RFW:01-0297

DNAPL ASSESSMENT
EAST STREET AREA 2 SITE
PITTSFIELD, MASSACHUSETTS

April 28, 1999

HSI GEOTRANS
A TETRA TECH COMPANY
6 Lancaster County Road, Suite Four
Harvard, Massachusetts 01451

DNAPL ASSESSMENT
EAST STREET AREA 2 SITE
PITTSFIELD, MASSACHUSETTS

PREPARED FOR:

GENERAL ELECTRIC COMPANY

PREPARED BY:

HSI GEOTRANS, INC.
6 LANCASTER COUNTY ROAD
HARVARD, MASSACHUSETTS 01451

Corporate Environmental Programs
General Electric Company
100 Woodlawn Avenue, Pittsfield, MA 01201

April 28, 1999

Mr. Bryan Olson
Mr. Dean Tagliaferro
Site Evaluation and Response Section (HBR)
U.S. Environmental Protection Agency
One Congress Street
Boston, MA 02203-2211

Mr. Alan Weinberg
Bureau of Waste Site Cleanup
Department of Environmental Protection
436 Dwight Street
Springfield, MA 01103

Re: General Electric –
East Street Area 2 Site
Pittsfield, Massachusetts

Dear Mr. Olson, Mr. Tagliaferro, Mr. Weinberg:

Enclosed please find the document entitled *DNAPL Assessment, East Street Area 2 Site, Pittsfield, Massachusetts.* This document has been prepared on behalf of the General Electric Company (GE) by HSI GeoTrans, Inc. It presents the results of investigations conducted for GE between March 11, 1999 and April 13, 1999, pursuant to the *Proposal for Supplemental Source Control Containment Recovery Measures (BBL, January 1999).*

Please contact me at (413) 494-3952 if you have any comments regarding the enclosed document.

Yours truly,

For

John D. Ciampa
Remediation Project Manager

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1 INTRODUCTION

As described in the Proposal for Supplemental Source Control Contaminant/ Recovery Measures (BBL, 1999), coal-tar-derived dense non-aqueous phase liquids (DNAPL) are present beneath portions of the East Street Area 2 Site. This report presents the findings of the further evaluation of DNAPL occurrence at the East Street Area 2 Site as proposed in the Proposal for Supplemental Source Control Containment/Recovery Measures (BBL, 1999) and conditionally approved by EPA in a letter dated February 11, 1999. The activities described in this report supplement the source control information previously submitted to the United States Environmental Protection Agency and the Massachusetts Department of Environmental Protection (the Agencies) in the following reports:

- Letter Report regarding Source Control Investigations and Preliminary Containment Barrier Design For East Street Area 2, General Electric Pittsfield Massachusetts (GE, Nov. 18, 1998)

- Proposal for Supplemental Source Control Containment / Recovery Measures (BBL, 1999)

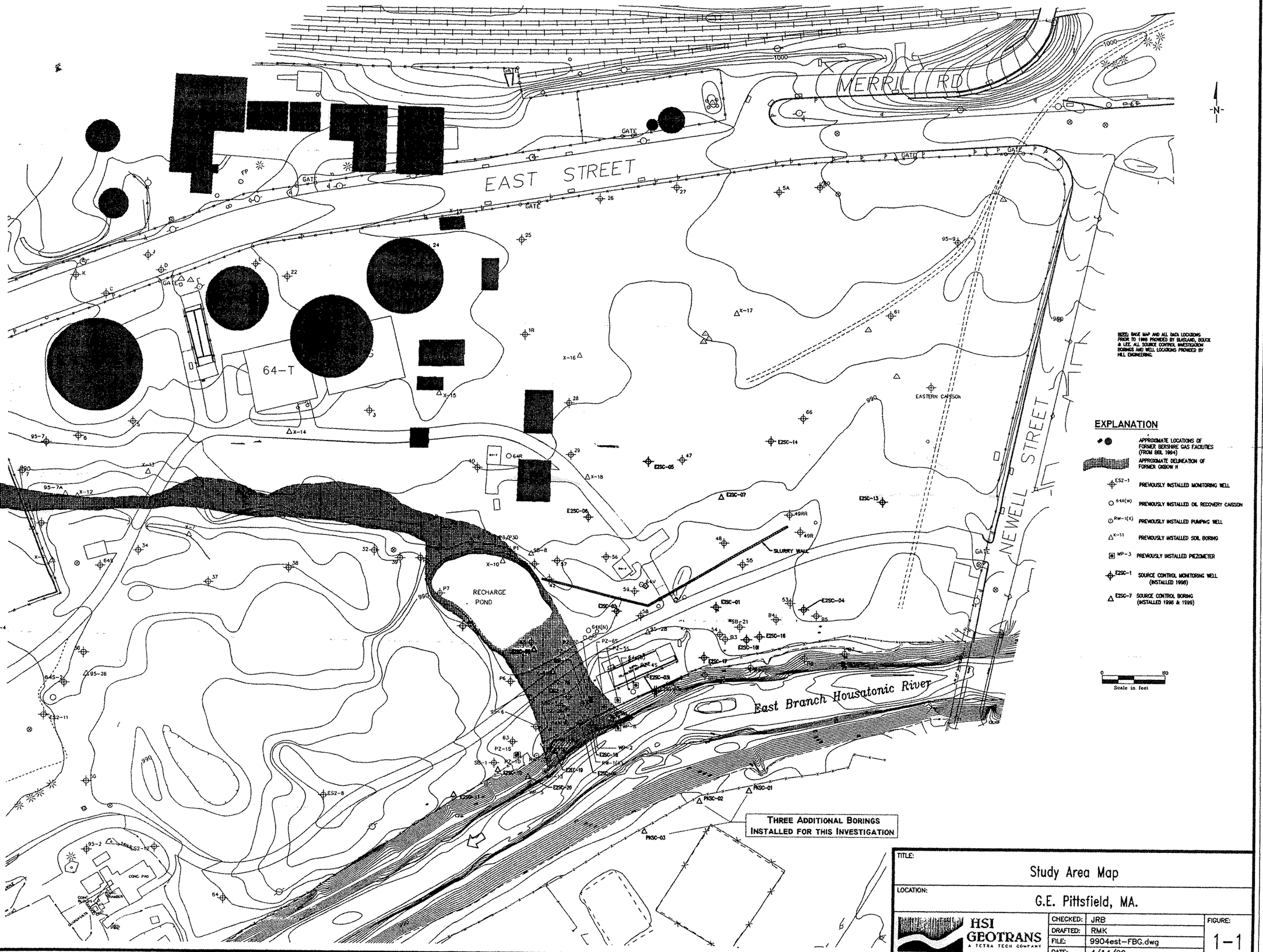
- Source Control Investigation Report Upper Reach of Housatonic River (First ½ Mile) (HSI GeoTrans, 1999)

The additional activities conducted for this evaluation of DNAPL occurrence included drilling and sampling three additional borings on the south side of the Housatonic River (opposite the East Street Area 2 Site) and DNAPL recovery testing of monitoring wells E2SC-17 and E2SC-03I. Results of previous physical and chemical testing of the DNAPL are also summarized in this report.

A portion of the Site was previously owned by the Berkshire Gas Company, which operated a Coal Gasification plant on this property from 1903 to 1972. Structures related to the Berkshire Gas facility, including gas receiver tanks and a tar separator, were located on the south side of East Street. The majority of these structures were removed prior to the 1973 GE purchase of the property (BBL, 1994). The locations of the former coal gasification plant structures are shown on Figure 1-1.

Prior investigations of the East Street Area 2 site downgradient of the former Berkshire Gas plant have shown that coal-tar related DNAPL is present beneath this portion of the Site. Coal-tar DNAPL was observed in soil cores during the drilling of several source control monitoring wells in October and November, 1998. DNAPL has subsequently accumulated in wells E2SC-02, E2SC-03I, and E2SC-17. DNAPL accumulations with the greatest apparent thickness have been observed in wells E2SC-03I and E2SC-17. Apparent DNAPL thicknesses of five to seven feet have been observed in these two wells. NAPL is also detected in monitoring well E2SC-06. Measurements made with an oil/water interface probe in this well indicate that the NAPL is lighter than the water. However, visual observations of a sample of the NAPL indicate both LNAPL and DNAPL components are present in E2SC-06.

The purposes of this most recent evaluation, as proposed by GE in the Proposal for Supplemental Source Control Containment/Recovery (BBL, 1999), were to further determine the areal extent of the DNAPL, determine the elevation of the till surface at three locations on the south side of the river, and evaluate the feasibility for removing DNAPL from the wells by pumping.



TITLE: Study Area Map

LOCATION: G.E. Pittsfield, MA.

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CHECKED:	JRB
DRAFTED:	RMK
FILE:	9904est-FBG.dwg
DATE:	4/14/99

FIGURE: 1-1

2 FIELD INVESTIGATIONS

As outlined in Section 1, additional field investigations were undertaken in March and April 1999 to evaluate the areal extent of DNAPL, collect more information regarding the elevation of the till surface and evaluate the feasibility of pumping the DNAPL from the subsurface.

2.1 ADDITIONAL BORINGS

Between March 11 and March 15, 1999, three borings (PKSC-01, PKSC-02 and PKSC-03) were drilled in Lakewood Park/Hibbard Playground on the south side of the Housatonic River. The locations of the borings are shown on Figure 1-1. The borings were drilled to determine the elevation of the till surface at these locations and to evaluate whether DNAPL had migrated beneath and to the south side of the river. The borings were drilled using the hollow stem auger method. Continuous samples of the unconsolidated deposits were collected using the Standard Penetration Test Method (ASTM D1586). Samples of the unconsolidated deposits were screened in the field for the presence of volatile organic compounds (VOCs) using a photo-ionization detector (PID). All samples were visually screened for the presence of DNAPL. Field observations including geologic descriptions, blow counts, and PID readings were recorded on boring logs. After completing the borings, the locations and ground surface elevations were surveyed relative to the 1927 Massachusetts State Plane Coordinate System and the 1929 National Geodetic Vertical Datum (NGVD). Drilling logs for the three new borings are included in Appendix A.

