REMEDIAL ALTERNATIVE EVALUATION REPORT
FORMER TIDEWATER FACILITY AND FORMER POWER PLANT
TIDEWATER AND MERRY STREETS
PAWTUCKET, RHODE ISLAND

PREPARED FOR:
RIDEM
Providence, Rhode Island

ON BEHALF OF:
Narragansett Electric Company
Providence, Rhode Island

PREPARED BY:
GZA GeoEnvironmental, Inc.
Providence, Rhode Island

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File No. 43654.00

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July 29, 2011
GZA File No. 05.0043654.00-C

Mr. Joseph Martella
Rhode Island Department of Environmental Management
Office of Waste Management
235 Promenade Street
Providence, Rhode Island 02908

Re: *Remedial Alternative Evaluation Report*
Former Tidewater MGP and Power Plant Site
Pawtucket, Rhode Island
RIDEM Case No. 95-022

Dear Mr. Martella:

On behalf of our client, The Narragansett Electric Company d/b/a National Grid (National Grid), GZA GeoEnvironmental Inc. (GZA) is pleased to provide the attached *Remedial Alternative Evaluation Report* for the property located at the Former Tidewater MGP and Power Plant Site located in Pawtucket, Rhode Island (the Site).

This *Remedial Alternative Evaluation* was completed in accordance with Section 7.04 of the Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (Remediation Regulations). This evaluation, combined with the January 2011 *Site Investigation Data Report* (SIDR), which was submitted to the Rhode Island Department of Environmental Management (RIDEM) in January 2011, serve to fulfill the requirements described in Section 7.08 of the Remediation Regulations for a *Site Investigation Report* (SIR). A completed Site Investigation Submission Checklist is included in Appendix B.

We look forward to continue to work cooperatively with RIDEM to advance this Site to compliance with the applicable regulations. Should you have any questions or comments regarding the information presented herein, please do not hesitate to contact the undersigned or Michele Leone at 781-907-3651.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

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Attachment: *Remedial Alternative Evaluation Report*

CC: Ms. Michele Leone, National Grid

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APPENDICIES

1.00 INTRODUCTION

On behalf of The Narragansett Electric Company, d/b/a National Grid (National Grid), GZA GeoEnvironmental Inc. (GZA) has prepared this *Remedial Alternative Evaluation Report* for the Former Tidewater Manufactured Gas Plant (MGP) and Former Power Plant Site located at the terminus of Tidewater and Merry Streets in Pawtucket, Rhode Island (refer to Figure 1 for the Site *Locus Plan*). Consistent with previous reports, the Site is defined as Pawtucket Tax Assessors Plat (A.P.) 54B Lot 826, A.P. 65B Lots 662, 645, 647, 649 and portions of 648, and portions of A.P. 67B Lot 11. These properties are collectively referred to herein as the "Site."

This evaluation, combined with the January 2011 *Site Investigation Data Report* (SIDR), which was submitted to the Rhode Island Department of Environmental Management (RIDEM) in January 2011, serve to fulfill the requirements described in Section 7.08 of the Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (Remediation Regulations) for a *Site Investigation Report* (SIR). In accordance with Section 7.08 of the Remediation Regulations, a completed Site Investigation Submission Checklist is included in Appendix B.

This *Remedial Alternative Evaluation* is organized as follows:

- Section 1.00 contains this introduction;
- Section 2.00 contains a brief summary of Site background information, a summary of the results of previous Site investigations, and the results of investigations performed since submittal of the SIDR to RIDEM in January 2011;
- Section 3.00 summarizes the Conceptual Site Model (CSM) including Site geology/hydrogeology. This section also includes a description of potential exposure pathways which have been identified based on the nature and extent of impact and the current Site setting and use;
- Section 4.00 outlines the remedial objectives for the Site;
- Section 5.00 identifies four remedial action alternatives and presents the comparative evaluation which was performed to facilitate selection of the preferred alternative;
- Section 6.00 presents the rationale for selection of the preferred remedial alternative for the Site. This section also identifies certain additional remedial design investigations/activities that are necessary prior to implementation of the preferred alternative (Limited Design Investigations per Section 9.05 of the Remediation Regulations);
- Section 7.00 presents a preliminary remedy implementation schedule; and,
- Section 8.00 contains the report Certification per Section 7.05 of the Remediation Regulations.

This report is subject to the Limitations as presented in Appendix A. The report and its conclusions are subject to modification if subsequent relevant information is developed by GZA or any other party.

2.00 BACKGROUND

The following provides a brief Site description, a summary of relevant past Site operations, a brief summary of the previous Site investigation findings, and a summary of investigations and evaluations completed at the Site since submittal of the SIDR to RIDEM in January 2011. For more detailed information on Site background, use, utilities, environmental setting, history, former operations, regulatory history, and the results of previous investigations, please refer to the January 2011 SIDR.

2.10 SITE DESCRIPTION AND SUMMARY OF HISTORIC USE

The Site was the location of the Tidewater MGP and the Pawtucket No. 1 Power Station. It is now largely vacant with the exception of an active natural gas regulating station located on the northwest portion and the use of the former Power Plant as an active switching station and electric substation on the central portion of the Site. The Site is secured with a locked perimeter chain-link fence.

The Site is situated between Taft Street, an extension of Tidewater Street and Thorton Street to the west, and the Seekonk River to the east and consists of approximately 23 acres across seven separate lots. The Site has been subdivided into four areas, as described below and shown on Figures 2A and 2B.

- North Fill Area (NFA) (northern portions of A.P. 54B Lot 826) – Figure 2A;
- Former Gas Plant Area (FGPA) (southern portions of A.P. 54B Lot 826 and A.P. 65B Lot 662) - Figure 2A;
- Former Power Plant Area (FPPA) (A.P. 65B Lot 645) – Figure 2B; and
- South Fill Area (SFA) (A.P. 65B Lots 647 and 649, portions of Lot 648 and portions of A.P. 67B Lot 11) – Figure 2B.

The entirety of the NFA, FGPA and FPPA are owned by National Grid, portions of the SFA are owned by National Grid (A.P. 65B Lots 647 and 649) and portions of the SFA are owned by the City of Pawtucket (A.P. 65B Lot 648 and A.P. 67B Lot 11). The current Site layout, key features, and previous exploration locations are shown on the attached Figures 2A and 2B, *Exploration Location Plan* for the North Fill Area and Former Gas Plant Area (Figure 2A) and the Former Power Plant Area and South Fill Area (Figure 2B).

The Site is bounded to the west and northwest by residential properties, light commercial facilities and two private schools (A.P. 65B Lots 613, 614, 615 and 616), to the east by the tidally-influenced Seekonk River, to the south and southwest by the Francis J. Varieur School (A.P. 65B Lot 644) and the Max Read Athletic Field (A.P. 65B Lots 646, 650 and 564 and A.P. 67B Lot 21), and to the north by undeveloped property owned by the City of Pawtucket (A.P. 54B Lot 827). The International Charter School, the Blackstone Academy, George W. Smith and Son, Inc. Construction Company and the Red Barn Studio Company are located to the west of the FGPA (A.P. 54B Lot 497).

Municipal water, sanitary sewer and electricity service the Site. The approximate locations of these and other utilities and relevant features are shown on Figures 2A and 2B.

Site topography generally slopes toward the Seekonk River, with an approximate maximum elevation of 35 feet mean sea level (MSL) along the western boundary of the Site to approximately 8 feet (MSL) along the river's edge. The Site is within Federal Emergency Management Agency (FEMA) Flood Zones V17 (Elevation 17, 1929 NGVD or NGVD29 (1929 National Geodetic Vertical Datum)) and A16 (Elevation 16 NGVD 29). The eastern area of the Site is located within the 200 foot jurisdictional limit of the Coastal Resource Management Council (CRMC) as shown on Figures 2A and 2B. The Site's surface consists primarily of vegetation and gravel. Certain areas of deteriorated pavement and concrete also exist.

The Seekonk River is tidally influenced and has been designated by the CRMC as Type 4 waters, defined as multipurpose waters and Type 6 waters, industrial waterfronts and commercial navigation channels. It is classified as SB1{a} waters by RIDEM. The SB1 portion of the classification is assigned to saline waters designated for primary and secondary contact recreational activities and wildlife habitat; suitable for aquacultural uses, navigation and industrial cooling; and good aesthetic value. The designation assumes that primary contact recreational activities may be impacted due to pathogens from approved wastewater discharges, and the "{a}" indicates that it is a "…partial use designation due to impacts from Combined Sewer Overflows (CSOs)."

The groundwater underlying the Site is classified by RIDEM as GB. Groundwater classified as GB refers to those groundwater resources which the Director of RIDEM has designated as not suitable for public or private drinking water use. The Site is located approximately 1.4 miles to the nearest GA designated area (drinking water that has been designated as suitable for public or private drinking water use), located east of the Site, near Slater Park, on the opposite side of the Seekonk River. The Site and surrounding area are serviced by municipal drinking water. There are no public drinking water supplies within a 1-mile radius of the Site. The closest wellhead protection area is approximately 1.2 miles to the north of the Site.

The shoreline of the Site was altered as a result of historic filling. Figures 2A and 2B depict this progression of filling based on reviews of the Sanborn Map series, historic aerial photos and other historic maps. The majority of the current shoreline (with the exception of the SFA) has been improved with various retaining structures (*i.e.* stone walls with timber or steel piling, rock/rubble banks, and brick/rubble banks). The shoreline embankment of the majority of the SFA is unimproved.

The following sections contain summaries of relevant historic uses for each of the four Site areas. As described previously, refer to the SIDR for more detailed information.

North Fill Area

The NFA was primarily used for coal and lumber storage from the late-1800s through the mid-1900s. The area has been primarily vacant land since that time period. Currently, the NFA consists of wooded/vegetated land.

Former Gas Plant Area

In the 1880s, the Pawtucket Gas Company commenced building the Tidewater MGP. The MGP operated from the 1880s to 1968. From the 1880s until 1954 the MGP generated gas using the coal carbonization and carbureted water gas processes. Coal was used as the principal fuel to produce coal gas in the coal carbonization process, while coke (enriched with fuel oil) was used to produce carbureted water gas. Coal and tars were also commonly used as feedstock in the carbureted water gas process. Coal and coke storage areas were located on the NFA, FGPA, and the FPPA. These raw materials were barged to the Site and the storage areas were generally positioned along the Seekonk River. In the later years of operation (1954 until the late-1960s), the MGP produced gas for peak shaving purposes. Residual by-products were generated during certain operational production phases of the MGP processes. Tars were a primary residual by-product of all three gas production processes. Coal tar is typically denser than water, relatively slow moving in the environment and persistent under geologic and hydrogeologic conditions typical of that found at the Site. It is generally composed of a complex mixture of polyaromatic hydrocarbons (PAHs) that exhibit low volatility, low solubility, low biodegradability and high adsorption tendencies. Lighter oils, raw condensate and purifying wastes represent other residual streams from the MGP. The purifying process often generated residual filtration mediums, containing filtered gas impurities such as naphthalene, cyanide, metals, sulfur, ammonias, phenols, and tars.

In 1968, the MGP facility was decommissioned. Based on available information, it appears that the majority of the above- ground MGP structures and tanks were razed at that time or before. The last of the two remaining gasholders on the Site (Nos. 7 and 8) were decommissioned and removed from the Site in 2010. Presently, there is an active natural gas regulating station present in the southwestern corner of the FGPA and several inactive former processing buildings.

Former Power Plant Area

In 1890, the Pawtucket Gas Company commenced building the Pawtucket No. 1 Station for power generation purposes. The No. 1 Station operated on Site from the early-1890s until 1975. Based on a review of aerial photographs, the current transformer yard was part of this electrical generation plant since at least 1939. The station used coal and petroleum based products for electricity generation. In addition, the plant used residual byproduct tar from the MGP for power generation. The primary source of potential environmental impacts associated with the former power plant operation is the storage, handling, transfer and use of fuel, particularly petroleum products historically stored in the three, larger above ground storage tanks (AST) formerly located on the southern portion of the FFPA. These tanks, with a capacity of 897,750 gallons each, were used to store fuel oil for former power plant and MGP operational purposes. In addition, a former underground fuel conveyance system consisting of piping and a wooden raceway extending from the former AST area on the FPPA north towards two former, 21,000 gallon underground storage tanks (USTs) that stored fuel oil and the FGPA portion of the Site was encountered during the recent 2010 investigation activities. This former feature likely was used to convey fuel across the Site. Presently, the transmission towers, transformer yard and engine room building (which contains the switching station) are still present on the FPPA.

South Fill Area

A historical map from 1895 shows a large cove present due south of the No.1 Station encompassing a large section of the southwest portion of the FPPA and the majority of the SFA. This area appears filled on the aerial images dated 1939. GZA did not identify any maps or other historic documents indicating precisely when between 1895 and 1939 this large cove area was filled. Historic maps and photos indicate evidence of tree clearing, shoreline alterations, and land disturbances from at least 1951 until at least 1976. The SFA is presently vacant consisting primarily of wooded/vegetated land. Two washout areas have formed on the SFA identified as north and south on Figure 2B. The south washout area is more significant and was caused by the discharge of surface water from athletic fields located to the west of the SFA through a deteriorated storm water structure located on the west side of the SFA. The south washout area will be addressed as part of a RIDEM-approved Short Term Response Action.

2.20 SITE INVESTIGATION RESULTS

Several Site investigations, limited response actions, and other activities have been completed to address certain environmental concerns at the Site between 1986 and present day. MGP residuals and petroleum hydrocarbon related impacts were detected in both surface and subsurface soils. In general, subsurface soils located at/or below the water table exhibited more significant impact when compared to surface soils. Surface soils at the Site exhibit widespread exceedances of the RIDEM Method 1 Industrial/Commercial Direct Exposure Criteria (I/C-DEC) primarily related to PAHs and certain inorganics (most notably arsenic and lead). More sporadic exceedances of the Method 1 GB Leachability Criteria were observed in surface soils. I/C-DEC and GB Leachability Criteria exceedances were also observed in subsurface soils. In certain areas of the Site, sporadic RIDEM Method 1 Upper Concentration Limit (UCL) exceedances in the surface soils and more widespread UCL exceedances in subsurface soils, particularly in the FGPA and FPPA, were identified.

In terms of groundwater quality, volatile organic compound (VOC) GB Groundwater Objective exceedances were observed in the eastern portion of the FGPA, FPPA, and SFA. Typical of former MGP and power plant sites, the most prevalent compounds detected in groundwater were benzene and naphthalene. Groundwater in these areas was also impacted by total petroleum hydrocarbons (TPH) and cyanide, and to a lesser extent PAHs.

In addition, light non-aqueous phase liquids (LNAPL) was observed on the eastern portion of the FGPA and FPPA and dense non-aqueous phase liquids (DNAPL) was observed on the eastern portions of the FGPA, FPPA and SFA adjacent to the riverfront within groundwater monitoring wells.

The following presents a summary of observations made and environmental data collected in comparison to relevant RIDEM standards[1].

- **<u>Visual Observations</u>:** In general, visual observations of impacts were confined to the overburden with minimal impacts to the underlying bedrock. As expected, the most prominent visual observations of impacted soils were generally within areas of the Site where former historical Site operations were heavily concentrated (*i.e.,* eastern portion of FGPA along the riverfront; footprint of former fuel oil tanks on the FPPA). Impacts were also observed in areas of former raw material storage (NFA) as well as the SFA.

  - <u>NFA</u>: evidence of historic filling was noted in the explorations completed on the easternmost portion of the NFA adjacent to the Seekonk River proximate to the former inlet. Fill materials in this portion of the Site were noted to consist of sandy materials mixed with varying percentages of coal, ash, coal dust, brick, slag and wood. Limited visual and/or olfactory evidence of impacts were noted within the surface and subsurface soils on the NFA, with the exception of the areas proximate to TB-17 and TB-16. These areas are within the footprint of the historic former inlet on the NFA. In the vicinity of TB-16, a localized area of crystallized naphthalene (as evident by the description of "white crystals" on the logs) was observed in the shallow fills above the water table. Crystallized naphthalene material was observed in a discrete layer within the shallow fills in certain test pits performed during the Site investigation at depths ranging from approximately 2 to 4 feet below ground surface (bgs). The presence of this residual material represents a UCL condition. At boring TB-17, small tar globs and tar odors were noted at a depth of 14 to 16 feet bgs. Based on the soil classification presented on this log, this depth is immediately below the fill at the top of the upper native sand layer, approximately 4 to 6 feet below the noted water table. The presence of slight coal tar-like odors were noted in the sand and till layers at TB-301 at depths ranging from approximately 20 to 26 feet bgs (elevation -10 to -16 NGVD), located approximately 25 feet north of TB-17. In addition, slight coal tar-like and/or petroleum/fuel oil-like odors were noted in the sand and till layers at MW-310S/D at depths ranging from 26 to 32 feet bgs (elevations -20 to -26 NGVD), located approximately 150 feet north of TB-17. Unlike TB-17, no visual evidence of impacts was noted at borings TB-301 or MW-310S/D.

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[1] Regulatory comparisons considered the current environmental setting and use of the property. Under current and foreseeable future conditions, the Site would likely continue operation as an electrical substation and natural gas facility owned by National Grid (industrial/commercial use). Accordingly, the data were compared to the RIDEM Method 1 GB Groundwater Objectives, the GB-Leachability Criteria, and the Industrial/Commercial Direct Exposure Criteria (I/C-DEC).

- FGPA: Descriptions of subsurface conditions in the FGPA indicate the presence of residual to product levels of MGP materials within the soil matrix. Stained and saturated soils are described commonly in the exploration logs and coal tar/naphthalene odors are indicated from slight to very strong. Odors are described as coal tar-like, fuel/petroleum-like, naphthalene-like, and sulfur-like; with coal tar/tar-like being the most prevalent. Descriptive visual indications of MGP-related impacts included stains, sheens (on soil and groundwater), tars, saturated soils, blebs, MGP wastes, and NAPL. In some cases, specific waste type descriptions were provided such as "wood chips," "bluish-green colored," and "iron oxide." The most significant impacts were observed within the footprint of the former MGP operations extending to the southern portion of this area (within and adjacent to a former Gasholder No. 4), TP-353, TP-354/354A/354B, TP-13/13A, and GZA-TP-6 (in the vicinity of the former UGGT-4), and from the retaining structure/outcrop/access roadway eastward to the Seekonk River. The presence of visual UCL conditions (i.e., product level materials within the soil matrix) were generally localized to this area of the FGPA as well. Several subsurface foundations of former MGP structures were observed within the fill in the central, southern and eastern portion of the FGPA. Explorations completed in the vicinity of these former MGP features exhibited MGP residuals, ranging from sheens to solidified tar-like material in the shallow fills (at depths ranging from approximately 0 to 5 feet below grade). Along the eastern portion of the FGPA, petroleum/fuel oil-like impacts ranging from sheen to blebs were generally noted in the fill and upper native sand layer at elevations 4 to -10 NGVD29. These impacts were commonly observed at and below the groundwater table. Below these depths, coal tar-like impacts ranging from sheen to saturated predominated within the glacial outwash and marine deposits. The degree of visually impacted soils generally decreased with depth through the glacial outwash (i.e., "sand" layer). In addition, observations of both petroleum and coal tar impacts diminished significantly south of MW-326 and north of MW-312 along the eastern portion of the FGPA. Limited visual and/or olfactory evidence of impact were generally noted in the till layer on the FGPA, with the exception of the area along the river adjacent to the former MGP structures (*i.e.,* MW-312S/D, TB-302) and the area east of the former Gasholders No. 7 and 8 (*i.e.,* MW-341, MW-339S/D). Within these areas, observed impacts were coal tar-like in nature and ranged from sheen to blebs within the till layer/top of bedrock (approximate elevation -20 feet NGVD29).

- FPPA: Similar to the NFA and FGPA, portions of the FPPA were subject to historic filling as evident in the explorations completed along the riverfront. The most significant fill thicknesses were encountered on the southeastern and southern portions (adjacent to the SFA). Conditions encountered in the FPPA differ from those observed in the FGPA. Consistent with historic use, observed impacts on the FPPA appear to be primarily related to former petroleum storage. Odors are reported as petroleum/fuel oil-like, naphtha-like (assumed to be "coal tar-like") and sulfur-like. Impacts were also generally noted to be limited to the fill and upper limits of the native sand layer.

Fuel oil impacts were observed within the fill and upper native sand layers in the areas east of the former Oil Tanks No. 1 and 2 located on the FPPA. Descriptors of visual petroleum/fuel oil-like impacts in this area of the FPPA ranged from sheen to blebs. Evidence of separate phase product was commonly noted on the water table in test pits advanced in this area of the FPPA. Below these depths, visual and/or olfactory observations of petroleum/fuel oil-like impacts were not noted. In addition, fuel oil impacts (described as a "sheen") were observed in the upper sand layer in the area of the former 20,000 gallon USTs (northeastern corner of FPPA). Test pits completed near the northeast portion of this area also encountered strong petroleum/fuel oil-like odors and sheen to coated soils. Fuel oil-like impacts (described as "coated") were also noted in the fill layer in the vicinity of MW-103. Petroleum impacts on the groundwater table were noted in test pits completed during the 2009/2010 SI proximate to MW-103. These observations of petroleum/fuel oil-like impacts described above on the FPPA are noted to be in close proximity to the former wooden raceway and/or inlet/outlet piping encountered in test pits TP-327, TP-381A, TP-381B, TP-381C and TP-380. Evidence of separate phase product was frequently encountered in test pits completed along the length of the former wood raceway and/or inlet/outlet piping on both the FGPA and FPPA. Other significant observations noted in the FPPA included blue/green staining (indicative of MGP-related cyanide complexes) in the shallow fills (generally less than 10 feet bgs) adjacent to the access road south of the substation, within the vicinity of the former fuel Oil Tanks No. 1, 2 and 3, in the areas proximate to MW-103 (*i.e.,* TP-384C, TP-331), and along the western property line south of Bowles Court. Evidence of white powder-like material within the fill (assumed to be indicative of crystallized naphthalene) was also noted in several test pits on the southern and southwestern portion of this Site area. Oily soils with petroleum-like odor were also noted in several explorations completed adjacent to or within the footprint of the former fuel Oil Tank Nos. 1, 2 and 3. In addition, the presence of wood chips, asbestos-like material and tar was noted in W-BVE-TP-9 north of former fuel Oil Tank No. 3. The visual observations of oily soils/sludges and naphthalene-like material represent potential UCL conditions on the FPPA.

- <u>SFA:</u> Impacts from MGP residuals including clinker, ash and purifier box material were evident throughout the areas of the SFA investigated. In addition, visual observations of hardened tar were noted in two areas: (1) on the face of the south washout area and (2) in the surface soils adjacent to the northern fence line separating the SFA and FPPA. Numerous test pit logs report "MGP wastes throughout" and indicate the presence of staining, sheens, tars, and NAPL. Visual observations indicative of potential UCL conditions were noted throughout the SFA. Odors noted in soils on the SFA are commonly described as coal tar-like, naphthalene-like and oil-like. At MW-334S/D, the presence of wood chips and purifier box material odor was noted at depths ranging from 5 to 10 feet bgs (NGVD). In addition, observations of blue staining were noted at W-BVE-TP-13, W-BVE-TP-10, and MW-320S/D and in the face of the south washout area. Evidence of coal tar-like impacts ranging from sheens to blebs extend from the depth of the water table through the fill into approximately the upper 10 to 15 feet of the native sand layer. In general, a decrease in observed impacts with increasing depth through the sand layer was noted.

- **Surface Soils:** In general, results of the analytical testing for surface soils at the Site (*i.e.* upper 2 feet of the soil column) indicate widespread exceedances of the I/C-DEC for arsenic and PAHs (primarily Benzo [a] Pyrene, Benzo [b] Fluoranthene and Benzo [a] Anthracene). Please note, certain of the arsenic exceedances in surficial soils are the result of the relatively low I/C-DEC for arsenic of 7 mg/kg. Visual evidence of fill was noted for the vast majority of surface soils on the Site. The primary exposure pathways of concern are direct contact with impacted soils and erosion/tracking of surface soils both on and off Site. With respect to the former, the entirety of the Site is surrounded with a locked perimeter fence.

    - NFA: I/C-DEC exceedances for both PAHs and arsenic were detected in surface soils throughout this area of the Site. In addition, TPH was detected at two locations above the I/C-DEC and GB Leachability Criterion and an isolated area of elevated lead was detected near the north boundary and on the adjacent City owned property to the north.

    - FGPA: Results of the analytical testing for surface soils in the FGPA indicate the presence of TPH above the I/C-DEC and GB Leachability Criterion primarily in the central portion of the FGPA, proximate to the former retort and water gas houses. Lead was detected in several samples in the vicinity of former Gasholders No. 7 and 8 at concentrations exceeding the I/C-DEC, with one UCL exceedance. Both PAHs and arsenic were detected at concentrations in excess of the I/C-DEC throughout the FGPA. In general, arsenic was more prevalent on the western portion of the FGPA while PAHs were detected in all areas of the FGPA.

    - FPPA: Results of the analytical testing for surface soils in FPPA indicate the presence of surface soil exceedances above the applicable Method 1 Criteria, generally within the former oil storage area (near former fuel Oil Tanks Nos. 1, 2 and 3) and the eastern portion of the FPPA. TPH above the I/C-DEC and GB Leachability Criterion were detected in eleven surface soil samples on the FPPA, with five samples exceeding the UCL. Lead was also detected in four samples exceeding the I/C-DEC. The TPH detections were located in the vicinity of former fuel Oil Tanks 1 and 2 and the northeast portion of the FPPA proximate to the former USTs. Cyanide was also detected in two surface soil samples at concentrations exceeding the I/C-DEC and the UCL. The elevated cyanide surface soil samples were generally located within or proximate to the footprint of the former fuel oil storage tank No. 1 on the FPPA. PAH I/C-DEC exceedances were widely distributed across the FPPA.

- SFA: Results of the analytical testing for surface soils in the SFA indicate the presence of VOCs above GB Leachability Criteria at two locations. The most elevated VOC concentrations were located in the vicinity of the south washout area. Inorganic impacts (primarily arsenic and lead) were observed more sporadically in the SFA. In addition, PAHs were observed above the I/C-DEC throughout this area of the Site with two samples exceeding the UCL.

