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ENVIRONMENT

Mr. Joshua Cook
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau C, 625 Broadway, 11th Floor
Albany, New York 12233-7014

Subject:
Second Status Report for Sediment Monitoring Activities
Port Jervis Former Manufactured Gas Plant (MGP) Site
City of Port Jervis, Orange County, New York
Site No. 3-36-049

Date:
August 27, 2010

Contact:
Andrew Corbin

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Our ref:
B0043021

Dear Mr. Cook:

On July 29, 2010, ARCADIS submitted the *Status Report for Sediment Monitoring Activities* (Status Report; ARCADIS 2010b) to the New York State Department of Environmental Conservation (NYSDEC) on behalf of Orange and Rockland Utilities, Inc. (O&R). The Status Report presented a summary of sediment monitoring activities conducted at the above-referenced site (the site) in May 2010. The Status Report also indicated that statistical and compositional data analyses would be conducted in response to the total polycyclic aromatic hydrocarbon (PAH) concentration of 986 milligrams per kilogram (mg/kg) associated with the sediment sample collected at location SD13 (Figure 1). The remainder of this letter summarizes the results of the statistical and compositional data analyses, which have been conducted in accordance with Section 5.2 of the *Remedial Design Work Plan* (Work Plan; ARCADIS 2010a).

Evaluation Results

In summary, the statistical data analysis indicated that the total PAH concentration of 986 mg/kg observed at location SD13 is not a statistical outlier (further discussed below), indicating this sample result is not outside the range of expected results.

The preliminary results of the compositional data analysis indicated the following:

- Some of the PAHs present at location SD13 probably have a coal tar product-type source.

- Site-related PAHs similar to the PAHs observed at location SD13 appeared to be evident in historical soil samples collected from locations DP5 and MW7 (see Figure 4-1 of the October 2005 *Remedial Investigation Report Phase II* [RI Report; The RETEC Group 2005] provided in Attachment A).

- The relatively high PAH concentrations observed in the sediment sample collected at location SD13 indicate that the coal tar in this sample was well weathered compared to the historical soil samples containing relatively fresh coal tar product-type material (e.g., soil samples collected at locations SB4 and MW1D; see Figure 4-1 of the RI Report provided in Attachment A).

- The total ion chromatograms (i.e., GC fingerprints) of the 2010 sediment samples with elevated PAHs indicated the presence of heavy-type oil (with SD13 having the highest concentration of Total Organic Carbon [TOC] and associated oil content). The source of this oil is unknown but it does not appear to be MGP related.

Note that the results of the compositional data analysis are preliminary and are based on a limited data set. The analytical results associated with the sediment sample collected at location SD13 are from a single point, and do not represent widespread sediment impacts (as evidenced by the surrounding data). As a result, O&R will complete the remaining upland investigation activities specified in the Work Plan to further refine the conceptual site model (including the groundwater-surface water interactions between the upland area and the Delaware River) in support of the remedial design, and following completion of the upland investigation, re-evaluate the need for additional sediment data.

Results of Statistical Analysis

As shown on Table 1 and previously discussed in the Status Report, total PAHs in 2010 were higher than those concentrations observed during historical sampling events at five of the eight sample locations (SD3, SD13, SD17, SD21, and SD23) and lower at three locations (SD15, SD19, and SD27). Overall, the range of total PAH concentrations reported in samples collected during the 2010 sampling event was broader than previously observed. Excluding the total PAH concentration of 986 mg/kg observed at location SD13, total PAH concentrations in the other 2010 samples ranged from non-detect (ND) to 37 mg/kg, as compared to 0.95 mg/kg to 18.2 mg/kg observed at approximately the same locations historically.

The 986 mg/kg total PAH concentration detected in the sample collected at location SD13 is an apparent anomalous value well outside the range of previous PAH data from the site. Although the order of magnitude difference in concentration of the sample collected at location SD13 may reflect a distinct variation in the nature of PAHs (i.e., composition and source) in the sample when compared to previous observations, the value itself is statistically not incomparable to previous monitoring data.

The sample size (n=8) of the 2010 data is relatively small; the 986 mg/kg concentration skews the data distribution, increasing the sample variance, and making statistical comparisons more difficult. However, when the data are log-transformed to normalize the data (a normal distribution, with 90% confidence), the elevated value of 986 mg/kg is not statistically an outlier (Grubbs test and Dixon test results). Furthermore, when compared to previous data from the approximately same eight monitoring locations, the mean, median, and distribution of the 2010 data are not significantly different, using the standard t-test, the Mann-Whitney W-test, and the Kolmogorov-Smirnov test, respectively. Together, statistical evaluations of the data indicate that the 986 mg/kg total PAH concentration observed in 2010 may represent the upper extreme of a highly variable data distribution. As indicated above, the 986 mg/kg result observed at location SD13 is a single sample result and is relatively higher than the results observed historically and in 2010.

Results of Compositional Analysis

The compositional analysis described herein consists of a preliminary forensic evaluation to determine probable potential sources of hydrocarbons (especially PAHs) detected in Delaware River sediment samples collected downgradient of the site. The compositional analysis was conducted using both PAH sediment data collected from the Delaware River and PAH soils data collected from upland areas of the site. The data set was developed during investigations performed between 1998 and 2010. Specifically, the preliminary forensic evaluation is based on the following samples collected during Remedial Investigation (RI) and 2010 sediment monitoring activities:

- Surface sediment samples collected during the RI and 2010 (sediment monitoring) that were co-located (as practicable) at eight locations (SD3, SD13, SD15, SD17, SD19, SD21, SD23, and SD27; Figure 1).

- Five surface sediment samples (RI) collected in the vicinity of the Port Jervis Outfall area (SED-01, SD1, SD36, SD37, and DP12; see Figure 4-9 of the RI Report provided in Attachment A).

- Surface sediment samples (RI) containing the highest PAH concentrations from two background locations upstream of the site and two locations downstream of the site (BSD1, BSD2, SD30, and SD40; see Figure 4-9 of the RI Report provided in Attachment A).

- Five soil samples from the upland portion of the site (RI) collected at locations SB4, MW1D, MW7, DP5, and TP4 (see Figure 4-1 of the RI Report provided in Attachment A).

- One sample (RI) from the storm sewer line associated with the Port Jervis Outfall (SSSED-UP). As indicated in the 3.5.4 of the RI Report, sample SSSED-UP was collected from a manhole immediately adjacent to King Street, northeast of the former MGP site.

The above sediment and soil samples were analyzed for the 16 priority pollutant PAHs by Method 8270. As part of the PAH analysis, a GC fingerprint was available for the 2010 sediment samples and certain historical sediment and soil samples. The results of the PAH analyses for the sediment and soil samples indicated above as well as sample collection dates are provided in Table 1. Table 1 also presents the TOC concentrations for these samples (where available).

Once the above data set was compiled, the following forensic evaluation methods were used to identify potential sources of PAHs in sediments:

1. PAH Compositional Analysis: For this evaluation selected PAH diagnostic ratios such as fluoranthene/pyrene (Fl/Py) and benzo(a)anthracene/chrysene (BAA/C) are calculated and used in determining PAH compositional similarities/differences that would indicate potential sources of PAHs in the sample. These diagnostic ratios have been actively applied in many forensic evaluations described in the scientific literature (Costa et al. 2004; Costa and Sauer 2005; Electric Power Research Institute [EPRI] 2000; McCarthy et al. 2000; Yunker et al. 2002) in differentiating PAH compositions that suggest potential sources of PAHs in the environment. The diagnostic ratios are commonly displayed in double ratio plots to easily see compositional similarities/differences. The PAHs selected for use in diagnostic ratios have physical/biodegradation properties which retain original composition during transport and weathering (i.e., the ratios remain constant) (Uhler and Mattingly 2006). Transport includes matrix to matrix transfer, such as non-aqueous phase liquid (NAPL) to soil transport. Weathering includes environmental processes such as evaporation, dissolution, and biodegradation that may affect overall composition of the material.

2. Hydrocarbon Type Identification Analysis: This method consists of evaluating the pattern displayed in GC fingerprints generated as part of the PAH analysis of the samples. GC fingerprints help to identify the types of fuel oil and other types of hydrocarbon material such as coal tar and natural organic material in the sample. This identification helps to determine the potential source of PAHs in the sample.

The total PAH concentrations and PAH diagnostic ratios were calculated (Table 1) and are presented graphically in double ratio plots (Figures 2, 3A, and 3B).

Historically, total PAH sediment concentrations at the eight locations sampled in 2010 ranged from 0.95 to 18.2 mg/kg. In 2010, the total PAH sediment concentrations collected from approximately the same eight locations ranged from ND to 37 mg/kg except for a sample collected at location SD13 where the total PAH concentration was 986 mg/kg. Total PAH concentrations in the sediment samples collected from the Port Jervis Outfall area in 2000 and 2004 ranged from 12 to 70 mg/kg. The two upstream sediment samples collected in 2004, which represented the five locations sampled upstream of the site, contained less than 1.0 mg/kg total PAHs, whereas the downstream sediment samples collected in 2000 and 2004 contained total PAH concentrations up to 16 mg/kg. The material within the Port Jervis storm sewer line upstream of the site contained 42.5 mg/kg total PAHs.