Representative samples from selected split-spoon cores were collected for laboratory chemical analysis. Composite samples were collected from the following depth intervals:

- zero to one foot
- one to six feet
- six to 15 feet

Each composite sample was analyzed for PCBs. One of the composite samples was analyzed for the compounds listed in Appendix IX of 40 CFR Part 264, excluding herbicides and pesticides, plus three additional compounds, benzidine, 2-chloroethyvinyl ether, and 1,2-diphenyhydrazine. Samples were also collected in Encore samplers® from each split spoon core. The sample from the interval with the highest PID headspace screening measurement was analyzed for VOCs by EPA Method 5035. In addition, a sample of the unconsolidated deposits at the interface of the stratified deposits and the till was collected for PCB analyses. The results of the chemical analyses of the soil samples are summarized in Appendix B. All sampling and analysis was conducted in accordance with the October 1998 Sampling and Analysis Plan/Data Collection and Analysis Quality Assurance Plan (BBL, 1998b).

The three new borings penetrated fill, stratified deposits of sand interbedded with gravel, and till. The till consisted of very dense silt, sand, and gravel, and was encountered at depths ranging from 44 to 56 feet below ground surface. Figure 2-1 is a contour map of the till surface elevation in the portion of the East Street Area 2 Site near the 64X recovery system and the river. The contour map shows that a trough exists in the till surface in the vicinity of monitoring wells E2SC-03I and E2SC-17. The till surface slopes gently to the southeast from the area of monitoring wells E2SC-03I and E2SC-17 towards the new borings PKSC-01 and PKSC-02 on the south side of the river. Figures 2-2 and 2-3 are east/west and north/south cross sections, respectively, showing the stratigraphy and the stratigraphic level of the LNAPL and DNAPL observed in monitoring wells. The cross section locations are shown on Figure 2-1.

As indicated on cross section B-B[1], DNAPL was not observed in the borings on the south side of the river, nor were indications of DNAPL observed in any of the samples collected from the three new borings. As shown in Appendix B, low concentrations of PCBs were detected in several of the samples collected from new borings. However, PCB soil concentrations were below two parts per million (ppm) with the exception of a single sample collected from zero to one foot in boring PKSC-02, which contained PCBs at a concentration of 2.7 ppm. No PCBs were detected in the samples collected just above the till surface. No

semi-volatile organic compounds (SVOCs) were detected in any samples collected from the new borings. Acetone was the only VOC detected. It was detected in three samples at low concentrations (estimated) ranging from .0086 to .031 ppm. Several inorganic and dioxin/dibenzofuran compounds were also detected in samples collected from the three new borings. These constituents were detected at concentrations which are within the ranges observed in previous background sampling of Housatonic River floodplain soils (BBL, 1996).

The SVOC polynuclear aromatic hydrocarbons (PAHs) were the constituents measured at the highest concentrations in the coal-tar DNAPL sample from monitoring well E2SC-03I. The VOCs benzene, toluene, ethylbenzene and xylene (BTEX) were also detected in the DNAPL sample from E2SC-03I. None of these compounds were detected in any of the samples collected from the three new borings.

2.2 DNAPL PUMPING AND RECOVERY TESTING

Since the installation of the Source Control Investigation monitoring wells at East Street Area 2 in October and November 1998, groundwater and DNAPL levels have been periodically monitored. Table 2-1 summarizes the groundwater level and NAPL levels measured. Because of the viscous nature of the DNAPL and its smearing on the inside of the well casing, these measurements are considered approximate.

DNAPL has also been removed from wells E2SC-03I and E2SC-17 manually since January 7, 1999. Initially, removal from both wells was done utilizing a bailer. Due to the high viscosity of the coal-tar DNAPL, manual removal using a bailer was difficult. A QED Pulse Pump (model LP 1301) was installed in monitoring well E2SC-17 on March 11, 1999 and in monitoring well E2SC-03I on March 31, 1999 to test the potential of improving DNAPL recovery. The QED pump was selected, after a review of available pumps, for its ability to pump viscous fluids and to fit into the two-inch diameter monitoring wells. This is

also the same pump which has been successfully used to remove DNAPL at the Newell Street Area II Site. Table 2-2 summarizes the weekly removal activities from these wells.

To further evaluate DNAPL recovery, DNAPL pumping tests were conducted in monitoring wells E2SC-03I and E2SC-17, between March 29 and April 13, 1999. The tests consisted of pumping DNAPL from the wells until water was observed in the discharge tubing and recording the volume of DNAPL removed. The wells were then allowed to recover and were pumped at least one more time. On March 29, 1999, 5.7 liters of DNAPL were recovered from E2SC-17 in five and one-half hours. The DNAPL in monitoring well E2SC-17 was allowed to recover and the well was pumped again on March 31, 1999. During the second test, one liter of DNAPL was recovered in three hours and 20 minutes of pumping. Four liters of DNAPL were pumped from well E2SC-03I over a four hour and ten minute period on March 31. On April 2, 1.3 liters of DNAPL were pumped from E2SC-03I in 50 minutes. The well was allowed to recover for three hours and 17 minutes and pumped again for one hour. During the second hour of pumping, approximately 3.7 liters of DNAPL were recovered. Based on these initial results, a longer term pumping test of E2SC-03I was conducted on April 13, 1999. DNAPL was pumped for approximately six hours and forty minutes, and approximately 10 liters of DNAPL were recovered. Table 2-3 summarizes the data recorded during the DNAPL pumping and recovery testing.

Table 2-1. Water Level and NAPL Level Table for E2SC-02, E2SC-03I, E2SC-06 and E2SC-17.

Boring	Date Measured	Measuring Point Elevation	Depth to LNAPL	Depth to Water	Groundwater Elevation	LNAPL Thickness	Depth to DNAPL	DNAPL Elevation	Comments
E2SC-02									
	10/26/98	987.57		22.74	964.83				
	10/28/98	987.57		16.26	971.31				
	11/2/98	987.57		16.10	971.47				
	11/4/98	987.57		16.11	971.46				NAPL on probe, Sheen
	11/6/98	987.57		16.11	971.46				Sheen
	11/9/98	987.57		16.14	971.43				Sheen
	11/13/98	987.57		15.93	971.64				Sheen
	11/25/98	987.57		16.13	971.44				Sheen
	12/8/98	987.57		16.12	971.45				NAPL on probe
	12/17/98	987.57		16.18	971.39		42.73	944.84	
	12/29/98	987.57		16.12	971.45		43.30	944.27	
	1/7/99	987.57		16.19	971.38				NAPL on probe
E2SC-03I									
	10/22/98	982.12		10.29	971.83		40.68	941.44	
	10/26/98	982.12		10.45	971.67		40.35	941.77	
	10/28/98	982.12		10.49	971.63		38.96	943.16	
	11/6/98	982.12		10.59	971.53		38.54	943.58	
	11/10/98	982.12		10.55	971.57		38.72	943.40	
	11/13/98	982.12		10.41	971.71		38.83	943.29	
	11/25/98	982.12		10.57	971.55		38.53	943.59	
	12/8/98	982.12		10.53	971.59		38.82	943.30	
	12/17/98	982.12		10.61	971.51		38.71	943.41	
	12/29/98	982.12		11.59	970.53		38.31	943.81	
	1/7/99	982.12		10.60	971.52		38.60	943.52	
	1/7/99	982.12		10.54	971.58		38.59	943.53	
	1/14/99	982.12		10.30	971.82		38.62	943.50	
	1/21/99	982.12		9.55	972.57		39.04	943.08	
	1/28/99	982.12		9.29	972.83		37.75	944.37	

Table 2-1. Water Level and NAPL Level Table for E2SC-02, E2SC-03I, E2SC-06 and E2SC-17.

Boring	Date Measured	Measuring Point Elevation	Depth to LNAPL	Depth to Water	Groundwater Elevation	LNAPL Thickness	Depth to DNAPL	DNAPL Elevation	Comments
	2/4/99	982.12		8.57	973.55		39.49	942.63	
	2/11/99	982.12		9.45	972.67		38.07	944.05	
	2/18/99	982.12		9.61	972.51		37.94	944.18	
	2/25/99	982.12		10.06	972.06		37.78	944.34	
	3/4/99	982.12		7.41	974.71		41.56	940.56	
	3/11/99	982.12		9.46	972.66		37.60	944.52	
	3/18/99	982.12		9.33	972.79		38.30	943.82	
	3/25/99	982.12		8.20	973.92		38.60	943.52	
E2SC-06									
	10/26/98	992.49		20.25	972.24				2.5' NAPL on tape, Sheen
	10/28/98	992.49	15.40	20.51	971.98	5.11			
	11/2/98	992.49	21.50	21.90	970.59	0.40			
	11/4/98	992.49	16.90	18.01	974.48	1.11			
	11/6/98	992.49		20.42	972.07				NAPL on probe
	11/9/98	992.49	17.72						Probe will not sink through NAPL.
	11/13/98	992.49	17.73						Probe will not sink through NAPL.
	11/25/98	992.49							Could not measure, casing smeared with NAPL, NAPL on probe
E2SC-17									
	10/28/98	985.38		13.59	971.79				
	11/4/98	985.38		13.66	971.72		47.90	937.48	
	11/6/98	985.38		13.65	971.73		47.75	937.63	
	11/9/98	985.38		13.66	971.72		47.70	937.68	
	11/13/98	985.38		13.46	971.92		47.57	937.81	
	11/25/98	985.38		13.67	971.71		46.61	938.77	
	12/8/98	985.38		13.65	971.73		45.07	940.31	
	12/17/98	985.38		14.71	970.67		43.85	941.53	
	12/29/98	985.38		13.66	971.72		43.83	941.55	
	1/7/99	985.38		13.79	971.59		44.17	941.21	
	1/7/99	985.38		13.64	971.74		43.95	941.43	

Table 2-1. Water Level and NAPL Level Table for E2SC-02, E2SC-03I, E2SC-06 and E2SC-17.

Boring	Date Measured	Measuring Point Elevation	Depth to LNAPL	Depth to Water	Groundwater Elevation	LNAPL Thickness	Depth to DNAPL	DNAPL Elevation	Comments
	1/14/99	985.38		13.39	971.99		44.05	941.33	
	1/21/99	985.38		12.71	972.67		44.35	941.03	
	1/28/99	985.38		12.30	973.08		44.29	941.09	
	2/4/99	985.38		11.76	973.62		44.26	941.12	
	2/11/99	985.38		12.49	972.89		44.17	941.21	
	2/18/99	985.38		12.65	972.73		44.00	941.38	
	3/4/99	985.38		11.93	973.45		44.26	941.12	

NOTES:

-Elevations are feet above NGVD.

