U	10 U	**1 J**	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	**4 J**	10 U	10 U	10 U	10 U	10 U	**1 J**	10 U	10 U
Total PAHs (ug/L)																
Total PAHs	NE	ND	ND	ND	ND	ND	ND	**39**	**2,390**	**17**	ND	ND	ND	**22**	**2**	ND

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

Well No.	Total Depth (feet)	Total BTEX Concentrations (ug/L)							
		Sampling Date							
		2008		2009		2010			
		March*	July*	March	Sept	March	Min	Max	Mean
MW-1	15.2	0.00	NS	0	0	0	0	0	0
MW-2S	14.45	0.00	0.00	0	0	0	0	0	0
MW-2D	26.4	0.00	0.00	0	0	0	0	0	0
MW-3	10.6	0.00	0.00	0	0	0	0	0	0
MW-4S	12.2	3.40	0.00	0	0	0	0	3	1
MW-4D	26.65	0.00	0.00	0	0	0	0	0	0
MW-5	16.6	1,016	678	975	1,257	637	637	1,257	913
MW-6	21.8	57.3	0.00	0	1	2	0	57	12
MW-7S	12.39	NS	0.00	0	0	0	0	0	0
MW-7D	28.26	NS	0.00	1	0	9	0	9	3
MW-8S	10.13	NS	0.00	0	0	0	0	0	0
MW-8D	25.23	NS	0.00	0	0	0	0	0	0
MW-9S	10.26	NS	0.00	0	0	0	0	0	0
MW-9D	23.48	NS	0.00	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

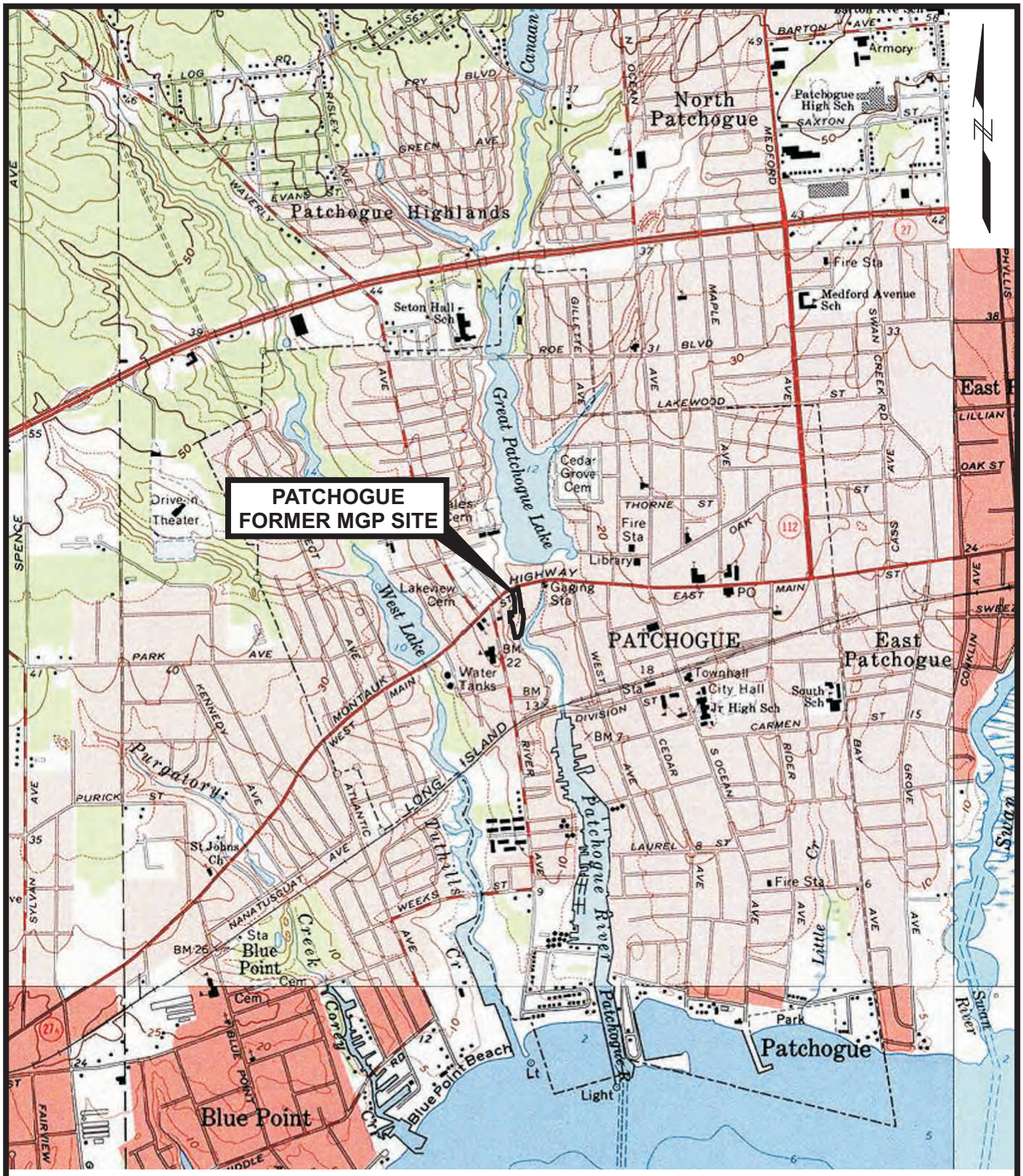
Table 4
Summary of Historical Total PAH Results
Patchogue Former MGP Site
First Semiannual 2010 Groundwater Monitoring Event