The following five soil samples were collected from the site in 1998 and 2000 and were included in the compositional analysis:

- The sample collected at location SB4 was collected from the base of Gas Holder A at a depth of approximately 8.3 feet below ground surface (bgs) and had a total PAH concentration of 19,060 mg/kg.

- The sample collected at location MW1D was collected at a depth of approximately 41 feet bgs downgradient of Gas Holder A and had a total PAH concentration of 3,248 mg/kg.

- The sample collected at location MW7 was collected from the 25- to 26-foot bgs depth increment downgradient of Gas Holder A and had a total PAH concentration of 249 mg/kg. This sample was selected because the boring log description indicated that tar like materials or NAPL were present in the depth interval from which the sample was collected. See Figure 4-2 of the RI Report (Attachment A) and the corresponding soil boring log for MW7 (Attachment B).

- The sample collected at location DP5 was collected from the 5- to 6-foot bgs depth increment within Tar Separator O and had a total PAH concentration of 1,403 mg/kg.

- The sample collected at location TP4 was collected at a depth of approximately 8 feet bgs in the vicinity of former Gas Oil Above-Ground Storage Tank (AST) G and had a total PAH concentration of 36 mg/kg. This sample was selected because the test pit log description indicated that black fuel oil was present in the depth interval from which the sample was collected. See Figure 4-3 of the RI Report (Attachment A) and the corresponding test pit log for TP4 (Attachment B).

The above sample locations are shown on Figure 4-1 of the RI Report provided in Attachment A. The range of total PAH concentrations in river sediments and site soils are displayed in Figure 2. Except for the SD13 sample results, the remaining 2010 sediment monitoring data are consistent with the range of total PAH concentrations previously detected during the RI, both upstream of SD13 and within the Port Jervis Outfall area.

The sample collected in 2010 at location SD13 is of particular interest because of its relatively high total PAH concentration in comparison with the other historical and recent sediment samples. To preliminarily assess the potential source of PAHs in sediments at location SD13, PAH compositional characteristics of the PAHs observed at that location were compared to those PAH characteristics of site and other potential PAH source samples (e.g., samples collected from the Port Jervis Outfall area). PAH diagnostic ratios, as those listed in Table 1, provide a common method in evaluating PAH compositional differences/similarities and are displayed in double ratio plots on Figures 3A and 3B.

For the sample collected at location SD13, the relatively high total PAH concentration and PAH composition indicates that the PAHs probably have a coal tar product-type source (such as sealcoat, creosote, or MGP-derived). From the diagnostic ratios of Fl/Py and BAA/C, which are the most commonly used diagnostic ratios to differentiate pyrogenic PAH sources (Figures 3A and 3B), this coal tar product appears to have originated from a carbureted water gas (CWG) process characterized by Fl/Py ratios between 0.67 and 1.0, and by BAA/C ratios generally greater than 1.0. Note that Figure 3B is only different from Figure 3A in that the samples with total PAH concentrations less than 10 mg/kg have been removed from the plot.

Site-related PAHs similar to the PAHs observed at location SD13 appeared to be evident in soil samples collected from locations DP5 and MW7, as characterized by the similarities in the diagnostic ratios (circle in Figure 3B). Other sediment samples collected at locations SD3 (total PAH concentration of 15.88 mg/kg [37.39 mg/kg duplicate result]) and SD23 (total PAH concentration of 27.6 mg/kg) also appeared to have PAH compositional characteristics similar to the DP5 and MW7 samples, indicating a common source.

The PAH compositions of all the sediment samples revealed relatively low concentrations of the more weathering-susceptible PAHs, the 2- and 3-ring PAHs (e.g., naphthalene). This was evident in the relatively high PAH concentrations observed in the sample collected at location SD13, indicating that the coal tar product-type material in this sample was well weathered compared to the soil samples that probably contain relatively fresh coal tar product-type material (e.g., soil samples collected at locations DP5 [similar diagnostic ratios as those of SD13], SB4 and MW1D).

The GC fingerprints of the 2010 sediment samples indicated the presence of heavy-type oil in samples with elevated PAHs. This heavy-type oil was represented by the UCM ('hump') and peaks in the region of the GC fingerprint from 6 to 12 minutes and best represented by the GC fingerprint of the sample collected at location SD13 (Attachment C). Table 1 summarizes the GC fingerprint observations for the 2010 samples. The samples containing the heavy-type oil contained similar type residual oil but at varying amounts, however the GC fingerprint cannot be used to determine the percent contribution of oil within the sample. The source of the residual oil observed in the samples is not known but would not be associated with the naphtha-type oil used during historical MGP operations at the site. The sample collected at location SD13 had the highest TOC concentration of all the sediment samples (Table 1) which may reflect the contribution of residual oil in the sample.

Conclusions

Based on the compositional analyses described above, the PAHs detected in the sediment samples collected and analyzed in 2010 appear to originate from a variety anthropogenic sources and are not necessarily site-related, with the probable exception of the PAH results associated with the sample collected at location SD13. The preliminary results indicate that the PAHs detected at location SD13 represent a mixture of oil and coal tar product-type contributions.

The sample analytical result reported at location SD13 is a single sample result and not an indication of widespread site-related impacts to the adjacent water body. O&R will complete the upland investigation activities to further refine the conceptual site model (including the groundwater-surface water interactions between the upland area and the Delaware River) in support of the remedial design, and following completion of the upland investigation, re-evaluate the need for additional sediment data.

Please feel free to contact Ms. Maribeth McCormick of O&R at 845.783.5534 with any questions or comments regarding the information provided herein.

Sincerely,

ARCADIS of New York, Inc.

Andrew Corbin, P.E.
Principal Engineer

Enclosures:

Table 1 – PAH Concentrations and Diagnostic Ratios of Sediment and Soil Samples

Figures

- Figure 1 – Sediment Sampling Locations
- Figure 2 – Diagnostic Ratios TPAH vs. Fl/Py
- Figure 3A – Diagnostic Ratios BAA/C vs. Fl/Py
- Figure 3B – Diagnostic Ratios BAA/C vs. Fl/Py with Samples TPAH>10 ppm

Attachments

- Attachment A – Figures 4-1, 4-2, 4-3, and 4-9 of the RI Report
- Attachment B – Historical Logs for MW7 and TP4
- Attachment C – GC Fingerprint for May 2010 Sediment Sample Collected at Location SD13

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ARCADIS. 2010a. Remedial Design Work Plan, Port Jervis Former MGP Site, Port Jervis, New York, Site No. 3-36-049, January 2010.

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Table

TABLE 1

PAH CONCENTRATIONS AND DIAGNOSTIC RATIOS OF SEDIMENT AND SOIL SAMPLES

SECOND STATUS REPORT FOR SEDIMENT MONITORING ACTIVITIES
PORT JERVIS FORMER MGP SITE
ORANGE AND ROCKLAND UTILITIES, INC. - PORT JERVIS, NEW YORK

Sample Type: Location ID: Date Collected:	Units	Sediment BSD1 10/26/04	Sediment BSD2 10/26/04	Soil DP5 10/25/00	Sediment DP12 10/20/00	Soil MW1D 04/24/98	Soil MW7 11/02/00	Soil SB4 04/22/98	Sediment SED-01 05/05/98	Sediment SD1 10/12/00
Semivolatile Organics										
Acenaphthene	mg/kg	ND(0.410)	ND(0.420)	120 J	ND(0.72)	320	17	1,400 J	0.18 J	0.14 J
Acenaphthylene	mg/kg	ND(0.410)	ND(0.420)	9.7	0.13 J	56 J	3.2 J	1,200 J	0.57 J	0.57 J
Anthracene	mg/kg	ND(0.410)	ND(0.420)	34	0.11 J	160 J	9.3	1,000 J	1.1	0.93
Benzo(a)anthracene	mg/kg	0.084 J	0.057 J	24	1	81 J	8.7	500 J	2.7	3.7
Benzo(a)pyrene	mg/kg	0.069 J	0.049 J	21	1	84 J	7.4	370 J	2.6	3.6
Benzo(b)fluoranthene	mg/kg	0.084 J	0.066 J	12	1.2	35 J	4.2 J	140 J	2.4	3.3
Benzo(g,h,i)perylene	mg/kg	ND(0.410)	ND(0.420)	6.8 J	0.71 J	34 J	5.4 J	130 J	1.6	2
Benzo(k)fluoranthene	mg/kg	0.045 J	ND(0.420)	12	0.96	ND(180)	5.4 J	ND(1,700)	1.9	2.4
Chrysene	mg/kg	0.080 J	0.053 J	24	1.3	96 J	9.1	500 J	3.5	4
Dibenzo(a,h)anthracene	mg/kg	ND(0.410)	ND(0.420)	2.8 J	0.23 J	8.5 J	0.78 J	ND(1,700)	0.48	0.76
Fluoranthene	mg/kg	0.140 J	0.084 J	43	1.8	93 J	23	ND(1,700)	5.2	5.8
Fluorene	mg/kg	ND(0.410)	ND(0.420)	47	ND(0.72)	93 J	15	310 J	0.32 J	0.36 J
Indeno(1,2,3-cd)pyrene	mg/kg	0.048 J	ND(0.420)	8.5	1	28 J	4.9 J	110 J	1.3	2.3
Naphthalene	mg/kg	ND(0.410)	ND(0.420)	800	ND(0.72)	1,400 B	50	9,000 B	0.170 J	ND(0.73)
Phenanthrene	mg/kg	ND(0.410)	ND(0.420)	170	0.69 J	480	56	3,000	3.4	4.1
Pyrene	mg/kg	0.120 J	0.081 J	68 J	1.9	280	30	1,400 J	4.7	7.6
Total PAHs	**mg/kg**	**0.670**	**0.390**	**1,402.8**	**12.03**	**3,248.5**	**249.38**	**19,060**	**32.12**	**41.56**
Miscellaneous										
Total Organic Carbon (Lloyd Kahn Method)	mg/kg	1.780	1.900	NA	NA	NA	NA	NA	NA	NA
Percent Solids	%	79.8	78.8	89.2	91.4	NA	94.9	NA	NA	90.6
Diagnostic Ratios										
Fluoranthene/Pyrene (Fl/Py)	--	1.17	1.04	0.63	0.95	0.33	0.77	1.21	1.11	0.76
Benzo(a)anthracene/Chrysene (BAA/C)	--	1.05	1.08	1.00	0.77	0.84	0.96	1.00	0.77	0.93
GC Fingerprint	--	--	--	--	--	--	--	--	--	--