-Depths are feet below Measuring Point Elevation.

-The Elevations of the bottom of the monitoring wells are:

E2SC-02 943.93
E2SC-03I 934.93
E2SC-06 970.76
E2SC-17 936.06

Table 2-2. Summary of weekly DNAPL removal from wells E2SC-3I and E2SC-17

Date	Volume Removed (Liters)	
	E2SC-03I	E2SC-17
1/7/99	3.0	2.0
1/14/99	0.7	1.6
1/21/99	0.9	1.2
1/28/99	1.4	1.0
2/4/99	1.2	1.0
2/11/99	1.3	1.2
2/18/99	1.3	1.0
2/25/99	0.4	0.75
3/4/99	1.5	2.0
3/11/99	0.45	0.755 *
3/18/99	0.5	3.0 *
3/25/99	0.5	4.0 *
4/1/99	7.0*	0.1*
4/8/99	6.0*	4.0*
4/15/99	7.0*	4.0*
4/22/99	5.5*	0.5*
* DNAPL recovered with pump.		

Table 2-3. DNAPL pumping and recovery test summary, E2SC-03I and E2SC-17

E2SC-03I (TEST 1) 3/31/99	
ELAPSED PUMPING TIME (MIN)	CUMULATIVE DNAPL RECOVERY (L)
40	0.025
44	0.05
70	0.1
76	0.175
82	0.275
88	0.35
94	0.425
100	0.875
158	1.125
174	1.425
178	1.605
185	1.88
204	2.23
210	2.53
224	2.78
230	3.18
235	3.58
246	4.03
250	4.08

Table 2-3. Continued

E2SC-031 (TEST 2) 4/2/99	
ELAPSED PUMPING TIME (MIN)	CUMULATIVE DNAPL RECOVERY (L)
0	0.05
7	0.3
23	0.7
40	1.05
50	1.3
247	1.7
253	1.9
263	2.125
274	2.475
279	2.825
285	3.15
293	3.525
300	3.875
305	4.225
307	4.725
309	4.975

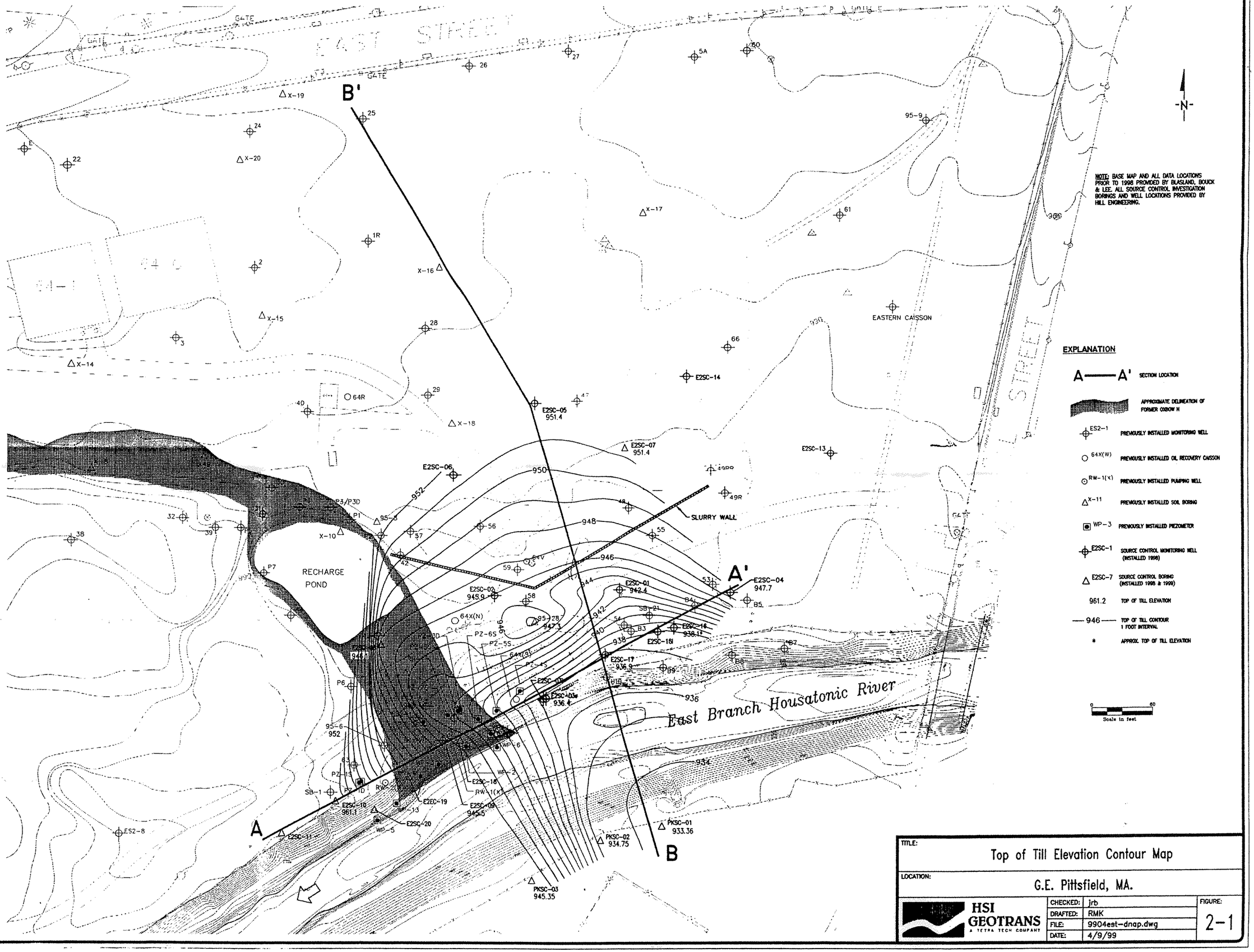
Table 2-3. Continued

E2SC-03I (TEST 3) 4/13/99	
ELAPSED PUMPING TIME (MIN)	CUMULATIVE DNAPL RECOVERY (L)
0	0.1
8	0.15
16	0.151
24	0.15125
32	0.1515
40	0.15175
48	0.152
50	0.152
53	0.1525
55	0.153
61	0.158
66	0.258
71	0.333
76	0.383
85	0.433
94	0.533
102	0.608
109	0.708
117	0.783
126	0.883
134	1.008
142	1.183
151	1.383
161	1.733
169	2.233
178	2.758
187	3.033
195	3.333
203	3.508
211	3.758
219	4.008
227	4.283
236	4.533
244	4.783
253	5.008
262	5.258
270	5.508
278	5.758
286	5.983
295	6.208
303	6.433
312	6.658

E2SC-03I (TEST 3) 4/13/99	
ELAPSED PUMPING TIME (MIN)	CUMULATIVE DNAPL RECOVERY (L)
320	6.858
329	7.058
337	7.258
346	7.458
354	7.658
362	7.858
370	8.158
379	8.483
387	9.733
396	9.983

E2SC-17 (TEST 1) 3/29/99	
ELAPSED PUMPING TIME (MIN)	CUMULATIVE DNAPL RECOVERY (L)
330	5.7

E2SC-17 (TEST 2) 3/31/99	
ELAPSED PUMPING TIME (MIN)	CUMULATIVE DNAPL RECOVERY (L)
150	0.65
160	0.75
170	0.87
180	0.97
190	1.02
200	1.045



TITLE: Top of Till Elevation Contour Map

LOCATION: G.E. Pittsfield, MA.

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A TETRA TECH COMPANY

CHECKED:	jrb
DRAFTED:	RMK
FILE:	9904est-dnap.dwg
DATE:	4/9/99

FIGURE: 2-1

A

A'

1000
990
980
970
960
950
940
930

E2SC-11
E2SC-10
SB-1
PZ-1
63
RW-2(X)
SB6
95-6
E2SC-09
RW-1(X)
PZ-3S
PZ-3D
PZ-4S
E2SC-03s
E2SC-03i
SB-17
SB-18
E2SC-17
54
E2SC-16s
E2SC-16i
SB-20
SB-21
53
E2SC-04

.10
ND
ND
9J
.5
ND
6.4P
1.8
.04P
1.4
20
3.9
3.0
.34P
.43P
.44P
140
140
.11
.09
53
ND
6.4P
.25
52
140
.22
2.4
24
.68
37
1.20
1.5
.99
.36
ND
ND
.11
ND
ND
ND
ND
7.5
3.7

THINLY BEDDED LOOSE FINE TO MEDIUM SAND

SAND & GRAVEL

FILL

MEDIUM DENSE TO DENSE; MEDIUM TO COARSE SAND & GRAVEL

DENSE TO VERY DENSE SILTY SAND AND GRAVEL (TILL)

SILT AND SILTY SAND

THINLY BEDDED LOOSE FINE TO MEDIUM SAND

MEDIUM DENSE TO DENSE; MEDIUM TO COARSE SAND & GRAVEL

SILT AND SILTY SAND

FILL

DENSE TO VERY DENSE SILTY SAND AND GRAVEL (TILL)

EXPLANATION

E2SC-10 — WELL OR BORING DESIGNATION

GROUND SURFACE

ND — TOTAL PCB CONCENTRATION IN SOIL (PPM) AND SOIL SAMPLE INTERVAL

LNAPL OBSERVED IN WELL

WELL SCREEN

WATER TABLE (DASHED WHERE INFERRED)

APPROXIMATE DNAPL LEVEL

FAINT STAINING OR ODOR

STAINED AND SHEEN

* NAPL OBSERVED IN SOIL

ND NOT DETECTED

P ANALYTE WAS DETECTED IN THE SAMPLE CONCENTRATION IS ESTIMATED DUE TO LABORATORY QA CONCERNS

NOTE: BASE MAP AND ALL DATA LOCATIONS PRIOR TO 1998 PROVIDED BY BLASLAND, BOUCK & LEE. ALL SOURCE CONTROL INVESTIGATION BORINGS AND WELL LOCATIONS PROVIDED BY HILL ENGINEERING.