Well No.	Total Depth (feet)	Total PAH Concentrations (ug/L)							
		Sampling Date							
		2008		2009		2010			
		March*	July*	March	Sept	March	Min	Max	Mean
MW-1	15.2	0.00	NS	0	0	0	0	0	0
MW-2S	14.45	0.00	0.70	0	0	0	0	1	0
MW-2D	26.4	0.00	0.00	0	0	0	0	0	0
MW-3	10.6	0.76	0.00	0	0	0	0	1	0
MW-4S	12.2	0.60	7.96	0	0	0	0	8	2
MW-4D	26.65	4.28	0.00	0	0	39	0	39	9
MW-5	16.6	1,773.90	1,798.70	2,730	3,373	2,390	1,774	3,373	2,413
MW-6	21.8	214.18	154.20	0	1	17	0.00	214	77
MW-7S	12.39	NS	0.00	0	0	0	0	0	0
MW-7D	28.26	NS	0.47	0	0	0	0	0	0
MW-8S	10.13	NS	0.00	0	0	22	0	22	6
MW-8D	25.23	NS	0.00	0	0	0	0	0	0
MW-9S	10.26	NS	12.01	0	0	2	0	12	4
MW-9D	23.48	NS	0.00	0	0	0	0	0	0

NOTES:

PAHs - 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)

PATCHOGUE FORMER MGP SITE
VILLAGE OF PATCHOGUE
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SITE LOCATION MAP

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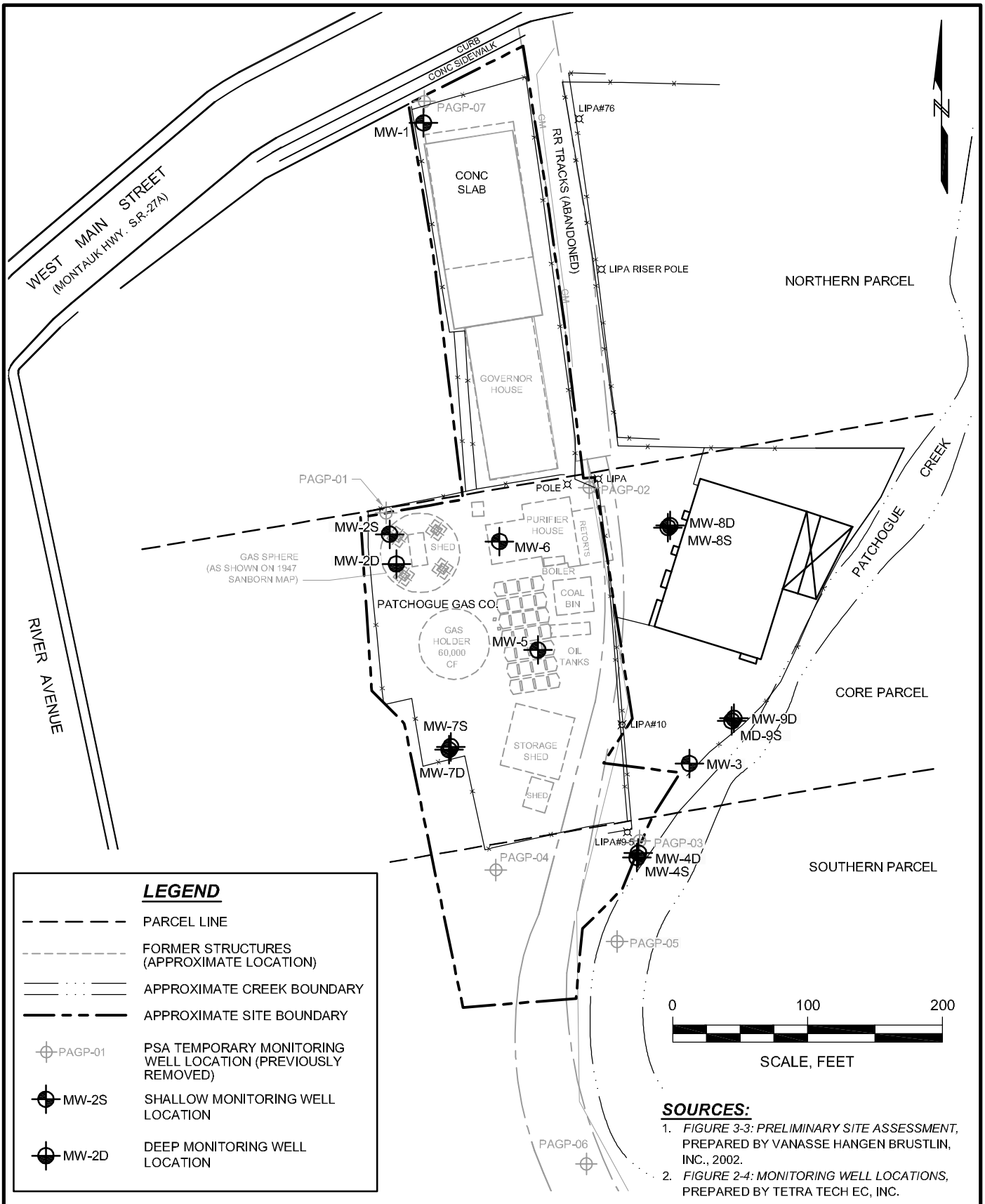