See notes on page 5.

TABLE 1

PAH CONCENTRATIONS AND DIAGNOSTIC RATIOS OF SEDIMENT AND SOIL SAMPLES

SECOND STATUS REPORT FOR SEDIMENT MONITORING ACTIVITIES
PORT JERVIS FORMER MGP SITE
ORANGE AND ROCKLAND UTILITIES, INC. - PORT JERVIS, NEW YORK

Sample Type:		Sediment		Sediment		Sediment		Sediment	
Location ID:		SD3		SD13		SD15		SD17	
Date Collected:	Units	10/12/00	05/10/10	10/27/04	05/05/10	10/27/04	05/05/10	10/27/04	05/05/10
Semivolatile Organics									
Acenaphthene	mg/kg	0.22 J	ND(0.370) [ND(0.390)]	0.040 J	4.200 J	0.190 J	ND(0.370)	ND(0.340)	0.770
Acenaphthylene	mg/kg	0.16 J	ND(0.370) [ND(0.390)]	0.480	12.000	0.340 J	ND(0.370)	ND(0.340)	0.890
Anthracene	mg/kg	0.24 J	ND(0.370) J [1.700 J]	0.210 J	86.000	0.250 J	ND(0.370)	ND(0.340)	1.300
Benzo(a)anthracene	mg/kg	0.96	1.700 [3.400]	0.440	85.000	0.740	ND(0.370)	0.081 J	3.500
Benzo(a)pyrene	mg/kg	0.86	2.200 [4.200]	0.550 J	94.000	0.750 J	ND(0.370)	0.100 J	3.500
Benzo(b)fluoranthene	mg/kg	1	1.600 [3.300]	0.650 J	62.000	0.860 J	ND(0.370)	0.130 J	3.500
Benzo(g,h,i)perylene	mg/kg	0.5	1.100 [1.700]	0.430 J	35.000	0.480 J	ND(0.370)	0.094 J	1.600
Benzo(k)fluoranthene	mg/kg	0.82	0.650 [1.500]	0.180 J	25.000	0.300 J	ND(0.370)	0.042 J	1.400
Chrysene	mg/kg	1.2	1.600 [3.500]	0.540 J	77.000	0.760	ND(0.370)	0.091 J	3.400
Dibenzo(a,h)anthracene	mg/kg	0.18 J	ND(0.370) [0.390]	0.110 J	6.000	0.130 J	ND(0.370)	ND(0.340)	ND(0.360)
Fluoranthene	mg/kg	2.6	2.700 [6.100]	1.400	130.000 D	1.600	1.600	0.150 J	5.900
Fluorene	mg/kg	0.35 J	ND(0.370) [ND(0.390)]	0.055 J	13.000	0.079 J	ND(0.370)	ND(0.340)	ND(0.360)
Indeno(1,2,3-cd)pyrene	mg/kg	0.61	0.730 [1.500]	0.420 J	27.000	0.490 J	ND(0.370)	0.076 J	1.400
Naphthalene	mg/kg	ND(0.39)	ND(0.370) [ND(0.390)]	ND(0.390)	ND(4.400)	0.095 J	ND(0.370)	ND(0.340)	ND(0.360)
Phenanthrene	mg/kg	1.2	ND(0.370) J [2.100 J]	0.610	140.000 D	0.700	ND(0.370)	0.051 J	2.800
Pyrene	mg/kg	2.6	3.600 [8.000]	0.810	190.000 D	0.820	1.600	0.130 J	6.800
Total PAHs	**mg/kg**	**13.5**	**15.880 [37.390]**	**6.925**	**986.200**	**8.584**	**3.200**	**0.945**	**36.760**
Miscellaneous									
Total Organic Carbon (Lloyd Kahn Method)	mg/kg	NA	6,430 J [2,310 J]	5,630 J	96,800 J	6,630 J	7,640 J	1,410 J	2,600 J
Percent Solids	%	85.4	83.3 [80.2]	85.7	69.9	79.5	84	95.7	87.9
Diagnostic Ratios									
Fluoranthene/Pyrene	--	1.00	0.75 [0.76]	1.73	0.68	1.95	1.00	1.15	0.87
Benzo(a)anthracene/Chrysene	--	0.80	1.06 [0.97]	0.81	1.10	0.97	--	0.89	1.03
GC Fingerprint	--	--	Similar to SD23	--	Similar to SD23 but much larger heavy oil UCM	--	Negligiable UCM and peaks	--	Similar to SD23 but larger UCM

See notes on page 5.

TABLE 1

PAH CONCENTRATIONS AND DIAGNOSTIC RATIOS OF SEDIMENT AND SOIL SAMPLES

SECOND STATUS REPORT FOR SEDIMENT MONITORING ACTIVITIES
PORT JERVIS FORMER MGP SITE
ORANGE AND ROCKLAND UTILITIES, INC. - PORT JERVIS, NEW YORK

Sample Type:		Sediment		Sediment		Sediment		Sediment		Sediment
Location ID:		SD19		SD21		SD23		SD27		SD30
Date Collected:	Units	10/27/04	05/05/10	10/27/04	05/05/10	10/27/04	05/05/10	10/27/04	05/05/10	10/26/04
Semivolatile Organics										
Acenaphthene	mg/kg	ND(0.400)	ND(0.380)	0.250 J	0.240 J	0.250 J	0.780	ND(0.410)	ND(0.400)	ND(0.430)
Acenaphthylene	mg/kg	0.059 J	ND(0.380)	0.140 J	ND(0.380)	0.570	ND(0.370)	0.094 J	ND(0.400)	ND(0.430)
Anthracene	mg/kg	ND(0.400)	ND(0.380)	0.100 J	ND(0.380)	0.370 J	0.890	0.091 J	ND(0.400)	0.099 J
Benzo(a)anthracene	mg/kg	0.160 J	ND(0.380)	0.240 J	1.200	1.800	2.400	0.280 J	ND(0.400)	0.340 J
Benzo(a)pyrene	mg/kg	0.150 J	ND(0.380)	0.180 J	1.400	1.700 J	2.400	0.250 J	ND(0.400)	0.350 J
Benzo(b)fluoranthene	mg/kg	0.190 J	ND(0.380)	0.200 J	0.710	1.800 J	2.700	0.300 J	ND(0.400)	0.450
Benzo(g,h,i)perylene	mg/kg	0.088 J	ND(0.380)	0.150 J	0.730	0.570 J	1.100	0.220 J	ND(0.400)	0.300 J
Benzo(k)fluoranthene	mg/kg	0.081 J	ND(0.380)	0.066 J	1.100	0.610 J	0.940	0.120 J	ND(0.400)	0.160 J
Chrysene	mg/kg	0.210 J	ND(0.380)	0.280 J	1.200	1.900	2.600	0.280 J	ND(0.400)	0.410 J
Dibenzo(a,h)anthracene	mg/kg	ND(0.400)	ND(0.380)	ND(0.510)	ND(0.380)	0.170 J	ND(0.370)	0.051 J	ND(0.400)	0.077 J
Fluoranthene	mg/kg	0.280 J	ND(0.380)	0.450 J	2.400	3.100	4.800	0.830	ND(0.400)	0.950
Fluorene	mg/kg	ND(0.400)	ND(0.380)	0.071 J	ND(0.380)	0.062 J	ND(0.370)	0.047 J	ND(0.400)	0.043 J
Indeno(1,2,3-cd)pyrene	mg/kg	0.085 J	ND(0.380)	0.120 J	0.610	0.600 J	0.990	0.210 J	ND(0.400)	0.270 J
Naphthalene	mg/kg	ND(0.400)	ND(0.380)	0.078 J	ND(0.380)	ND(0.400)	ND(0.370)	ND(0.410)	ND(0.400)	ND(0.430)
Phenanthrene	mg/kg	0.079 J	ND(0.380)	0.280 J	ND(0.380)	0.790	2.800	0.490	ND(0.400)	0.540
Pyrene	mg/kg	0.270 J	ND(0.380)	0.480 J	2.400	3.800	5.200	0.590	ND(0.400)	0.620
Total PAHs	**mg/kg**	**1.652**	**ND(0.380)**	**3.085**	**11.990**	**18.092**	**27.600**	**3.853**	**ND(0.400)**	**4.609**
Miscellaneous										
Total Organic Carbon (Lloyd Kahn Method)	mg/kg	1,400	1,240 J	1,290 J	1,430 J	24,600 J	2,230 J	2,980	5,150 J	10,100 J
Percent Solids	%	83.3	82.4	64.5	86	83.4	86.1	80	82.1	77
Diagnostic Ratios										
Fluoranthene/Pyrene	--	1.04	--	0.94	1.00	0.82	0.92	1.41	--	1.53
Benzo(a)anthracene/Chrysene	--	0.76	--	0.86	1.00	0.95	0.92	1.00	--	0.83
GC Fingerprint	--	--	Negligiable UCM and peaks	--	Similar to SD23 but smaller UCM	--	Small heavy oil UCM	--	Negligiable UCM and peaks	--

See notes on page 5.