10
VERTICAL SCALE
VERTICAL EXAGGERATION 4X
0
HORIZONTAL SCALE
0
40
SCALE IN FEET

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Figure 2-2 Cross-Section A-A'

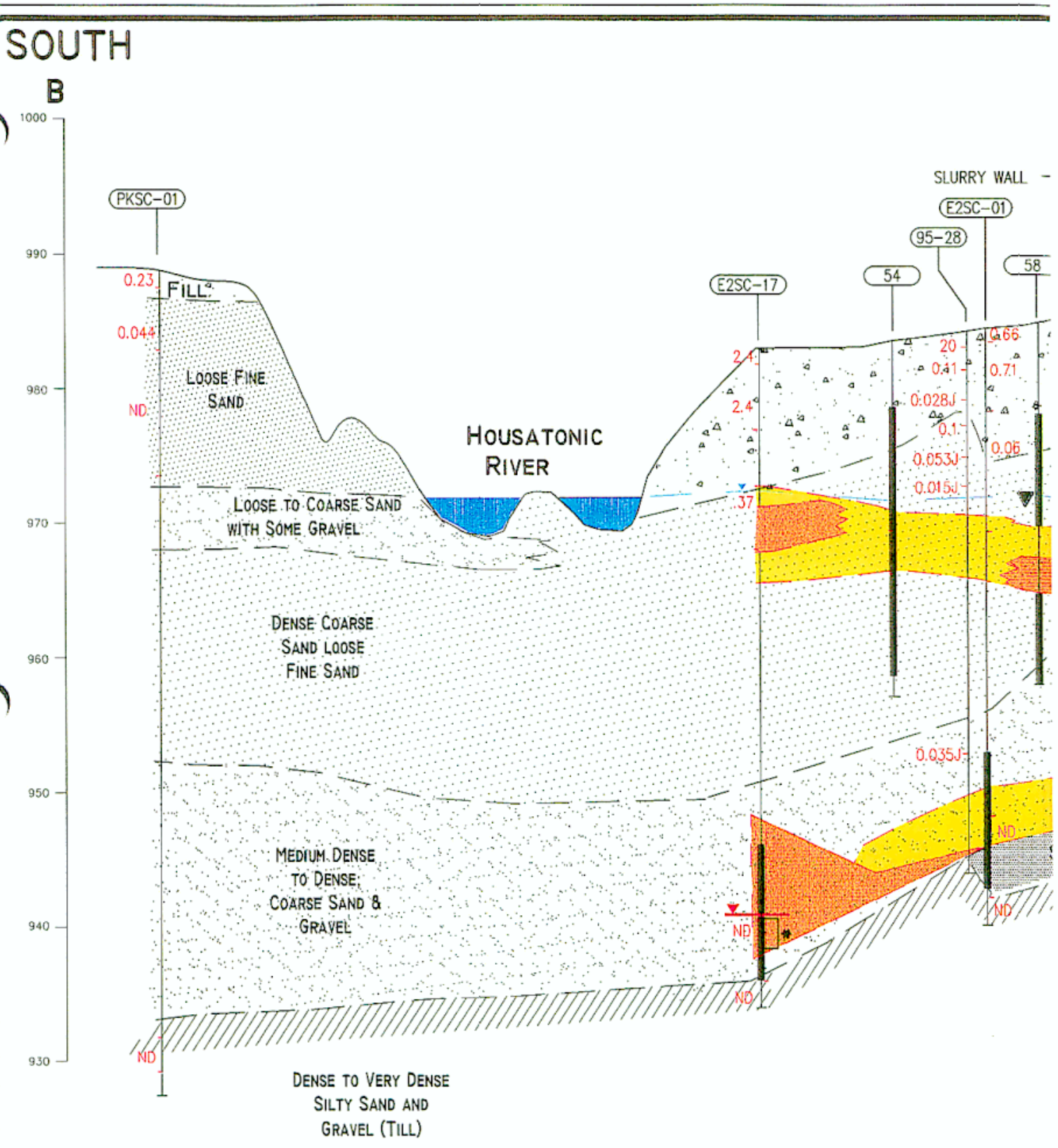
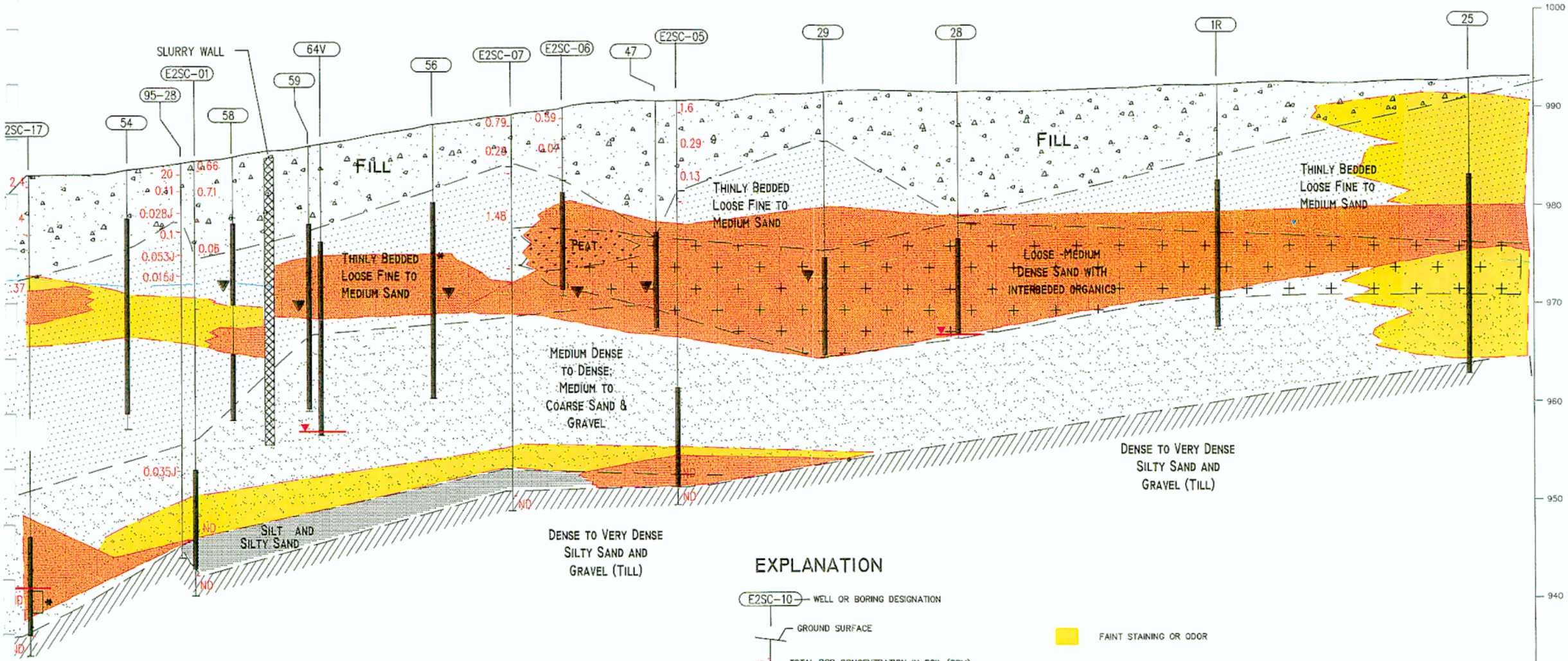


Figure 2-3 Cross-Section B-B'

NORTH

B'



EXPLANATION

- E2SC-10 — WELL OR BORING DESIGNATION
- GROUND SURFACE
- ND — TOTAL PCB CONCENTRATION IN SOIL (PPM) AND SOIL SAMPLE INTERVAL
- WELL SCREEN
- WATER TABLE (DASHED WHERE INFERRED)
- LNAPL OBSERVED IN WELL
- APPROXIMATE DNAPL LEVEL
- * NAPL OBSERVED IN SOIL
- ND NOT DETECTED
- P ANALYTE WAS DETECTED IN THE SAMPLE CONCENTRATION IS ESTIMATED DUE TO LABORATORY QA CONCERNS

- FAINT STAINING OR ODOR
- STAINED AND SHEEN

VERTICAL SCALE 10 — VERTICAL EXAGGERATION 4X

HORIZONTAL SCALE 0 — 40

SCALE IN FEET

NOTE: BASE MAP AND ALL DATA LOCATIONS PRIOR TO 1998 PROVIDED BY BLASLAND, BOUCK & LEE. ALL SOURCE CONTROL INVESTIGATION BORINGS AND WELL LOCATIONS PROVIDED BY HILL ENGINEERING.

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9904estS-B.DWG

3 DNAPL PHYSICAL AND CHEMICAL PROPERTIES

Samples of DNAPL from wells ES2-6, 64V, and E2SC-03I have been collected and analyzed for chemical and physical properties. The DNAPL was analyzed for PCBs and Appendix IX+3 constituents. Interfacial tension and specific gravity of the DNAPL were also measured.

3.1 PHYSICAL PROPERTIES

DNAPL samples from recovery well 64V and monitoring wells E2SC-03I and ES2-6 have been tested for specific gravity. Specific gravity ranges from 1.03 for DNAPL from recovery well 64V, to 1.39 for DNAPL from monitoring well ES2-6. The interfacial tension between DNAPL from well E2SC-03I and distilled water was determined using a DuNoy tensiometer. The interfacial tension at room temperature ranged from 27.7 to 29.2 dynes/cm. The viscosity of the DNAPL from well E2SC-03I could not be determined because it coated the capillary tube of the viscometer which prohibited the taking of visual measurements. Based on literature review, the viscosity of coal-tar DNAPLs ranges from 10 to 100 centipoise (Mercer and Cohen, 1993). Observations during pumping of E2SC-03I indicate that the viscosity of the DNAPL from the well is variable, ranging from a thick oil to a grease-like consistency. The results of specific gravity and interfacial tension measurements are summarized in Table 3-1.

3.2 CHEMICAL PROPERTIES

Samples of DNAPL from recovery well 64V and monitoring wells ES2-6 and E2SC-03I have been analyzed for PCBs, VOCs and SVOCs. The composition of the three samples are similar and typical of coal tar DNAPL. The major constituents of the DNAPL are the SVOC polynuclear aromatic hydrocarbons (PAHs). Naphthalene was the PAH compound detected at the highest concentration in all of the samples. Naphthalene concentrations ranged from 34,000 mg/kg in the sample from 64V to 110,000 mg/kg in the sample from E2SC-03I. The DNAPL also contains the VOCs benzene, toluene,

ethylbenzene and xylene. Of these compounds, ethylbenzene was detected at the highest concentrations, ranging from 53 mg/kg in the sample from E2SC-03I, to 3700 mg/kg in the sample from ES2-6. No PCBs were detected in the samples from ES2-6 or E2SC-03I. Two samples from recovery well 64V were analyzed for PCBs and contained 202 mg/kg and 288 mg/kg total PCBs. At this location, the DNAPL in recovery well 64V occurs at a shallower depth and may be mixed with the LNAPL that is collected in this well. This mixing may account for the presence of PCBs in the DNAPL at this location and its lower density compared to the DNAPL found at greater depths in wells ES2-6 and E2SC-03I. Table 3-2 summarizes the concentrations of the detected compounds in the DNAPL samples from wells E2SC-03I, ES2-6 and 64V.