- **Subsurface Soils:** Subsurface soils (those located greater than 2 feet below ground surface) are characterized by similar impacts as surface soils (*i.e.,* TPH and PAHs above RIDEM Method 1 criteria), but generally at higher concentrations and at a higher frequency of detections, with the exception of the NFA. In addition, exceedances of VOCs (GB Leachability Criteria) were also detected in subsurface soils in higher frequency than in surface soils. Inorganics (arsenic, lead, cyanide and other inorganics) were not detected as frequently in subsurface samples when compared to surface soil detections. Similar to surface soil results, PAHs and arsenic were prevalent throughout the Site, and VOCs, TPH and lead exceedances tended to be more localized. The exposure pathways of concern for subsurface soils include direct contact to impacted soils during potential future construction/utility work and potential for continued degradation of underlying groundwater quality.

    - NFA: Results of the analytical testing for the subsurface soils located on the NFA indicate the presence of limited exceedances of the I/C-DEC, limited to primarily PAHs (Benzo [a] Pyrene), arsenic and lead. No exceedances of the UCL were observed for subsurface soils on the NFA. The extent of the exceedances for the NFA appears to generally coincide with the footprint of the historic former water inlet (between TB-16 and TB-17). Consistent with observations made during the explorations in this area, soil quality improves with depth with the exception of a few isolated locations.

    - FGPA: Results of the analytical testing for the subsurface soils located in the FGPA indicate the presence PAHs, TPH, and VOCs above the I/C-DEC, GB Leachability Criteria (TPH and VOCs only) and UCLs. The inorganic impacts exceeding the I/C-DEC were limited to arsenic, beryllium and lead. There is one UCL exceedance of VOCs, eleven UCL exceedances of TPH and three UCL exceedances of PAHs at eight locations at varying depths. The extent of exceedances of applicable RIDEM criteria in subsurface soils in the FGPA appears to be concentrated to the southeastern portion of the FGPA and east of the retaining wall/former oil tank area to the Seekonk River. As expected, subsurface soil exceedances appear to be coincident with areas of the FGPA where historical MGP features and operations were located and also coincident with the depths of staining and other observations of impacts. With the exception of PAHs and arsenic, which tend to be more widely distributed, the majority of the other UCL exceedances were concentrated in this area of the FGPA. Across the FGPA, the majority of exceedances occurred less than 10 feet below ground surface. The natural groundwater table is encountered approximately 9 to 13 feet bgs in this area. The deepest organic compound UCL exceedances occurred at a depth of 14 to 16 feet bags. The deepest RIDEM Method 1 exceedances were detected at 26 to 28 feet bgs along the eastern portion of the FGPA adjacent to the river (TB-302, MW-312S/D).

- FPPA: Results of the analytical testing for the subsurface soils located in the FPPA indicate the presence of PAHs and TPH above the I/C-DEC, GB Leachability Criterion (TPH only) and UCLs. VOCs were detected above the GB Leachability Criteria in one soil sample. Similar to other Site areas, the inorganic impacts exceeding the I/C-DEC on the FPPA were primarily related to arsenic. There are eight UCL exceedances of TPH and one UCL exceedance of PAHs at eight locations at varying depths. The majority of these exceedances are located proximate to the former fuel storage tanks. The deepest UCL exceedances occurred at a depth of 9 to 10 feet bgs, although most of the UCL exceedances occurred at a depth of less than 7 feet bgs. The extent of applicable RIDEM criteria exceedances in subsurface soils on the FPPA was generally limited to the former oil storage area in the southern portion of the FPPA and the vicinity of the former pipe raceway which runs between the FGPA and the FFPA and the oil inlet and outlet piping which extended from the former oil storage area to the eastern side of the former power plant boiler room. This is consistent with our observations of visual impacts noted on the FPPA. The exception is PAH exceedances for the I/C-DEC, which are generally located over the entirety of the FPPA. The majority of subsurface soil exceedances on the FPPA for PAHs occurred within the upper 10 feet of soil in the fill unit. The deepest soil analytical exceedances (Benzo [a] Pyrene) occurred at 22 to 24 feet bgs in the northern portion of the FPPA downgradient of the former UST area. The natural groundwater table is encountered approximately 9 to 12 feet bgs in this area.

- SFA: Results of the analytical testing for the subsurface soils located in the SFA indicate the presence of PAHs and TPH above the I/C-DEC, GB Leachability Criterion (TPH only) and UCLs (TPH only). One sample exceeded the UCL for TPH at a depth of 8 to 10 feet. Polychlorinated Biphenyls (PCBs) were detected in one sample exceeding the I/C-DEC, and GB Leachability Criterion at a depth of 2 to 13.5 feet bgs. The extent of PAH exceedances on the SFA was widespread and similar to surface soils, the majority of applicable RIDEM criteria exceedances in subsurface soils occurred in the area that was formerly a cove on the Site. Exceedances were noted at depths over 20 feet bgs in this area, however, the majority of exceedances occurred less than 10 feet bgs. The natural groundwater table is encountered approximately 6 to 21 feet bgs in this area.

- **DNAPL:** DNAPL, both in the form of accumulated thicknesses within groundwater monitoring wells and visual observations made during the performance of investigations, were detected in certain areas of the Site. With respect to observations within groundwater monitoring wells as recorded by GZA between April 2009 and December 2010, DNAPL impacts were predominantly observed within the FGPA, FPPA and SFA portions of the Site, immediately adjacent to the Seekonk River. DNAPL was detected at the Site at thicknesses ranging from trace amounts to approximately 10 feet. DNAPL impacts in wells on the FGPA and the FPPA were generally observed at lesser thicknesses than those on the SFA. The thickest DNAPL present (2 to 10 feet) is located in MW-320D on the SFA. Fingerprint analysis of this sample indicates a petroleum product in the boiling range of coal tar. DNAPL has also been observed historically in monitoring well MW-1 at a thickness up to 0.75 feet. This well is located immediately upgradient from MW-320D. On the FGPA, DNAPL has been observed at four well locations ranging from trace to approximately 2.7 feet in thickness. The four wells where DNAPL has been observed on the FGPA are all located within the areas where former MGP operations were concentrated, particularly those related to separation and tar processes (*i.e.*, clarification tanks, separators, boiling tanks). Remnants of several subsurface foundations, tanks, vaults, etc. related to the former MGP were observed in this area of the FGPA; with many explorations completed in this area of the Site exhibiting the most significant impacts (tar saturated soils, staining, *etc*.). A sample of DNAPL collected from this area of the FGPA (MW-4) was identified as a petroleum product in the boiling range of coal tar oil. In the FPPA, DNAPL was detected in trace amounts in MW-103 and is presumed to be a heavier end fuel oil (similar to No. 6) based on visual and olfactory observations. The exposure pathways of concern for DNAPL include direct contact during potential future construction/utility work, potential for migration, and continued degradation of underlying groundwater quality.

- **LNAPL:** LNAPL has been observed by GZA between April 2009 and December 2010 within numerous monitoring wells located on the FGPA and FPPA at thicknesses ranging from trace amounts to approximately 1.4 feet. These observed LNAPL impacts were most significant in the eastern portions of the FGPA and the FPPA. On the FGPA, LNAPL thicknesses have been observed in four wells at thicknesses ranging from trace to 0.5 feet (MW-3). Similarly, LNAPL has been observed at three locations on the FPPA at thicknesses ranging from trace to 1.4 feet (M&E MW-5). The most significant thickness of LNAPLs were observed in the northern portion of the FPPA which coincides with the locations of the former wood piping raceway and piping associated with the ASTs as well as the former fuel underground storage tanks. Fingerprint analysis of recoverable LNAPL collected from a well on the FGPA indicated a petroleum product in the boiling range of No. 2 fuel oil/diesel. The exposure pathways of concern for LNAPL include direct contact during potential future construction/utility work, potential for migration, and continued degradation of underlying groundwater quality.

- **Groundwater Quality:** The most significant groundwater impacts (in terms of dissolved phase constituents) were observed within the FGPA and the SFA generally coincident with the observed DNAPL, LNAPL and subsurface soil impacts. In these locations, benzene and naphthalene were consistently present at concentrations above their respective GB Groundwater Objective. Ethylbenzene was detected in three locations in only the FGPA at concentrations above the GB Groundwater Objective. Naphthalene was detected above the calculated Method 2 GB Groundwater Objective in three locations in the FGPA and in one location in the SFA. TPH, cyanide, and to a lesser extent certain PAHs have also been detected in Site groundwater in these areas of the Site. While these dissolved phase constituents are very mobile and are likely migrating with the groundwater toward the Seekonk River, the Site is within a GB Groundwater Resource Area (non-drinking water) and the nearest GA and wellhead protection area (WHPA) are located approximately 1.4 miles (to the east) and 2.1 miles (to the north) from the Site, respectively. Given the observed groundwater flow and regional groundwater flow direction (towards the Seekonk River), as well as the locations of the nearest public drinking water supplies and WHPA, groundwater impacts from the Site are not expected to affect local drinking water resource areas. In addition, groundwater at the Site is not expected to be classified as a potential future source of drinking water. As such, exposure to impacted groundwater via on-Site drinking water supplies is not expected to be a concern at the Site.

- **Sediments:** The sediment field investigation findings indicated the detection of certain PAHs in localized areas. In addition, results of sediment sampling indicate the presence of visual impacts to sediment in cores collected proximate to certain areas of the FGPA, FPPA and SFA. These areas generally coincide with portions of the Site where significant upland impacts are noted. When compared to other New England properties that were formerly occupied by MGPs, however, the concentration and extent of organic compounds (PAHs and VOCs) in sediment was generally lower in magnitude (and occupied only localized, discrete areas off the shore of the Tidewater Site). The observed sediment impacts adjacent to the FGPA, FPPA and SFA portions of the Site could be the result of dissolved groundwater, DNAPL and/or LNAPL migration through the fills or through the underlying sand unit via vertical gradients/tidal influences. There are also likely upgradient/regional impacts to the Seekonk River that could have degraded sediment quality adjacent to the Site. Given the localized nature of observed sediment impact and the likely existence of additional upgradient/regional sources, future response actions specific to sediment impact do not appear to be warranted and have therefore not been included as part of this evaluation. However, as described further herein, in the development and evaluation of remedial alternatives for the Site, potential migration of impacts to the Seekonk River was considered a key exposure pathway to be addressed.

- **Sheens:** Sheens have been intermittently observed on the Seekonk River adjacent to certain portions of the FGPA and the FPPA and to a lesser extent, the SFA. The Site was inspected on at least a bi-weekly basis for sheens along the entirety of the shoreline. The sheens have been observed in four general shoreline areas along the Site downgradient of the following areas: 1) the FGPA near MW-4[2]; 2) the FGPA/FPPA near MW-326S and TB-12/MW-3; 3) the FPPA near the shoreline bulkhead proximate to MW-315S/D; and 4) the FPPA proximate to the Narragansett Bay Commission (NBC) CSO outfall. These sheens have been observed at mid or low tide only. These observations may be the result of localized LNAPL migration, migration of DNAPL encountered near the top of the till or bedrock, or a combination of both. Two separate sheens were sampled in August 2010: Sheen-1-08302010 (Sheen 1) and Sheen-2-08302010 (Sheen 2). Sheen 1 was collected in the southern portion of the FGPA and described as "light/faint" in nature. Analysis revealed no discernible pattern. This sheen is presumed to have originated off-Site. Sheen 2 was collected in the area directly proximate to MW-4 and noted to be along the shoreline where the residual coal tar-like material was noted on the stone bulkhead. This sample is considered to be more representative of the periodic outbreak conditions along the shoreline near MW-326 and MW-3. Analytical results for Sheen 2 indicated the presence of a gas oil product or a mixture of diesel/No. 2 fuel oil and/or a heavier petroleum product. As described above, potential migration of impacts to the Seekonk River represents a key potential exposure pathway to be addressed.

2.30 RECENT INVESTIGATIONS AND EVALUATIONS

Following submittal of the January 2011 SIDR, certain additional investigation and monitoring activities have been performed at the Site. These activities have included pre-construction investigations associated with the proposed natural gas regulator station upgrades on the FGPA to assess soil quality and conditions within the proposed work area, as well as monthly NAPL monitoring and recovery evaluations at monitoring wells across the Site. Site inspections and sheen observations were completed on a bi-weekly basis. The following sections present summaries of these activities.

2.30.1 Spring 2011 Natural Gas Regulator Station Investigations

National Grid is implementing facility upgrades to the existing natural gas regulator station located in the southwest portion of the FGPA portion of the Site. These upgrades are being performed during the summer of 2011. The facility upgrades, which have been approved by the Rhode Island Public Utility Commission (PUC), will consist of the relocation of an

[2] In response to sheen observations in this area, oil containment booms and oil snares were installed in the Seekonk River, along the shoreline where the sheen was observed. Subsequently, a temporary cap designed to limit the migration of sheen materials into the Seekonk River. The cap, which consisted of a sand/organoclay layer, followed by a reactive core mat and then an armor layer, was installed in December 2009 and continues to be effective.

existing overhead 16-inch gas main to below ground, shallow excavation work within the fenced natural gas station area to properly abandon existing facilities, general renovation of the buildings, and updating of all the above ground equipment including electronic and communication services within the buildings.

As part of preconstruction activities for the proposed upgrade work, test pit excavations and hand augers were conducted to evaluate existing utility configuration. Soil samples were collected and analyzed to assess soil quality. In addition, based on the results of a Hazardous Building Material Assessment survey completed by Coneco Engineers and Scientists, Incorporated (Coneco) of Bridgewater, Massachusetts on behalf of National Grid that revealed localized elevated PCB concentrations in soil and on certain concrete surfaces within the fenced regulator station area, additional characterization sampling and testing was completed by GZA to assess the vertical and lateral extent of PCB impacts. The following sections present a brief summary of these investigations. For further information, please refer to the documents referenced below which have been submitted to RIDEM.

GZA April 2011 Pre-construction Soil Sampling and Emission Modeling

As described above, in April 2011, test pits and hand auger locations were completed in proposed excavation areas to evaluate existing utility configuration and assess soil quality in preparation for completion of the proposed facility upgrades. As part of this assessment, soil samples representative of expected soil conditions to be encountered during the reconstruction work were collected and submitted for analytical testing.

Based on observations made during subsurface explorations, the soils expected to be encountered during the proposed excavations will consist primarily of fill, ranging in thickness from approximately 2 to 6 feet below grade.

As part of this assessment, a total of ten (10) soil samples representative of expected soil conditions to be encountered during the reconstruction work were collected and submitted for analytical testing, including VOCs via EPA Method 8260B, PAHs via EPA Method 8270C, select metals, TPH via EPA Method 8100M, PCBs via EPA Method 8082A and TOC. Results of the analytical testing indicated the presence of certain inorganic compounds (primarily arsenic and lead), VOCs and PAHs at relatively low concentrations; typical of urban fill material (average concentrations of less than 1 mg/kg of VOCs, 10 mg/kg of heavier weight PAHs and less than 5 mg/kg of lighter weight PAHs). PCB concentrations were also detected in one localized area within the regulator station work area associated with a dripping process pipe, as described further below. For details regarding the sampling and testing associated with these preconstruction activities, please refer to GZA's April 2011 *Materials Management Plan* (MMP) which was submitted to RIDEM.

As requested by RIDEM, the VOC soil sampling results were used to model predicted volatile air emissions to evaluate the applicability of RIDEM's Air Pollution Control (APC) Permits (Regulation No. 9) to the proposed earthwork activities associated with the natural gas regulator station upgrades. The results of this predictive modeling indicated that the earthwork activities do not have the potential to increase emissions by greater than the minimum quantity as specified in Appendix A of RIDEM APC Regulation No. 9 and therefore a minor source permit was not required for this activity. For further information, please refer to GZA's April 19, 2011 *Evaluation of Applicability of Air Pollution Control Regulation No. 9 & Air Quality Monitoring Program* (AQMP). RIDEM responded to GZA's April 19, 2011 submittal by issuing a comment memo dated April 22, 2011 which stated their general concurrence with the AQMP. Furthermore, RIDEM agreed that a preconstruction air permit is not necessary for the proposed natural gas regulator upgrade work.

In addition to the soil sampling and air modeling performed by GZA, a Hazardous Building Material Assessment survey was completed by Coneco, on behalf of National Grid in preparation for the facility upgrades. As part of this survey, Conceco collected a discrete soil sample (0-3 inches bgs) from an area of surface soil staining located beneath a metal riser pipe/valve assembly associated with the natural gas regulator station operations, RB-E/Soil-01. Results of analytical testing indicated the presence of PCBs as Aroclor 1248 at a concentration of 2,870 mg/kg and Aroclor 1260 at a concentration of 308 mg/kg. These concentrations are in excess of the Method 1 I/C-DEC for PCBs (10 mg/kg). As such, a *Hazardous Material Release Notification Form* was submitted to the RIDEM, Office of Compliance and Inspection on April 14, 2011. In addition, the detection of total PCBs at 3,178 mg/kg in the above referenced soil sample suggests the presence of PCB Remediation Waste as defined in the federal Toxic Substance Control Act (TSCA).

To further characterize PCB concentrations within the area of surface staining stemming from the dripping pipe/valve assembly, GZA, on behalf of National Grid collected additional surface soil samples within the fenced regulator station area. Concrete samples were also collected from a scrubber equipment pad and retaining wall proximate to the pipe/valve assembly.

Based on results of the additional testing, one localized shallow area of PCB-impacted surface soil and concrete (>1 mg/kg) was identified within the regulator station work area. The pipe/valve assembly was wrapped with polyethylene to mitigate the potential for continued dripping. This section of piping/valve will be removed and replaced as part of the facility upgrade. Based on characterization work completed, PCB soil impacts appear to be shallow (less than 3 feet below grade) and localized to the immediate area of the riser pipe. Concrete impacts are also limited to small portions of an adjacent concrete pad and retaining wall.

2.30.2 NAPL Monitoring and Recovery Operations

Between January 2011 and June 2011, GZA completed routine monitoring of NAPL thicknesses and recovery evaluations. These field activities, which were completed on a monthly basis, were performed to assess the presence of NAPL within existing Site monitoring wells as well as to evaluate the relative mobility and recoverability of observed NAPL.

During the monthly monitoring events, GZA performed a gauging round of those wells which historically exhibited NAPL to obtain current NAPL thicknesses. A comprehensive gauging round of the entire existing groundwater monitoring well network was completed during the April 2011 monitoring event. The results of the groundwater and NAPL gauging are summarized in Tables 1A and 1B, respectively, and indicate LNAPL and DNAPL thicknesses were generally consistent with those previously observed and documented in the January 2011 SIDR.

During the January through June 2011 monitoring events, in certain wells where measurable levels of NAPL were present, an effort was made to recover NAPL and monitor its relative rate of return (if any). LNAPL and DNAPL recovery was performed with a peristaltic pump with dedicated tubing positioned directly below the top of the NAPL surface. The LNAPL and/or DNAPL were extracted from the well until groundwater was observed within the tubing at which point the pump was deactivated. The recovery of the LNAPL and/or DNAPL was then monitored with an oil/water interface probe. Tables 2A and 2B summarize the results of the DNAPL and LNAPL recovery efforts, respectively. At well locations were recoverable NAPL was not previously observed during the 2010 SIDR field efforts, a sample of the NAPL was collected and submitted for laboratory testing.

The most significant observations are as follows:

- **DNAPL:** Between January 2011 and June 2011, measurable levels of DNAPL (defined as equal to or greater than 0.01 feet) were detected in five (5) monitoring wells: in the FGPA, MW-4, MW-303 and MW-341 and in the SFA, MW-320D and MW-1. The DNAPL thicknesses observed in these wells ranged from approximately 0.08 feet in MW-303 to 4.15 feet in MW-320D. Consistent with the 2010 Site investigations, the well locations where DNAPL is detected in the FGPA is in the area of the former MGP processes particularly those related to separation and tar processes (*i.e.,* clarification tanks, separators, boiling tanks). In addition, measureable DNAPL was detected during this timeframe at monitoring well MW-341 which is located downgradient of the former Gasholders No. 7 and 8. DNAPL was detected in trace amounts only from this well as reported in the January 2011 SIDR. A sample of measurable DNAPL was collected from MW-341 on February 18, 2011 and submitted to Alpha Analytical Laboratory through New Fields located in Mansfield, Massachusetts for hydrocarbon fingerprint analysis via EPA Method 8015. The DNAPL sample was identified as lightly weathered MGP tar (Laboratory Data Certificates are included in Appendix C, Addendum to Hydrocarbon Characterization of Sheen and NAPL Samples). DNAPL was detected in trace amounts only in MW-320S and MW-339D. DNAPL was not detected in MW-339D before March of 2011. It should be noted that monitoring well MW-103, which was the only well on the FPPA where measureable DNAPL was detected during the 2010 SIDR, did not show evidence of DNAPL during the January 2011 to June 2011 timeframe.

DNAPL recovery evaluations were attempted at two (2) wells (MW-303 and MW-341) installed on the FGPA portions of the Site. As presented in Table 2A, MW-341 appears to recover much more readily than other wells located on Site. The rate of recovery for MW-341 appears to be on the order of 1 month (i.e., on 2/17/11, purge volume was 0.2 gallons and approximately 1 month later on 3/29/11, purge volume was 0.25 gallons; similarly, recovery on 5/5/11 was 0.5 gallons and on 6/3/11, recovery volume returned to 0.5 gallons). Unlike LNAPL, DNAPL in most of the wells encountered at the Site proved to be much more difficult to recover due to its physical characteristics (*i.e.,* highly viscous). At several well locations, DNAPL could not be pumped or recovered via bailing. Based on the recently collected data, in general it appears that DNAPL is slow to recover (on the order of months) and at some locations (*i.e.,* MW-320D, MW-4), is not readily recoverable.

- **LNAPL:** Between January 2011 and June 2011, measurable levels of LNAPL (defined as equal to or greater than 0.01 feet) were detected in seven (7) monitoring wells: in the FGPA, MW-210, MW-3, MW-312S, MW-313S and MW-326S and in the FPPA, MW-103 and M&E MW-5. The LNAPL thicknesses observed in these wells ranged from approximately 0.02 feet in MW-313S to 5.57 feet in MW-3. There were no new detections of LNAPL since the January 2011 SIDR. The well locations where LNAPL was detected in the FGPA are in the area of the former MGP processes and the former raceway footprint. On the FPPA, the well locations are in the vicinity of the former service USTs (M&E MW-5) and/or former piping raceway. During the January to June 2011 timeframe, samples of measurable LNAPL were collected from MW-3 and MW-313S on February 18, 2010 and M&E MW-5 on May 5, 2011. The samples were submitted to Alpha Analytical Laboratory through New Fields located in Mansfield, Massachusetts for hydrocarbon fingerprint analysis via EPA Method 8015. LNAPL from MW-3 and M&E MW-5 were identified as weathered fuel oil #2/diesel. LNAPL from MW-313S was identified as weathered fuel oil #2/diesel with pyrogenic PAHs attributable to MGP tar. Laboratory Data Certificates are included in Appendix C, Addendum to Hydrocarbon Characterization of Sheen and NAPL Samples.

  During the monthly monitoring events, LNAPL recovery evaluations were attempted at five (5) wells (M&E MW-5, MW-210, MW-3, MW-312S and MW-313S). These wells are located on the FGPA and FPPA portions of the Site. While the available information is limited, LNAPL appears to recover relatively slowly. In addition, observed LNAPL thicknesses seem to be highly dependent upon the tidal cycle for the Site. As presented in Table 2B, the rate of LNAPL recovery appears to be on the order of 1 to 2 months (timeframe over which recorded purge volume appears to return to original measurement).

2.30.3 Sheen Observations

Between, January 2011 and June 2011, sheens have been intermittently observed on the Seekonk River adjacent to certain portions of the FGPA and the FPPA. The Site is inspected on an at least bi-weekly basis for sheens along the entirety of the shoreline. Sheens have been observed in three general shoreline areas along the Site downgradient of the following areas: 1) the FGPA/FPPA near MW-326S and TB-12/MW-3; 2) the FPPA near the shoreline bulkhead proximate to MW-315S/D; and 3) the FPPA proximate to the Narragansett Bay Commission (NBC) CSO outfall. These sheens have been observed at mid or low tide only. There were no sheens sighted proximate to MW-4 where the cap was installed or the SFA during this time period. Sheen observations during the January to June 2011 time period are summarized in Table 3.

3.00 CONCEPTUAL SITE MODEL SUMMARY

This section provides a summary of the CSM and describes Site geology, occurrence and movement of groundwater, the distribution and transport of Site contaminants, and potential exposure pathways. The information summarized herein is based on the results of the previously and recently completed investigations and was used to facilitate development of the remedial alternatives evaluated in Section 5.00.

3.10 SITE GEOLOGY

Site stratigraphy generally consists of fill materials underlain by stratified gravel, sands, silt and clay, underlain by glacial till and bedrock. The foundations of certain historic gas plant features are visible at the surface in the central portion of the FGPA. The foundations and other features of former gas and power plant structures, buildings, concrete and brick foundations, tanks, piping, etc. were encountered during Site explorations. The January 2011 SIDR included cross section profiles at select locations across the Site using these primary stratigraphic units to illustrate subsurface conditions. These profiles form the basis of our understanding of Site hydrogeology and distribution of impacts.

The thickness of the fill materials was observed to be highly variable, ranging from none to over 20 feet. Consistent with Site topography and the historic shoreline location, observed fill thicknesses generally increase eastward across the Site with the most significant thickness of the fill material encountered along the shoreline. Fill material observed at the Site consist of sandy materials mixed with varying percentages of relatively inert materials such as ash, slag, coal, brick, concrete, and wood. The shallow test pit explorations also revealed metal debris, buried abandoned piping and evidence of blue stained soil. In general, the presence of these types of anthropologic materials was used to support the soil being classified as fill.