TABLE 1

PAH CONCENTRATIONS AND DIAGNOSTIC RATIOS OF SEDIMENT AND SOIL SAMPLES

SECOND STATUS REPORT FOR SEDIMENT MONITORING ACTIVITIES
PORT JERVIS FORMER MGP SITE
ORANGE AND ROCKLAND UTILITIES, INC. - PORT JERVIS, NEW YORK

Sample Type: Location ID: Date Collected:	Units	Sediment SD36 10/28/04	Sediment SD37 10/28/04	Sediment SD40 10/12/00	Sediment SSSED-UP --	Soil TP4 04/22/98
Semivolatile Organics						
Acenaphthene	mg/kg	0.130 J	0.320 J	0.071 J	0.180 J	1.8 J
Acenaphthylene	mg/kg	0.910	1.300 J	0.27 J	0.690 J	1.4 J
Anthracene	mg/kg	1.100	2.000 J	0.25 J	0.690 J	3.5 J
Benzo(a)anthracene	mg/kg	2.300	3.900	1.4	2.500	2.2 J
Benzo(a)pyrene	mg/kg	2.100	3.700	1.5	2.500	2 J
Benzo(b)fluoranthene	mg/kg	2.400	4.300	1.7	3.000	0.78 J
Benzo(g,h,i)perylene	mg/kg	1.600	2.500	0.7	1.500	1.1 J
Benzo(k)fluoranthene	mg/kg	1.000	1.500 J	1.1	1.200	ND(3.9)
Chrysene	mg/kg	2.200	3.700	1.8	3.300	2.4 J
Dibenzo(a,h)anthracene	mg/kg	0.320 J	0.350 J	0.28 J	0.100 J	0.29 J
Fluoranthene	mg/kg	7.000	14.000	2.5	9.700	1.2 J
Fluorene	mg/kg	0.950	1.900 J	0.11 J	0.610 J	1.9 J
Indeno(1,2,3-cd)pyrene	mg/kg	1.500	2.400	0.84	1.700	0.87 J
Naphthalene	mg/kg	0.810	2.600	0.062 J	0.400 J	0.98 J
Phenanthrene	mg/kg	7.000	15.000	1	7.100	10
Pyrene	mg/kg	5.700	11.000	2.7	7.300	5.6
Total PAHs	**mg/kg**	**37.020**	**70.470**	**16.283**	**42.470**	**36.02**
Miscellaneous						
Total Organic Carbon (Lloyd Kahn Method)	mg/kg	3,906	18,300 J	NA	64,100	NA
Percent Solids	%	82.6	71.2	55.3	68.7	NA
Diagnostic Ratios						
Fluoranthene/Pyrene	--	1.23	1.27	0.93	1.33	0.21
Benzo(a)anthracene/Chrysene	--	1.05	1.05	0.78	0.76	0.92
GC Fingerprint	--	--	--	--	--	--

See notes on page 5.

TABLE 1

PAH CONCENTRATIONS AND DIAGNOSTIC RATIOS OF SEDIMENT AND SOIL SAMPLES

SECOND STATUS REPORT FOR SEDIMENT MONITORING ACTIVITIES
PORT JERVIS FORMER MGP SITE
ORANGE AND ROCKLAND UTILITIES, INC. - PORT JERVIS, NEW YORK

Notes:

1. May 2010 sediment samples were collected by ARCADIS and submitted to Shealy Environmental Services, Inc. for analysis of certain semivolatile organic compounds (SVOCs) and Total Organic Carbon (TOC). Sample data have been validated as part of a data quality assessment. The results of that assessment were provided in Attachment B of the *Status Report for Sediment Monitoring Activities* (ARCADIS 2010).
2. NA - Not analyzed.
3. ND - Analyte was not detected. The number in parentheses is the associated quantitation limit.
4. Field duplicate results are presented in brackets.
5. -- - Not applicable/available.

Data Qualifiers:

Organics (SVOCs)

B - Analyte was also detected in the associated method blank.
D - Concentration is based on a diluted sample analysis.
J - The compound was positively identified; however, the associated numerical value is an estimated concentration only.

Inorganics (TOC)

J - The analyte was positively identified; however, the associated numerical value is an estimated concentration only.

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Figures

PIKE STREET

FIRST STREET

(MEETING HALL)

2-4 FIRST ST.
(MEDER RESIDENCE)

ROUTE 209 BRIDGE

CONCRETE RETAINING WALL

T7 T8 T9 T10 T11 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22 T23 T24 T25 T26

SD7 SG1 SD9 SD2 SD3 SD10 SD11 SD12 SD13 SD14 SD15 SD16 SD17 SD18 SD19 SD20 SD21 SD22 SD23 SD24 SD25 SD26 SD27 SD28 SD29 SD38

RBB3/TW2 RBB4/TW3 RBB2/TW4 RBB5/TW5

NOTES:

1. BASE MAP MODIFIED FROM DRAWINGS PORT_JERVIS_08.DWG, FIG2-1_GW3-08.DWG, AND FIG4-9.DWG PROVIDED BY AECOM.
2. ALL LOCATIONS AND SITE FEATURES ARE APPROXIMATE.

0 30' 60'
GRAPHIC SCALE

LEGEND:

- EDGE OF WATER (APPROXIMATE)
- EXISTING STRUCTURE/BUILDING
- LIMIT OF GROUNDWATER IMPACTS
- RBB2/TW4 TEMPORARY WELL LOCATION (NO LONGER EXISTING)
- SG1 STAFF GAUGE LOCATION
- T14 SEDIMENT TRANSECT LOCATION
- SD13 HISTORICAL SEDIMENT PROBING/SAMPLING LOCATION
- HISTORICAL PROBING LOCATION
- MAY 2010 SEDIMENT MONITORING LOCATION

DELAWARE RIVER

PORT JERVIS FORMER MGP SITE
ORANGE AND ROCKLAND UTILITIES, INC.
PORT JERVIS, NEW YORK
SECOND STATUS REPORT FOR SEDIMENT MONITORING ACTIVITIES

SEDIMENT SAMPLING LOCATIONS

ARCADIS

FIGURE 1

CITY: SYRACUSE DIV/GROUP: ENVCAD DB: N. SMITHGALL K. WOOD K. DAVIS LD: PIC: M. CARRILLO-SHERIDAN PM: A. CORBIN TM: A. CORBIN LYR: ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVITIES\B004302100\0000\0006\IDW\GSED-MON43021B03.dwg LAYOUT: 1SAVED: 8/26/2010 10:41 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: ----PLOTSTYLETABLE: PLTFULLCTB PLOTTED: 8/26/2010 10:45 AM BY: GETTS, BRIAN
XREFS: IMAGES: PROJECTNAME: ----
43021X01