Table 3-1. Summary of DNAPL physical measurements

SPECIFIC GRAVITY	
ES2-6	1.39
64V	1.03
E2SC-03I	1.076
INTERFACIAL TENSION (DYNES/CM)	
E2SC-03I	
Oil to water	28.5
Oil to water	27.7
Oil to water	27.7
Water to Oil	29.2

Table 3-2. Summary of Detected Appendix IX Compound concentrations in DNAPL samples from monitoring wells E2SC-03I, ES2-6, and recovery well 64V.

Compound	E2SC-03I Result	E2SC-03I Units	ES2-6* Result	ES2-6* Units	64V* Result	64V* Units
Metals						
Antimony	0.13 B	mg/kg				
Arsenic	3	mg/kg				
Barium	0.22 B	mg/kg				
Chromium	0.079 B	mg/kg				
Copper	8.7	mg/kg				
Lead	1.3	mg/kg				
Mercury	0.061 B	mg/kg				
Nickel	0.66 B	mg/kg				
Selenium	0.92	mg/kg				
Tin	2.2 B	mg/kg				
Zinc	2.2	mg/kg				
SVOC						
1-Methylnaphthalene					14000	mg/kg
2-Methylnaphthalene	34000	mg/kg	28000	mg/kg	11000	mg/kg
Acenaphthene	3800	mg/kg	18000	mg/kg	15000	mg/kg
Acenaphthylene	19000	mg/kg	5500	mg/kg	2900	mg/kg
Acetophenone	160 J	mg/kg				
Anthracene	8500	mg/kg	9200	mg/kg	6500	mg/kg
Benzo(a)anthracene	5500	mg/kg	6800	mg/kg	4900	mg/kg
Benzo(a)pyrene	4500	mg/kg	4900	mg/kg	4200	mg/kg
Benzo(b)fluoranthene	2800	mg/kg				
Benzo(b,k)fluoranthene			8100	mg/kg	4300	mg/kg
Benzo(ghi)perylene	1100 J	mg/kg			1700	mg/kg
Benzo(k)fluoranthene	1300 J	mg/kg				
Chrysene	4800	mg/kg	5400	mg/kg	3700	mg/kg
Dibenz(a,h)anthracene	320 J	mg/kg			320	mg/kg
Dibenzofuran	770 J	mg/kg			590	mg/kg
Fluoranthene	11000	mg/kg	13000	mg/kg	9900	mg/kg
Fluorene	11000	mg/kg				
Indeno(1,2,3-cd)pyrene	980 J	mg/kg			1500	mg/kg
N-Nitrosodiphenylamine	110 J	mg/kg				
Naphthalene	110000	mg/kg	75000	mg/kg	9700	mg/kg
Phenanthrene	32000	mg/kg	39000	mg/kg	26000	mg/kg
Pyrene	15000	mg/kg	22000	mg/kg	15000	mg/kg
VOC						
Benzene	1.3 J	mg/kg				
Ethylbenzene	53	mg/kg	3700	mg/kg	700	mg/kg
Toluene	19	mg/kg	250	mg/kg		
Xylenes (total)	43	mg/kg	2900	mg/kg	600	mg/kg

Notes:

* Sample not analyzed for metals.

B For organics, compound found in method blank. For metals, result is between Method Detection Limit and Reporting Limit.

J For organics, result is between Method Detection Limit and Reporting Limit.

4 RESULTS OF INVESTIGATION

The additional data collected during this investigation have provided a further understanding of the areal extent of the DNAPL at the East Street Area 2 Site, increased definition of the topography of the till surface, and an assessment of the ability to pump the DNAPL.

4.1 AREAL EXTENT OF DNAPL

Separate phase DNAPL has been directly observed in seven wells in the southeastern portion of the East Street Area 2 Site. Wells in which DNAPL has been observed are listed in Table 4-1 and shown on Figure 4-1. Additionally, boring X-19 (see Figure 4-1), drilled during prior investigations of the site, was drilled into a former tar separator associated with the previously existing manufactured gas plant (MGP) operated by Berkshire Gas Company. This tar separator may represent one potential DNAPL source in this area. As shown on Figure 4-1, wells located downgradient of the former MGP area show that DNAPL has accumulated in a narrow zone extending southward from the area of the former MGP. DNAPL has apparently migrated from the area of the former MGP along the sloping till surface. The thickest accumulation of DNAPL has been observed in monitoring well E2SC-03I, which is located in the center of a depression in the till surface near the 64X recovery system.

DNAPL has been consistently detected in monitoring wells E2SC-03I and E2SC-17 since they were completed in October 1998. DNAPL was first detected in monitoring well E2SC-02 on December 17, 1998, approximately two months after it was completed. DNAPL was measured a second time on December 29, 1998, and a thickness of 0.34 feet was measured. During the last measurement made in E2SC-02 on January 7, 1999, ameasurable thickness of DNAPL was not indicated but DNAPL was observed on the probe when it was removed from the well. As previously mentioned, NAPL has also been detected in monitoring well E2SC-06. The NAPL in E2SC-06 appears to be a mixture of DNAPL and LNAPL.

Wells from prior investigations in this portion of the site which have encountered separate phase DNAPL are monitoring wells ES2-6, 28 and recovery well 64V. DNAPL was detected in well ES2-6 shortly after it was installed in 1994. Subsequent monthly measurements of ES2-6 since May 1996 have not detected DNAPL. DNAPL was initially observed in well 28 during a well inventory conducted in May 1995. This well is not regularly monitored for DNAPL. In addition to the LNAPL collected from recovery well 64V, DNAPL (if present) is removed monthly. The DNAPL is removed, using a pneumatic piston pump. Table 4-2 summarizes the volume of DNAPL collected from recovery well 64V since 1997.

Monitoring wells 28, E2SC-06, and recovery well 64V were not drilled to the till surface. Based on the depths of these wells relative to the till surface, the DNAPL observed in these wells appears to be perched on shallower, low permeability layers.

4.2 RESULTS OF DNAPL PUMPING TESTS

The DNAPL pumping tests conducted on monitoring wells E2SC-03I and E2SC-17 indicate that it is possible to pump the viscous coal-tar DNAPL at low rates. The QED pulse pump was capable of pumping the DNAPL despite its high viscosity. During the first test in each well, different pressures and pulse rates were evaluated. Based on this evaluation, a pressure of 40 psi with a discharge pulse of 30 seconds and recharge time of eight minutes were used for the subsequent tests. The DNAPL pumping tests at well E2SC-17 indicated that the DNAPL recharge to that well is relatively slow. After pumping and a recovery period of two days, only one liter of DNAPL was removed from the well. Well E2SC-03I, however, appears to recharge more quickly. After pumping and allowing the well to recharge for two days, 4.9 liters of DNAPL were removed.

During the longer term pumping/recovery test conducted in well E2SC-03I approximately 10 liters of DNAPL were removed during the six hour and 36 minutes of pumping. Figure 4-2 is a cumulative DNAPL recovery graph for E2SC-03I. At the end of the test, water was removed with the DNAPL indicating that the well is not capable of

sustaining the approximate 1.5 liter per hour average DNAPL pumping rate observed during the test.

Increased DNAPL recovery rates may be sustainable from a larger diameter well with a screen that is compatibly sized for the grain size of the deposits above the till layer. The existing monitoring wells were not designed as extraction wells. They are constructed with 2-inch diameter casing with 10-slot well screens. The small well-screen diameter and slot size of the existing monitoring wells potentially limit the rate that the viscous DNAPL can enter the well. The deposits above the till layer are described as well-graded, medium to coarse sand and sandy gravel. Based on these descriptions, it is possible that a well screen with a larger slot size could be used to enhance DNAPL recovery near monitoring well cluster E2SC-03. A larger diameter well constructed with a larger screen slot size compared to that of the existing monitoring wells, may allow the DNAPL to enter the well more easily and be recovered at a higher rate.

Table 4-1. Wells in which separate phase DNAPL has been observed

28	E2SC-17
64V	E2SC-02
ES2-6	E2SC-06*
E2SC-03I	
* Oil/water interface probe indicated LNAPL in the well, visual observation of the NAPL indicated that both LNAPL and DNAPL components were present.	

Table 4-2. DNAPL recovery from recovery well 64V, in gallons

	1997	1998	1999
JANUARY	3	2	2
FEBRUARY	3	2	2
MARCH	2	3	2
APRIL	3	2	
MAY	4	2.5	
JUNE	4	0	
JULY	3	3.5	
AUGUST	4	5	
SEPTEMBER	5	2.5	
OCTOBER	5	2	
NOVEMBER	5	4	
DECEMBER	3	3	
TOTAL	44	31.5	6

TITLE: Areal Extent of DNAPL

LOCATION: G.E. Pittsfield, MA.