Beneath the fill layer, the native materials at the Site are characterized as estuarine deposits (primarily in the northwestern portion of the Site), glacial outwash and marine deposits. Within the NFA, the native materials underlying the fill are characterized as estuarine deposits generally consisting of light brown sands, silts, clays and gravel. These native estuarine deposits ranged in thickness from approximately 10 to 25 feet from the west to east and generally grade from finer to coarser sands with increasing depth. The native materials underlying the fill in the FGPA are consistent with glacial outwash and marine deposits generally consisting of dark brown sand, and gravels. In general, the thickness of the outwash and marine deposits increases from west to east. On the western portion of this area, these deposits are generally observed to range in thickness from 10 to 15 feet. On the eastern side of this area, proximate to the Seekonk River, these materials thicken to approximately 25 to 35 feet. Proximate to the Seekonk River, discontinuous layers of low permeability marine deposits (*i.e.,* silt) were encountered within the upland borings and sediment cores, inferred to range in thickness from approximately 2 to 10 feet. In the FPPA, materials encountered beneath the fills consisted of marine fluvial deposits characterized by stratified fine to coarse sands with varying percentages of silts and gravels. Based on explorations performed, the thickness of these marine fluvial deposits is inferred to range from approximately 10 to 15 feet on the western portion and thicken to up to approximately 20 feet proximate to the Seekonk River. In the SFA, similar deposits appear to increase in thickness from west to east, with thicknesses of approximately 10 to 15 feet on the western portion of the SFA and up to 25 feet proximate to the Seekonk River.

The elevation of the top of the glacial till is inferred to generally slope downward from west to east as the estuarine and outwash deposits thicken. The top of the glacial till was deepest in the central and southern portion of the FGPA and in the SFA adjacent to the river. The thickness of glacial till varies throughout the Site, generally ranging between 5 to 10 feet thick, with the exception of the SFA where thicknesses of glacial till range from 5 to 20 feet thick. With the exception of the central portion of the FGPA, the top of the bedrock surface also slopes downward in a general west to east direction towards the Seekonk River. The bedrock surface was encountered at approximately elevation 4 feet (NGVD29) along the western portion of the Site and at -20 to -36 feet (NGVD29) proximate to the Seekonk River. Shallow bedrock, encountered at approximately 5 feet below grade along with a bedrock outcrop was observed in the central portion of the FGPA, west and east of a concrete retaining wall. The ground surface elevation drops approximately 0.5 and 10 feet on the west and east side of this retaining wall, respectively, which runs in a north/south orientation (see Figure 2A). The bedrock high in the central portion of the FGPA extends from the outcrop approximately 400 feet south towards the FPPA. Observations suggest that from this central area, the bedrock surface slopes downward in an easterly and northerly direction towards the Seekonk River. Along the riverfront, the bedrock surface dips to the south/southeast and to the north/northwest.

3.20 HYDROGEOLOGY

Approximately 90% of the Site is comprised of gravel surfaced access roads and parking areas and wooded/vegetated areas. The remaining 10% of the Site is improved with asphalt paved areas, buildings and the remnants of concrete foundations and slabs. Given that the majority of the Site is comprised of gravel and landscaped surfaces, the majority of storm water is expected to infiltrate the surface and recharge the groundwater. Excess storm water which does not permeate the ground surface is expected to generally flow eastward across the Site via overland flow into the Seekonk River. A City of Pawtucket storm drain line traverses the FPPA portion of the Site. In addition, within the south washout area located on the SFA are the remnants of a storm drainage system consisting of a deteriorated headwall and two 15-inch diameter concrete pipes that convey off-Site storm water runoff from the nearby school and athletic facility. These municipal storm drain lines on the FPPA and SFA discharge directly into the Seekonk River. Review of groundwater elevations observed in monitoring wells at the Site indicate that groundwater flow patterns on the FPPA may be locally affected by the presence of the City of Pawtucket storm drain. On the FPPA, three storm water collection structures have also been observed in the vicinity of the No. 1 Power Station. No catch basins have been observed on the NFA, FGPA or SFA.

Observed groundwater elevations have ranged from approximately 9 to 20 feet NGVD29 (near the northwestern portion of the Site) down to 4 to -1 feet NGVD29 proximate to the Seekonk River. In general, groundwater is encountered within the fill materials across the FPPA and SFA and within the underlying native materials in the FGPA and NFA. Regional groundwater flow is generally to the east towards the Seekonk River. Site groundwater elevations are tidally influenced and have been observed to fluctuate approximately 5 feet between mean low and high water. Significant tidal fluctuations have been observed at distances of up to 80 feet from the shoreline of the Seekonk River.

Upward vertical gradients were observed in the upland (more than 50 feet from the shoreline of the Seekonk River) multi-level well locations on the FGPA and FPPA. This information is consistent with the fact that Site is located along a river at the base of a local topographic high. Vertical gradient data for the multi-level wells along the Seekonk River indicates the presence of intermittent upward and downward vertical gradients, further suggesting that the wells located along the river are tidally-influenced.

3.30 EXPOSURE PATHWAYS

Based on the nature and extent of impacts observed on-Site and the current Site setting and use, the following potential exposure pathways have been identified:

1. Potential migration of LNAPL and DNAPL into the Seekonk River;
2. Direct contact with near surface impacted soils;
3. Potential for off-Site tracking of impacted surface materials from certain areas via vehicle and pedestrian traffic;
4. Potential erosion of impacted surface soils and potential runoff to the Seekonk River;
5. Direct contact with subsurface soils by future construction/utility workers;

6. Potential for continued degradation of groundwater quality; and
7. Potential migration of impacted groundwater.

The following sections further describe the potential exposure pathways identified above. As described in Section 5.00, the primary goal of the selected remedial alternative is to adequately address these exposure pathways.

3.30.1 Potential LNAPL and DNAPL Migration

Measurable LNAPL impacts at varying thicknesses were detected in monitoring wells in the FGPA and the FPPA. In addition, evidence of separate phase product was noted within soil explorations completed in the vicinity of the former piping raceway and piping associated with the former ASTs, as well as near the former fuel storage tanks No. 1 and 2. These LNAPL detections are located in various areas of the Site, are likely the result of multiple source areas and are not observed in monitoring wells consistently across the Site areas. In the event a contiguous layer of LNAPL existed, the distribution pattern would tend to be more consistent and defined. The LNAPL distribution pattern suggests individual, localized "pockets" of LNAPL. Based on the LNAPL recovery evaluations, as discussed in Section 2.30.2, isolated pockets where a recoverable volume of LNAPL was identified are located proximate to wells M&E MW-5 in the FPPA, and MW-3, MW-312S, MW-313S, MW-326S and MW-210 in the FGPA. These well locations were generally located within approximately 200 feet of the shoreline. The migration of LNAPL is influenced by its physical and chemical properties as well as hydrogeologic conditions. Based on the estimated hydraulic transmissivity of the soils adjacent to the river and the tidal nature of the Seekonk River, there is a potential for these LNAPL impacts to migrate towards the river. The shoreline downgradient of the areas of LNAPL impacts is constructed of a manmade bulkhead and steel structures and stone retaining walls with rip-rap embankments, and is noted to be in varying degrees of disrepair. Evidence of sheen outbreaks ranging from spots to bands have been observed in the Seekonk River adjacent to the areas of the Site where upland LNAPL impacts have been noted. These observations may be the result of LNAPL migration, migration of DNAPL, or a combination of both. Although construction details are not available, the steel bulkhead walls which are present adjacent to the river along the FPPA and southern portions of the FGPA are potentially limiting migration to certain degree.

DNAPL impacts were predominantly observed on the FGPA in the vicinity of the former MGP operations and in the SFA. In general, DNAPL impacts were observed in areas immediately adjacent to the Seekonk River. Similar to the pattern of LNAPL impacts described above, DNAPL was not observed in all wells; suggesting the presence of localized pockets and not a consistent, contiguous layer. Isolated DNAPL pockets are observed in wells MW-303, MW-4/TB-13, MW-339D and MW-341 in the FGPA and MW-1/TB-6, MW-320S and MW-320D in the SFA.

Given the length of time they have been in the environment at this Site and their physical properties, further migration of observed DNAPL would likely be very slow. On the SFA, significant coal tar soil impacts (indicative of potential DNAPL) were noted at depths at and below the water table within the fill and native sand layer. On the FGPA, DNAPL impacts were generally located in areas where former MGP operations were concentrated, particularly those related to separation and tar processes (*i.e.,* clarification tanks, separators, boiling tanks). Limited DNAPL impacts were also observed on the western portion of the FGPA. Similar to the SFA, significant coal tar-like impacts were generally noted in soil on the FGPA at depths at and below the water table in the fill and sand units. Given the significant visual impacts at depth observed on the FGPA and SFA, DNAPL vertical migration through the more permeable fill, underlying sands and/or silt materials appears to have occurred. However, with the exception of a few select locations (*i.e.,* MW-341, MW-312), limited visual impacts were noted in the underlying till at the Site. Remnants of several subsurface foundations, tanks, vaults, *etc*. related to the former MGP were observed in the central, southern and eastern portions of the FGPA. Explorations performed in the vicinity of these features generally exhibited the most significant impacts (tar saturated soils, staining, *etc*.). While these structures were taken out of use several decades ago, continued release of tars, oils, and other residual materials from certain of these former structures represents a potential source of impact to the environment.

Based on the results of DNAPL recovery operations, as discussed in Section 2.30.2, these materials are very slow to recover and would therefore be very difficult to recover in an automated manner. These observations are consistent with the physical properties of these DNAPLs. DNAPLs tend to "sink" through more permeable deposits (*i.e.,* fill) and accumulate in localized areas on lower permeable deposits (*i.e.,* glacial till and bedrock). In addition, groundwater monitoring wells tend to act as collection points or sinks for these materials and therefore the DNAPL thicknesses measured in wells are often greater than the thicknesses actually present in the subsurface.

<u>3.30.2 Direct Contact/Potential Tracking/Erosion - Surface Soils</u>

Widespread arsenic and PAH surface soil impacts were detected across the Site at concentrations exceeding the I/C-DEC. TPH impacts above the I/C-DEC and GB Leachability were primarily noted on the FGPA and FPPA in areas of the Site where historic operations related to the MGP and power plant were concentrated. Lead surface soil impacts were primarily noted on the FGPA proximate to the former Gasholders No. 7 and 8 and on the FPPA within the former oil storage areas and the hillside area north of former fuel Oil Tank No. 3. Cyanide surface soil impacts were also noted at the Site, primarily in the southern portion of the FPPA proximate to the former fuel storage tanks. There were no exceedances of direct exposure criteria for VOCs in the surface soils on Site. Exceedances of the UCL for lead, PAHs, TPH and cyanide were encountered in surface soils on the FGPA, FPPA and SFA portions of the Site. Lesser concentration surface soil impacts were noted on the NFA portion of the Site.

For surface soil, the primary potential exposure pathways of concern at the Site are direct contact, erosion, and potential on/off-Site vehicle/pedestrian tracking. In addition, the potential for further degradation of groundwater quality in areas of impacted surface soil concentrations is also a concern. The entirety of the Site is fenced and restricted to unauthorized access. Therefore, under current Site conditions, the concern related to direct exposure is somewhat mitigated by the presence of a security fence which restricts access to National Grid personnel and authorized visitors.

3.30.3 Direct Contact with Subsurface Soils

Similar to surface soil, widespread subsurface soil impacts were detected throughout the Site at concentrations exceeding the Method 1 I/C-DEC and in the FGPA, FPPA and SFA at concentrations exceeding the GB Leachability Criteria. In addition, the most elevated subsurface impacts tend to be observed on the FGPA and FPPA portions of the Site, coincident with former MGP and power plant operations, and in the SFA. UCL exceedances for TPH and PAHs were also noted primarily within the FGPA and FPPA and localized areas of the SFA (TPH only).

For subsurface soils, the primary exposure pathway of concern is direct contact to impacted soils during potential future construction/utility work. In addition, similar to surface soils, continued degradation of groundwater quality is also a concern for areas characterized by impacted subsurface soils. While under existing Site conditions direct exposure to these impacts is not a concern given their depth (greater than 2 feet below grade), a potential exists for exposure to these impacted materials during on-Site construction and potential Site redevelopment.

3.30.4 Groundwater Quality/Migration

Groundwater at the Site is characterized by exceedances of the GB Groundwater Objectives for benzene, ethylbenzene and naphthalene. Elevated levels of TPH, cyanide, and to a lesser degree certain PAHs were also detected in Site groundwater. In terms of dissolved phase constituents, groundwater appears to be most impacted in the FGPA and in the SFA coincident with areas of significant subsurface soil impacts and NAPL observations. As indicated in the preceding sections, there exists the potential for further degradation of Site groundwater quality via leaching from impacted surface and subsurface soils. This leaching can occur as a result of infiltration of precipitation.

Dissolved phase constituents are mobile and expected to move with the groundwater toward the Seekonk River. However, as previously indicated, the Site is within a GB Groundwater Resource Area. The nearest GA and WHPA are located approximately 1.4 miles (to the east) and 2.1 miles (to the north) from the Site, respectively. Given the observed groundwater flow patterns on-Site, the regional groundwater flow direction (towards the Seekonk River) and the locations of the nearest public drinking water supplies and WHPA (not located hydraulically downgradient of the Site), it is not expected that impacts from the Site would affect these groundwater drinking water resource areas. Furthermore, groundwater at the Site is not expected to be classified as a potential future source of drinking water, therefore drinking-water related exposures do not appear to pose a significant level of risk at the Site.

4.00 REMEDIAL OBJECTIVES

Consistent with the Remediation Regulations, the overall remedial objective is to provide protection of human health and the environment relative to the identified Site impacts. Section 3.30 describes the primary exposure pathways and impacts associated with the Tidewater Site. Given these potential exposure pathways and the identified Site impacts, under existing conditions and Site use, receptors of primary potential concern include:

- On-Site workers associated with the limited Site industrial operations;
- Trespassers and their potential on-Site activities (both on National Grid and City owned parcels); and
- Ecological, including receptors associated with terrestrial and aquatic environments (Seekonk River).

The following media specific remedial objectives were identified for this Site based on the identified potential exposure pathways and current receptors. These objectives are consistent with the criteria outlined in the Remediation Regulations. As described in Section 2.00, given the localized nature of observed sediment impact adjacent to the Site and the likely existence of additional upgradient/regional sources, future response actions specific to sediment impacts have not been included as part of this evaluation. However, mitigating potential migration of on-Site impacts to the Seekonk River was included as part of the overall Site remedial objectives.

1. Mitigation of potential migration of NAPLs to the Seekonk River;
2. Prevention of direct contact to soils impacted with contaminants at concentrations above the Method 1 I/C-DEC;
3. Mitigation of potential tracking and erosion of near surface impacted soils;
4. Reduction in the extent, mass, and mobility of NAPLs to the extent practicable to address UCL conditions;
5. Limiting further degradation of groundwater quality via infiltration.

The remedial alternatives identified in Section 5.00 were evaluated based on several criteria, including their ability to achieve these objectives. In performing the remedial alternative evaluation, we assumed that an Environmental Land Usage Restriction (ELUR) preventing use of groundwater and restricting use of the Site to commercial, industrial or passive recreational use will be an integral part of the selected remedy. In addition, the ELUR would include a Materials Management Plan (MMP) to address handling of impacted soil and groundwater which may be encountered during future construction projects or other activities.

Section 5.00 presents an evaluation of identified remedial alternatives for the Site and Section 6.00 presents the selected remedial alternative along with the rationale for its selection. Section 7.00 describes a preliminary implementation schedule.

5.00 REMEDIAL ACTION ALTERNATIVE EVALUATION

Four Remedial Action Alternatives (RAAs) for the Site have been identified:

- RAA 1: No Action with Monitored Natural Attenuation (MNA);
- RAA 2: Engineered Cap, Physical Containment and Limited Source Removal;
- RAA 3: Source Removal/Stabilization, Localized Physical Containment and Engineered Cap; and
- RAA 4: Significant Source Removal and Engineered Cap.

Each of these alternatives is described below. Conceptual layouts for each of the evaluated remedial alternatives are presented as Figures 3, 4, 5A, 5B, and 6. Estimated costs for implementing each of these alternatives are summarized in Table 5. These costs are broken down by capital costs related to pre-construction activities, construction oversight, general conditions, construction/remediation implementation, and long term costs related to operation and maintenance. The estimated costs also include a contingency of 20% which is typical for this type of estimating effort.

5.10 REMEDIAL ACTION ALTERNATIVES

Please note, each of the alternatives presented below also includes addressing the PCB impacts identified within the fenced substation area on the FPPA consistent with the February 2009 *Self-Implementing Plan to Address PCB-Impacted Soils* prepared by VHB and submitted to and approved by the USEPA and RIDEM.

5.10.1 Remedial Action Alternative #1: No Action with Monitored Natural Attenuation

Under this alternative, no actions would be taken to address identified soil impacts and natural attenuation mechanisms would be relied upon to address groundwater/NAPL impacts. Natural attenuation monitoring would be performed initially semi-annually and over the longer term on an annual basis and would consist of gauging the Site monitoring well network for the presence of NAPL and collecting and analyzing groundwater samples from select monitoring wells. An ELUR would be implemented for continued restricted industrial use of the Site and restrictions on groundwater use at the Site (not for potable use). The ELUR would include a MMP to address handling of impacted soils during potential future construction projects.

This alternative could be implemented immediately. The total estimated remedial cost for RAA 1 is approximately $2,720,000 over a 30 year period.

5.10.2 Remedial Action Alternative #2: Engineered Cap, Physical Containment and Limited Source Removal

RAA 2 involves the installation of an engineered cap designed to mitigate potential direct exposure to impacted soils, potential erosion and tracking of impacted surface soils, and contributions to the further degradation of groundwater quality. With the exception of the

NFA, this cap would consist of an impermeable cap comprised of up to 2 feet of clean soil underlain by a geomembrane or clay material. The cap on the NFA would consist of a one-foot thick permeable soil cap underlain by a geotextile.

A containment wall (approximately 1,600 linear feet) would be installed along the eastern (downgradient) edge of the Site along the riverfront in the FGPA, FPPA and SFA portions of the Site to mitigate potential migration of NAPL impacts towards the river. The containment wall would be keyed approximately two feet into the underlying till layer (approximately 25 to 40 feet bgs). This wall would also be installed on the riverside of the existing bulkhead across portions of the FGPA and FPPA and would serve to further limit migration of NAPLs/impacted soils. Focused NAPL recovery would be performed immediately upgradient of the wall from a series of newly installed recovery wells and in other Site areas where NAPLs have accumulated in monitoring wells. Under this alternative, the former tank (UGGT-1), raceway structures and an area of crystallized naphthalene which were encountered during the 2010 Site investigation in the NFA will be addressed via removal. Best Management Practices (BMPs) associated with odor, dust and vapor control would be implemented during construction of the cap, containment wall and limited source removal activities. Following construction, this alternative would also include routine groundwater quality monitoring to assess performance. This alternative includes establishment of an ELUR which would include restrictions on the use of the groundwater at the Site, restricted use of the property and guidelines on disturbance and maintenance of the engineered cap. The ELUR would include a MMP to address handling of impacted materials during potential future construction projects. This also includes implementation of annual inspections to assure compliance and long-term maintenance of the engineered soil cap.

This alternative includes the excavation and off-Site disposal of approximately 125 tons of impacted material, 25,000 gallons of MGP residuals and 2,750 tons of trench spoils. Approximately 140 trucks would be necessary for the transportation and off-Site disposal of these impacted materials. An additional 4,900 trucks would be required for the import of clean materials associated with backfill and final Site grading and backfill of source removal areas. Implementation of this alternative would be on the order of 16 months and is estimated to span approximately 2 construction seasons (assumes 8 month construction season). The total estimated remedial cost for this alternative is approximately $25,030,000.

5.10.3 Remedial Action Alternative #3: Source Removal/Stabilization, Localized Physical Containment and Engineered Cap

RAA 3 includes source removal of known structures/areas containing NAPLs and/or analytical UCL exceedances. Two options for this alternative were evaluated. RAA 3A involves source removal in all four Site areas (NFA, FGPA, FPPA, and the SFA) along with containment. Under RAA 3B, *in-situ* stabilization (ISS) of approximately 24,200 CY is presented as an alternative to construction of a 200 ft containment wall section along the SFA portion of the Site. Removal efforts would involve excavation and off-Site disposal of certain source areas to the water table/smear zone and will likely involve NAPL removal/off-Site disposal and/or groundwater management during removal activities. It is estimated that approximately 17,000 cubic yards (CY) of impacted soil would require excavation and off-

Site disposal under this alternative. Containment wall sections would be installed along select portions of the eastern (downgradient) edge of the Site along the riverbank to mitigate potential migration of NAPL impacts. The containment wall sections would be located downgradient of remaining areas of significant source areas where NAPL is evident and deeper impacts have not been addressed. Similar to RAA 2, this containment wall would also be installed across portions of the FGPA and FPPA. The total length of the containment walls under this alternative is 660 feet. Focused NAPL recovery would be performed immediately upgradient of the wall sections and in other Site areas where NAPLs are observed as described in RAA 2. An engineered soil cap similar to that described in RAA 2 would also be installed to mitigate potential direct exposure to impacted soils, potential erosion and tracking of impacted surface soils, and contributions to the further degradation of groundwater quality. BMPs associated with odor, dust and vapor control would be implemented during construction of the cap, containment wall (or ISS) and source removal. This alternative would also include routine groundwater quality monitoring to assess performance and establishment of an ELUR and MMP similar to RAA 2.

This alternative includes the excavation and off-Site disposal of approximately 32,700 tons of impacted material (30,500 tons of material from source removal and 2,200 tons of trenching spoils). Approximately 1,450 trucks would be necessary for the transportation and off-Site disposal of impacted materials. An additional 6,000 trucks would be required for the import of clean materials associated with final Site grading and backfill of source removal areas. Implementation of RAA 3 would be on the order of 17 months and is estimated to occur over 2.5 construction seasons. The total estimated remedial cost for this alternative is approximately $34,020,000. Implementation of ISS in the SFA as an alternative to the containment wall would add an additional $2.2M to the total costs for this alternative.

5.10.4 Remedial Action Alternative #4: Significant Source Removal and Engineered Cap

RAA 4 includes extensive excavation of observed source area impacts associated with former MGP and power plant operations across the Site (estimated at approximately 120,600 CY of impacted soil removed and disposed off-Site). Removal efforts would involve excavation of impacted areas to the depth of observed significant visual impacts (*i.e.*, visual indicators of "coated, blebs, saturated and/or free product"). Implementation will require NAPL and groundwater management, including groundwater treatment and discharge. In areas no excavated, a permeable engineered soil cap would be installed to mitigate potential direct exposure to impacted soils and potential erosion and tracking of impacted surface soils. Dust, vapor and odor migration during remedial implementation (capping and excavation) would require mitigation using engineered control technologies. This alternative would also include routine groundwater quality monitoring to assess performance and establishment of an ELUR and MMP similar to RAAs 2 and 3.

This alternative includes the excavation and off-Site disposal of approximately 219,000 tons of impacted material (217,800 tons of material from source removal and 1,200 tons of trenching spoils). Approximately 9,500 trucks would be necessary for the transportation and off-Site disposal of impacted materials. An additional 10,800 trucks would be required for the import of clean materials associated with final Site grading. Implementation of this remedial alternative would be on the order of years (approximately 25 months over 3 construction seasons). Total estimated remedial costs for RAA 4 are approximately $78,830,000.

5.20 COMPARATIVE EVALUATION OF ALTERNATIVES

Consistent with the requirements of Section 7.04 of the Remediation Regulations, these alternatives were developed considering the potential exposure pathways and remedial objectives described in Section 4.00, the Site's hydrogeologic setting, characteristics and extent of detected impacts, practical and logistical limitations, current and anticipated future Site use, technical feasibility, compliance with applicable regulations and public concerns. Cost-effectiveness and permanency of the remedial alternative were also considered, as well as compliance with potential risks to human health and the environment, including protection of natural resources (*i.e.*, groundwater) and addressing the presence of UCLs.

The four alternatives were evaluated based on the following criteria:

- Comparative Effectiveness/Permanency: This criterion provides an evaluation of the effectiveness of the remedial alternatives in obtaining the stated remedial goals and the degree of certainty that the remedial alternative will be successful.

- Comparative Compliance with Remediation Regulations: This criterion includes an evaluation of the compliance with direct goals set out in the Remediation Regulations.

- Comparative Implementability: This criterion evaluates the comparative difficulty in implementing the remedial alternative. It includes an evaluation of:
    - The technical complexity of the remedial alternative;
    - Integration of the remedial alternative with Site use; and
    - Necessary monitoring, operations, maintenance, or Site access.

- Comparative Cost: This criterion includes evaluation of implementation costs, including design, construction, and, if necessary, operation and maintenance costs.

- Comparative Risk: This criterion includes an evaluation of the alternatives ability to address identified exposure risks.

- Comparative Implementation Risk: This criterion includes an evaluation of the short term risks (both on-Site and associated with the surrounding community) associated with the construction of the remedial alternative.

- Comparative Timeliness: This criterion includes an evaluation of timeliness of the remedial alternative in attaining the remedial goals.

The comparative evaluation of the alternatives based on these criteria is presented in detail in Table 4. The rationale for the selection of the preferred remedial alternative is presented in Section 6.00.

6.00 RECOMMENDED REMEDIAL ACTION ALTERNATIVE

The comparative analysis completed during this study was performed utilizing criteria consistent with the Remediation Regulations, coupled with technical assessments of Site specific hydrogeological factors and other Site specific conditions. These conditions include current and anticipated future Site use as well as the potential impacts both on-Site and to the surrounding community during remedial implementation.

6.10 JUSTIFICATION OF SELECTION OF THE PREFERRED REMEDIAL ACTION ALTERNATIVE

Table 4 presents the detailed comparative evaluation of the four remedial action alternatives. Based on this evaluation, RAA 2 was selected as the preferred alternative for the Site. This alternative involves the installation of an engineered soil cap across the entire Site, installation of a steel sheet pile wall to serve as a containment wall along the riverside of portions of the FGPA, FPPA and portions of the SFA, and limited source removal in the FGPA and the FPPA. Further details of the selected remedy are presented in Section 6.20.

The following summarizes the rationale for selection of RAA 2.

- **Ability to Achieve Remedial Objectives**. As described in Section 4.00, five (5) media specific remedial objectives were identified for this Site based on the identified potential exposure pathways, current receptors and the requirements of the Remediation Regulations. As described below, RAA 2 addresses each of these objectives.

    1. *Mitigation of potential migration of NAPLs to the Seekonk River*.