Figure 2. Diagnostic Ratios TPAH vs Fl/Py

Port Jervis: Upstream, Adjacent Site, Outfall, but some Site Samples

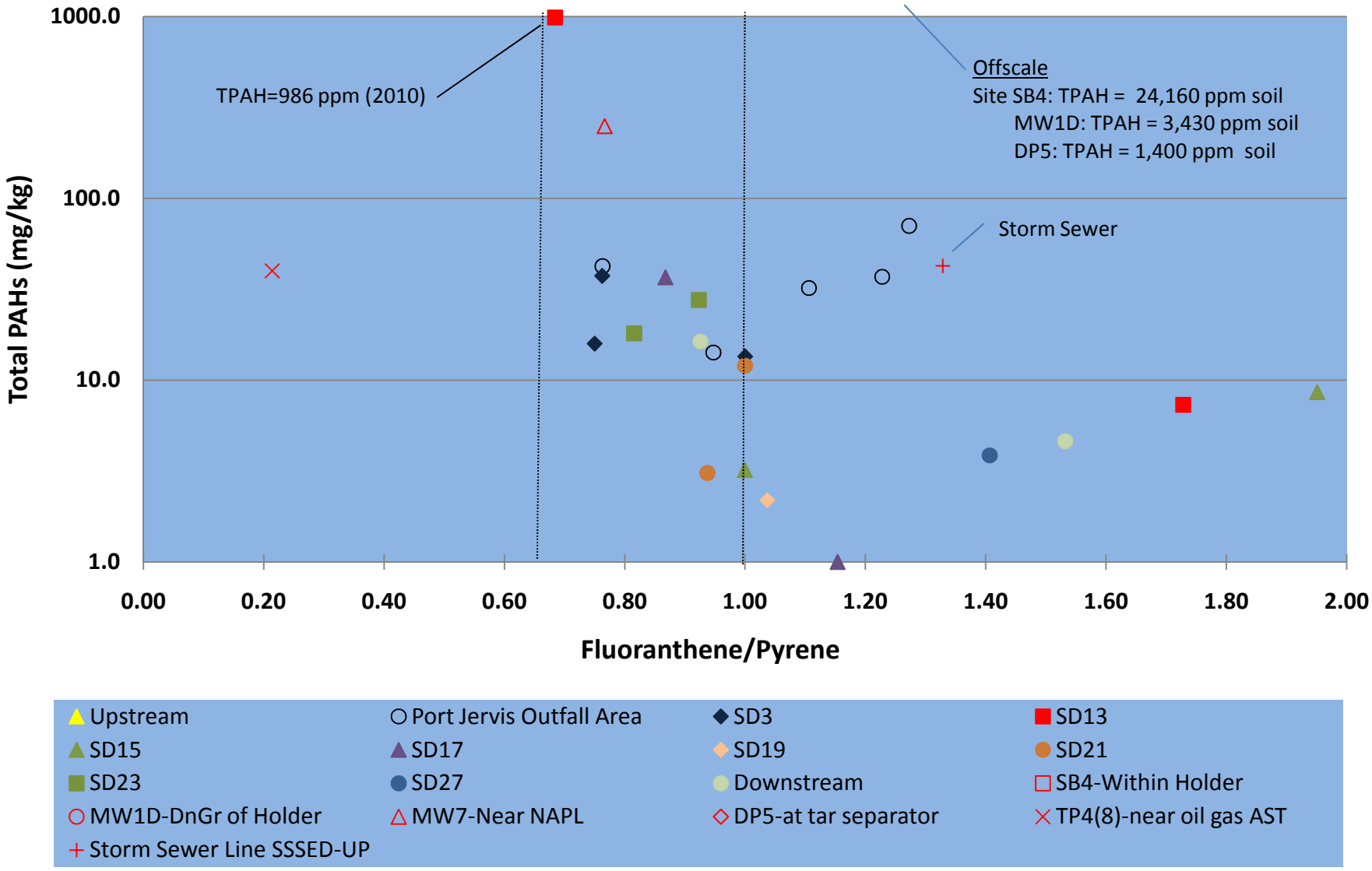


Figure 3A. Diagnostic Ratios BAA/C vs Fl/Py

Port Jervis: Upstream, Adjacent Site, Outfall, and Site Samples

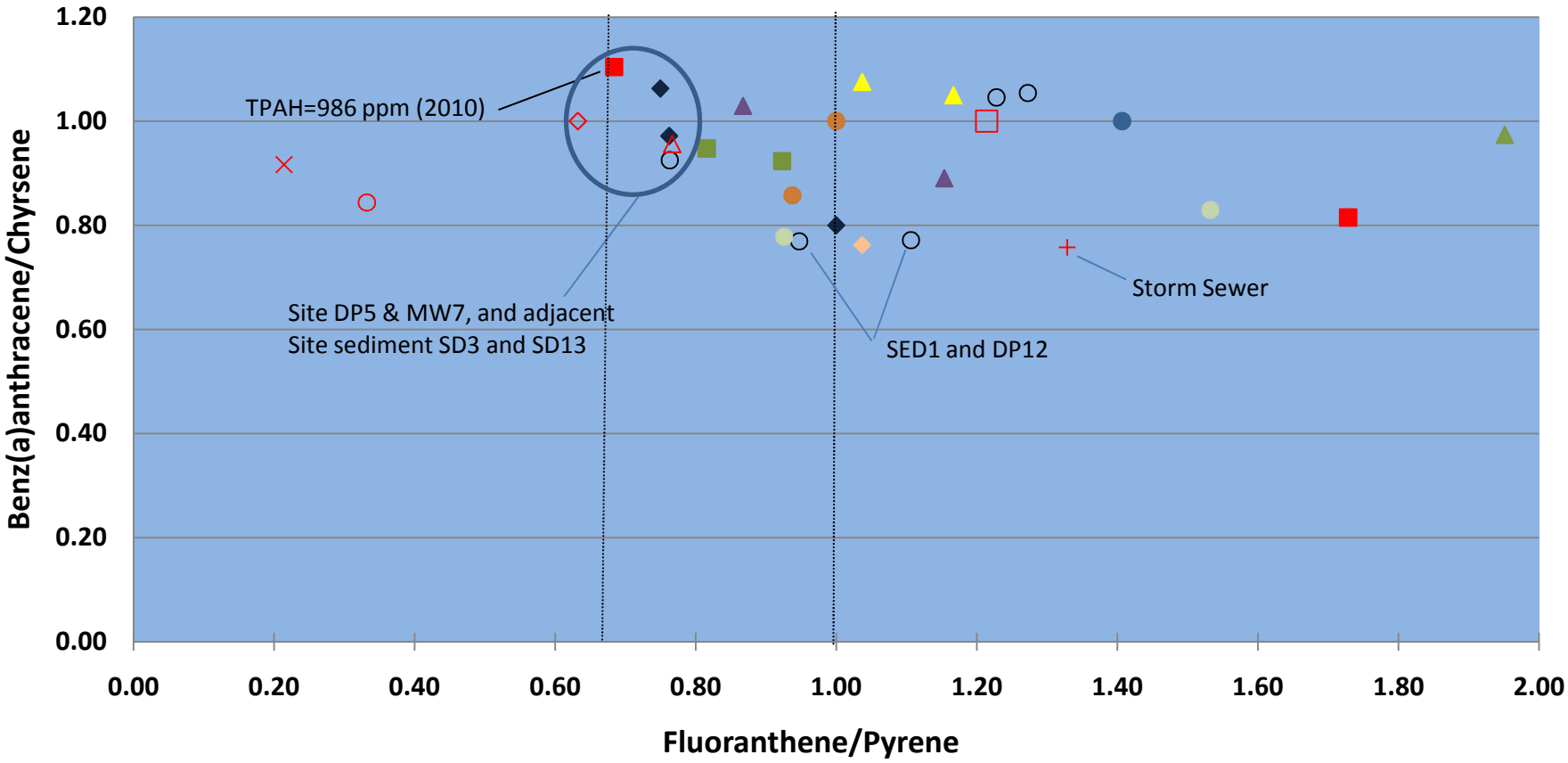
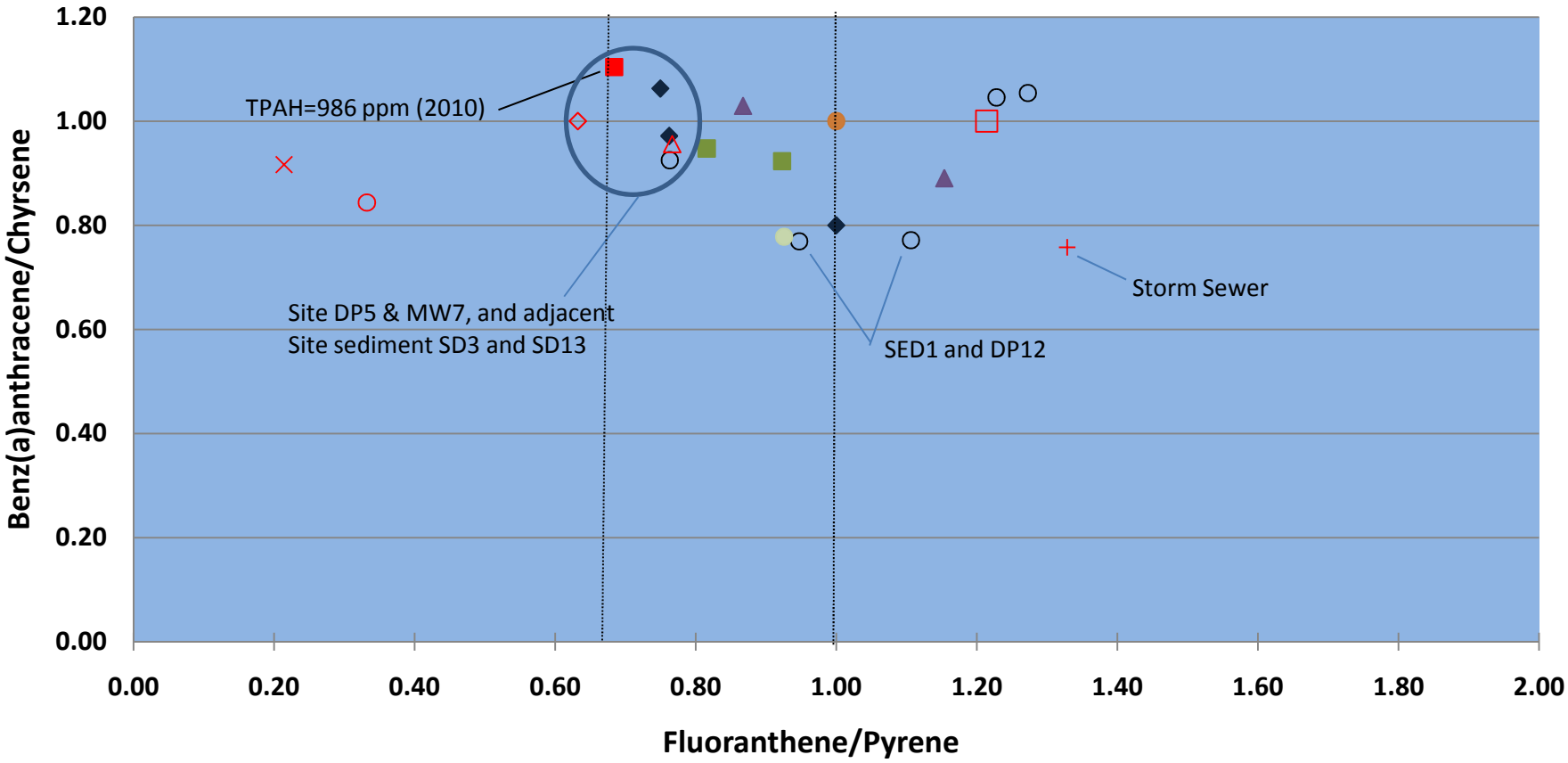