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CHECKED:	jrb
DRAFTED:	RMK
FILE:	9904est-dnap.dwg
DATE:	4/9/99

FIGURE: 4-1

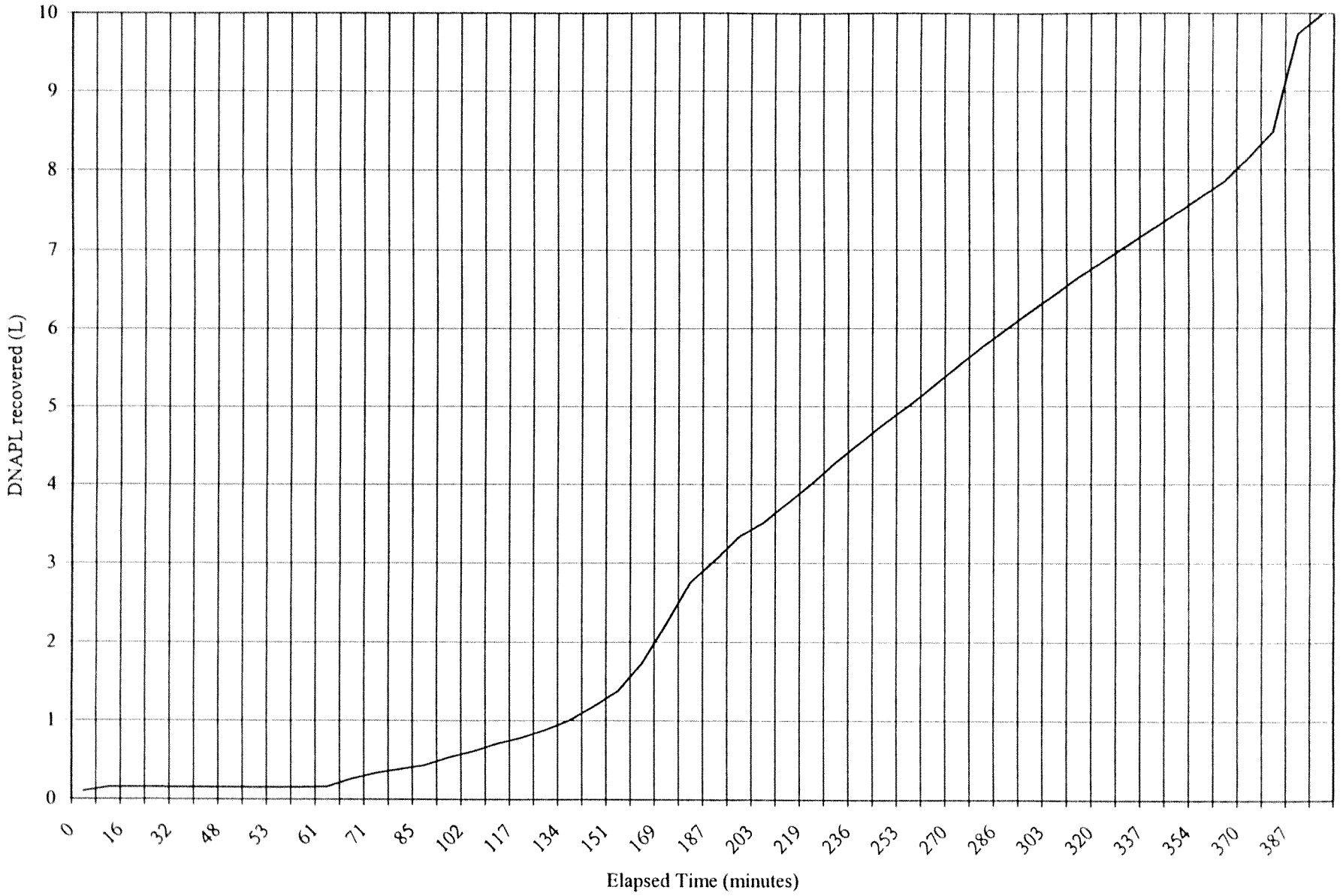

Figure 4-2 Cumulative DNAPL Recovery Well E2SC-03I

HSI Geotrans P:\Projects\GE\P009\E2SC-03IPUMP.xlsChart

5 RECOMMENDATIONS

The testing conducted to date indicates that it is possible to pump coal tar DNAPL at low rates from existing monitoring wells. The DNAPL pumping rate from existing two-inch diameter monitoring wells may be limited by the well construction. A new well designed for recovery of viscous DNAPL may be capable of yielding DNAPL at a higher rate than was obtained from the monitoring wells. It is recommended that a four to six inch diameter well be installed to the top of the till adjacent to monitoring well cluster E2SC-03. This location was chosen based on the higher DNAPL recovery rate measured in well E2SC-03I and its position within the center of the till trough. The purpose of installing this well would be to conduct additional pumping to determine if DNAPL recovery can be sustained utilizing a larger diameter well with a larger screen slot size. If the DNAPL recovery is sustainable, an automated DNAPL collection system for this portion of the site may be warranted.

6 REFERENCES

BBL, 1994, MCP Interim Phase II Report and Current Assessment Summary for East Street Area 2/US EPA Area 4, August, 1994.

BBL, 1996, Evaluation of Housatonic River Sediment and Flood Plain Soil Data on Hazardous Constituents to Assess Need for Further Sampling, 1996.

BBL, 1999, Proposal for Supplemental Source Control Contaminant/Recovery Measures, January, 1999.

BBL, 1998, Revised Sampling and Analysis Plan/Data Collection and Analysis Quality Assurance Plan, October, 1998.

Cohen, R.M. and Mercer, 1993, DNAPL Site Evaluation, C.K. Smoey, Boca Raton, Florida.

GE, 1998, Letter Report Regarding Source Control Investigations and Preliminary Contaminant Barrier Design for East Street Area 2. General Electric, Pittsfield, Massachusetts, November, 1999.

HSI GeoTrans, 1999, Source Control Investigation Report Upper Reach of Housatonic River (First ½ Mile), February 9, 1999.

APPENDIX A
BORING LOGS

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER P009-001
PROJECT NAME Source Control Upper Reach Housatonic River
LOCATION Pittsfield, Massachusetts
DRILLING METHOD HSA
SAMPLING METHOD SS
GROUND ELEVATION 989.36
TOP OF CASING None
LOGGED BY SKC
NORTHING 533345.2065

BORING/WELL NUMBER PKSC-01
DATE DRILLED 3/17/99
CASING TYPE/DIAMETER None
SCREEN TYPE/SLOT None
GRAVEL PACK TYPE None
GROUT TYPE/QUANTITY Portland/Volclay
DEPTH TO WATER
GROUND WATER ELEVATION
EASTING 133512.0729

FID (ppm)	BLOW COUNTS	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.5	4 3	SS01					Loose, Yellowish Brown, SAND w/ some organics, dry, well graded, (Soil Horizon).	1.0
0	4 9 6 6	SS02					Medium Dense, Moderate yellowish Brown, SAND w/ little coal slag, dry, well graded, (Fill).	3.0
12	1 1 2 2	SS03					Very loose, Dusk Yellow, fine and coarse SAND w/ trace organics, dry, poorly graded, (SP).	5.0
0	1 2	SS04		5			Same as above.	6.0
30	2 3 2 2	SS05					Top 0.3 same as above.Middle 0.4 very loose, Light Brown, coarse SAND, dry, well graded, (SW). Bottom 0.1 Very loose, Dark Brown, SAND, dry, well graded, (SW).	8.0
6.5	2 2 2 3	SS06					Loose, Moderate yellowish Brown, SAND w/ few gravel, dry, well graded, sub-rounded, (SW).	10.0
20	3 2 2 4	SS07		10			Same as above.	12.0
1	1 2 3 3	SS08					Loose, Moderate olive Brown, fine SAND w/ few silt, trace organics, dry, well graded, (SW).	14.0
3	1 1	SS09					Loose, Olive Grey, fine SAND w/ few silt, trace organics,moist, well graded, (SW).	15.0
0	15 15	SS10		15			Very loose, Moderate olive Brown, fine to medium SAND w/ little organics, moist, well graded, (SW).	16.0
0	2 3 6 6	SS11					Top 1.5 same as above. Bottom 0.3 loose, Moderate olive Grey, coarse SAND w/ little gravel, moist, well graded, sub-rounded, (SW).	18.0
0	3 4 4 4	SS12					Similar to above except Fe staining and wet.	20.0
0	1 3 4 7	SS13		20			Top 0.7 same as above. Bottom 0.5 loose, Moderate olive Brown, fine SAND w/ trace silt, wet, well graded, (SW).	22.0
0	4 4 6 12	SS14					Medium dense, Moderate olive Brown, fine SAND w/ trace silt, wet, well graded, lamination, (SW).	24.0
0	3 3 5 10	SS15					Loose, Dark yellowish Brown, SAND w/ trace silt, wet, well graded, laminations, some Fe staining, (SW).	26.0
0	4 7 7 5	SS16		25			Top 0.7 same as above. Bottom 0.8 medium dense,Olive Grey, coarse SAND w/ some gravel, wet, well graded, (SW-GW).	28.0
1	3 5 5 10	SS17					Loose, Moderate olive Brown, fine SAND w/ little gravel, trace organics, wet, well graded, laminations, (SW).	30.0
0.5	4 4 5 6	SS18					Loose, Dark yellowish Brown, 5 cm layers fine SAND and coarse GRAVEL , wet, poorly graded, some Fe staining in gravel layers, sub-angular, (SP-GP).	32.0
0	4 5 5 6	SS19		30			Loose, Light olive Grey, fine to medium SAND w/ little fines, wet, poorly graded, (SP).	34.0
0	6 7	SS20					Top 1.6 medium dense, Olive Grey, SAND and GRAVEL w/ little slit, wet, well graded,	
				35			Continued Next Page	

BORING WELL P009_SI_MA.GDT 4/12/99

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER P009-001 **BORING/WELL NUMBER** PKSC-01

PROJECT NAME Source Control Upper Reach Housatonic River **DATE DRILLED** 3/17/99

Continued from Previous Page

FID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (ft BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
	7 10						(SW-GW). Bottom 0.4 loose, Moderate olive Brown, SAND, wet, well graded, (SW).	36.0
0	3 5 7 8	SS21					Medium dense, Light Olive to Olive Grey, GRAVEL w/ little sand, wet, well graded, sub-angular, (GW).	38.0
0	6 12 12 12	SS22					Medium dense, Light olive Brown, coarse GRAVEL w/ some fine sand, little silt, wet, well graded, sub-angular, (GW).	40.0
0	8 12 12 12	SS23		40			Same as above.	42.0
N/A	7 8 8 8	SS24					No Recovery.	44.0
0	17 21 21 21	SS25		45			Dense, Dark yellowish Brown, coarse GRAVEL w/ some sand, trace silt, wet, well graded, sub-angular, (GW).	46.0
0	8 8 8 8	SS26					Dense, Moderate to Dark olive Brown, coarse GRAVEL w/ some coarse and fine sand, trace silt, wet, well graded, sub-angular, (GW-SW).	48.0
0	11 13 13 13	SS27					Very dense, Dark to Dusky yellowish Brown, gravelly coarse SAND w/ trace silt, moist, well graded, sub-round, (SW-GW).	50.0
0	11 11 11 11	SS28		50			Similar to above except Moderate olive Grey in color.	52.0
0	6 6 6 6	SS29					Dense, Light olive Grey to Olive Grey, fine SAND, wet, poorly graded, (SP).	54.0
0	21 21 21 21	SS30		55			Dense, Light olive Grey, SAND w/ little gravel, moist, well graded, (SW).	56.0
0	24	SS31					Hard, Dusky Yellow to Light olive grey, fine SAND and SILT, wet, well graded, (ML).	57.0
0	10 16 15 17	SS32					Medium dense, Dusky Yellow to Light olive Grey, coarse GRAVEL w/ fine sand, some silt, wet, well graded, sub-angular, (GM).	59.0
0	12 28 27	SS33		60			Similar to above w/ coarse GRAVEL and SILT w/ few fine sand, (Till).	61.0