        The combination of the engineered cap, containment wall, and monitoring/recovery of NAPL would serve to effectively mitigate further migration of residual NAPL. The impermeable cap would limit infiltration which would further retard the potential for NAPL migration and the containment wall and NAPL recovery would serve to physically limit further NAPL impacts to the adjacent Seekonk River.

    2. *Prevention of direct contact to soils impacted with contaminants at concentrations above the Method 1 I/C-DEC.*

        The engineered cap combined with the ELUR would serve to effectively prevent direct contact with impacted soils. In addition, the ELUR would include a MMP to address handling of impacted soil and groundwater which may be encountered during future construction projects or other activities.

3. *Mitigation of potential tracking and erosion of near surface impacted soils.*

   Potential exposure risks associated with tracking and erosion of impacted surficial materials would be effectively addressed via the installation of the extensive surface cap.

4. *Reduction in the extent, mass, and mobility of NAPLs to the extent practicable to address UCL conditions.*

   RAA 2 involves the removal and off-Site disposal of three identified potential source areas (the former tank -UGGT-1, raceway structures and an area of crystallized naphthalene). In addition, as described above, the installation of the impermeable cap, containment wall, and NAPL recovery operations serve to effectively contain residual NAPL and other UCL conditions at the Site.

5. *Limiting further degradation of groundwater quality via infiltration.*

   RAA 2 includes the installation of an approximately 18.6 acre, impermeable cap over the areas of the Site where the most significant surface and subsurface soil impacts have been observed. This cap will prevent degradation of groundwater quality by limiting infiltration and subsequent leaching of contaminants.

When compared to the more intrusive alternatives (RAA 3 and RAA 4), RAA 2 is considered to be as effective and reliable in achieving these remedial objectives. The primary difference between RAA-2 and RAA-3/RAA-4 is the volume/mass of impacted materials removed and disposed off-Site. RAA-2 includes removal and off-Site disposal of three discrete areas of potential source materials which will be accomplished via vacuuming/pumping of liquids (approximately 25,000 gallons) and the excavation of a limited area (125 tons), while RAA-3 and RAA-4 involve much more extensive impacted soil removal and off-Site disposal (31,000 and 217,000 tons, respectively). When considering the stated remedial objectives, the benefits of this additional material removal and off-Site disposal are limited. As summarized in Table 4, RAA 2 is considered to be as effective as RAA 3 and RAA 4 in preventing exposures to Site soil contaminants through direct contact, limiting migration of soils via tracking and erosion, and mitigating migration of NAPLs to the river.

- **Low Degree of Implementation Risk.** RAA-2 is considered to have the lowest comparative implementation risk (with the exception of RAA 1, No Action) due to the lack of extensive source removal and subsequent excavation/soil management, handling and off-Site disposal procedures. As presented under RAA 2, implementation risks are limited to dust and airborne contaminant migration during capping, wall construction and limited source removal activities. The limited source removal activities will not consist of significant contaminated soil excavation, but instead it is anticipated that the removal of contaminated materials will be completed via vactoring and/or shallow excavation. It is expected that these risks can likely be readily managed via the implementation of engineered controls given the nature and magnitude of the proposed activities. In comparison, due to the handling of larger volumes of contaminated soils over more extensive Site areas, the remedial activities proposed under RAA 3 and RAA 4 are expected to have higher levels of short-term implementation risk associated with potential odor, vapor and dust migration both on and off-Site. It is anticipated under RAA 3 and RAA 4, impacted material quantities which will require management will be on the order of 39,000 tons and 219,000 tons, respectively, while RAA 2 source removal volumes will be approximately 2,875 tons. Due to the quantity of contaminated soil, this material will require extensive management, on-Site stockpiling and subsequent loading and off-Site transportation. Based on the anticipated removal volumes, approximately 3,400 and 19,000 truck trips to and from the Site will be necessary to implement the source removal portion of RAA 3 and RAA 4, respectively, while RAA 2 will require approximately 140 truck trips. Half of these truck trips under each scenario will be transporting contaminated soil off-Site, and due to limited access to the Site, will require traffic management through the neighboring community.

  Considering the proximity to the surrounding community, the challenges associated with managing all the potential implementation risks associated with RAA 3 and RAA 4 are significant. Risks associated with potential exposures to odors, dust and vapors to both on-Site workers as well as the surrounding community would require mitigation via implementation of engineered controls (containment structures, odor suppressant foams, *etc*). In addition, certain types of engineered controls used for these more disruptive remedial options (*i.e.*, containment structures), pose significant risk of injury to on-Site workers associated with movement of these large scale structures. Given the extent of the excavations included in RAA 3 and RAA 4, containment structures would likely be large and also require multiple relocations. Relocating these structures are inherently dangerous given their size and the type of equipment involved (typically large cranes and rail systems). In addition, working within these structures creates a work environment with additional risks including: accumulation of vapors, confined spaces, lack of natural light and others similar risks.

Overall, the degree of implementation risks associated with the more disruptive and intrusive remedies included in RAA 3 and RAA 4 were considered to be more significant and disproportionate to the limited benefits of these alternatives (*i.e.*, more extensive source removal) when compared to RAA 2. Given the proximity of sensitive receptors to the Site and concerns regarding potential migration of dust, vapor and odor during implementation, as well as concerns to on-Site worker safety, RAA 2 was considered to be more favorable due to its inherently lower implementation risk.

- **As timely at achieving remedial goals**. RAA 2 is considered to be as timely to execute as RAA 3 and timelier than RAA 4, with approximately 2 construction seasons required for implementation. With respect to achieving remedial goals, RAA 2 is considered as timely as RAA 3 and 4 with respect to mitigating risks associated with impacted soil and migration of NAPLs to the river. In addition, the impermeable cap under RAA 2 would serve to limit further degradation of groundwater quality in the short and long term. Lastly, RAA 2 is considered to be as timely as RAAs 3 and 4 at addressing the presence of UCLs/source areas via installation of the impermeable cap, containment wall and limited source removal. While RAA 4, given the scope and magnitude of this alternative, may be the timeliest with respect to mitigating risk associated with source areas and impacted soils, its ultimate reliability and effectiveness is subject to the success and feasibility of the removal efforts.

6.20 DETAILS OF THE PREFERRED REMEDIAL ACTION ALTERNATIVE

As part of the preferred remedy, an engineered cap would be constructed across the entire Site area. The engineered cap would consist of a permeable cap in portions of the Site where surface and subsurface soil impacts are more limited and are unlikely to impact underlying groundwater but still present potential erosion and direct contact issues. In areas of the Site where these issues are of concern, an impermeable cap would be constructed. It is anticipated that, following the removal of the crystallized naphthalene a permeable cap will be installed across the NFA consisting of a one-foot thick, permeable soil cap with an underlying geotextile. The cap across the remainder of the Site (FGPA, FPPA and SFA) would consist of an impermeable cap comprised of up to 2 feet of soil, an underlying drainage system, underlain by an impermeable layer (*i.e.*, geomembrane or clay layer). Cap installation would require clearing/grubbing and Site grading (requiring approximately 60,000 CY of imported clean fill based on preliminary grading calculations). Installation of the engineered soil cap under this alternative would aim at mitigating exposure to Site soil contaminants through direct contact and limiting migration of soils via surface runoff and off-Site tracking. In addition, the impermeable cap presented under this alternative would be designed to address issues associated with further degradation of groundwater quality.

A steel sheet piling containment wall (approximately 1,600 linear feet) would also be installed along the eastern (downgradient) edge of the Site along the riverfront in the FGPA, FPPA and SFA portions of the Site to mitigate potential migration of NAPL impacts towards the river. The containment wall would be keyed approximately two feet into the underlying till layer (approximately 25 to 40 feet below grade). This sheet pile wall would serve to further limit migration of NAPLs/impacted soils through the shoreline. Pre-excavation will likely be necessary in certain areas to facilitate installation of this containment wall. Focused NAPL recovery would be performed immediately upgradient of the wall from a series of newly installed recovery wells and in other Site areas where NAPLs have accumulated in monitoring wells.

Under this alternative, the former tank (UGGT-1), raceway structures which were encountered during the 2010 Site investigation will be addressed. Remedial activities will include removal of liquids (groundwater and NAPL) from the structures for off-Site disposal. The structures would then be left in place and filled with grout and/or flowable fill. In addition, the localized area of crystallized naphthalene on the NFA (approximately 25 ft by 30 ft by 3 ft average thickness) will be removed and transported off-Site for disposal.

This alternative includes establishment of an ELUR which would include restrictions on the use of the groundwater at the Site (*i.e.*, not for potable use), restricted use of the property (industrial, commercial and/or passive recreational use) and guidelines on disturbance and maintenance of the engineered cap. As previously discussed, the ELUR would include a MMP to address handling of impacted materials during future construction projects.

To evaluate the performance of the remedy, certain monitoring and maintenance activities will be completed, including a groundwater and NAPL monitoring program, monitoring and maintenance program associated with the engineered cap and containment wall, as well as general Site inspections. In preparing the cost estimates, a 30 year monitoring and maintenance period was included. The proposed groundwater and NAPL monitoring program would consist of gauging on a semi-annual basis the entire Site monitoring well network for groundwater levels and the presence of NAPL. At select monitoring well locations where measurable NAPL is present, we have assumed that NAPL recovery would be completed on a quarterly basis for the first five years, on a semi-annual basis for the following five years and annually thereafter. In addition, the proposed groundwater monitoring program would also consist of collecting groundwater samples (annually) from select monitoring wells (approximately 30 wells) to be analyzed for VOCs. Additional natural attenuation parameters (dissolved oxygen, ORP, nitrates, iron, manganese, sulfate and total organic carbon) would also be included as part of this long term monitoring. The maintenance program would consist of annual inspections of the engineered cap and containment wall for possible deficiencies that require repair. The results of this groundwater monitoring, inspections and a summary of any required maintenance activities would be documented in annual reports submitted to RIDEM.

6.30 LIMITED DESIGN EVALUATIONS

Prior to implementation of the preferred remedial alternative, in accordance with Section 9.05 of the Remediation Regulations, certain Limited Design Investigations (LDIs) would be required during the design and engineering phase. We currently anticipate that these LDIs would include groundwater modeling to evaluate the potential effect the proposed containment wall will have on groundwater flow (groundwater flow patterns, mounding, *etc*). We do not anticipate that groundwater extraction and treatment will be required. Depending on the modeling results, specific wall design elements, including the use of weep holes in certain areas to limit natural groundwater flow effects may be considered.

In addition, pre-design activities for the containment wall would include performance of a limited test pitting/boring program along the layout of the containment wall to evaluate the presence of potential obstructions and required depth of the wall. A utility survey would also be performed to determine the location and depth of the active utilities present on the Site in order to properly incorporate these utilities into the design of the engineered cap and containment wall. We would also anticipate that the potential for volatile emissions resulting from the proposed remedial activities would be modeled to evaluate the applicability of RIDEM's APC Permits (Regulation No. 9). These results, along with consultations with RIDEM, will be used to design an air quality control and monitoring program that is protective of both on-Site workers and the surrounding community for the remedy implementation phase.

7.00 ANTICIPATED SCHEDULE

With respect to anticipated schedule and sequence, National Grid is prepared to proceed as outlined below in a timely manner upon receipt of a *Program Letter* from RIDEM confirming completion of the SIR and acceptance of the preferred remedial alternative. In developing this anticipated schedule, we have assumed receipt of this *Program Letter* by the end of September 2011.

- Public Notice: Fall 2011
- RIDEM Issuance of *Remedial Decision Letter*: Fall 2011
- Performance of LDI: Fall 2011 – early 2012
- Preparation and Submittal of RAWP: Summer 2012
- RIDEM Issuance of *Remedial Approval Letter*: Fall 2012
- Solicitation of Contractor Quotations: Winter 2012/Spring 2013
- Implementation of Remedial Construction: 2013/2014 (two construction seasons)
- Preparation of *Remedial Action Closure Report*: 2015

8.00 CERTIFICATION

To address Rule 7.05 of the Remediation Regulations, the following statements of certification are provided.

GZA GeoEnvironmental, Inc. certifies to the best of its knowledge, that this Remedial Alternative Evaluation Report, in conjunction with the SIDR, is complete and accurate.

James J. Clark

James J. Clark, PE
GZA GeoEnvironmental, Inc

National Grid certifies, to the best of its knowledge, that this Remedial Alternative Evaluation Report in conjunction with the SIDR, is a complete and accurate representation of the contaminated Site and the release(s) and contains all known facts surrounding the release.

M Leone

Michele Leone
Manager - New England Site Investigation & Remediation Program
National Grid

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TABLES

TABLE 1A
SUMMARY OF GROUNDWATER MEASUREMENTS
Former Tidewater Facility
Pawtucket, Rhode Island

Site Area	Well ID	Measured Well Depth (Feet below Top of PVC)	Top of PVC Elevation (Feet)	Range of LNAPL Observed (feet)	Range of DNAPL Observed (feet)	April 23, 2009 Groundwater Gauging Information						June 18, 2009 Groundwater Gauging Information						May 17, 2010 Groundwater Gauging Information						May 20, 2011 Groundwater Gauging Information					
						Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)	Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)	Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)	Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)
NFA	MW-5 / TB-14	11.60	32.23	NP	NP	Dry	11.60	Dry	NP	NP	Dry	Dry	11.60	Dry	NP	NP	Dry												
NFA	MW-7 / TB-20	27.45	31.98	NP	NP							18.6	27.45	13.38	NP	NP	13.38												
NFA	MW-204	16.77	9.47	NP	NP							9.15	16.77	0.32	NP	NP	0.32												
NFA	MW-205	15.00	12.20	NP	NP																								
NFA	MW-206	28.77	37.22	NP	NP							25.85	28.77	11.37	NP	NP	11.37												
NFA	MW-310S	17.35	9.59	NP	NP																								
NFA	MW-310D	36.20	9.18	NP	NP																								
NFA	MW-311	22.00	10.26	NP	NP																			9.10	22	1.16	NP	NP	1.16
FGPA	MW-201	15.00	13.76	NP	NP							9.26	15.00	4.50	NP	NP	4.50												
FGPA	MW-202	13.80	14.39	NP	NP							2.70	13.80	11.69	NP	NP	11.69												
FGPA	MW-203	14.80	10.29	NP	NP							7.70	14.80	2.59	NP	NP	2.59												
FGPA	MW-207 (Note 3)	11.75	14.50	NP	NP							1.10	11.75	13.40	NP	NP	13.40												
FGPA	MW-208	21.75	28.23	NP	NP	11.90	21.75	16.33	NP	NP	16.33	13.94	21.75	14.29	NP	NP	14.29												
FGPA	MW-209	21.05	24.74	NP	NP	8.91	21.05	15.83	NP	NP	15.83	10.75	21.05	13.99	NP	NP	13.99												
FGPA	MW-210	17.28	11.35	0.05-2.54	NP							8.40	17.28	2.95	0.05	NP	2.99												
FGPA	MW-3 / TB-12	17.00	11.46	trace - 5.57	NP							11.47	17.00	-0.01	0.02	NP	0.01												
FGPA	MW-4 / TB-13(Note 1)	17.65	10.58	NP	trace - 1.15							2.70	17.65	7.88	NP	NP	7.88												
FGPA	MW-303	41.85	9.07	NP	trace - 2.53													7.91	41.85	1.16	NP	NP	1.16						
FGPA	MW-312S	23.55	10.64	trace - 0.45	trace																			8.65	23.55	1.99	NP	NP	1.99
FGPA	MW-312D	31.90	10.57	NP	trace																			6.15	31.9	4.42	NP	NP	4.42
FGPA	MW-313S	24.90	11.74	trace - 4.52	trace													11.18	24.90	0.56	0.01	NP	0.57						
FGPA	MW-313D	47.35	12.01	NP	NP													11.05	47.35	0.96	NP	NP	0.96						
FGPA	MW-326S	26.60	12.61	trace - 0.3	NP																								
FGPA	MW-326D	45.05	11.91	NP	NP																								
FGPA	MW-333S	18.30	12.30	NP	NP																								
FGPA	MW-333D	45.20	12.30	NP	NP																								
FGPA	MW-335S	15.75	11.50	NP	NP																								
FGPA	MW-335D	36.50	11.96	NP	NP																								
FGPA	MW-336	15.00	12.73	NP	NP																								
FGPA	MW-339S	12.35	15.26	NP	NP																								
FGPA	MW-339D	20.95	15.42	NP	trace																								
FGPA	MW-341	30.10	19.62	NP	trace - 2																								
FPPA	M&E MW-1 (Note 4)	15.05	9.36	NP	NP	9.20	15.05	0.16	NP	NP	0.16	7.85	15.05	1.51	NP	NP	1.51												
FPPA	M&E MW-2 (Note 2)	13.85	10.81	NP	NP	9.22	13.85	1.59	NP	NP	1.59	9.49	13.85	1.32	NP	NP	1.32												
FPPA	M&E MW-4 (Note 4)	7.81		NP	NP	5.50	7.81		NP	NP		5.93	7.81	-5.93	NP	NP	-5.93												
FPPA	M&E MW-5	16.88	8.92	0.04 - 3.24	NP	10.47	16.88	-1.55	1.35	NP	-0.40	7.94	16.88	0.98	0.44	NP	1.35												
FPPA	MW-6 / TB-8	19.03	13.49	NP	NP	11.54	19.03	1.95	NP	NP	1.95																		
FPPA	MW-101/TB-101	16.00	10.94	NP	NP	10.20	16.00	0.74	NP	NP	0.74	10.12	16.00	0.82	NP	NP	0.82												
FPPA	MW-109/TB-109	19.30	14.09	NP	NP	9.98	19.30	4.11	NP	NP	4.11	11.36	19.30	2.73	NP	NP	2.73												
FPPA	MW-102	26.80	19.74	NP	NP	17.78	26.80	1.96	NP	NP	1.96	18.18	26.80	1.56	NP	NP	1.56												
FPPA	MW-103	16.90	11.33	trace - 0.31	trace - 0.08	9.70	16.90	1.63	NP	NP	1.63	9.98	16.90	1.35	NP	NP	1.35												
FPPA	MW-104	14.90	11.77	NP	NP	10.90	14.90	0.87	NP	NP	0.87	11.20	14.90	0.57	NP	NP	0.57												
FPPA	MW-105	27.55	22.14	NP	NP	19.75	27.55	2.39	NP	NP	2.39	20.14	27.55	2.00	NP	NP	2.00												
FPPA	MW-314S	24.50	10.37	0.01	NP													11.73	24.50	-1.36	0.01	NP	-1.35	10.17	24	0.20	NP	NP	0.20
FPPA	MW-314D	43.40	10.38	NP	NP													10.64	43.40	-0.26	NP	NP	-0.26	8.48	43.3	1.90	NP	NP	1.90
FPPA	MW-315S	26.40	10.98	NP	NP																			10.89	26.25	0.09	NP	NP	0.09
FPPA	MW-315D	41.70	10.69	NP	NP																			10.65	41.65	0.04	NP	NP	0.04
FPPA	MW-316S	22.30	24.52	NP	NP																			20.32	22.25	4.20	NP	NP	4.20
FPPA	MW-316D	31.55	24.68	NP	NP																			20.10	31.45	4.58	NP	NP	4.58
FPPA	MW-317S	27.40	25.35	NP	NP																			22.99	27.35	2.36	NP	NP	2.36
FPPA	MW-317D	36.20	25.47	NP	NP																			21.28	36.1	4.19	NP	NP	4.19
FPPA	MW-337	20.00	13.53	NP	NP																								
FPPA	MW-338S	18.45	13.94	NP	NP																								
FPPA	MW-338D	39.65	13.48	NP	NP																								
SFA	MW-1 / TB-6	23.20	19.59	NP	trace - 0.8	17.44	23.20	2.15	NP	0.29	2.15	17.77	23.20	1.82	NP	0.8	1.82												
SFA	MW-107	27.35	21.80	NP	NP	19.40	27.35	2.40	NP	NP	2.40	19.80	27.35	2.00	NP	NP	2.00												
SFA	MW-318S	27.00	18.96	NP	NP																			17.63	26.9	1.33	NP	NP	1.33
SFA	MW-318D	43.60	18.70	NP	NP																			18.50	43.5	0.20	NP	NP	0.20
SFA	MW-319S	27.10	19.96	NP	NP													18.36	27.10	1.60	NP	NP	1.60						
SFA	MW-319D	43.85	20.33	NP	NP													19.69	43.85	0.64	NP	NP	0.64						
SFA	MW-320S	10.95	7.73	NP	trace - 1.73													5.85	10.95	1.88	NP	0.18	1.88						
SFA	MW-320D	25.70	8.69	NP	1.1 - 10													8.85	25.70	-0.16	NP	3.7	-0.16						
SFA	MW-321S	12.55	6.47	NP	NP													4.70	12.55	1.77	NP	NP	1.77						
SFA	MW-321D	29.10	6.51	NP	NP													4.90	29.10	1.61	NP	NP	1.61						
SFA	MW-334S	28.80	21.34	NP	NP																								
SFA	MW-334D	43.20	21.53	NP	NP																								

Notes

NFA = North Fill Area
FGPA = Former Gas Plant Area
FPPA = Former Power Plant Area
SFA = South Fill Area
Elevations are relative to NGVD-1929.
NP - Indicates No Product observed.
Blanks indicate no measurement collected on that particular day.
Potentiometric elevations for wells exhibiting LNAPL include 0.85 correction factor.

1. MW-4 was periodically gauged between October 2009 to January 2010 to assess thickness of DNAPL

Date	Depth to GW	Potentiometric Elevation	DNAPL Thickness
10/30/2009	11.25	-0.67	0.20
11/3/2009	11.29	-0.71	NP
11/4/2009	11.46	-0.88	0.10
11/12/2009	11.30	-0.72	0.27
1/21/2010	8.75	1.83	0.15

2. Not found after June 16, 2010.
3. Buried during gasholders Nos. 7 and 8 decommissioning and demolition.
4. Found to have casing broken on December 3, 2010.

TABLE 1A
SUMMARY OF GROUNDWATER MEASUREMENTS
Former Tidewater Facility
Pawtucket, Rhode Island