Figure 3B. Diagnostic Ratios BAA/C vs Fl/Py with Samples TPAH>10 ppm

Port Jervis: Upstream, Adjacent Site, Outfall and Site Samples



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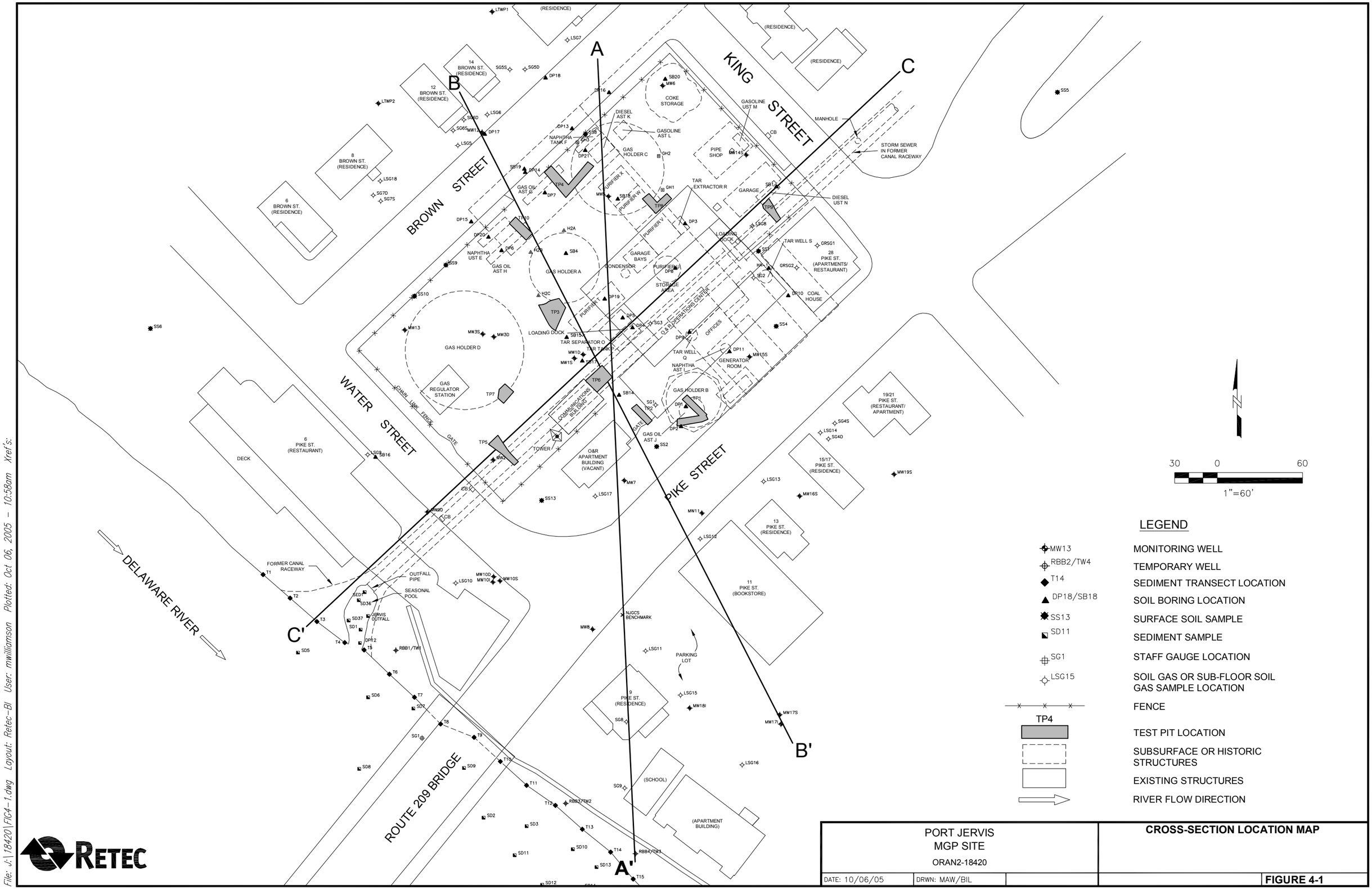
Attachments

ARCADIS

Attachment A

Figures 4-1, 4-2, 4-3, and 4-9 of the RI Report



LEGEND

MW13	MONITORING WELL
RBB2/TW4	TEMPORARY WELL
T14	SEDIMENT TRANSECT LOCATION
DP18/SB18	SOIL BORING LOCATION
SS13	SURFACE SOIL SAMPLE
SD11	SEDIMENT SAMPLE
SG1	STAFF GAUGE LOCATION
LSG15	SOIL GAS OR SUB-FLOOR SOIL GAS SAMPLE LOCATION
	FENCE
TP4	TEST PIT LOCATION
	SUBSURFACE OR HISTORIC STRUCTURES
	EXISTING STRUCTURES
	RIVER FLOW DIRECTION