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER P009-001
PROJECT NAME Source Control Upper Reach Housatonic River
LOCATION Pittsfield, Massachusetts
DRILLING METHOD HSA
SAMPLING METHOD SS
GROUND ELEVATION 990.05
TOP OF CASING None
LOGGED BY NSB
NORTHING 533331.1171

BORING/WELL NUMBER PKSC-02
DATE DRILLED 3/11/99
CASING TYPE/DIAMETER None
SCREEN TYPE/SLOT None
GRAVEL PACK TYPE None
GROUT TYPE/QUANTITY Portland/Volclay
DEPTH TO WATER
GROUND WATER ELEVATION
EASTING 133450.2186

FID (ppm)	BLOW COUNTS	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0	5 10	SS01					Loose, Olive Brown, SAND w/ little gravel and organics, dry, well graded, sub-angular, (SW).	1.0
0	6 8 8	SS02					Medium dense, Moderate olive Brown, SAND w/ 0.2 interval of organics, little gravel, dry, well graded, sub-angular, (Fill).	3.0
1	2 2 1 2	SS03					Very loose, Light olive Brown, medium to coarse SAND, trace organics, dry, well graded, (SW).	5.0
1	2 1	SS04		5			Similar to above except moist.	6.0
4	2 1 2 1	SS05					Same as above.	8.0
12	1 2 3 3	SS06					Very loose, Moderate olive Brown, medium to coarse SAND w/ trace gravel and organics, moist, well graded, sub-round, (SW).	10.0
11	4 3 3 3	SS07		10			Loose, Moderate olive Brown, SAND w/ trace gravel and organics, dry, well graded, sub-round, (SW).	12.0
10	3 2 3 3	SS08					Loose, Moderate olive Brown, fine SAND w/ some silt, trace organics, dry, well graded, laminated, (SW-ML).	14.0
8	2 3	SS09					Similar to above except moist.	15.0
12	1 1 2 1	SS10		15			Soft, Olive Brown to Olive Grey, medium to fine SAND and SILT w/ little organics. wet, well graded, (ML-SW).	17.0
28	2 3 8 10	SS11					Top 1.4 soft, Olive Grey, SILT and SAND w/ trace organics, wet, well graded, (ML-SW).	18.4
30	3 5 6 6	SS12		20			Bottom 0.4 medium dense, coarse SAND w/ little gravel, wet, well graded, sub-angular, (SW).	19.0
150	4 2 3 5	SS13					Top 0.2 same as above (Bottom). Middle 0.6 medium dense, Moderate olive Brown, coarse SAND w/ few gravel, wet, well graded, sub-angular, Fe staining, (SW). Bottom 0.2 medium dense, Moderate olive Brown, SAND, wet, well graded, (SW). Similar to above (Top to Bottom) except Bottom 0.1 Olive Grey, SAND and GRAVEL.	21.0
11	5 10 9 9	SS14					Medium dense, Moderate olive Brown, SAND w/ few silt, trace gravel, wet, graded, sub-angular, laminated, (SW).	23.0
4	4 11 12 14	SS15		25			Medium dense, Moderate olive Brown, SAND w/ few gravel, wet, well graded, sub-round (SW).	25.0
5	8 8 9 11	SS16					Medium dense, Moderate olive Brown, SAND w/ trace fine gravel, wet, well graded, sub-round, (SW).	27.0
0	9 10 11 10	SS17					Medium dense, Moderate olive Brown, SAND w/ trace fine gravel and silt, wet, well graded, (SW).	29.0
1	10 12 27 32	SS18		30			Dense, Moderate olive Brown, fine to medium SAND w/ trace gravel and silt, wet, well graded, (SW).	31.0
0.5	8 8 10 12	SS19					Medium dense, Moderate olive Brown, fine to medium SAND w/ little gravel and silt, wet, well graded, sub-round, (SW).	33.0
				35				35.0

Continued Next Page

BORING_WELL P009-... .SI MA GDT 4/12/99

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BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER P009-001 **BORING/WELL NUMBER** PKSC-02

PROJECT NAME Source Control Upper Reach Housatonic River **DATE DRILLED** 3/11/99

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FID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0	5 7 11 13	SS20					Same as above.	37.0
0.5	5 7 13 24	SS21					Similar to above except few silt.	39.0
0.5	14 16 12 20	SS22		40			Medium dense, Moderate olive Brown, SAND w/ few gravel, trace silt, wet, well graded, sub-round (SW).	41.0
0.5	12 13 14 13	SS23					Same as above.	43.0
1	18 25 24 24	SS24					Medium dense, Moderate olive Brown, SAND and GRAVEL, w/ trace silt, wet, well graded, sub-round, (SW-GW).	45.0
0	19 21 23	SS25		45			Same as above.	47.0
1	15 16 20 16	SS26					Similar to above except little Fe staining.	49.0
0	13 24 23	SS27		50			Medium dense, Moderate olive Brown, medium to coarse SAND w/ trace silt, Wet, well graded, (SW).	51.0
0	16 15 16	SS28					Same as above.	53.0
0	12 26 31 18	SS29					Dense, Olive Brown, SAND w/ little gravel, wet, well graded, sub-rounded, (SW).	55.0
0	21 15 19	SS30		55			Top 0.3 medium dense, Olive Grey, SAND w/ some gravel, wet, well graded, sub-round, (SW). Bottom 1.7 medium dense, Moderate olive Brown, SAND and SILT w/ few coarse gravel, wet, well graded, (SW-ML).	57.0
0	14 19 26	SS31					Hard, Moderate olive Brown, coarse SILT w/ some fine sand and coarse gravel, wet, well graded, (ML).	59.0
0	35 35 35	SS32		60			Hard, Moderate olive Brown, SILT and GRAVEL w/ trace fine sand, moist, well graded, (Till).	61.0

BORING_WELL_PL_HSI_MA.GDT 4/12/99

HSI GEOTRANS
A TETRA TECH COMPANY

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER P009-001
PROJECT NAME Source Control Upper Reach Housatonic River
LOCATION Pittsfield, Massachusetts
DRILLING METHOD HSA
SAMPLING METHOD SS
GROUND ELEVATION 989.35
TOP OF CASING None
LOGGED BY SKC
NORTHING 533291.3937

BORING/WELL NUMBER PKSC-03
DATE DRILLED 3/15/99
CASING TYPE/DIAMETER None
SCREEN TYPE/SLOT None
GRAVEL PACK TYPE None
GROUT TYPE/QUANTITY Portland/Volclay
DEPTH TO WATER
GROUND WATER ELEVATION
EASTING 133380.7075

FID (ppm)	BLOW COUNTS	SAMPLE ID.	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0	2 3	SS01					Loose, Dark to dusky yellowish Brown, fine SAND w/ few organics, little gravel, dry, well graded, (SW).	1.0
0	8 16 19 18	SS02					Dense, Moderate yellowish Brown, fine SAND w/ trace organics and gravel, dry, well graded, sub-angular, (SW).	3.0
N/A	3 2 2 3	SS03					No Recovery.	5.0
1.3	2 2	SS04		5			Very loose, Moderate to Dusky yelowish Brown, fine SAND w/ trace organics and gravel, dry, well graded, sub-round, (SW).	6.0
N/A	2 2 2 4	SS05					Very loose, Moderate olive Brown, fine SAND w/ gravel, moist, well graded, sub-round, (SW).	8.0
0.3	4 3 3 3	SS06					Loose, Moderate olive Brown, fine SAND w/ some gravel, trace coal slag, dry, well graded, Fe staining, sub-angular, (SW).	10.0
1	2 3 3 4	SS07		10			Top 0.7 same as above. Bottom 0.6 loose, Moderate to Dusky yellowish Brown, fine SAND w/ some gravel, trace organics, dry, poorly graded, (SP).	12.0
0.3	2 3 4 4	SS08					Loose, Moderate yellowish Brown, fine SAND w/ few organics, dry, well graded, some Fe staining, (SW).	14.0
0.6	4 3	SS09					Loose, Moderate yellowish Brown, fine SAND w/ trace organics, moist, poorly graded, some Fe staining, (SP).	15.0
0	3 2	SS10		15			Top 0.5 loose, Moderate yellowish Brown, SAND, dry, well graded, (SW). Bottom 0.2 loose, Dusky yellowish Brown, fine SAND w/ trace organics, dry, well graded, (SW).	16.0
0	4 4 7 8	SS11					Loose, Dusky yellowish Brown, fine SAND, (3-5 mm laminations Moderate yellowish Brown, fine SAND, few organics), moist, well graded, (SW).	18.0
0	6 6 8 8	SS12					Top 0.25 similar to above except few coarse sand. Bottom 0.25 medium dense, Dusky yellowish Brown, coarse SAND, wet, poorly graded, some Fe staining, (SP).	20.0
0	2 5 4 7	SS13		20			Top 0.7 Same as above. Bottom 0.6 loose, Dark yellowish Brown, fine SAND, wet, poorly graded, little Fe staining, (SP).	22.0
0	5 7 9 12	SS14					Medium dense, Moderate olive Brown to olive Grey, fine SAND, wet, well graded, (SW).	24.0
0	7 10 18 13	SS15		25			Medium dense, Moderate olive Brown, fine SAND w/ trace silt and organics, wet, well graded, (SW).	26.0
0.5	5 5 4 6	SS16					Top 0.9 medium dense, Light olive Grey, fine SAND, wet, well graded, (SW).	26.9
							Bottom 0.6 stiff, Olive Grey, SILT, wet, well graded, (ML)	28.0
0	WOR 2 6	SS17					Loose, Dark greenish Grey, very fine SAND, wet, well graded, (SW-ML)	30.0
0	1 4 4	SS18		30			Same as above.	32.0
0	WOR 5 5 6	SS19					Same as above.	34.0
1	WOR 15	SS20		35			Dense, Very light Grey to Greenish Black, coarse to very coarse GRAVEL w/ some	