Site Area	Well ID	Measured Well Depth (Feet below Top of PVC)	Top of PVC Elevation (Feet)	Range of LNAPL Observed (feet)	Range of DNAPL Observed (feet)	June 16, 2010 Groundwater Gauging Information						November 2, 2010 Groundwater Gauging Information						November 19, 2010 Groundwater Gauging Information						December 3, 2011 Groundwater Gauging Information					
						Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)	Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)	Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)	Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)
NFA	MW-5 / TB-14	11.60	32.23	NP	NP	Dry	11.60	Dry	NP	NP	Dry	Dry	11.60	Dry	NP	NP	Dry							Dry	11.60	Dry	NP	NP	Dry
NFA	MW-7 / TB-20	27.45	31.98	NP	NP	19.14	27.45	12.84	NP	NP	12.84	20.27	27.45	11.71	NP	NP	11.71							20.55	27.45	11.43	NP	NP	11.43
NFA	MW-204	16.77	9.47	NP	NP	5.87	16.77	3.60	NP	NP	3.60	9.8	16.77	-0.33	NP	NP	-0.33							7.62	16.77	1.85	NP	NP	1.85
NFA	MW-205	15.00	12.20	NP	NP	1.58	15.00	10.62	NP	NP	10.62	2.18	15.00	10.02	NP	NP	10.02							2.96	15.00	9.24	NP	NP	9.24
NFA	MW-206	28.77	37.22	NP	NP	26.17	28.77	11.05	NP	NP	11.05	27.05	28.77	10.17	NP	NP	10.17							26.9	28.77	10.32	NP	NP	10.32
NFA	MW-310S	17.35	9.59	NP	NP	9.90	17.35	-0.31	NP	NP	-0.31	12.82	17.35	-3.23	NP	NP	-3.23							7.68	17.35	1.91	NP	NP	1.91
NFA	MW-310D	36.20	9.18	NP	NP	5.50	36.20	3.68	NP	NP	3.68	9.37	36.20	-0.19	NP	NP	-0.19							7.34	36.20	1.84	NP	NP	1.84
NFA	MW-311	22.00	10.26	NP	NP	6.96	22.00	3.30	NP	NP	3.30	10.4	22.00	-0.14	NP	NP	-0.14							8.49	22.00	1.77	NP	NP	1.77
FGPA	MW-201	15.00	13.76	NP	NP	9.24	15.00	4.52	NP	NP	4.52	10.23	15.00	3.53	NP	NP	3.53							9.38	15.00	4.38	NP	NP	4.38
FGPA	MW-202	13.80	14.39	NP	NP	2.90	13.80	11.49	NP	NP	11.49	4.85	13.80	9.54	NP	NP	9.54							4.25	13.80	10.14	NP	NP	10.14
FGPA	MW-203	14.80	10.29	NP	NP	7.86	14.80	2.43	NP	NP	2.43	8.91	14.80	1.38	NP	NP	1.38							7.87	14.80	2.42	NP	NP	2.42
FGPA	MW-207 (Note 3)	11.75	14.50	NP	NP							Buried / Destroyed												Buried / Destroyed					
FGPA	MW-208	21.75	28.23	NP	NP	14.35	21.75	13.88	NP	NP	13.88	16.56	21.75	11.67	NP	NP	11.67							16.33	21.75	11.90	NP	NP	11.90
FGPA	MW-209	21.05	24.74	NP	NP	10.94	21.05	13.80	NP	NP	13.80	13.3	21.05	11.44	NP	NP	11.44							13.07	21.05	11.67	NP	NP	11.67
FGPA	MW-210	17.28	11.35	0.05-2.54	NP	8.10	17.28	3.25	0.05	NP	3.29	10.55	17.28	0.80	NP	NP	0.80							8.95	17.28	2.40	NP	NP	2.40
FGPA	MW-3 / TB-12	17.00	11.46	trace - 5.57	NP	10.00	17.00	1.46	trace	NP	1.46	12.2	17.00	-0.74	trace	NP	-0.74	10.54	17.00	0.92	0.05	NP	0.96	11.85	17.00	-0.39	trace	NP	-0.39
FGPA	MW-4 / TB-13(Note 1)	17.65	10.58	NP	trace - 1.15	10.60	17.65	-0.02	NP	trace	-0.02	12.15	17.65	-1.57	NP	trace	-1.57	10.73	17.65	-0.15	NP	trace	-0.15	10.6	17.65	-0.02	NP	trace	-0.02
FGPA	MW-303	41.85	9.07	NP	trace - 2.53	8.71	41.85	0.36	NP	trace	0.36	10.12	41.85	-1.05	NP	2.53	-1.05	8.74	41.85	0.33	NP	0.55	0.33	8.92	41.85	0.15	NP	0.5	0.15
FGPA	MW-312S	23.55	10.64	trace - 0.45	trace	8.37	23.55	2.27	NP	trace	2.27	11.25	23.55	-0.61	0.45	NP	-0.23	9.58	23.55	1.06	0.13	NP	1.17	9.03	23.55	1.61	trace	NP	1.61
FGPA	MW-312D	31.90	10.57	NP	trace	8.26	31.90	2.31	NP	trace	2.31	11.4	31.90	-0.83	NP	NP	-0.83							10.05	31.90	0.52	NP	NP	0.52
FGPA	MW-313S	24.90	11.74	trace - 4.52	trace	9.94	24.90	1.80	trace	NP	1.80	12.71	24.90	-0.97	NP	trace	-0.97	10.86	24.90	0.88	NP	NP	0.88	11.9	24.90	-0.16	NP	NP	-0.16
FGPA	MW-313D	47.35	12.01	NP	NP	9.85	47.35	2.16	NP	NP	2.16	12.77	47.35	-0.76	NP	NP	-0.76							11.82	47.35	0.19	NP	NP	0.19
FGPA	MW-326S	26.60	12.61	trace - 0.3	NP	11.05	26.60	1.56	NP	NP	1.56	13.58	26.60	-0.97	trace	NP	-0.97	11.91	26.60	0.70	0.3	NP	0.96	11.87	26.60	0.74	trace	NP	0.74
FGPA	MW-326D	45.05	11.91	NP	NP	10.00	45.05	1.91	NP	NP	1.91	12.82	45.05	-0.91	NP	NP	-0.91							12.15	45.05	-0.24	NP	NP	-0.24
FGPA	MW-333S	18.30	12.30	NP	NP																			10.96	18.30	1.34	NP	NP	1.34
FGPA	MW-333D	45.20	12.30	NP	NP																			10.6	45.20	1.70	NP	NP	1.70
FGPA	MW-335S	15.75	11.50	NP	NP																			9.22	15.75	2.28	NP	NP	2.28
FGPA	MW-335D	36.50	11.96	NP	NP																			10.02	36.50	1.94	NP	NP	1.94
FGPA	MW-336	15.00	12.73	NP	NP																			10.37	15.00	2.36	NP	NP	2.36
FGPA	MW-339S	12.35	15.26	NP	NP																			6.62	12.35	8.64	NP	NP	8.64
FGPA	MW-339D	20.95	15.42	NP	trace																			6.36	20.95	9.06	NP	NP	9.06
FGPA	MW-341	30.10	19.62	NP	trace - 2																			9.42	30.10	10.20	NP	trace	10.20
FPPA	M&E MW-1 (Note 4)	15.05	9.36	NP	NP	7.30	15.05	2.06	NP	NP	2.06	10.62	15.05	-1.26	NP	NP	-1.26							Damaged					
FPPA	M&E MW-2 (Note 2)	13.85	10.81	NP	NP	8.12	13.85	2.69	NP	NP	2.69	10.96	13.85	-0.15	NP	NP	-0.15							10.54	13.85	0.27	NP	NP	0.27
FPPA	M&E MW-4 (Note 4)	7.81		NP	NP							Not Found												Damaged / Destroyed					
FPPA	M&E MW-5	16.88	8.92	0.04 - 3.24	NP	9.15	16.88	-0.23	NP	NP	-0.23	8.5	16.88	0.42	0.04	NP	0.45	9.2	16.88	-0.28	1.17	NP	0.71	Damaged					
FPPA	MW-6 / TB-8	19.03	13.49	NP	NP	11.38	19.03	2.11	NP	NP	2.11	12	19.03	1.49	NP	NP	1.49							11.64	19.03	1.85	NP	NP	1.85
FPPA	MW-101/TB-101	16.00	10.94	NP	NP	9.30	16.00	1.64	NP	NP	1.64	10.53	16.00	0.41	NP	NP	0.41							10.31	16.00	0.63	NP	NP	0.63
FPPA	MW-109/TB-109	19.30	14.09	NP	NP	10.83	19.30	3.26	NP	NP	3.26	12.55	19.30	1.54	NP	NP	1.54							12.13	19.30	1.96	NP	NP	1.96
FPPA	MW-102	26.80	19.74	NP	NP	17.60	26.80	2.14	NP	NP	2.14	18.38	26.80	1.36	NP	NP	1.36							17.9	26.80	1.84	NP	NP	1.84
FPPA	MW-103	16.90	11.33	trace - 0.31	trace - 0.08	9.16	16.90	2.17	NP	NP	2.17	10.56	16.90	0.77	0.01	trace	0.78	10.36	16.90	0.97	NP	0.08	0.97	10.28	16.90	1.05	trace	NP	1.05
FPPA	MW-104	14.90	11.77	NP	NP	9.86	14.90	1.91	NP	NP	1.91	10.41	14.90	1.36	NP	NP	1.36							10.13	14.90	1.64	NP	NP	1.64
FPPA	MW-105	27.55	22.14	NP	NP	19.80	27.55	2.34	NP	NP	2.34	20.46	27.55	1.68	NP	NP	1.68							20.17	27.55	1.97	NP	NP	1.97
FPPA	MW-314S	24.50	10.37	0.01	NP	9.05	24.50	1.32	NP	NP	1.32	11.05	24.50	-0.68	NP	NP	-0.68							10.65	24.50	-0.28	NP	NP	-0.28
FPPA	MW-314D	43.40	10.38	NP	NP	8.85	43.40	1.53	NP	NP	1.53	11.05	43.40	-0.67	NP	NP	-0.67							10.67	43.40	-0.29	NP	NP	-0.29
FPPA	MW-315S	26.40	10.98	NP	NP	9.80	26.40	1.18	NP	NP	1.18	11.95	26.40	-0.97	NP	NP	-0.97							11.62	26.40	-0.64	NP	NP	-0.64
FPPA	MW-315D	41.70	10.69	NP	NP	9.86	41.70	0.83	NP	NP	0.83	11.68	41.70	-0.99	NP	NP	-0.99							11.35	41.70	-0.66	NP	NP	-0.66
FPPA	MW-316S	22.30	24.52	NP	NP	20.95	22.30	3.57	NP	NP	3.57	Dry	22.30	Dry	NP	NP	Dry							22.05	22.30	2.47	NP	NP	2.47
FPPA	MW-316D	31.55	24.68	NP	NP	20.78	31.55	3.90	NP	NP	3.90	22.31	31.55	2.37	NP	NP	2.37							22.18	31.55	2.50	NP	NP	2.50
FPPA	MW-317S	27.40	25.35	NP	NP	23.03	27.40	2.32	NP	NP	2.32	23.69	27.40	1.66	NP	NP	1.66							23.4	27.40	1.95	NP	NP	1.95
FPPA	MW-317D	36.20	25.47	NP	NP	21.15	36.20	4.32	NP	NP	4.32	23	36.20	2.47	NP	NP	2.47							22.92	36.20	2.55	NP	NP	2.55
FPPA	MW-337	20.00	13.53	NP	NP																			11.94	20.00	1.59	NP	NP	1.59
FPPA	MW-338S	18.45	13.94	NP	NP																			12.22	18.45	1.72	NP	NP	1.72
FPPA	MW-338D	39.65	13.48	NP	NP																			13.52	39.65	-0.04	NP	NP	-0.04
SFA	MW-1 / TB-6	23.20	19.59	NP	trace - 0.8	17.38	23.20	2.21	NP	trace	2.21	Dry	23.20	Dry	NP	trace	Dry	17.86	23.20	1.73	NP	NP	1.73	17.7	23.20	1.89	NP	0.5	1.89
SFA	MW-107	27.35	21.80	NP	NP	19.52	27.35	2.28	NP	NP	2.28	20.14	27.35	1.66	NP	NP	1.66							19.84	27.35	1.96	NP	NP	1.96
SFA	MW-318S	27.00	18.96	NP	NP	16.51	27.00	2.45	NP	NP	2.45	17.46	27.00	1.50	NP	NP	1.50							17.22	27.00	1.74	NP	NP	1.74
SFA	MW-318D	43.60	18.70	NP	NP	16.10	43.60	2.60	NP	NP	2.60	18.89	43.60	-0.19	NP	NP	-0.19							18.96	43.60	-0.26	NP	NP	-0.26
SFA	MW-319S	27.10	19.96	NP	NP	17.55	27.10	2.41	NP	NP	2.41	18.55	27.10	1.41	NP	NP	1.41							18.53	27.10	1.43	NP	NP	1.43
SFA	MW-319D	43.85	20.33	NP	NP	17.65	43.85	2.68	NP	NP	2.68	19.62	43.85	0.71	NP	NP	0.71							20.22	43.85	0.11	NP	NP	0.11
SFA	MW-320S	10.95	7.73	NP	trace - 1.73	5.60	10.95	2.13	NP	NP	2.13	6.1	10.80	1.63	NP	1.73	1.63	6.28	10.95	1.45	NP	NP	1.45	5.9	10.95	1.83	NP	0.2	1.83
SFA	MW-320D	25.70	8.69	NP	1.1 - 10	8.40	25.70	0.29	NP	1.1	0.29	8.77	23.20	-0.08	NP	6.48	-0.08	10	25.70	-1.31	NP	1.5	-1.31	8.95	25.70	-0.26	NP	10	-0.26
SFA	MW-321S	12.55	6.47	NP	NP	4.50	12.55	1.97	NP	NP	1.97	5.03	12.55	1.44	NP	NP	1.44							4.87	12.55	1.60	NP	NP	1.60
SFA	MW-321D	29.10	6.51	NP	NP	4.75	29.10	1.76	NP	NP	1.76	5.38	29.10	1.13	NP	NP	1.13							5.57	29.10	0.94	NP	NP	0.94
SFA	MW-334S	28.80	21.34	NP	NP																			19.39	28.80	1.95	NP	NP	1.95
SFA	MW-334D	43.20	21.53	NP	NP																			21.46	43.20	0.07	NP	NP	0.07

Notes

NFA = North Fill Area
FGPA = Former Gas Plant Area
FPPA = Former Power Plant Area
SFA = South Fill Area
Elevations are relative to NGVD-1929.
NP - Indicates No Product observed.
Blanks indicate no measurement collected on that particular day.
Potentiometric elevations for wells exhibiting LNAPL include 0.85 correction factor.

1. MW-4 was periodically gauged between October 2009 to January 2010 to assess thickness of DNAPL

Date	Depth to GW	Potentiometric Elevation	DNAPL Thickness
10/30/2009	11.25	-0.67	0.20
11/3/2009	11.29	-0.71	NP
11/4/2009	11.46	-0.88	0.10
11/12/2009	11.30	-0.72	0.27
1/21/2010	8.75	1.83	0.15

2. Not found after June 16, 2010.
3. Buried during gasholders Nos. 7 and 8 decommissioning and demolition.
4. Found to have casing broken on December 3, 2010.

TABLE 1A
SUMMARY OF GROUNDWATER MEASUREMENTS
Former Tidewater Facility
Pawtucket, Rhode Island

Site Area	Well ID	Measured Well Depth (Feet below Top of PVC)	Top of PVC Elevation (Feet)	Range of LNAPL Observed (feet)	Range of DNAPL Observed (feet)	January 24, 2011 Groundwater Gauging Information							February 17, 2011 Groundwater Gauging Information							March 29, 2011 Groundwater Gauging Information							April 26, 2011 Groundwater Gauging Information						
						Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)		Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)		Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)		Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)
NFA	MW-5 / TB-14	11.60	32.23	NP	NP	Dry	11.60	Dry	NP	NP	Dry																10.98	11.6	21.25	NP	NP	21.25
NFA	MW-7 / TB-20	27.45	31.98	NP	NP	20.02	27.45	11.96	NP	NP	11.96																17.73	27.4	14.25	NP	NP	14.25
NFA	MW-204	16.77	9.47	NP	NP	6.67	16.77	2.80	NP	NP	2.80																8.79	16.75	0.68	NP	NP	0.68
NFA	MW-205	15.00	12.20	NP	NP	1.73	15.00	10.47	NP	NP	10.47																1.2	15	11.00	NP	NP	11.00
NFA	MW-206	28.77	37.22	NP	NP	26.62	28.77	10.60	NP	NP	10.60																25.43	28.7	11.79	NP	NP	11.79
NFA	MW-310S	17.35	9.59	NP	NP	6.67	17.35	2.92	NP	NP	2.92																8.56	36.1	1.03	NP	NP	1.03
NFA	MW-310D	36.20	9.18	NP	NP	6.06	36.20	3.12	NP	NP	3.12																8.52	17.1	0.66	NP	NP	0.66
NFA	MW-311	22.00	10.26	NP	NP	7.2	22.00	3.06	NP	NP	3.06																9.28	22	0.98	NP	NP	0.98
FGPA	MW-201	15.00	13.76	NP	NP	4.95	15.00	8.81	NP	NP	8.81																7.93	14.98	5.83	NP	NP	5.83
FGPA	MW-202	13.80	14.39	NP	NP	3.87	13.80	10.52	NP	NP	10.52																2.34	13.85	12.05	NP	NP	12.05
FGPA	MW-203	14.80	10.29	NP	NP	8.05	14.80	2.24	NP	NP	2.24																7.21	14.81	3.08	NP	NP	3.08
FGPA	MW-207 (Note 3)	11.75	14.50	NP	NP	Buried / Destroyed																					Destroyed					
FGPA	MW-208	21.75	28.23	NP	NP	Not Found							15.6	21.75	12.63	NP	NP	12.63									13.13	21.68	15.10	NP	NP	15.10
FGPA	MW-209	21.05	24.74	NP	NP	12.45	21.05	12.29	NP	NP	12.29																10.04	21.03	14.70	NP	NP	14.70
FGPA	MW-210	17.28	11.35	0.05-2.54	NP	8.15	17.28	3.20	0.23	NP	3.40		9.34	17.28	2.01	0.92	NP	2.79		10.36	17.28	0.99	2.54	NP	3.15		9.63	17.32	1.72	2.48	NP	3.83
FGPA	MW-3 / TB-12	17.00	11.46	trace - 5.57	NP	13.55	17.00	-2.09	5.57	NP	2.64		10.01	17.00	1.45	0.8	NP	2.13		12.31	17.00	-0.85	1.71	NP	0.60		12.18	16.7	-0.72	1.64	NP	0.67
FGPA	MW-4 / TB-13(Note 1)	17.65	10.58	NP	trace - 1.15	7.78	17.65	2.80	NP	1.15	2.80		8.71	17.65	1.87	NP	trace	1.87		10.82	17.65	-0.24	NP	trace	-0.24		10.54	16.28	0.04	NP	trace	0.04
FGPA	MW-303	41.85	9.07	NP	trace - 2.53	5.95	41.85	3.12	NP	trace	3.12		6.99	41.85	2.08	NP	0.88	2.08		8.62	41.85	0.45	NP	0.15	0.45		8.49	41.7	0.58	NP	0.4	0.58
FGPA	MW-312S	23.55	10.64	trace - 0.45	trace	8.47	23.55	2.17	trace	NP	2.17		8.63	23.55	2.01	trace	NP	2.01		9.71	23.55	0.93	trace	NP	0.93		9.69	23.55	0.95	0.2	NP	1.12
FGPA	MW-312D	31.90	10.57	NP	trace	7.38	31.90	3.19	NP	NP	3.19									10	31.90	0.57	NP	NP	0.57		9.9	31.9	0.67	NP	NP	0.67
FGPA	MW-313S	24.90	11.74	trace - 4.52	trace	12.8	24.90	-1.06	4.52	NP	2.78		9.81	24.90	1.93	0.22	NP	2.12		11.26	24.90	0.48	0.04	NP	0.51		11.13	24.8	0.61	0.05	NP	0.65
FGPA	MW-313D	47.35	12.01	NP	NP	8.7	47.35	3.31	NP	NP	3.31									11.15	47.35	0.86	NP	NP	0.86		11.03	47.2	0.98	NP	NP	0.98
FGPA	MW-326S	26.60	12.61	trace - 0.3	NP	9.72	26.60	2.89	NP	NP	2.89		13.17	26.60	-0.56	trace	NP	-0.56		12.02	26.60	0.59	trace	NP	0.59		11.96	26.6	0.65	0.03	NP	0.68
FGPA	MW-326D	45.05	11.91	NP	NP	8.95	45.05	2.96	NP	NP	2.96		12.39	45.05	-0.48	NP	NP	-0.48		11.17	45.05	0.74	NP	NP	0.74		11.25	45	0.66	NP	NP	0.66
FGPA	MW-333S	18.30	12.30	NP	NP	9.38	18.30	2.92	NP	NP	2.92																11.62	18.3	0.68	NP	NP	0.68
FGPA	MW-333D	45.20	12.30	NP	NP	9	45.20	3.30	NP	NP	3.30																11.42	45	0.88	NP	NP	0.88
FGPA	MW-335S	15.75	11.50	NP	NP	5.35	15.75	6.15	NP	NP	6.15																8.91	15.55	2.59	NP	NP	2.59
FGPA	MW-335D	36.50	11.96	NP	NP	8.45	36.50	3.51	NP	NP	3.51																10.78	36	1.18	NP	NP	1.18
FGPA	MW-336	15.00	12.73	NP	NP	11.24	15.00	1.49	NP	NP	1.49																10.23	15	2.50	NP	NP	2.50
FGPA	MW-339S	12.35	15.26	NP	NP	6.35	12.35	8.91	NP	NP	8.91		6.02	12.35	9.24	NP	NP	9.24		5.04	12.35	10.22	NP	NP	10.22		4.7	12.3	10.56	NP	NP	10.56
FGPA	MW-339D	20.95	15.42	NP	trace	6.05	20.95	9.37	NP	NP	9.37		8.83	20.95	6.59	NP	NP	6.59		4.85	20.95	10.57	NP	trace	10.57		4.63	21	10.79	NP	trace	10.79
FGPA	MW-341	30.10	19.62	NP	trace - 2	8.8	30.15	10.82	NP	1.5	10.82		8.63	30.10	10.99	NP	1	10.99		6.88	30.15	12.74	NP	1.8	12.74		6.36	30.15	13.26	NP	1.5	13.26
FPPA	M&E MW-1 (Note 4)	15.05	9.36	NP	NP	Damaged																					9.14	16.9	0.22	NP	NP	0.22
FPPA	M&E MW-2 (Note 2)	13.85	10.81	NP	NP	8.95	13.85	1.86	NP	NP	1.86																10.23	13.75	0.58	NP	NP	0.58
FPPA	M&E MW-4 (Note 4)	7.81		NP	NP	Destroyed																					Not Found					
FPPA	M&E MW-5	16.88	8.92	0.04 - 3.24	NP	Damaged														13.53	16.88	-4.61	3.24	NP	-1.86		10.65	14.65	-1.73	3.16	NP	0.96
FPPA	MW-6 / TB-8	19.03	13.49	NP	NP	11.8	19.03	1.69	NP	NP	1.69																11.66	19	1.83	NP	NP	1.83
FPPA	MW-101/TB-101	16.00	10.94	NP	NP	6.58	16.00	4.36	NP	NP	4.36																9.77	16	1.17	NP	NP	1.17
FPPA	MW-109/TB-109	19.30	14.09	NP	NP	Not Found							12.06	19.30	2.03	NP	NP	2.03									10.98	19.25	3.11	NP	NP	3.11
FPPA	MW-102	26.80	19.74	NP	NP	18	26.80	1.74	NP	NP	1.74																17.84	26.81	1.90	NP	NP	1.90
FPPA	MW-103	16.90	11.33	trace - 0.31	trace - 0.08	10.06	16.90	1.27	0.31	NP	1.53		10.61	16.90	0.72	trace	NP	0.72		10.25	16.90	1.08	trace	NP	1.08		9.77	16.88	1.56	0.02	NP	1.58
FPPA	MW-104	14.90	11.77	NP	NP	Not Found							10.55	14.90	1.22	NP	NP	1.22									9.73	14.8	2.04	NP	NP	2.04
FPPA	MW-105	27.55	22.14	NP	NP	20.21	27.55	1.93	NP	NP	1.93																9.78	27.53	12.36	NP	NP	12.36
FPPA	MW-314S	24.50	10.37	0.01	NP	6.4	24.50	3.97	NP	NP	3.97									9.85	24.50	0.52	NP	NP	0.52		9.47	24	0.90	NP	NP	0.90
FPPA	MW-314D	43.40	10.38	NP	NP	8.58	43.40	1.80	NP	NP	1.80																9.79	43.3	0.59	NP	NP	0.59
FPPA	MW-315S	26.40	10.98	NP	NP	9.86	26.40	1.12	NP	NP	1.12																10.59	26.25	0.39	NP	NP	0.39
FPPA	MW-315D	41.70	10.69	NP	NP	9.63	41.70	1.06	NP	NP	1.06																10.43	41.65	0.26	NP	NP	0.26
FPPA	MW-316S	22.30	24.52	NP	NP	21.93	22.30	2.59	NP	NP	2.59																20.75	22.25	3.77	NP	NP	3.77
FPPA	MW-316D	31.55	24.68	NP	NP	22.05	31.55	2.63	NP	NP	2.63																21.07	31.45	3.61	NP	NP	3.61
FPPA	MW-317S	27.40	25.35	NP	NP	23.42	27.40	1.93	NP	NP	1.93																22.99	27.35	2.36	NP	NP	2.36
FPPA	MW-317D	36.20	25.47	NP	NP	22.56	36.20	2.91	NP	NP	2.91																21.64	36.1	3.83	NP	NP	3.83
FPPA	MW-337	20.00	13.53	NP	NP	11.88	20.00	1.65	NP	NP	1.65		12.3	20.00	1.23	NP	NP	1.23									11.63	19.9	1.90	NP	NP	1.90
FPPA	MW-338S	18.45	13.94	NP	NP	12.35	18.45	1.59	NP	NP	1.59		12.62	18.45	1.32	NP	NP	1.32									11.79	18.4	2.15	NP	NP	2.15
FPPA	MW-338D	39.65	13.48	NP	NP	12.46	39.65	1.02	NP	NP	1.02		13.4	39.65	0.08	NP	NP	0.08									12.67	39.55	0.81	NP	NP	0.81
SFA	MW-1 / TB-6	23.20	19.59	NP	trace - 0.8	17.85	23.20	1.74	NP	trace	1.74		18.06	23.20	1.53	NP	NP	1.53		17.86	23.20	1.73	NP	0.4	1.73		17.6	23.2	1.99	NP	0.67	1.99
SFA	MW-107	27.35	21.80	NP	NP	19.86	27.35	1.94	NP	NP	1.94																19.45	27.67	2.35	NP	NP	2.35
SFA	MW-318S	27.00	18.96	NP	NP	17.26	27.00	1.70	NP	NP	1.70																16.93	26.9	2.03	NP	NP	2.03
SFA	MW-318D	43.60	18.70	NP	NP	18.65	43.60	0.05	NP	NP	0.05																17.47	43.5	1.23	NP	NP	1.23
SFA	MW-319S	27.10	19.96	NP	NP	18.56	27.10	1.40	NP	NP	1.40																18.26	27.13	1.70	NP	NP	1.70
SFA	MW-319D	43.85	20.33	NP	NP	20.15	43.85	0.18	NP	NP	0.18																19.3	43.7	1.03	NP	NP	1.03
SFA	MW-320S	10.95	7.73	NP	trace - 1.73	6.05	10.95	1.68	NP	trace	1.68		6.35	10.95	1.38	NP	trace	1.38		6.3	10.95	1.43	NP	trace	1.43		7.14	12	0.59	NP	trace	0.59
SFA	MW-320D	25.70	8.69	NP	1.1 - 10	9.45	25.70	-0.76	NP	3.2	-0.76		8.7	25.70	-0.01	NP	2.15	-0.01		8.25	25.70	0.44	NP	4.15	0.44		8.03	25.32	0.66	NP	3	0.66
SFA	MW-321S	12.55	6.47	NP	NP	4.92	12.55	1.55	NP	NP	1.55																4.78	12.5	1.69	NP	NP	1.69
SFA	MW-321D	29.10	6.51	NP	NP	5.58	29.10	0.93	NP	NP	0.93																4.85	29	1.66	NP	NP	1.66
SFA	MW-334S	28.80	21.34	NP	NP	19.48	28.80	1.86	NP	NP	1.86																19.07	28.83	2.27	NP	NP	2.27
SFA	MW-334D	43.20	21.53	NP	NP	21.25	43.20	0.28	NP	NP	0.28																20.56	43.15	0.97	NP	NP	0.97

Notes

NFA = North Fill Area
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FPPA = Former Power Plant Area
SFA = South Fill Area
Elevations are relative to NGVD-1929.
NP - Indicates No Product observed.
Blanks indicate no measurement collected on that particular day.
Potentiometric elevations for wells exhibiting LNAPL include 0.85 correction factor.

1. MW-4 was periodically gauged between October 2009 to January 2010 to assess thickness of DNAPL.

Date	Depth to GW	Potentiometric Elevation	DNAPL Thickness
10/30/2009	11.25	-0.67	0.20
11/3/2009	11.29	-0.71	NP
11/4/2009	11.46	-0.88	0.10
11/12/2009	11.30	-0.72	0.27
1/21/2010	8.75	1.83	0.15

2. Not found after June 16, 2010.
3. Buried during gasholders Nos. 7 and 8 decommissioning and demolition.
4. Found to have casing broken on December 3, 2010.