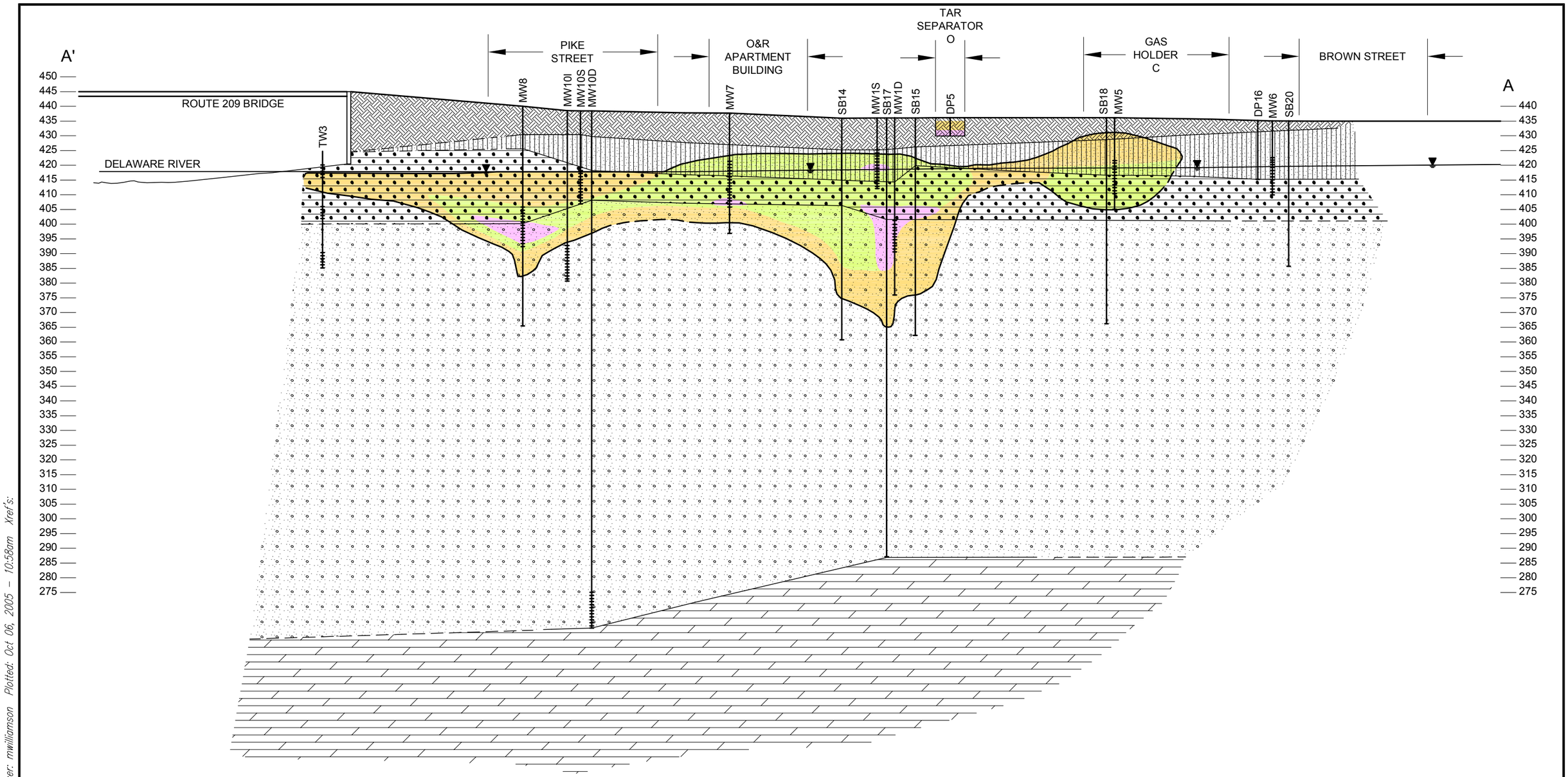
RETEC

PORT JERVIS
MGP SITE
ORAN2-18420

CROSS-SECTION LOCATION MAP

DATE: 10/06/05 | DRWN: MAW/BIL | **FIGURE 4-1**

File: J:\18420\FIG4-1.dwg Layout: Retec-BW User: mwilliamson Plotted: Oct 06, 2005 - 10:58am Xref's:



NOTE: THE DESCRIPTIONS AND COLORED PORTIONS OF THE FIGURE ARE GENERAL IN NATURE AND ARE BASED ON A LIMITED NUMBER OF SAMPLES. REFER TO THE BORELOGS AND THE RESULTS OF THE CHEMICAL ANALYSES FOR SPECIFIC INFORMATION REGARDING THE SUBSURFACE GEOLOGIC UNITS AND THE DISTRIBUTION OF HYDROCARBONS.

25 0 50

1"=50' HORIZONTAL

RETEC

PORT JERVIS MGP SITE ORAN2-18420			GEOLOGIC CROSS SECTION A-A'
DATE: 10/06/05	DRWN: MAW/BIL		FIGURE 4-2

File: J:\18420\FIG4-2.dwg Layout: Retec-Bill User: mwilliamson Plotted: Oct 06, 2005 - 10:58am Xref's:

B

B'

12 BROWN ST. (RESIDENCE)

BROWN STREET

FORMER GAS OIL AST G

EXISTING GAS HOLDER A FOUNDATION

PURIFIER TANK

FORMER TAR SEPARATOR FOUNDATION O

FORMER HOLDER B

FORMER GAS-OIL AST FOUNDATION J

PIKE STREET

11 PIKE ST. (BOOKSTORE)

LTWP2 MW12 DP14 SB19 TP4 DP7 DP6 SB4 SP15 MW1S MW1D SB17 SB14 MW7 MW11 MW17S MW17I

440 435 430 425 420 415 410 405 400 395 390 385 380 375 370 365 360 355 350 345 340 335 330 325 320 315 310 305 300 295 290 285 280 275

FILL

SHALE BEDROCK

GM-COARSE GRAINED ALUVIUM

SW-GLACIAL OUTWASH

SM-FINE GRAINED ALLUVIUM

WELL SCREENED SECTION

SOIL BORING

OVERBURDEN SOIL: HYDROCARBON–LIKE ODOR

OVERBURDEN SOIL: HYDROCARBON–LIKE STAINING, SHEEN OR NAPL BLEBS

OVERBURDEN SOIL: OCCASSIONAL LENS OF TAR–LIKE MATERIAL OR NAPL MIXED WITH SOIL

OVERBURDEN SOIL: SOIL SATURATED WITH TAR–LIKE MATERIAL OR NAPL

PIEZOMETRIC SURFACE

CONTACT

INFERRED CONTACT

LIMIT OF OBSERVED IMPACT

INFERRED LIMIT OF IMPACT

NOTE: THE DESCRIPTIONS AND COLORED PORTIONS OF THE FIGURE ARE GENERAL IN NATURE AND ARE BASED ON A LIMITED NUMBER OF SAMPLES. REFER TO THE BORELOGS AND THE RESULTS OF THE CHEMICAL ANALYSES FOR SPECIFIC INFORMATION REGARDING THE SUBSURFACE GEOLOGIC UNITS AND THE DISTRIBUTION OF HYDROCARBONS.

15 0 30

1"=30' HORIZONTAL

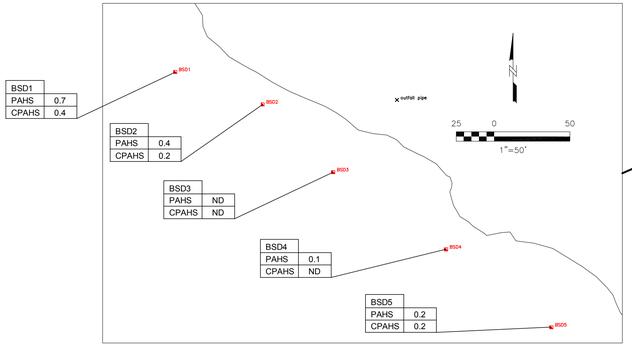
RETEC

PORT JERVIS
MGP SITE
ORAN2-18420

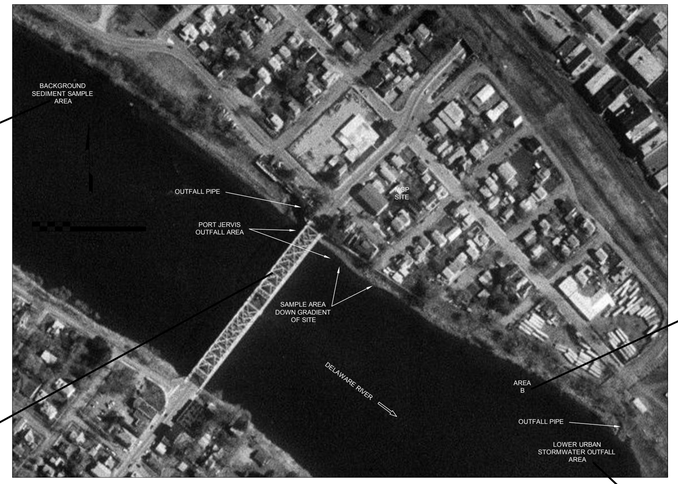
GEOLOGIC CROSS SECTION B-B'

DATE: 10/06/05 | DRWN: MAW/BIL | **FIGURE 4-3**

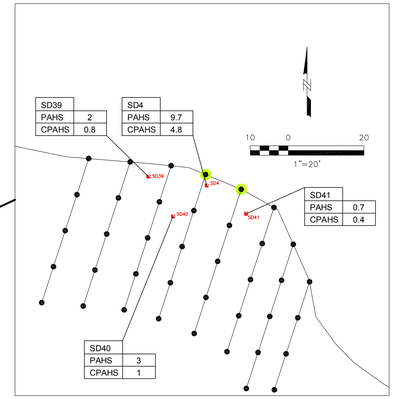
File: J:\18420\Fig4-3.dwg Layout: Retec-Bill User: mwilliamson Plotted: Oct 06, 2005 - 10:59am Xref's:



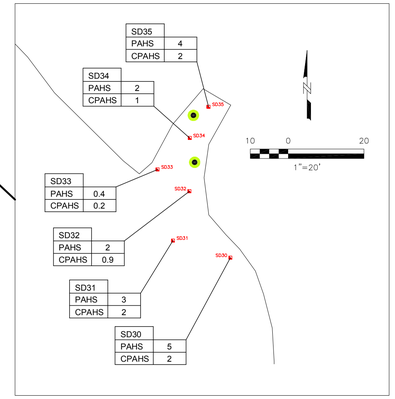
BACKGROUND
SEDIMENT SAMPLE
AREA



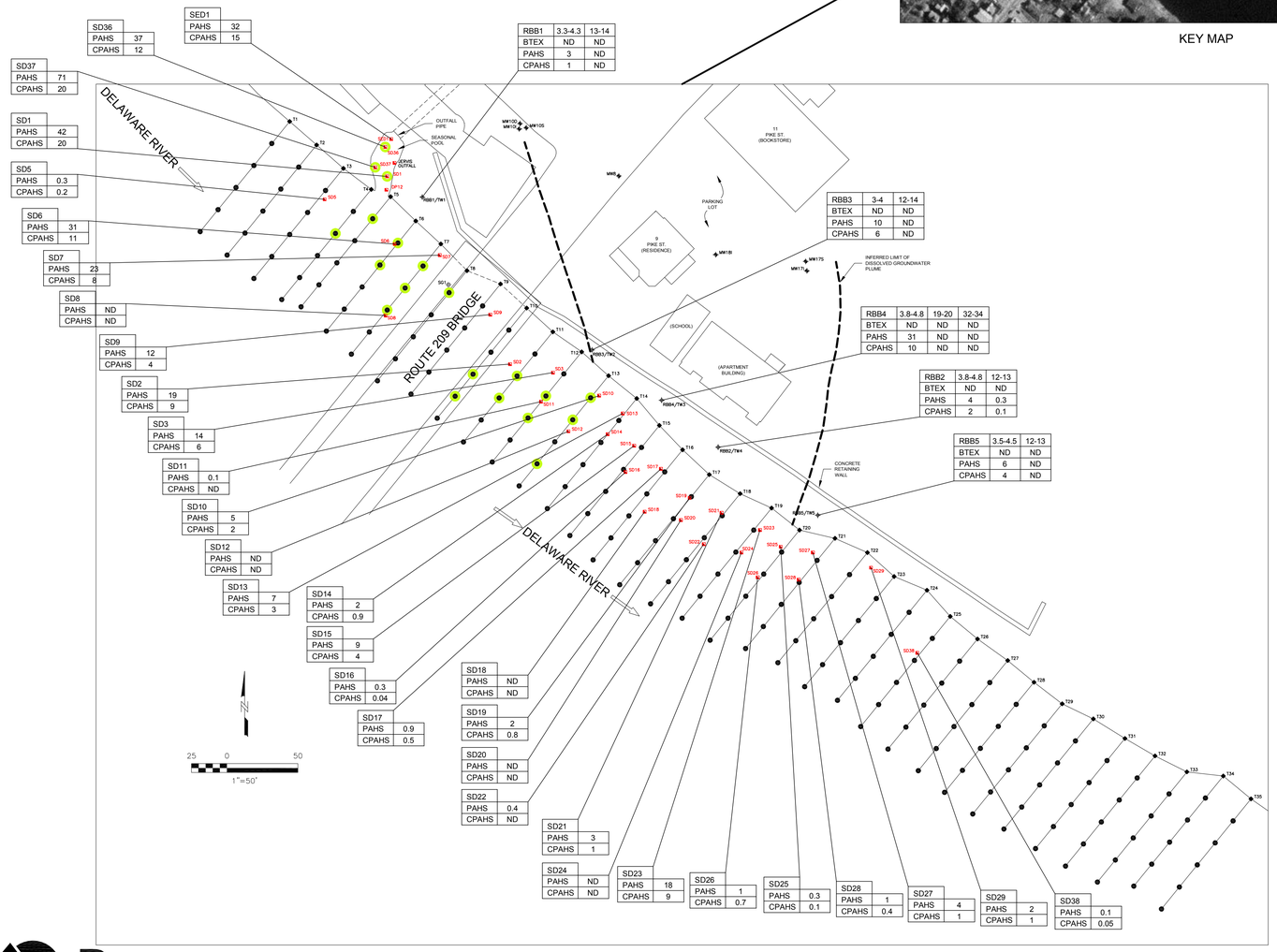
KEY MAP



AREA
B



LOWER URBAN
STORMWATER OUTFALL
AREA



PORT JERVIS OUTFALL AND
DOWN GRADIENT OF SITE
SEDIMENT SAMPLE AREAS

LEGEND

- MW1.3 — MONITORING WELL
- RBB2/TW4 — TEMPORARY WELL
- T14 — SEDIMENT TRANSECT LOCATION
- SD2 — SEDIMENT SAMPLE
- SG1 — STAFF GAUGE LOCATION
- PROBING LOCATION
- PROBING LOCATION WHERE TRACE HYDROCARBON LIKE SHEEN OBSERVED
- FENCE
- EXISTING STRUCTURES
- INFERRED LIMIT OF IMPACTED GROUNDWATER PLUME
- RIVER FLOW DIRECTION

RETEC

PORT JERVIS MGP SITE ORAN2-18420			**SEDIMENT INVESTIGATION AND RIVERBANK BORING SUBSURFACE SOIL RESULTS**
DATE: 10/06/05	DRWN: MAW/BIL		**FIGURE 4-9**

File: J:\18420\TF04-9.dwg Layout: #IDC_01 User: mwilkinson Plotted: Oct 06, 2005 - 11:00am

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Attachment B

Historical Logs for MW7 and TP4

ThermoRetec
1001 West Seneca Street, Suite 204
Ithaca, New York 14850-3342

Well ID: MW7

Project Name: Port Jervis MGP Site
Location: Port Jervis, NY
Project Number: ORAN2-15063
Date Completed: 11-2-00
Drilling Company: Boart Longyear
Drilling Method: RotoSonic
Sampling Method: 4 inch ID Core Barrel

Boring Location: Apartment Building Parking Lot
Ground Elevation (ft/MSL): 438.08
PVC Elevation (ft/msl): 437.72
Total Depth (ft): 45.0
Boring Diameter Inner (in): 6 inch ID
Water Level During Drilling (ft/bgs): 18.0
Logged By: James Edwards

Depth (Feet)	Recovery (feet)	Laboratory Sample ID	PID (ppm)	USCS Symbol	Lithology Symbol	Geologic Description	Well Construction	Well Dimension
0				FILL		Asphalt.		Curb Box wtih Locking Cap
-2	4.0					Fine-medium sand with silt. Brown, moist.		Grouted Annulus 1-6 ft
-4				SM				
-6								Beotonite Seal 6-10 ft
-8				SM				
-10	10.0							#00 sand 10-13 ft
-12				SM				2 inch PVC Riser 1.0-15 ft
-14						Fine-medium sand with silt. Brown, wet.		
-16				SM		Hydrocarbon-like odor and sheen.		0.20 PVC Screen 15-30 ft
-18						Fine-coarse gravel with some coarse sand. Brown, wet.		# 2 sand 13-30 ft
-20	10.0			GP		Strong hydrocarbon-like odor and stain		

Remarks:

Laboratory Sample: MW7 (25-26), (43-45)

MGP Indicators

ThermoRetec
1001 West Seneca Street, Suite 204
Ithaca, New York 14850-3342

Well ID: MW7

Depth (Feet)	Recovery (feet)	Laboratory Sample ID	PID (ppm)	USCS Symbol	Lithology Symbol	Geologic Description	Well Construction	Well Dimension
-22						Visible NAPL blebs.		
-24				GP		Visible NAPL mixed with gravel at 24-26 ft bgs.		
-26		MW7 (25-26)						
-28				SM		Fine-medium sand. Gray, wet.		
-30	10.0					Trace hydrocarbon-like odor.		Threaded End Plug
-32				SM		Sand mixed with NAPL blebs at 32 ft bgs		
-34								Natural Backfill 30-45 ft
-36				SM		Trace NAPL blebs and hydrocarbon odor		
-38								
-40	5.0			SM		Fine-medium sand. Brown, wet.		
-42		MW7 (43-45)						
-44				SM				
-46						Boring Terminated at 45.0 ft		

Remarks:

Laboratory Sample: MW7 (25-26), (43-45)

MGP Indicators

ATLANTIC
ENVIRONMENTAL DIVISION

GEI Consultants, Inc.

188 Norwich Avenue
P.O. Box 297
Colchester, CT 06415

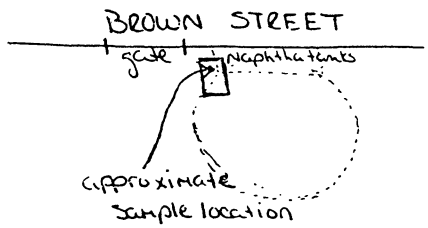
Form 1031
Ph: (860) 537-0751
Fax: (860) 537-6347

TEST PIT DESCRIPTION SHEET

PROJECT NUMBER: 97679-1002
TEST PIT NUMBER: TP-4
GENERAL LOCATION AND/OR PURPOSE: near gas holder and naphtha tanks
DATE: 4/13/98
TIME OPENED: 1630 **TIME CLOSED:** 1800

LOCAL "CALL BEFORE YOU DIG" CASE NO.: 2060431
OBSERVER: Ben Foster
ASSISTANT: Carolyn Lewis
OTHERS:
CONTRACTOR:
EQUIPMENT: John Deere 410E Backhoe

IN THE SPACE PROVIDED BELOW, NOTE WHAT WAS FOUND IN THE TEST PIT AND SKETCH DIMENSIONS, SOIL TYPES, AND WASTE. NOTE ANY BURIED METAL OBJECTS.



0-0.4' bgs - asphalt

0.4' bgs - concrete slab

0.4-6' bgs - brown sand, rock, gravel, debris, some wet soil

- slight fuel oil odor
- some black fuel oil

6-8' bgs - black fuel oil

collected sample PJ-TP4-01 at 8 ft bgs

be = 8 ft bgs

VIDEO DOCUMENTED: YES ___ NO X
PHOTOGRAPHED: YES X NO ___
PIEZOMETER NO. USED IN BACKFILL:
DEPTH TO WATER: _____ FT

NAPL SEEPAGE: YES ___ NO ___
BULK SAMPLES: YES ___ NO ___
QUANTITY: _____

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Attachment C

GC Fingerprint for May 2010 Sediment Sample Collected at Location SD13

Data File: \\Organics\GC\chem\msd10.i\10may1710.b\10051719.D
Date : 17-MAY-2010 16:09
Client ID: SD-13_0510
Sample Info: 10may1710.b, LE07013-007, 10X
Volume Injected (uL): 0.5
Column phase: DB-5.625

Instrument: msd10.i

Operator: WD
Column diameter: 0.18