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HSI GEOTRANS
A TETRA TECH COMPANY

BORING/WELL CONSTRUCTION LOG

PROJECT NUMBER P009-001 **BORING/WELL NUMBER** PKSC-03

PROJECT NAME Source Control Upper Reach Housatonic River **DATE DRILLED** 3/15/99

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FID (ppm)	BLOW COUNTS	SAMPLE ID	EXTENT	DEPTH (ft. BGL)	U.S.C.S.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
							sand, wet, poorly graded, (GP).	36.0
1		SS21					Top 0.5 similar to above except well graded, (GW). Bottom 0.1 loose, Light olive Grey, fine SAND, wet, well graded, (SW).	38.0
0.5		SS22					Medium dense, Light olive Grey, fine SAND w/ some gravel, wet, well graded, angular, (SW-GW).	40.0
0		SS23		40			Medium dense, Dark yellowish Brown, fine to medium SAND w/ some coarse gravel, wet, well graded, sub-angular (SP).	42.0
0		SS24					Same as above.	44.0
0		SS25		45			Medium dense, Dark yellowish Brown, coarse GRAVEL and fine SILT, moist, well graded, sub-angular (GM).	46.0
N/A		SS26					HARD, Dark yellowish Brown, coarse GRAVEL and SILT w/ some clay, moist, well graded, sub-angular, (Till).	48.0

BORING_WELL P009-..SI_MA.GDT 4/12/99

APPENDIX B

SUMMARY OF SOIL CONCENTRATION DATA

Hibbard Playground/Lakewood Park PCB Soil Concentration Data (Preliminary)

Location	*Sample Name*	*Sample Depth*	*Compound*	*Result*	*Qualifier*	*Modifier*	*Units*
PKSC-01							
	CS01	0-1					
			Aroclor 1254	ND			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1248	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1242	ND			mg/kg
			Aroclor 1260	0.23			mg/kg
			Total PCBs	**0.23**			mg/kg
	CS0106	1-6					
			Aroclor 1260	0.044			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1248	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1242	ND			mg/kg
			Aroclor 1254	ND			mg/kg
			Total PCBs	**0.044**			mg/kg
	CS0615	6-15					
			Aroclor 1248	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1254	ND			mg/kg
			Aroclor 1260	ND			mg/kg
			Aroclor 1242	ND			mg/kg
			Total PCBs	**ND**			mg/kg
	CS5759	57-59					
			Aroclor 1254	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1248	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1242	ND			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1260	ND			mg/kg
			Total PCBs	**ND**			mg/kg

Hibbard Playground/Lakewood Park PCB Soil Concentration Data (Preliminary)

Location	*Sample Name*	*Sample Depth*	*Compound*	*Result*	*Qualifier*	*Modifier*	*Units*
PKSC-02							
	CS01	0-1					
			Aroclor 1232	ND			mg/kg
			Aroclor 1242	ND			mg/kg
			Aroclor 1248	ND			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1260	1.1			mg/kg
			Aroclor 1254	1.6			mg/kg
			Aroclor 1016	ND			mg/kg
			Total PCBs	**2.7**			mg/kg
	CS0106	1-6					
			Aroclor 1221	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1242	ND			mg/kg
			Aroclor 1260	0.6			mg/kg
			Aroclor 1254	1.2			mg/kg
			Aroclor 1248	ND			mg/kg
			Total PCBs	**1.8**			mg/kg
	CS0615	6-15					
			Aroclor 1242	ND			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1254	0.14			mg/kg
			Aroclor 1248	ND			mg/kg
			Aroclor 1260	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Total PCBs	**0.14**			mg/kg
	CS5557	55-57					
			Aroclor 1254	ND			mg/kg
			Aroclor 1242	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1248	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1260	ND			mg/kg
			Total PCBs	**ND**			mg/kg

Hibbard Playground/Lakewood Park PCB Soil Concentration Data (Preliminary)

Location	*Sample Name*	*Sample Depth*	*Compound*	*Result*	*Qualifier*	*Modifier*	*Units*
	CS5961	59-61					
			Aroclor 1242	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1254	ND			mg/kg
			Aroclor 1260	ND			mg/kg
			Aroclor 1248	ND			mg/kg
			Total PCBs	**ND**			mg/kg
PKSC-03							
	CS01	0-1					
			Aroclor 1242	ND			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1248	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1254	0.14			mg/kg
			Aroclor 1260	0.21			mg/kg
			Total PCBs	**0.35**			mg/kg
	CS0106	1-6					
			Aroclor 1016	ND			mg/kg
			Aroclor 1248	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1254	ND			mg/kg
			Aroclor 1260	0.17			mg/kg
			Aroclor 1242	ND			mg/kg
			Total PCBs	**0.17**			mg/kg
	CS0615	6-15					
			Aroclor 1260	ND			mg/kg
			Aroclor 1242	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1248	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1221	ND			mg/kg
			Aroclor 1254	ND			mg/kg
			Total PCBs	**ND**			mg/kg

Hibbard Playground/Lakewood Park PCB Soil Concentration Data (Preliminary)

Location	*Sample Name*	*Sample Depth*	*Compound*	*Result*	*Qualifier*	*Modifier*	*Units*
	CS4446	44-46					
			Aroclor 1221	ND			mg/kg
			Aroclor 1254	ND			mg/kg
			Aroclor 1232	ND			mg/kg
			Aroclor 1248	ND			mg/kg
			Aroclor 1016	ND			mg/kg
			Aroclor 1242	ND			mg/kg
			Aroclor 1260	ND			mg/kg
			Total PCBs	**ND**			mg/kg

Hibbard Playground/Lakewood Park Detected Metals Soil Concentrations(Preliminary).

Location	*Sample Name*	*Sample Depth (feet)*	*Compound*	*Result*	*Qualifier*	*Units*
PKSC-01						
	CS0615	6-15				
			Arsenic	4.6		mg/kg
			Barium	33.9		mg/kg
			Beryllium	0.35	B	mg/kg
			Cadmium	0.45	B	mg/kg
			Chromium	10.2		mg/kg
			Cobalt	12.4		mg/kg
			Copper	20.6		mg/kg
			Lead	7.8		mg/kg
			Mercury	0.018	B	mg/kg
			Nickel	17.4		mg/kg
			Vanadium	11.2		mg/kg
			Zinc	64.9		mg/kg
PKSC-02						
	CS0615	6-15				
			Antimony	0.18	B	mg/kg
			Arsenic	7.5		mg/kg
			Barium	26.6		mg/kg
			Beryllium	0.22	B	mg/kg
			Cadmium	0.4	B	mg/kg
			Chromium	9		mg/kg
			Cobalt	11.9		mg/kg
			Copper	22.6		mg/kg
			Lead	9.4		mg/kg
			Mercury	0.089	B	mg/kg
			Nickel	16		mg/kg
			Vanadium	8.1		mg/kg
			Zinc	55.3		mg/kg
PKSC-03						
	CS0106	1-6				
			Arsenic	5.7		mg/kg
			Barium	24.5		mg/kg
			Beryllium	0.18	B	mg/kg
			Cadmium	0.38	B	mg/kg
			Chromium	10.3		mg/kg
			Cobalt	12.7		mg/kg
			Copper	27.4		mg/kg

Hibbard Playground/Lakewood Park Detected Metals Soil Concentrations(Preliminary).

Location	*Sample Name*	*Sample Depth (feet)*	*Compound*	*Result*	*Qualifier*	*Units*
			Lead	12.5		mg/kg
			Mercury	0.099	B	mg/kg
			Nickel	17.8		mg/kg
			Thallium	0.83	B	mg/kg
			Vanadium	9.2		mg/kg
			Zinc	63.4		mg/kg

Qualifier

B *Result is between MDL and RL*

Hibbard Playground/ Lakewood Park Detected VOC Soil Concentration Data (Preliminary).

Location	*Sample Name*	*Sample Depth (feet)*	*Compound*	*Result*	*Qualifier*	*Modifier*	*Units*
PKSC-01							
	SS05	6-8					
			Acetone	0.0086	J		mg/kg
PKSC-02							
	SS06	8-10					
			Acetone	0.031	J		mg/kg
PKSC-03							
	SS05	5-6					
			Acetone	0.015	J		mg/kg

Qualifier

J *For organics, result is between Method Detection Limit and ReportingLimit.*

Hibbard Playground/Lakewood Park Detected Dioxin and Furan Concentration Data (Preliminary).

Location	*Sample Name*	*Sample Depth*	*Compound*	*Result*	*Qualifier*	*Units*
PKSC-01	CS0615	6-15				
			2,3,7,8-TCDF	0.0000010		mg/kg
			OCDD	0.0000027	J	mg/kg
			TOTAL TCDF	0.0000010		mg/kg
PKSC-02	CS0615	6-15				
			1,2,3,4,6,7,8-HpCDD	0.0000162		mg/kg
			1,2,3,4,6,7,8-HpCDF	0.0000175		mg/kg
			1,2,3,4,7,8,9-HpCDF	0.0000031	J	mg/kg
			1,2,3,4,7,8-HxCDF	0.0000039	J	mg/kg
			1,2,3,6,7,8-HxCDF	0.0000023	J	mg/kg
			OCDD	0.0000678		mg/kg
			OCDF	0.0000194		mg/kg
			TOTAL HpCDD	0.0000194		mg/kg
			TOTAL HpCDF	0.0000229		mg/kg
			TOTAL HxCDF	0.0000069		mg/kg
			TOTAL PeCDF	0.0000118		mg/kg
			TOTAL TCDF	0.0000153		mg/kg
PKSC-03	CS0106	1-6				
			1,2,3,4,6,7,8-HpCDF	0.0000040	J	mg/kg
			2,3,7,8-TCDF	0.0000074		mg/kg
			OCDD	0.0000137		mg/kg
			OCDF	0.0000033	J	mg/kg
			TOTAL HpCDF	0.0000086		mg/kg
			TOTAL TCDF	0.0000385		mg/kg

Qualifier

J *Result is an estimated value that is below the lower calibration limit but above the target detection level.*