SOURCES:

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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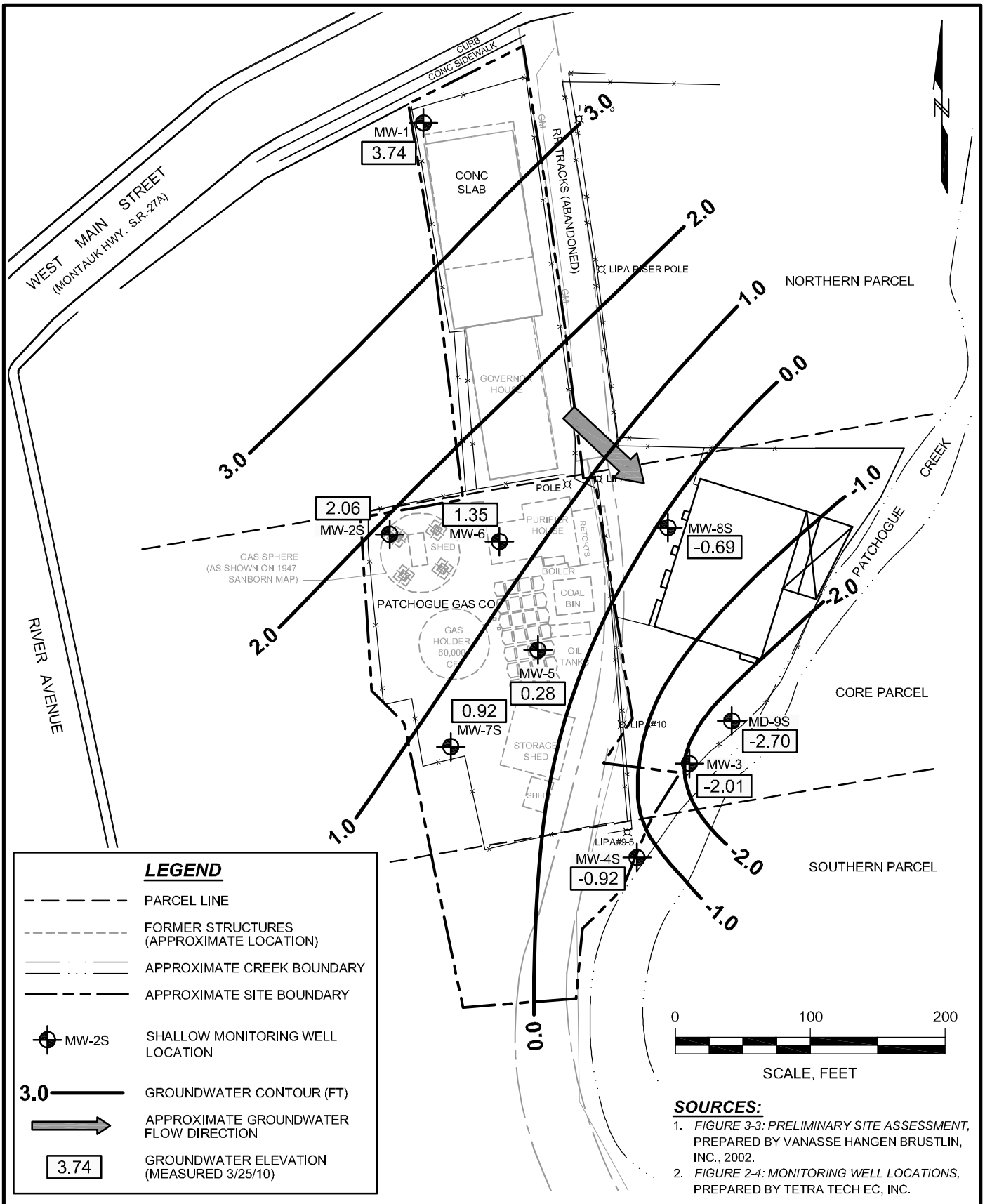