TABLE 1A
SUMMARY OF GROUNDWATER MEASUREMENTS
Former Tidewater Facility
Pawtucket, Rhode Island

Site Area	Well ID	Measured Well Depth (Feet below Top of PVC)	Top of PVC Elevation (Feet)	Range of LNAPL Observed (feet)	Range of DNAPL Observed (feet)	May 4, 2011 Groundwater Gauging Information						June 3, 2011 Groundwater Gauging Information						June 29, 2011 Groundwater Gauging Information					
						Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)	Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater Elevation (feet)	Depth To Water (ft)	Total Well Depth (ft)	GW Elevation (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Corrected Groundwater
NFA	MW-5 / TB-14	11.60	32.23	NP	NP																		
NFA	MW-7 / TB-20	27.45	31.98	NP	NP																		
NFA	MW-204	16.77	9.47	NP	NP																		
NFA	MW-205	15.00	12.20	NP	NP																		
NFA	MW-206	28.77	37.22	NP	NP																		
NFA	MW-310S	17.35	9.59	NP	NP																		
NFA	MW-310D	36.20	9.18	NP	NP																		
NFA	MW-311	22.00	10.26	NP	NP																		
FGPA	MW-201	15.00	13.76	NP	NP																		
FGPA	MW-202	13.80	14.39	NP	NP																		
FGPA	MW-203	14.80	10.29	NP	NP																		
FGPA	MW-207 (Note 3)	11.75	14.50	NP	NP	Destroyed						Destroyed						Destroyed					
FGPA	MW-208	21.75	28.23	NP	NP																		
FGPA	MW-209	21.05	24.74	NP	NP																		
FGPA	MW-210	17.28	11.35	0.05-2.54	NP	9.03	17.3	2.32	2.02	NP	4.04	9.05	17.3	2.30	1	NP	3.15	8.98	17.3	2.37	0.33	NP	2.65
FGPA	MW-3 / TB-12	17.00	11.46	trace - 5.57	NP	9.49	17.1	1.97	0.27	NP	2.20	10.43	17.1	1.03	0.8	NP	1.71	11.21	17.1	0.25	0.03	NP	0.28
FGPA	MW-4 / TB-13(Note 1)	17.65	10.58	NP	trace - 1.15	7.8	16.3	2.78	NP	trace	2.78	8.78	16.3	1.80	NP	trace	1.80	9	16.3	1.58	NP	trace	1.58
FGPA	MW-303	41.85	9.07	NP	trace - 2.53	6.12	41.7	2.95	NP	0.6	2.95	7	41.8	2.07	NP	0.08	2.07	7.1	41.8	1.97	NP	0.25	1.97
FGPA	MW-312S	23.55	10.64	trace - 0.45	trace	8.52	23.5	2.12	0.28	NP	2.36	8.72	23.5	1.92	0.01	NP	1.93	8.78	23.5	1.86	0.14	NP	1.98
FGPA	MW-312D	31.90	10.57	NP	trace	8.59	32	1.98	NP	NP	1.98	8.12	31.9	2.45	NP	NP	2.45	8.55	31.9	2.02	NP	NP	2.02
FGPA	MW-313S	24.90	11.74	trace - 4.52	trace	9.12	24.6	2.62	0.02	NP	2.64	10.49	24.6	1.25	trace	NP	1.25	11.23	24.6	0.51	0.01	NP	0.52
FGPA	MW-313D	47.35	12.01	NP	NP	9.07	47.3	2.94	NP	NP	2.94	10.45	47.25	1.56	NP	NP	1.56	11.21	47.25	0.80	NP	NP	0.80
FGPA	MW-326S	26.60	12.61	trace - 0.3	NP	10.34	26.6	2.27	0.01	NP	2.28	11.46	26.6	1.15	trace	NP	1.15	12.28	26.6	0.33	0.01	NP	0.34
FGPA	MW-326D	45.05	11.91	NP	NP	9.55	45.3	2.36	NP	NP	2.36	10.75	45.3	1.16	NP	NP	1.16	11.45	45.3	0.46	NP	NP	0.46
FGPA	MW-333S	18.30	12.30	NP	NP																		
FGPA	MW-333D	45.20	12.30	NP	NP																		
FGPA	MW-335S	15.75	11.50	NP	NP																		
FGPA	MW-335D	36.50	11.96	NP	NP																		
FGPA	MW-336	15.00	12.73	NP	NP																		
FGPA	MW-339S	12.35	15.26	NP	NP	4.75	12.38	10.51	NP	NP	10.51	5.21	12.35	10.05	NP	NP	10.05	5.65	12.35	9.61	NP	NP	9.61
FGPA	MW-339D	20.95	15.42	NP	trace	4.54	21.02	10.88	NP	NP	10.88	4.95	20.95	10.47	NP	NP	10.47	5.4	20.95	10.02	NP	NP	10.02
FGPA	MW-341	30.10	19.62	NP	trace - 2	6.79	30.15	12.83	NP	2	12.83	7.28	30.15	12.34	NP	1.55	12.34	8.1	30.15	11.52	NP	1.3	11.52
FPPA	M&E MW-1 (Note 4)	15.05	9.36	NP	NP																		
FPPA	M&E MW-2 (Note 2)	13.85	10.81	NP	NP																		
FPPA	M&E MW-4 (Note 4)	7.81		NP	NP	Not Found						Not Found						Not Found					
FPPA	M&E MW-5	16.88	8.92	0.04 - 3.24	NP	8.42	14.65	0.50	1.12	NP	1.45	8.4	14.65	0.52	1.2	NP	1.54	8.4	14.65	0.52	0.4	NP	0.86
FPPA	MW-6 / TB-8	19.03	13.49	NP	NP																		
FPPA	MW-101/TB-101	16.00	10.94	NP	NP																		
FPPA	MW-109/TB-109	19.30	14.09	NP	NP																		
FPPA	MW-102	26.80	19.74	NP	NP																		
FPPA	MW-103	16.90	11.33	trace - 0.31	trace - 0.08	8.6	16.9	2.73	0.18	NP	2.88	10.02	16.9	1.31	0.09	NP	1.39	10.79	16.9	0.54	0.01	NP	0.55
FPPA	MW-104	14.90	11.77	NP	NP																		
FPPA	MW-105	27.55	22.14	NP	NP																		
FPPA	MW-314S	24.50	10.37	0.01	NP	8.45	24	1.92	NP	NP	1.92	10.32	24	0.05	NP	NP	0.05	10.04	24	0.33	NP	NP	0.33
FPPA	MW-314D	43.40	10.38	NP	NP	8.31	43.3	2.07	NP	NP	2.07	10.82	43.3	-0.44	NP	NP	-0.44	10.32	43.3	0.06	NP	NP	0.06
FPPA	MW-315S	26.40	10.98	NP	NP																		
FPPA	MW-315D	41.70	10.69	NP	NP																		
FPPA	MW-316S	22.30	24.52	NP	NP																		
FPPA	MW-316D	31.55	24.68	NP	NP																		
FPPA	MW-317S	27.40	25.35	NP	NP																		
FPPA	MW-317D	36.20	25.47	NP	NP																		
FPPA	MW-337	20.00	13.53	NP	NP																		
FPPA	MW-338S	18.45	13.94	NP	NP																		
FPPA	MW-338D	39.65	13.48	NP	NP																		
SFA	MW-1 / TB-6	23.20	19.59	NP	trace - 0.8							17.75	23.2	1.84	NP	0.15	1.84	17.67	23.2	1.92	NP	0.6	1.92
SFA	MW-107	27.35	21.80	NP	NP																		
SFA	MW-318S	27.00	18.96	NP	NP																		
SFA	MW-318D	43.60	18.70	NP	NP																		
SFA	MW-319S	27.10	19.96	NP	NP																		
SFA	MW-319D	43.85	20.33	NP	NP																		
SFA	MW-320S	10.95	7.73	NP	trace - 1.73							6.11	11.2	1.62	NP	trace	1.62	6.06	11.2	1.67	NP	trace	1.67
SFA	MW-320D	25.70	8.69	NP	1.1 - 10							9.52	25.3	-0.83	NP	4.1	-0.83	8.5	25.3	0.19	NP	4.1	0.19
SFA	MW-321S	12.55	6.47	NP	NP																		
SFA	MW-321D	29.10	6.51	NP	NP																		
SFA	MW-334S	28.80	21.34	NP	NP																		
SFA	MW-334D	43.20	21.53	NP	NP																		

Notes

NFA = North Fill Area
FGPA = Former Gas Plant Area
FPPA = Former Power Plant Area
SFA = South Fill Area
Elevations are relative to NGVD-1929.
NP - Indicates No Product observed.
Blanks indicate no measurement collected on that particular day.
Potentiometric elevations for wells exhibiting LNAPL include 0.85 correction factor.

1. MW-4 was periodically gauged between October 2009 to January 2010 to assess thickness of DNAPL

Date	Depth to GW	Potentiometric Elevation	DNAPL Thickness
10/30/2009	11.25	-0.67	0.20
11/3/2009	11.29	-0.71	NP
11/4/2009	11.46	-0.88	0.10
11/12/2009	11.30	-0.72	0.27
1/21/2010	8.75	1.83	0.15

2. Not found after June 16, 2010.
3. Buried during gasholders Nos. 7 and 8 decommissioning and demolition.
4. Found to have casing broken on December 3, 2010.

TABLE 1B
SUMMARY OF NAPL MEASUREMENTS
Former Tidewater Facility
Pawtucket, Rhode Island

Site Area	Well ID	Measured Well Depth (Feet below Top of PVC)	Top of PVC Elevation (Feet)	Range of LNAPL Observed (feet)	Range of DNAPL Observed (feet)	April 23, 2009					June 18, 2009					May 17, 2010					May 20, 2011					June 16, 2010					November 2, 2010				
						Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness	Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness	Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness	Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness	Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness	Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness
						(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)
NFA	MW-5 / TB-14	11.60	32.23	NP	NP	Dry	-	NP	-	NP	Dry	-	NP	-	NP											Dry	-	NP	-	NP	Dry	-	NP	-	NP
NFA	MW-7 / TB-20	27.45	31.98	NP	NP						18.60	-	NP	-	NP											19.14	-	NP	-	NP	20.27	-	NP	-	NP
NFA	MW-204	16.77	9.47	NP	NP						9.15	-	NP	-	NP											5.87	-	NP	-	NP	9.8	-	NP	-	NP
NFA	MW-205	15.00	12.20	NP	NP																					1.58	-	NP	-	NP	2.18	-	NP	-	NP
NFA	MW-206	28.77	37.22	NP	NP						25.85	-	NP	-	NP											26.17	-	NP	-	NP	27.05	-	NP	-	NP
NFA	MW-310S	17.35	9.59	NP	NP																					9.9	-	NP	-	NP	12.82	-	NP	-	NP
NFA	MW-310D	36.20	9.18	NP	NP																					5.5	-	NP	-	NP	9.37	-	NP	-	NP
NFA	MW-311	22.00	10.26	NP	NP																9.1	-	NP	-	NP	6.96	-	NP	-	NP	10.4	-	NP	-	NP
FGPA	MW-201	15.00	13.76	NP	NP						9.26	-	NP	-	NP											9.24	-	NP	-	NP	10.23	-	NP	-	NP
FGPA	MW-202	13.80	14.39	NP	NP						2.70	-	NP	-	NP											2.9	-	NP	-	NP	4.85	-	NP	-	NP
FGPA	MW-203	14.80	10.29	NP	NP						7.70	-	NP	-	NP											7.86	-	NP	-	NP	8.91	-	NP	-	NP
FGPA	MW-207 (Note 3)	11.75	14.50	NP	NP						1.10	-	NP	-	NP																Buried / Destroyed				
FGPA	MW-208	21.75	28.23	NP	NP	11.9	-	NP	-	NP	13.94	-	NP	-	NP											14.35	-	NP	-	NP	16.56	-	NP	-	NP
FGPA	MW-209	21.05	24.74	NP	NP	8.91	-	NP	-	NP	10.75	-	NP	-	NP											10.94	-	NP	-	NP	13.3	-	NP	-	NP
FGPA	MW-210	17.28	11.35	0.05-2.54	NP						8.40	8.35	0.05	-	NP											8.1	8.05	0.05	-	NP	10.55	-	NP	-	NP
FGPA	MW-3 / TB-12	17.00	11.46	trace - 5.57	NP						11.47	11.45	0.02	-	NP											10	trace	trace	-	NP	12.2	trace	trace	-	NP
FGPA	MW-4 / TB-13(Note 1)	17.65	10.58	NP	trace - 1.15						2.70	-	NP	-	NP											10.6	-	NP	trace	trace	12.15	-	NP	trace	trace
FGPA	MW-303	41.85	9.07	NP	trace - 2.53											7.91	-	NP	-	NP						8.71	-	NP	trace	trace	10.12	-	NP	39.32	2.53
FGPA	MW-312S	23.55	10.64	trace - 0.45	trace																8.65	-	NP	-	NP	8.37	-	NP	trace	trace	11.25	10.8	0.45	-	NP
FGPA	MW-312D	31.90	10.57	NP	trace																6.15	-	NP	-	NP	8.26	-	NP	trace	trace	11.4	-	NP	-	NP
FGPA	MW-313S	24.90	11.74	trace - 4.52	trace											11.18	11.17	0.01	-	NP						9.94	trace	trace	-	NP	12.71	-	NP	trace	trace
FGPA	MW-313D	47.35	12.01	NP	NP											11.05	-	NP	-	NP						9.85	-	NP	-	NP	12.77	-	NP	-	NP
FGPA	MW-326S	26.60	12.61	trace - 0.3	NP																					11.05	-	NP	-	NP	13.58	trace	trace	-	NP
FGPA	MW-326D	45.05	11.91	NP	NP																					10	-	NP	-	NP	12.82	-	NP	-	NP
FGPA	MW-333S	18.30	12.30	NP	NP																														
FGPA	MW-333D	45.20	12.30	NP	NP																														
FGPA	MW-335S	15.75	11.50	NP	NP																														
FGPA	MW-335D	36.50	11.96	NP	NP																														
FGPA	MW-336	15.00	12.73	NP	NP																														
FGPA	MW-339S	12.35	15.26	NP	NP																														
FGPA	MW-339D	20.95	15.42	NP	trace																														
FGPA	MW-341	30.10	19.62	NP	trace - 2																														
FPPA	M&E MW-1 (Note 4)	15.05	9.36	NP	NP	9.2	-	NP	-	NP	7.85	-	NP	-	NP											7.3	-	NP	-	NP	10.62	-	NP	-	NP
FPPA	M&E MW-2 (Note 2)	13.85	10.81	NP	NP	9.22	-	NP	-	NP	9.49	-	NP	-	NP											8.12	-	NP	-	NP	10.96	-	NP	-	NP
FPPA	M&E MW-4 (Note 4)	7.81		NP	NP	5.5	-	NP	-	NP	5.93	-	NP	-	NP																Not Found				
FPPA	M&E MW-5	16.88	8.92	0.04 - 3.24	NP	10.47	9.12	1.35	-	NP	7.94	7.50	0.44	-	NP											9.15	-	NP	-	NP	8.5	8.46	0.04	-	NP
FPPA	MW-6 / TB-8	19.03	13.49	NP	NP	11.54	-	NP	-	NP																11.38	-	NP	-	NP	12	-	NP	-	NP
FPPA	MW-101/TB-101	16.00	10.94	NP	NP	10.2	-	NP	-	NP	10.12	-	NP	-	NP											9.3	-	NP	-	NP	10.53	-	NP	-	NP
FPPA	MW-109/TB-109	19.30	14.09	NP	NP	9.98	-	NP	-	NP	11.36	-	NP	-	NP											10.83	-	NP	-	NP	12.55	-	NP	-	NP
FPPA	MW-102	26.80	19.74	NP	NP	17.78	-	NP	-	NP	18.18	-	NP	-	NP											17.6	-	NP	-	NP	18.38	-	NP	-	NP
FPPA	MW-103	16.90	11.33	trace - 0.31	trace - 0.08	9.7	-	NP	-	NP	9.98	-	NP	-	NP											9.16	-	NP	-	NP	10.56	10.55	0.01	trace	trace
FPPA	MW-104	14.90	11.77	NP	NP	10.9	-	NP	-	NP	11.20	-	NP	-	NP											9.86	-	NP	-	NP	10.41	-	NP	-	NP
FPPA	MW-105	27.55	22.14	NP	NP	19.75	-	NP	-	NP	20.14	-	NP	-	NP											19.8	-	NP	-	NP	20.46	-	NP	-	NP
FPPA	MW-314S	24.50	10.37	0.01	NP											11.73	11.72	0.01	-	NP	10.17	-	NP	-	NP	9.05	-	NP	-	NP	11.05	-	NP	-	NP
FPPA	MW-314D	43.40	10.38	NP	NP											10.64	-	NP	-	NP	8.48	-	NP	-	NP	8.85	-	NP	-	NP	11.05	-	NP	-	NP
FPPA	MW-315S	26.40	10.98	NP	NP																10.89	-	NP	-	NP	9.8	-	NP	-	NP	11.95	-	NP	-	NP
FPPA	MW-315D	41.70	10.69	NP	NP																10.65	-	NP	-	NP	9.86	-	NP	-	NP	11.68	-	NP	-	NP
FPPA	MW-316S	22.30	24.52	NP	NP																20.32	-	NP	-	NP	20.95	-	NP	-	NP	Dry	-	NP	-	NP
FPPA	MW-316D	31.55	24.68	NP	NP																20.1	-	NP	-	NP	20.78	-	NP	-	NP	22.31	-	NP	-	NP
FPPA	MW-317S	27.40	25.35	NP	NP																22.99	-	NP	-	NP	23.03	-	NP	-	NP	23.69	-	NP	-	NP
FPPA	MW-317D	36.20	25.47	NP	NP																21.28	-	NP	-	NP	21.15	-	NP	-	NP	23	-	NP	-	NP
FPPA	MW-337	20.00	13.53	NP	NP																														
FPPA	MW-338S	18.45	13.94	NP	NP																														
FPPA	MW-338D	39.65	13.48	NP	NP																														
SFA	MW-1 / TB-6	23.20	19.59	NP	trace - 0.8	17.44	-	NP	22.91	0.29	17.77	-	NP	22.40	0.8											17.38	-	NP	trace	trace	Dry	-	NP	trace	trace
SFA	MW-107	27.35	21.80	NP	NP	19.4	-	NP	-	NP	19.80	-	NP	-	NP											19.52	-	NP	-	NP	20.14	-	NP	-	NP
SFA	MW-318S	27.00	18.96	NP	NP																17.63	-	NP	-	NP	16.51	-	NP	-	NP	17.46	-	NP	-	NP
SFA	MW-318D	43.60	18.70	NP	NP																18.5	-	NP	-	NP	16.1	-	NP	-	NP	18.89	-	NP	-	NP
SFA	MW-319S	27.10	19.96	NP	NP											18.36	-	NP	-	NP						17.55	-	NP	-	NP	18.55	-	NP	-	NP
SFA	MW-319D	43.85	20.33	NP	NP											19.69	-	NP	-	NP						17.65	-	NP	-	NP	19.62	-	NP	-	NP
SFA	MW-320S	10.95	7.73	NP	trace - 1.73											5.85	-	NP	10.77	0.18						5.6	-	NP	-	NP	6.1	-	NP	9.07	1.73
SFA	MW-320D	25.70	8.69	NP	1.1 - 10											8.85	-	NP	22.00	3.7						8.4	-	NP	24.6	1.1	8.77	-	NP	16.72	6.48
SFA	MW-321S	12.55	6.47	NP	NP											4.7	-	NP	-	NP						4.5	-	NP	-	NP	5.03	-	NP	-	NP
SFA	MW-321D	29.10	6.51	NP	NP											4.9	-	NP	-	NP						4.75	-	NP	-	NP	5.38	-	NP	-	NP
SFA	MW-334S	28.80	21.34	NP	NP																														
SFA	MW-334D	43.20	21.53	NP	NP																														

Notes
NFA = North Fill Area
FGPA = Former Gas Plant Area
FPPA = Former Power Plant Area
SFA = South Fill Area
Elevations are relative to NGVD-1929.
NP - Indicates No Product observed.
Blanks indicate no measurement collected on that particular day.

1. MW-4 was periodically gauged between October 2009 to January 2010 to assess thickness of DNAPL.

Date	Depth to GW	Potentiometric Elevation	DNAPL Thickness
10/30/2009	11.25	-0.67	0.20
11/3/2009	11.29	-0.71	NP
11/4/2009	11.46	-0.88	0.10
11/12/2009	11.30	-0.72	0.27
1/21/2010	8.75	1.83	0.15

2. Not found after June 16, 2010.
3. Buried during gasholders Nos. 7 and 8 decommissioning and demolition.
4. Found to have casing broken on December 3, 2010.

TABLE 1B
SUMMARY OF NAPL MEASUREMENTS
Former Tidewater Facility
Pawtucket, Rhode Island

Site Area	Well ID	Measured Well Depth (Feet below Top of PVC)	Top of PVC Elevation (Feet)	Range of LNAPL Observed (feet)	Range of DNAPL Observed (feet)	November 19, 2010					December 3, 2010					January 24, 2011					February 17, 2011					March 29, 2011					April 26, 2011				
						Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness	Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness	Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness	Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness	Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness	Depth to Water	Depth to LNAPL	LNAPL Thickness	Depth to DNAPL	DNAPL Thickness
						(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)
NFA	MW-5 / TB-14	11.60	32.23	NP	NP						Dry	-	NP	-	NP	Dry	-	NP	-	NP											10.98	-	NP	-	NP
NFA	MW-7 / TB-20	27.45	31.98	NP	NP						20.55	-	NP	-	NP	20.02	-	NP	-	NP											17.73	-	NP	-	NP
NFA	MW-204	16.77	9.47	NP	NP						7.62	-	NP	-	NP	6.67	-	NP	-	NP											8.79	-	NP	-	NP
NFA	MW-205	15.00	12.20	NP	NP						2.96	-	NP	-	NP	1.73	-	NP	-	NP											1.2	-	NP	-	NP
NFA	MW-206	28.77	37.22	NP	NP						26.9	-	NP	-	NP	26.62	-	NP	-	NP											25.43	-	NP	-	NP
NFA	MW-310S	17.35	9.59	NP	NP						7.68	-	NP	-	NP	6.67	-	NP	-	NP											8.56	-	NP	-	NP
NFA	MW-310D	36.20	9.18	NP	NP						7.34	-	NP	-	NP	6.06	-	NP	-	NP											8.52	-	NP	-	NP
NFA	MW-311	22.00	10.26	NP	NP						8.49	-	NP	-	NP	7.2	-	NP	-	NP											9.28	-	NP	-	NP
FGPA	MW-201	15.00	13.76	NP	NP						9.38	-	NP	-	NP	4.95	-	NP	-	NP											7.93	-	NP	-	NP
FGPA	MW-202	13.80	14.39	NP	NP						4.25	-	NP	-	NP	3.87	-	NP	-	NP											2.34	-	NP	-	NP
FGPA	MW-203	14.80	10.29	NP	NP						7.87	-	NP	-	NP	8.05	-	NP	-	NP											7.21	-	NP	-	NP
FGPA	MW-207 (Note 3)	11.75	14.50	NP	NP						Buried / Destroyed					Buried / Destroyed					Destroyed					Destroyed					Destroyed				
FGPA	MW-208	21.75	28.23	NP	NP						16.33	-	NP	-	NP	Not Found					15.6	-	NP	-	NP						13.13	-	NP	-	NP
FGPA	MW-209	21.05	24.74	NP	NP						13.07	-	NP	-	NP	12.45	-	NP	-	NP											10.04	-	NP	-	NP
FGPA	MW-210	17.28	11.35	0.05-2.54	NP						8.95	-	NP	-	NP	8.15	7.92	0.23	-	NP	9.34	8.42	0.92	-	NP	10.36	7.82	2.54	-	NP	9.63	7.15	2.48	-	NP
FGPA	MW-3 / TB-12	17.00	11.46	trace - 5.57	NP	10.54	10.49	0.05	-	NP	11.85	trace	trace	-	NP	13.55	7.98	5.57	-	NP	10.01	9.21	0.8	-	NP	12.31	10.6	1.71	-	NP	12.18	10.54	1.64	-	NP
FGPA	MW-4 / TB-13(Note 1)	17.65	10.58	NP	trace - 1.15	10.73	-	NP	trace	trace	10.6	-	NP	trace	trace	7.78	-	NP	16.5	1.15	8.71	-	NP	trace	trace	10.82	-	NP	trace	trace	10.54	-	NP	trace	trace
FGPA	MW-303	41.85	9.07	NP	trace - 2.53	8.74	-	NP	41.3	0.55	8.92	-	NP	41.35	0.5	5.95	-	NP	trace	trace	6.99	-	NP	40.97	0.88	8.62	-	NP	41.7	0.15	8.49	-	NP	41.3	0.4
FGPA	MW-312S	23.55	10.64	trace - 0.45	trace	9.58	9.45	0.13	-	NP	9.03	trace	trace	-	NP	8.47	trace	trace	-	NP	8.63	trace	trace	-	NP	9.71	trace	trace	-	NP	9.69	9.49	0.2	-	NP
FGPA	MW-312D	31.90	10.57	NP	trace						10.05	-	NP	-	NP	7.38	-	NP	-	NP						10	-	NP	-	NP	9.9	-	NP	-	NP
FGPA	MW-313S	24.90	11.74	trace - 4.52	trace	10.86	-	NP	-	NP	11.9	-	NP	-	NP	12.8	8.28	4.52	-	NP	9.81	9.59	0.22	-	NP	11.26	11.22	0.04	-	NP	11.13	11.08	0.05	-	NP
FGPA	MW-313D	47.35	12.01	NP	NP						11.82	-	NP	-	NP	8.7	-	NP	-	NP						11.15	-	NP	-	NP	11.03	-	NP	-	NP
FGPA	MW-326S	26.60	12.61	trace - 0.3	NP	11.91	11.61	0.3	-	NP	11.87	trace	trace	-	NP	9.72	-	NP	-	NP	13.17	trace	trace	-	NP	12.02	trace	trace	-	NP	11.96	11.93	0.03	-	NP
FGPA	MW-326D	45.05	11.91	NP	NP						12.15	-	NP	-	NP	8.95	-	NP	-	NP	12.39	-	NP	-	NP	11.17	-	NP	-	NP	11.25	-	NP	-	NP
FGPA	MW-333S	18.30	12.30	NP	NP						10.96	-	NP	-	NP	9.38	-	NP	-	NP											11.62	-	NP	-	NP
FGPA	MW-333D	45.20	12.30	NP	NP						10.6	-	NP	-	NP	9	-	NP	-	NP											11.42	-	NP	-	NP
FGPA	MW-335S	15.75	11.50	NP	NP						9.22	-	NP	-	NP	5.35	-	NP	-	NP											8.91	-	NP	-	NP
FGPA	MW-335D	36.50	11.96	NP	NP						10.02	-	NP	-	NP	8.45	-	NP	-	NP											10.78	-	NP	-	NP
FGPA	MW-336	15.00	12.73	NP	NP						10.37	-	NP	-	NP	11.24	-	NP	-	NP											10.23	-	NP	-	NP
FGPA	MW-339S	12.35	15.26	NP	NP						6.62	-	NP	-	NP	6.35	-	NP	-	NP	6.02	-	NP	-	NP	5.04	-	NP	-	NP	4.7	-	NP	-	NP
FGPA	MW-339D	20.95	15.42	NP	trace						6.36	-	NP	-	NP	6.05	-	NP	-	NP	8.83	-	NP	-	NP	4.85	-	NP	trace	trace	4.63	-	NP	trace	trace
FGPA	MW-341	30.10	19.62	NP	trace - 2						9.42	-	NP	trace	trace	8.8	-	NP	28.65	1.5	8.63	-	NP	29.1	1	6.88	-	NP	28.35	1.8	6.36	-	NP	28.65	1.5
FPPA	M&E MW-1 (Note 4)	15.05	9.36	NP	NP						Damaged					Damaged															9.14	-	NP	-	NP
FPPA	M&E MW-2 (Note 2)	13.85	10.81	NP	NP						10.54	-	NP	-	NP	8.95	-	NP	-	NP											10.23	-	NP	-	NP
FPPA	M&E MW-4 (Note 4)	7.81		NP	NP						Not Found					Not Found					Not Found					Not Found					Not Found				
FPPA	M&E MW-5	16.88	8.92	0.04 - 3.24	NP	9.2	8.03	1.17	-	NP	Damaged					Damaged										13.53	10.29	3.24	-	NP	10.65	7.49	3.16	-	NP
FPPA	MW-6 / TB-8	19.03	13.49	NP	NP						11.64	-	NP	-	NP	11.8	-	NP	-	NP											11.66	-	NP	-	NP
FPPA	MW-101/TB-101	16.00	10.94	NP	NP						10.31	-	NP	-	NP	6.58	-	NP	-	NP											9.77	-	NP	-	NP
FPPA	MW-109/TB-109	19.30	14.09	NP	NP						12.13	-	NP	-	NP	Not Found					12.06	-	NP	-	NP						10.98	-	NP	-	NP
FPPA	MW-102	26.80	19.74	NP	NP						17.9	-	NP	-	NP	18	-	NP	-	NP											17.84	-	NP	-	NP
FPPA	MW-103	16.90	11.33	trace - 0.31	trace - 0.08	10.36	-	NP	16.82	0.08	10.28	trace	trace	-	NP	10.06	9.75	0.31	-	NP	10.61	trace	trace	-	NP	10.25	trace	trace	-	NP	9.77	9.75	0.02	-	NP
FPPA	MW-104	14.90	11.77	NP	NP						10.13	-	NP	-	NP	Not Found					10.55	-	NP	-	NP						9.73	-	NP	-	NP
FPPA	MW-105	27.55	22.14	NP	NP						20.17	-	NP	-	NP	20.21	-	NP	-	NP											9.78	-	NP	-	NP
FPPA	MW-314S	24.50	10.37	0.01	NP						10.65	-	NP	-	NP	6.4	-	NP	-	NP						9.85	-	NP	-	NP	9.47	-	NP	-	NP
FPPA	MW-314D	43.40	10.38	NP	NP						10.67	-	NP	-	NP	8.58	-	NP	-	NP											9.79	-	NP	-	NP
FPPA	MW-315S	26.40	10.98	NP	NP						11.62	-	NP	-	NP	9.86	-	NP	-	NP											10.59	-	NP	-	NP
FPPA	MW-315D	41.70	10.69	NP	NP						11.35	-	NP	-	NP	9.63	-	NP	-	NP											10.43	-	NP	-	NP
FPPA	MW-316S	22.30	24.52	NP	NP						22.05	-	NP	-	NP	21.93	-	NP	-	NP											20.75	-	NP	-	NP
FPPA	MW-316D	31.55	24.68	NP	NP						22.18	-	NP	-	NP	22.05	-	NP	-	NP											21.07	-	NP	-	NP
FPPA	MW-317S	27.40	25.35	NP	NP						23.4	-	NP	-	NP	23.42	-	NP	-	NP											22.99	-	NP	-	NP
FPPA	MW-317D	36.20	25.47	NP	NP						22.92	-	NP	-	NP	22.56	-	NP	-	NP											21.64	-	NP	-	NP
FPPA	MW-337	20.00	13.53	NP	NP						11.94	-	NP	-	NP	11.88	-	NP	-	NP	12.3	-	NP	-	NP						11.63	-	NP	-	NP
FPPA	MW-338S	18.45	13.94	NP	NP						12.22	-	NP	-	NP	12.35	-	NP	-	NP	12.62	-	NP	-	NP						11.79	-	NP	-	NP
FPPA	MW-338D	39.65	13.48	NP	NP						13.52	-	NP	-	NP	12.46	-	NP	-	NP	13.4	-	NP	-	NP						12.67	-	NP	-	NP
SFA	MW-1 / TB-6	23.20	19.59	NP	trace - 0.8	17.86	-	NP	-	NP	17.7	-	NP	22.7	0.5	17.85	-	NP	trace	trace	18.06	-	NP	-	NP	17.86	-	NP	22.8	0.4	17.6	-	NP	22.53	0.67
SFA	MW-107	27.35	21.80	NP	NP						19.84	-	NP	-	NP	19.86	-	NP	-	NP											19.45	-	NP	-	NP
SFA	MW-318S	27.00	18.96	NP	NP						17.22	-	NP	-	NP	17.26	-	NP	-	NP											16.93	-	NP	-	NP
SFA	MW-318D	43.60	18.70	NP	NP						18.96	-	NP	-	NP	18.65	-	NP	-	NP											17.47	-	NP	-	NP
SFA	MW-319S	27.10	19.96	NP	NP						18.53	-	NP	-	NP	18.56	-	NP	-	NP											18.26	-	NP	-	NP
SFA	MW-319D	43.85	20.33	NP	NP						20.22	-	NP	-	NP	20.15	-	NP	-	NP											19.3	-	NP	-	NP
SFA	MW-320S	10.95	7.73	NP	trace - 1.73	6.28	-	NP	-	NP	5.9	-	NP	10.75	0.2	6.05	-	NP	trace	trace	6.35	-	NP	trace	trace	6.3	-	NP	trace	trace	7.14	-	NP	trace	trace
SFA	MW-320D	25.70	8.69	NP	1.1 - 10	10	-	NP	24.2	1.5	8.95	-	NP	15.7	10	9.45	-	NP	22.5	3.2	8.7	-	NP	23.55	2.15	8.25	-	NP	21.55	4.15	8.03	-	NP	22.32	3
SFA	MW-321S	12.55	6.47	NP	NP						4.87	-	NP	-	NP	4.92	-	NP	-	NP											4.78	-	NP	-	NP
SFA	MW-321D	29.10	6.51	NP	NP						5.57	-	NP	-	NP	5.58	-	NP	-	NP											4.85	-	NP	-	NP
SFA	MW-334S	28.80	21.34	NP	NP						19.39	-	NP	-	NP	19.48	-	NP	-	NP											19.07	-	NP	-	NP
SFA	MW-334D	43.20	21.53	NP	NP						21.46	-	NP	-	NP	21.25	-	NP	-	NP											20.56	-	NP	-	NP

Notes

NFA = North Fill Area
FGPA = Former Gas Plant Area
FPPA = Former Power Plant Area
SFA = South Fill Area
Elevations are relative to NGVD-1929.
NP - Indicates No Product observed.
Blanks indicate no measurement collected on that particular day.

1. MW-4 was periodically gauged between October 2009 to January 2010 to assess thickness of DNAPL.

Date	Depth to GW	Potentiometric Elevation	DNAPL Thickness
10/30/2009	11.25	-0.67	0.20
11/3/2009	11.29	-0.71	NP
11/4/2009	11.46	-0.88	0.10
11/12/2009	11.30	-0.72	0.27
1/21/2010	8.75	1.83	0.15

2. Not found after June 16, 2010.
3. Buried during gasholders Nos. 7 and 8 decommissioning and demolition.
4. Found to have casing broken on December 3, 2010.

TABLE 1B
SUMMARY OF NAPL MEASUREMENTS
Former Tidewater Facility
Pawtucket, Rhode Island

Site Area	Well ID	Measured Well Depth (Feet below Top of PVC)	Top of PVC Elevation (Feet)	Range of LNAPL Observed (feet)	Range of DNAPL Observed (feet)	May 4, 2011					June 3, 2011					June 29, 2011				
						Depth to Water (feet)	Depth to LNAPL (feet)	LNAPL Thickness (feet)	Depth to DNAPL (feet)	DNAPL Thickness (feet)	Depth to Water (feet)	Depth to LNAPL (feet)	LNAPL Thickness (feet)	Depth to DNAPL (feet)	DNAPL Thickness (feet)	Depth to Water (feet)	Depth to LNAPL (feet)	LNAPL Thickness (feet)	Depth to DNAPL (feet)	DNAPL Thickness (feet)
NFA	MW-5 / TB-14	11.60	32.23	NP	NP															
NFA	MW-7 / TB-20	27.45	31.98	NP	NP															
NFA	MW-204	16.77	9.47	NP	NP															
NFA	MW-205	15.00	12.20	NP	NP															
NFA	MW-206	28.77	37.22	NP	NP															
NFA	MW-310S	17.35	9.59	NP	NP															
NFA	MW-310D	36.20	9.18	NP	NP															
NFA	MW-311	22.00	10.26	NP	NP															
FGPA	MW-201	15.00	13.76	NP	NP															
FGPA	MW-202	13.80	14.39	NP	NP															
FGPA	MW-203	14.80	10.29	NP	NP															
FGPA	MW-207 (Note 3)	11.75	14.50	NP	NP			Destroyed					Destroyed					Destroyed		
FGPA	MW-208	21.75	28.23	NP	NP															
FGPA	MW-209	21.05	24.74	NP	NP															
FGPA	MW-210	17.28	11.35	0.05-2.54	NP	9.03	7.01	2.02	-	NP	9.05	8.05	1	-	NP	8.98	8.65	0.33	-	NP
FGPA	MW-3 / TB-12	17.00	11.46	trace - 5.57	NP	9.49	9.22	0.27	-	NP	10.43	9.63	0.8	-	NP	11.21	11.18	0.03	-	NP
FGPA	MW-4 / TB-13(Note 1)	17.65	10.58	NP	trace - 1.15	7.80	-	NP	trace	trace	8.78	-	NP	trace	trace	9.00	-	NP	trace	trace
FGPA	MW-303	41.85	9.07	NP	trace - 2.53	6.12	-	NP	41.1	0.6	7.00	-	NP	41.72	0.08	7.10	-	NP	41.55	0.25
FGPA	MW-312S	23.55	10.64	trace - 0.45	trace	8.52	8.24	0.28	-	NP	8.72	8.71	0.01	-	NP	8.78	8.64	0.14	-	NP
FGPA	MW-312D	31.90	10.57	NP	trace	8.59	-	NP	-	NP	8.12	-	NP	-	NP	8.55	-	NP	-	NP
FGPA	MW-313S	24.90	11.74	trace - 4.52	trace	9.12	9.1	0.02	-	NP	10.49	trace	trace	-	NP	11.23	11.22	0.01	-	NP
FGPA	MW-313D	47.35	12.01	NP	NP	9.07	-	NP	-	NP	10.45	-	NP	-	NP	11.21	-	NP	-	NP
FGPA	MW-326S	26.60	12.61	trace - 0.3	NP	10.34	10.33	0.01	-	NP	11.46	trace	trace	-	NP	12.28	12.27	0.01	-	NP
FGPA	MW-326D	45.05	11.91	NP	NP	9.55	-	NP	-	NP	10.75	-	NP	-	NP	11.45	-	NP	-	NP
FGPA	MW-333S	18.30	12.30	NP	NP															
FGPA	MW-333D	45.20	12.30	NP	NP															
FGPA	MW-335S	15.75	11.50	NP	NP															
FGPA	MW-335D	36.50	11.96	NP	NP															
FGPA	MW-336	15.00	12.73	NP	NP															
FGPA	MW-339S	12.35	15.26	NP	NP	4.75	-	NP	-	NP	5.21	-	NP	-	NP	5.65	-	NP	-	NP
FGPA	MW-339D	20.95	15.42	NP	trace	4.54	-	NP	-	NP	4.95	-	NP	-	NP	5.40	-	NP	-	NP
FGPA	MW-341	30.10	19.62	NP	trace - 2	6.79	-	NP	28.15	2	7.28	-	NP	28.6	1.55	8.10	-	NP	28.85	1.3
FPPA	M&E MW-1 (Note 4)	15.05	9.36	NP	NP															
FPPA	M&E MW-2 (Note 2)	13.85	10.81	NP	NP															
FPPA	M&E MW-4 (Note 4)	7.81		NP	NP			Not Found					Not Found					Not Found		
FPPA	M&E MW-5	16.88	8.92	0.04 - 3.24	NP	8.42	7.3	1.12	-	NP	8.40	7.2	1.2	-	NP	8.40	8	0.4	-	NP
FPPA	MW-6 / TB-8	19.03	13.49	NP	NP															
FPPA	MW-101/TB-101	16.00	10.94	NP	NP															
FPPA	MW-109/TB-109	19.30	14.09	NP	NP															
FPPA	MW-102	26.80	19.74	NP	NP															
FPPA	MW-103	16.90	11.33	trace - 0.31	trace - 0.08	8.60	8.42	0.18	-	NP	10.02	9.93	0.09	-	NP	10.79	10.78	0.01	-	NP
FPPA	MW-104	14.90	11.77	NP	NP															
FPPA	MW-105	27.55	22.14	NP	NP															
FPPA	MW-314S	24.50	10.37	0.01	NP	8.45	-	NP	-	NP	10.32	-	NP	-	NP	10.04	-	NP	-	NP
FPPA	MW-314D	43.40	10.38	NP	NP	8.31	-	NP	-	NP	10.82	-	NP	-	NP	10.32	-	NP	-	NP
FPPA	MW-315S	26.40	10.98	NP	NP															
FPPA	MW-315D	41.70	10.69	NP	NP															
FPPA	MW-316S	22.30	24.52	NP	NP															
FPPA	MW-316D	31.55	24.68	NP	NP															
FPPA	MW-317S	27.40	25.35	NP	NP															
FPPA	MW-317D	36.20	25.47	NP	NP															
FPPA	MW-337	20.00	13.53	NP	NP															
FPPA	MW-338S	18.45	13.94	NP	NP															
FPPA	MW-338D	39.65	13.48	NP	NP															
SFA	MW-1 / TB-6	23.20	19.59	NP	trace - 0.8						17.75	-	NP	23.05	0.15	17.67	-	NP	22.6	0.6
SFA	MW-107	27.35	21.80	NP	NP															
SFA	MW-318S	27.00	18.96	NP	NP															
SFA	MW-318D	43.60	18.70	NP	NP															
SFA	MW-319S	27.10	19.96	NP	NP															
SFA	MW-319D	43.85	20.33	NP	NP															
SFA	MW-320S	10.95	7.73	NP	trace - 1.73						6.11	-	NP	trace	trace	6.06	-	NP	trace	trace
SFA	MW-320D	25.70	8.69	NP	1.1 - 10						9.52	-	NP	21.2	4.1	8.50	-	NP	21.2	4.1
SFA	MW-321S	12.55	6.47	NP	NP															
SFA	MW-321D	29.10	6.51	NP	NP															
SFA	MW-334S	28.80	21.34	NP	NP															
SFA	MW-334D	43.20	21.53	NP	NP															

Notes

NFA = North Fill Area
FGPA = Former Gas Plant Area
FPPA = Former Power Plant Area
SFA = South Fill Area
Elevations are relative to NGVD-1929.
NP - Indicates No Product observed.
Blanks indicate no measurement collected on that particular day.

1. MW-4 was periodically gauged between October 2009 to January 2010 to assess thickness of DNAPL

Date	Depth to GW	Potentiometric Elevation	DNAPL Thickness
10/30/2009	11.25	-0.67	0.20
11/3/2009	11.29	-0.71	NP
11/4/2009	11.46	-0.88	0.10
11/12/2009	11.30	-0.72	0.27
1/21/2010	8.75	1.83	0.15

2. Not found after June 16, 2010.
3. Buried during gasholders Nos. 7 and 8 decommissioning and demolition.
4. Found to have casing broken on December 3, 2010.

TABLE 2A
SUMMARY OF DNAPL RECOVERY
Former Tidewater Facility
Pawtucket, Rhode Island

Well ID	Date	Start Pumping	Depth to Water (feet)	Depth to DNAPL (feet)	Depth to Bottom (feet)	Estimated Volume Purged (gallons)	Tide Condition	Notes
MW-1	7/2/2010		17.99	22.9	22.72	0.25		
MW-1	11/19/2010	12:30	17.86	trace	22.75		Low	DNAPL on probe (0.25")
MW-303	7/2/2010		8.8	41.18	42	Trace		
MW-303	11/2/2010	14:10	10.12	39.32	42	0.75	Mid	Measured thickness of DNAPL from probe, was not able to get to bottom, so estimate by probe
MW-303	11/19/2010	10:15	8.74	41.6	42	0.10	Low	DNAPL is very viscous
MW-303	2/17/2011	12:44	6.99	40.97	42.02	0.10	Low	DNAPL is very viscous
MW-303	5/5/2011	10:32	6.12	41.1	41.7	0.05	High	DNAPL is very viscous
MW-303	6/29/2011	10:02	7.1	41.55	41.7	Trace	Mid	Was not able to recover any DNAPL due to extreme viscosity
MW-312D	7/2/2010		10.37	trace	31.87	Trace		
MW-313S	7/2/2010		dry		24.8	Trace		
MW-313S	11/19/2010	9:30	10.86	trace	24.9		Mid	Did not pump
MW-320D	7/2/2010		8.15	15.6	23.2	0.25		
MW-320D	11/2/2010	15:20	8.77	16.72	23.3		Mid	Was not able to recover any DNAPL due to extreme viscosity
MW-320D	11/19/2010	13:15	10	24.2	26.4	0.1	Low	Measured from top of casing, DNAPL is very viscous
MW-320S	7/2/2010		6.4	9.23	10.8	Trace		
MW-320S	11/19/2010	13:00	6.28	9.68	10.9		Low	Did not pump due to viscosity of DNAPL.
MW-341	2/17/2011	14:25	8.68	29.1	30.1	0.2	Low	
MW-341	3/29/2011	10:38	6.88	28.35	30.15	0.25	Low	
MW-341	5/5/2011	10:27	8.45	28.15	30.15	0.5	High	
MW-341	6/3/2011	10:54	7.28	28.6	30.15	0.5	High	
MW-341	6/17/2011	9:50	7.56	28.55	30.15	0.1	High	
MW-341	6/29/2011	9:24	8.1	28.85	30.15	0.5	Mid/High	
MW-4	7/2/2010		10.85	trace	15.5	0.05		
MW-4	11/19/2010	10:12	10.73	trace	15.95		Mid	

Notes:

Depth to bottom in this table are from 11/2/2010 gauging round, if not recorded

TABLE 2B
SUMMARY OF LNAPL RECOVERY

File No. 05.0043654.00
7/25/2011

Former Tidewater Facility
Pawtucket, Rhode Island

Well ID	Date	Start Pumping	Depth to LNAPL (feet)	Depth to Water (feet)	Depth to Bottom (feet)	Estimated Volume Purged (gallons)	Tide Condition	Notes
M&E MW-5	7/2/2010		6.43	6.6	14.6	0.05		
M&E MW-5	11/19/2010	11:20	8.03	9.2	14.6	0.35	Low	
M&E MW-5	3/29/2011	15:28	10.29	13.53	16.88	0.75	Mid	elevations adjusted for broken PVC
M&E MW-5	5/5/2011	9:32	9.63	10.75	16.88	0.50	High	elevations adjusted for broken PVC
M&E MW-5	6/3/2011	14:15	7.20	8.4	14.65	0.50	Low	elevations adjusted for broken PVC
M&E MW-5	6/29/2011	13:05	8.00	8.4	14.65	0.50	Low	elevations adjusted for broken PVC
MW-103	7/2/2010		10.31	10.32	16.82	trace		
MW-103	11/19/2010	12:00	10.35	10.36	16.85	trace	Low	Blebs in purge water
MW-210	7/2/2010		9.6	9.75	17.3	0.05		
MW-210	2/17/2011	12:14	8.42	9.34	17.15	0.5	Low	
MW-210	3/29/2011	11:25	7.82	10.36	17.3	0.5	Low	
MW-210	5/5/2011	11:10	7.01	9.03	17.3	0.5	High	
MW-210	6/3/2011	11:50	8.05	9.05	17.3	0.5	Mid	
MW-210	6/29/2011	10:45	8.65	8.98	17.3	0.10	Mid	
MW-3	11/19/2010	9:22	10.47	10.54	17	0.20	Mid	
MW-3	2/17/2011	10:40	9.21	10.01	16.72	0.50	Mid	
MW-3	3/29/2011	11:59	10.6	12.31	17.05	0.25	Low	
MW-3	5/5/2011	13:31	9.22	9.49	17.1	0.20	Mid	
MW-3	6/3/2011	12:37	9.63	10.43	17.1	0.10	Mid	
MW-312S	7/2/2010		10.02	10.11	23.5	0.05		
MW-312S	11/2/2010	14:45	10.85	11.25	23.5	0.5	Mid	
MW-312S	11/19/2010	9:40	9.45	9.58	23.5	0.25	Mid	
MW-312S	5/5/2011	12:45	8.24	8.52	23.5	0.10	Mid	
MW-313S	2/17/2011	11:56	9.59	9.81	24.76	0.10	Low	
MW-326S	11/19/2010	9:20	11.61	11.91	26.6	0.25	Mid	

Notes:

Depth to bottom in this table are from 11/2/2010 gauging round, if not recorded

TABLE 3
SUMMARY OF SHEEN OBSERVATIONS
Former Tidewater Facility
Pawtucket, Rhode Island

Date	Time	Approximate Tidal Stage	Sheen Observation Location	Sheen Characteristics
10/30/2009	1045	Low	Vicinity of MW-4 in FGPA	Small bright spots
11/5/2009	1600	Low	Vicinity of MW-3 in FGPA away from shore	Faint sheen bands
11/12/2009	950	Low	Vicinity of MW-4 in FGPA	Small bright spots
11/12/2009	950	Low	Vicinity of MW-3 in FGPA away from shore	Faint sheen bands
11/18/2009	1130	Mid	Vicinity of MW-3 in FGPA away from shore	Faint sheen bands
4/14/2010	1230	Mid	Vicinity of MW-3 in FGPA	Moderate bright bands
4/16/2010	1515	Low	Vicinity of MW-3 in FGPA	4 Sheen spots
4/28/2010	1245	Mid	Vicinity of MW-3 in FGPA	Bright sheen spots
5/11/2010	1100	Low	Vicinity of MW-3 in FGPA	Large sheen spots
5/11/2010	1330	Mid	North east corner of FPPA	Large sheen strands
5/12/2010	1315	Low	Adjacent to MW-326 S/D	Large sheen spots
5/12/2010	1315	Low	Shoreline cap area near MW-4	Small sheen spots
6/3/2010	800	Mid	Shoreline cap area near MW-4	Small sheen spots
6/18/2010	720	Low	Adjacent to MW-326 S/D	Moderate bright bands
7/7/2010	1345	Mid	Northern NFA	Long,dull bands
7/7/2010	1400	Mid	Shoreline cap area near MW-4	Small sheen spots
7/7/2010	1415	Mid	Adjacent to MW-326 S/D	Faint sheen bands
7/7/2010	1425	Mid	SFA south outwash river sediments	Few sheen spots
7/20/2010	920	Low	Adjacent to MW-326 S/D	Large bright plume
8/17/2010	950	Mid	Adjacent to MW-326 S/D	Slight sheen bands
8/20/2010	1530	Mid	34" Sewer pipe outfall washout adjacent to MW-103	Slight sheen
8/20/2010	1550	Mid	SFA south outwash stormwater out-flow	Slight sheen
8/26/2010	1450	Low	Adjacent to MW-326 S/D	Moderate, bright stands
8/27/2010	1600	Low	SFA south outwash river sediments	Few sheen spots
8/30/2010	1400	Mid	Adjacent to MW-315 (FPPA) between wood pilons and bulk head	Small sheen spots
8/30/2010	1505 - 1900	Mid	Along the FGPA, NFA and north of Site property	Long, dull bands
8/30/2010	1845	Mid	Adjacent to MW-326 S/D	Moderate, bright stands
2/17/2011	1130	Low	Adjacent to MW-326 S/D	Long, dull bands
3/4/2011	940	Mid	Adjacent to MW-326 S/D	Long dull bands
3/4/2011	1030	Low	54" CSO pipe outfall washout adjacent to MW-103	Slight sheen
3/17/2011	1000	Mid	54" CSO pipe outfall washout adjacent to MW-103	Slight sheen
3/29/2011	1500	Mid	Along entirety of the FPPA.	Heavy long dull sheen
3/29/2011	1500	Mid	54" CSO pipe outfall washout adjacent to MW-103	Slight sheen
4/14/2011	1000	Low	54" CSO pipe outfall washout adjacent to MW-103	Slight sheen
4/26/2011	1000	Low	Shoreline between MW-311 and MW-203	Trace sheen
4/26/2011	1300	Low to Mid	54" CSO pipe outfall washout adjacent to MW-103	Sheen
5/4/2011	1245	Low to Mid	54" CSO pipe outfall washout adjacent to MW-103	Trace sheen spots
5/4/2011	1345	Low	From MW-4 to bend in the shoreline (adjacent to MW-326)	Large bright bands fading to a dull sheen
5/4/2011	1355	Low	Bulkhead area in FPPA	Large bright bands fading to a dull sheen
5/4/2011	1358	Low	Along entirety of the FPPA.	Large bands of sheen dull
5/4/2011	1402	Low	54" CSO pipe outfall washout adjacent to MW-103	Large bright bands fading to a dull sheen
5/5/2011	1346	Low to Mid	Adjacent to MW-326 S/D	Sheen
5/5/2011	1415	Low	From MW-4 to bend in the shoreline (adjacent to MW-326)	Large bright bands fading to a dull sheen
5/5/2011	1420	Low	Bulkhead area in FPPA	Sheen
5/5/2011	1425	Low	54" CSO pipe outfall washout adjacent to MW-103	Slight sheen bands
5/5/2011	1450	Low	From bulkhead to bend in the shoreline (adjacent to MW-326) FGPA and FPPA	Heavy large bright bands fading to a dull sheen
5/5/2011	1452	Low	54" CSO pipe outfall washout adjacent to MW-103	Heavy large bright bands fading to a dull sheen to the north and south
6/3/2011	1457	Low	Bulkead Area in FPPA	Faint dull bands of sheen
6/3/2011	1459	Low	54" CSO pipe outfall washout adjacent to MW-103	Trace sheen spots
6/29/2011	1115	Low	Adjacent to MW-326 S/D	Faint dull bands
6/29/2011	1138	Low	Adjacent to MW-326 S/D	Heavy bright bands
6/29/2011	1142	Low	Bulkead Area in FPPA	Slight Sheen
6/29/2011	1146	Low	54" CSO pipe outfall washout adjacent to MW-103	Sheen spots
6/29/2011	1210	Low	Adjacent to MW-326 S/D	Faint dull bands
6/29/2011	1220	Low	54" CSO pipe outfall washout adjacent to MW-103	Faint dull bands

Notes:
1. SFA refers to the South Fill Area.
2. FPPA refers to the Former Power Plant Area.
3. FGPA refers to the Former Gas Plant Area.
4. NFA refers to the North Fill Area.
5. This table shows only the times and locations at which sheens were observed. Observations were made at other times when sheens were not observed.