LEGEND

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

SOURCES:

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SHALLOW GROUNDWATER CONTOUR MAP

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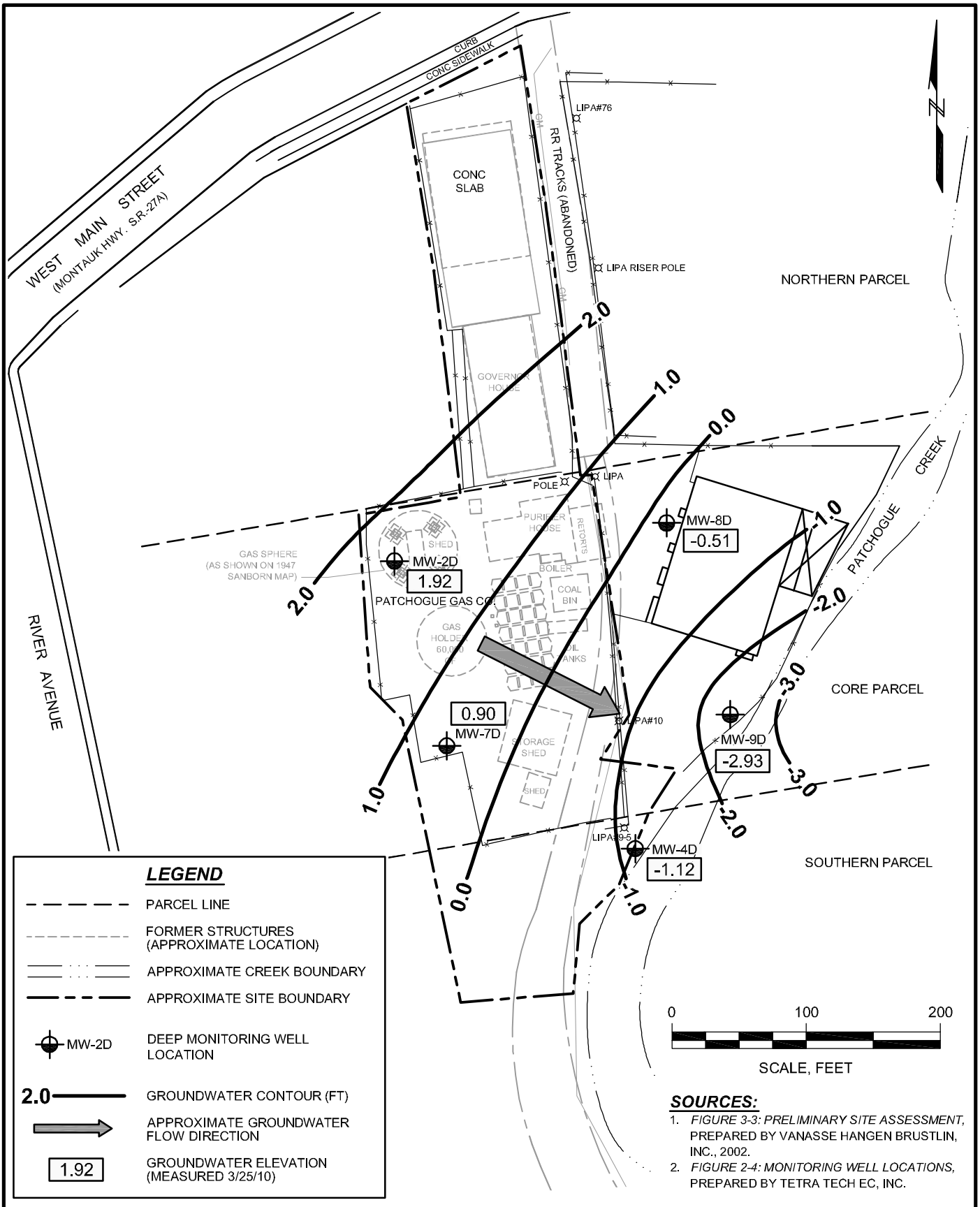

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DEEP GROUNDWATER CONTOUR MAP

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