TABLE 4

Comparative Evaluation of Remedial Alternatives
Former Tidewater MGP and Power Plant
Pawtucket, Rhode Island

Remedial Action Alternative	Description[1]	Comparative Effectiveness/Reliability	Comparative Compliance with Remediation Regulations	Comparative Implementability	Comparative Cost[2]	Comparative Risk	Comparative Implementation Risk	Comparative Timeliness
Remedial Action Alternative #1 No Action With Monitored Natural Attenuation	Under this alternative, no actions would be taken to address identified soil impacts and natural attenuation mechanisms would be relied upon to address groundwater/ NAPL impacts. Natural attenuation monitoring would be performed initially semi-annually and over the longer term on an annual basis and would consist of gauging the Site monitoring well network for the presence of NAPL and collecting and analyzing groundwater samples from select monitoring wells. Groundwater samples would be analyzed for the presence of Site specific COCs (VOCs, PAHs, inorganics, cyanide, TPH) as well as natural attenuation parameters to monitor progress. The Site would remain secured with the current locked fencing to prevent trespasser access. An Environmental Land Usage Restriction (ELUR) would be implemented for continued restricted industrial use of the Site and restrictions on groundwater use at the Site (not for potable use). The ELUR would include a Material Management Plan (MMP) to address handling of impacted soils during future construction projects.	This alternative is considered to be the least effective at mitigating exposure to Site soil (surface and subsurface) contaminants through direct contact, potential erosion of surface soils (and subsequent runoff) to the river or potential off-Site tracking of surface soil contaminants. Given the observed extent of impacts, this alternative would also be the least effective and reliable at mitigating potential migration of impacted groundwater or NAPL, significantly reducing the extent or mass of NAPL, or reducing subsurface impacts contributing to degradation of groundwater quality at the Site (i.e., source areas).	Implementation of this alternative is considered the least favorable with respect to compliance with the RIDEM Remediation Regulations as it does not address the following regulatory concerns: • Direct exposure to impacted soils beyond the current secured fencing designed to limit trespassing • Presence of groundwater concentrations above the GB Groundwater Objective (GBGO) • Presence of Site contaminants in excess of the Upper Concentration Limits (UCLs) (including analytical exceedances and NAPLs) • Soil concentrations in excess of GB Leachability Criteria	This alternative is readily implementable when compared to the other alternatives due to the lack of technical complexity associated with the implementation. Continued long term groundwater/ NAPL monitoring is required along with routine Site inspections and security fence maintenance.	Lowest cost alternative due to the lack of capital costs. Long term costs are relatively low and are primarily associated with routine groundwater and natural attenuation monitoring. Capital Costs: $15,000 O&M Costs: $75,000 per year Contingency Costs (20%): $0.5M Total: $2.7 M (over 30 year period)	This alternative would not address short or long term exposure risks associated with direct contact with impacted soils, potential runoff from erosion of impacted surface soils or off-Site tracking concerns. Also does not address risk of potential migration of impacted groundwater and/or NAPL to the river or risk associated with subsurface impacts (source areas) which contribute to degradation of groundwater quality at the Site.	No risk associated with the implementation of this alternative when compared to RAA 2, RAA 3 and RAA 4.	This alternative is considered the least timely to mitigate identified risks associated with impacted soils, groundwater quality degradation, or NAPL and impacted groundwater migration. Alternative not designed to address compliance with the RIDEM regulatory criteria in a timely manner, including observed UCL exeedances associated with measurable NAPL and soil concentrations, direct exposure to impacted surface soils, soils in excess of the GB Leachability Criteria and exceedances of the GBGO.
Remedial Action Alternative #2 Engineered Cap, Physical Containment and Limited Source Removal	This alternative involves the installation of an engineered cap designed to mitigate potential direct exposure to impacted soils, potential erosion and tracking of impacted surface soils, and contributions to the further degradation of groundwater quality. On the NFA, the engineered soil cap would consist of a one-foot thick, permeable soil cap with an underlying geotextile. The engineered cap on the remainder of the Site (FGPA, FPPA and SFA) would consist of an impermeable cap comprised of up to two-feet of soil, an underlying drainage system, underlain by an impermeable layer (i.e., geomembrane or clay layer). Cap installation would require clearing/grubbing and Site grading. Preliminary capping estimates indicate approximately 60,000 CY of imported fill	This alternative is considered to be highly effective and reliable at mitigating exposure to Site soil contaminants through direct contact and at limiting migration of soils via surface runoff and off-Site tracking and moderately effective in addressing issues associated with further degradation of groundwater quality via the installation of the caps (when compared to RAA 3 and RAA 4 which involve more extensive source removal). This alternative is considered as effective and reliable as RAA 3 and RAA 4 at mitigating migration of NAPLs and dissolved phase contaminants to the river via the installation of the impermeable cap, limited source	Similar to RAA 3 and RAA 4, compliance with the regulatory requirements associated with direct exposure to soils and leachability concerns, as well as NAPL migration, would be effectively addressed upon implementation of this alternative. In addition, through implementation of the wall, impermeable cap and limited source removal, this alternative is considered as effective with respect to addressing the presence of UCLs when compared to RAA 3 and RAA 4. With respect to addressing groundwater quality, RAA 2 is considered as effective as	Readily implementable when compared to RAA 3 and RAA 4. Low to moderate technical complexity associated with the installation of the cap. Moderate technical challenges associated with the installation of the containment wall due to the extent of wall (length and depth), proximity to the river and potential subsurface obstructions along wall alignment. Given length and depth of proposed containment wall, certain hydrogeologic concerns associated with disruption to natural groundwater flow and	Moderate upfront capital costs for Site preparation and earthwork activities associated with installation of the engineered cap, limited source removal and the containment wall when compared to other alternatives. Similar to RAA 3 and RAA 4, long term costs are moderate and are associated with routine groundwater quality and natural attenuation monitoring and cap,	Similar to RAA 3 and RAA 4, this alternative would address RIDEM's requirements in terms of controlling short and long term direct exposure risks. In addition, would address potential risks associated with erosion of surface soils to river, off-Site tracking of impacted surface soils and further degradation of groundwater via limiting infiltration slightly less effectively as RAA 3 and RAA 4. In addition, similar to RAA 3, this alternative also addresses the short and	This alternative utilizes standard and common construction techniques/materials.. Implementation risks are limited to dust and airborne contaminant migration during capping and wall construction and limited source removal activities. These risks can likely be readily managed via the implementation of engineered controls. When compared to RAA 3 and RAA 4 which both include	Implementation of this alternative would be on the order of 16 months and is estimated to span approximately 2 construction seasons (assumes 8 month construction season). This alternative would be considered as timely as RAA 3 and RAA 4 to mitigate risks associated with impacted soils (i.e., direct exposure, erosion and off-Site tracking) and migration of NAPLs to the river. In addition, the cap would serve to address further degradation of groundwater in the short

TABLE 4

Comparative Evaluation of Remedial Alternatives
Former Tidewater MGP and Power Plant
Pawtucket, Rhode Island

Remedial Action Alternative	Description[1]	Comparative Effectiveness/Reliability	Comparative Compliance with Remediation Regulations	Comparative Implementability	Comparative Cost[2]	Comparative Risk	Comparative Implementation Risk	Comparative Timeliness
	will be required to prepare the subgrade. No impacted soil is expected to be removed from the Site. Installation of impermeable cap will be coupled with an engineered storm water drainage system. A containment wall (approximately 1,600 linear feet) would also be installed along the eastern (downgradient) edge of the Site along the riverfront in the FGPA, FPPA and SFA portions of the Site to mitigate potential migration of NAPL impacts towards the river.. The containment wall would be keyed approximately two feet into the underlying till layer (approximately 25 to 40 feet below grade). For the purpose of this evaluation, we have assumed this containment wall would consist of a driven sheet pile wall installed on the riverside of the current bulkhead across portions of the FGPA and the FPPA, and this sheet pile wall would serve to replace the current bulkhead wall to further limit migration of NAPLs/impacted soils through the existing bulkhead. Pre-excavation will likely be necessary in certain areas to facilitate installation of this containment wall. Focused NAPL recovery would be performed immediately upgradient of the wall from a series of newly installed recovery wells and in other Site areas where NAPLs have accumulated in monitoring wells. These recovery operations would likely be performed on a monthly basis initially, and then quarterly, followed by semi-annually depending on recovery observations using either manual methods (bailing), peristaltic pumps (LNAPLs) or pneumatic piston driven pumps (DNAPLs). Under this alternative, the former tank (UGGT-1) and raceway structures which were encountered during the 2010 Site investigation will be addressed. Remedial activities will include removal of liquids (groundwater and NAPL) from the structures for off-Site disposal. The structures would then be left in place and	removal, the installation of the subsurface barrier wall and long term NAPL recovery and effective/reliable at reducing the extent /mass of NAPL at existing well locations.	RAA 3 but less effective than RAA 4. (As described below, these latter two alternatives include 1) removal of limited impacts to depths of the water table/smear zone combined with containment and 2) more significant source removal, respectively.)	the potential for mounding exist for this alternative. Groundwater modeling will be required to evaluate these potential design issues. Cap and wall installation, as well as limited source removal, will require the application of certain engineered controls to address potential on and off-Site odor, vapor and dust migration. These controls will likely include the use of odor suppressant foams, application of water, etc. Given that this alternative does not include significant contaminated soil removal, when compared to RAA 3 and RAA 4, the odor, vapor and dust issues are considered to be readily manageable. In addition, this alternative does not involve truck traffic to and from the Site associated with the off-Site transport of impacted materials. Moderate short term disruption to Site during the installation of the cap and containment wall; however long term disruption to the Site is minimal. Continued long term groundwater and NAPL monitoring is required. Implementation of soil cap and wall will require coordination and permitting with Coastal Resource Management Council (CRMC), RIDEM and the Army Corp of Engineers (ACOE).	inspections, maintenance and repair. Capital Costs: $18M O&M Costs: $107,000 per year Contingency Costs (20%): $4.2M Total: $25.0M	long term risk of potential migration of NAPLs to the river and provides containment of residual source materials. Modeling and longer term monitoring would be required to verify containment wall performance.	significant excavation of source materials, implementation risks associated with odor, vapor, and dust would be considered low to moderate. In addition, specific air quality monitoring would be required. Vapor emission modeling would be required to assess appropriate air controls during implementation. Given the proximity of the Site to sensitive receptors, testing the effectiveness of the engineered controls prior to implementation may be warranted. This alternative includes groundwater modeling to foresee the effect of the containment wall on groundwater flow patterns, specifically for the potential of groundwater flow disruption and mounding. In addition, this alternative does not involve the significant trucking of contaminated impacted material from the Site and the inherent risks to the neighborhood associated with RAA 3 and RAA 4. Truck	and long term. In addition, this alternative is as timely as RAA 3 and RAA 4 at addressing the RIDEM criteria pertaining to presence of UCL exceedances (via the impermeable cap, containment wall and limited structure removal). This alternative is not as timely as RAA 4 but as timely as RAA 3 at addressing groundwater quality issues. Long term monitoring would be required to assess achievement of remedial goals.

Comparative Evaluation of Remedial Alternatives
Former Tidewater MGP and Power Plant
Pawtucket, Rhode Island

Remedial Action Alternative	Description[1]	Comparative Effectiveness/Reliability	Comparative Compliance with Remediation Regulations	Comparative Implementability	Comparative Cost[2]	Comparative Risk	Comparative Implementation Risk	Comparative Timeliness
	filled with grout and/or flowable fill. In addition, the localized area of crystallized naphthalene on the NFA will be removed and transported off-Site for disposal. Best management practices (BMPs) associated with odor, dust and vapor control would be implemented during construction of the cap, containment wall, and limited source removal. This alternative would also include routine groundwater quality monitoring to assess performance (assumes 30 years of monitoring). Groundwater monitoring would be performed semi-annually for the first 5 years and annually thereafter. This alternative includes establishment of an ELUR which would include restrictions on the use of the groundwater at the Site (i.e., not for potable use), restricted use of the property (industrial, commercial and/or passive recreational use) and guidelines on disturbance and maintenance of the engineered cap. The ELUR would include a MMP to address handling of impacted soils during future construction projects. This also includes implementation of annual inspections to assure the long-term maintenance of the engineered soil cap.						traffic is limited to importing clean material.	
Remedial Action Alternative # 3 Source Removal/Stabilization, Localized Physical Containment and Engineered Cap	This alternative includes source removal of known structures/areas containing NAPLs and/or analytical UCLs (estimated at approximately 17,000 CY of soil). Removal efforts would involve excavation of certain source areas to the water table/smear zone and will likely involve NAPL removal/off-Site disposal and/or groundwater management during removal activities. Excavation depths will range from 4 to 12 feet below ground surface. In addition to limited source area removal, containment wall sections would be installed along select portions of the eastern (downgradient) edge of the Site along the riverbank (estimated at	Similar to RAA 2, this alternative is considered highly effective and reliable in mitigating migration of NAPLs contaminants to river. It is also considered as effective as RAA 2 and RAA 4 at mitigating direct exposure to subsurface impacts, and addressing issues associated with surface runoff and off-Site tracking of materials. Given the inclusion of source removal, this alternative is considered more effective and reliable when compared to RAA 2 and less effective and reliable than RAA 4 in reducing potential source areas and the extent/mass of NAPL.	Similar to RAA 2, compliance with the regulatory requirements associated with direct exposure to soils and leachability concerns, as well as NAPL migration, would be effectively addressed upon implementation of this alternative. RAA 3 is considered as effective as RAA 2 and RAA 4 with respect to regulatory compliance associated UCLs/source areas/ NAPLs. In addressing groundwater quality, RAA 3 is considered as effective as RAA 2 but not as effective as RAA 4.	This alternative is considered more difficult to implement than RAA 2 and more implementable than RAA 4 based on the extent of source area removal. The primary challenges associated with this alternative are associated with managing potential exposure risks (both on and off-Site) associated with the source area removal efforts. These risks include potential vapor, odor, and dust migration. These potential exposure risks may be addressed via the use of engineered controls (i.e.,	Moderate to significant upfront capital costs associated with limited source area excavation activities and best management practice controls (i.e., sprung structures, odor controls), Site preparation and earthwork activities associated with installation of the engineered cap and the containment wall (or ISS). Long term costs are associated	This alternative addresses the short and long term risks associated with potential migration of NAPLs to the river in a similar manner when compared to RAA 2 and RAA 4. RAA 2 is as effective as RAA 3 but less effective than RAA 4 at addressing concerns regarding further degradation of groundwater quality. In addition, this alternative would address both short and long term exposure	Similar to RAA 2, this alternative utilizes standard and common construction techniques for capping and installation of the containment wall and implementation of these components can be likely managed using engineered controls. However, when compared to RAA 1 and RAA 2, this alternative is considered to have a	Implementation of this remedy would be on the order of 17 months and is estimated to occur over approximately 2.5 construction seasons. This alternative would be considered as timely as RAA 2 to mitigate risks associated with source areas, impacted soils (i.e., direct exposure, erosion and off-Site tracking) and migration of NAPLs to the river. Groundwater quality concerns would likely be addressed in the long term. This

TABLE 4

Comparative Evaluation of Remedial Alternatives
Former Tidewater MGP and Power Plant
Pawtucket, Rhode Island

Remedial Action Alternative	Description[1]	Comparative Effectiveness/Reliability	Comparative Compliance with Remediation Regulations	Comparative Implementability	Comparative Cost[2]	Comparative Risk	Comparative Implementation Risk	Comparative Timeliness
	approximately 860 linear feet under RAA 3A) to mitigate potential migration of NAPL impacts. The containment wall sections would be located downgradient of remaining areas of significant source areas where NAPL is evident and deeper impacts have not been addressed. The construction of the containment wall would be similar to RAA 2. For the purpose of this evaluation, we have assumed this containment wall would consist of a driven sheet pile wall installed on the riverside of the current bulkhead across portions of the FGPA and the FPPA, and this sheet pile wall would serve to replace the current bulkhead wall. Pre-excavation will likely be necessary in certain areas to facilitate installation of this containment wall. Focused NAPL recovery would be performed immediately upgradient of the wall sections and in other Site areas where NAPLs are observed as described in RAA 2. A prefabricated hydraulic plug would be installed around the drain line on the FPPA portion of the Site to limit preferential flow along the utility backfill to the river. Under this alternative, in-situ stabilization (ISS) is presented as an alternative to construction of a 200 ft containment wall section along the SFA portion of the Site. (Incorporation of ISS as an alternative approach is presented as RAA 3B.) ISS is a process in which a binding reagent is added to the soil to create a monolithic, block-like structure that encapsulates and contains the contaminants. Typical in-situ solidification processes include injection grouting and in-situ soil mixing. For the ISS option under this alternative, the entire soil column over an area approximately 30,000 SF to a depth up to 22 feet below ground surface (approximately 24,200 CY) would be stabilized thus binding the soil contaminants and NAPLs to the soil matrix. ISS treatment results in increase of soil column (approximately 20%) which would require management. Lab	The effectiveness and reliability of the ISS option (presented as RAA 3B) under this alternative in addressing the source areas and identified NAPL impacts within the SFA portion of the Site is dependent on the uniform distribution/contact of the reagent with the soil matrix. Given the heterogeneity of the Site fill materials and the organic nature of Site impacts in the SFA, this alternative is considered to have questionable effectiveness in terms of successfully binding the contaminants/NAPLs to the soil matrix and therefore mitigating potential migration and contribution to groundwater quality degradation. ISS does not result in reduction of source area/NAPL mass or volume. Lab scale treatability studies would be necessary to verify performance.		containment/sprung structures, odor suppressant foams, application of water, etc.). Given the proximity of the Site to the neighboring community/sensitive receptors, testing of potential engineered controls prior to full-scale implementation may be warranted. Similar to RAA 2, moderate technical challenges associated with the installation of the containment wall due to potential subsurface obstructions along wall alignment. In addition, ISS option under RAA 3 is significantly more technically complex due to limited application of technology with this suite of organic constituents. Moderate to low implementability of ISS when compared to other alternatives which rely on proven earthwork techniques. The geology (boulders/fill) and presence of subsurface obstructions also present unique implementability challenges for ISS which relies on distribution of a binding agent within the subsurface. Similar to RAA 2, hydrogeologic concerns associated with disruption to natural groundwater flow and the potential for mounding exist for this alternative; however to a lesser degree given the discontinuous nature of the containment wall sections and/or ISS areas. Under this alternative, containment wall sections are	with the recovery of residual NAPL on the upgradient portion of the containment wall sections and groundwater monitoring and would be considered minimal to moderate when compared to other alternatives. Capital Costs: $25.5M O&M Costs: $107,000 per year Contingency Costs (20%): $5.7M Total: $34.0M Note: Implementation of ISS in the SFA as an alternative to the containment wall would add an additional $2.2M to the total costs for RAA 3 (refer to RAA 3B)	risks associated with direct contact with impacted soils, as well as erosion of soils to river and off-Site tracking of impacted surface soils (similar to RAA 2 and RAA 4). Implementation of ISS under this alternative for the SFA portion of the Site (as an alternative to the containment wall) would be considered to have a high risk of failure given the potential for improper binding of contaminants due to poor distribution of binding agents throughout the areas of impact and heterogeneous mix ratios.	higher level of short term implementation risk associated with potential odor, vapor and dust migration both on and off-Site associated with proposed source removal activities and truck traffic to/from the Site. (Based on the anticipated removal volume and trenching spoils management, approximately 3,400 truck trips will be necessary, of which half will contain impacted material). When compared to RAA 4 which involves more significant source removal activity, the short term implementation risks associated with odor, vapor and dust migration under RAA 3 would be considered moderate. These potential exposure and implementation risks may be managed via the implementation of engineered controls (containment structures, odor suppressant foams, application of water, etc.). Use of sprung structures involves the use of large scale equipment (crane) or the use of rail system for mobilization around the Site. The use of sprung	alternative is considered to be timelier than RAA 2 but less timely than RAA 4 in addressing the RIDEM regulatory criteria with respect to UCLs/source areas/ NAPLs and groundwater quality. Long term monitoring would be required (groundwater and NAPL, stabilized soils if performed) to evaluate performance of this remedy.

TABLE 4

Comparative Evaluation of Remedial Alternatives
Former Tidewater MGP and Power Plant
Pawtucket, Rhode Island

Remedial Action Alternative	Description[1]	Comparative Effectiveness/Reliability	Comparative Compliance with Remediation Regulations	Comparative Implementability	Comparative Cost[2]	Comparative Risk	Comparative Implementation Risk	Comparative Timeliness
	scale treatability studies would be required to develop the proper mixing ratios and verify effectiveness and reliability of the ISS technology. An engineered soil cap similar to that described in RAA 2 would be installed to mitigate potential direct exposure to impacted soils and potential erosion and tracking of impacted surface soils. BMPs associated with odor, dust and vapor control would be implemented during construction of the cap, containment wall (or ISS) and source removal. These BMPs may include containment/sprung structures, odor suppressant foams, application of water, etc. This alternative would also include routine groundwater quality monitoring to assess performance/effectiveness of the remedy (assumes 30 years of monitoring). Groundwater monitoring would be performed semi-annually for the first 5 years and annually thereafter. This alternative includes establishment of an ELUR which would include restrictions on the use of the groundwater at the Site (i.e., not for potable use), restricted use of the property (industrial, commercial and/or passive recreational use) and guidelines on disturbance and maintenance of the engineered cap. The ELUR would include a MMP to address handling of impacted soils during future construction projects. This also includes implementation of annual inspections to assure the long-term maintenance of the engineered soil cap.			considered more readily implementable than RAA 2 due to shorter sections and expected lower comparable disruptions to hydrogeologic setting. Groundwater mounding effect will need to be evaluated/modeled as part of final design. Similar to RAA 2, low to moderate technical complexity associated with the installation of the cap. Moderate short term disruption to Site use during the installation of the cap and the installation of the containment wall; moderate to significant short-term disruption to Site use during excavation activities. Long term disruption to the Site is minimal. Similar to RAA 2 and RAA 4, implementation of RAA 3 will require coordination and permitting with CRMC, RIDEM and ACOE.			structures involves a moderate to high level of risk to construction workers associated with mobilizing (risk of personal injury) and working within the sprung structures (inherent risks such as air quality, working in confined spaces, lack of natural light, etc.). In addition, specific air quality monitoring would be required. Vapor emission modeling would be required to assess appropriate air controls during implementation. Given the proximity of the Site to sensitive receptors, testing the effectiveness of the engineered controls prior to implementation may be warranted. This alternative includes groundwater modeling to assess the effect of the containment wall on groundwater flow patterns, specifically for the potential of groundwater flow disruption and mounding. However, as the containment wall in this alternative is only in sections along the riverside edge of the Site, the potential for	

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Comparative Evaluation of Remedial Alternatives
Former Tidewater MGP and Power Plant
Pawtucket, Rhode Island

Remedial Action Alternative	Description[1]	Comparative Effectiveness/Reliability	Comparative Compliance with Remediation Regulations	Comparative Implementability	Comparative Cost[2]	Comparative Risk	Comparative Implementation Risk	Comparative Timeliness
							disruptions in the groundwater flow patterns is not anticipated to be as extensive as RAA 2.	
Remedial Action Alternative # 4 Significant Source Removal and Engineered Cap	This alternative includes extensive excavation of observed source area impacts associated with former MGP and power plant operations across the Site. Removal efforts would involve excavation of impacted areas to the depth of observed significant visual impacts (i.e., visual indicators of "coated, blebs, saturated and/or free product"). It is estimated that approximately 120,600 CY of impacted material will be removed under this alternative. These removals would include the excavation and off-site disposal of below grade former plant structures. Depths of proposed excavation range from 4 to 35 feet below ground surface. Deep excavation would require significant earth support systems. Implementation will require NAPL and groundwater management, including groundwater treatment and discharge. In those areas of the Site not addressed via the significant source removal, an engineered soil cap would be installed to mitigate potential direct exposure to impacted soils and potential erosion and tracking of impacted surface soils. The engineered soil cap would consist of a one-foot thick, permeable soil cap with an underlying geotextile. Cap installation would require clearing/grubbing and Site grading. Preliminary capping estimates indicate approximately 60,000 CY of imported fill will be required to prepare the subgrade. Dust, odor and vapor migration during remedial implementation (capping and excavation) would require mitigation using engineered control technologies (e.g., foaming, use of sprung structures, application of water, etc.).	Similar to RAA 2 and RAA 3, this alternative is considered to be highly effective and reliable at mitigating exposure to Site soil contaminants through direct contact, surface runoff, or off-Site tracking. Given the extent of proposed source area removal, this alternative is also considered the most effective and reliable at reducing the source of subsurface impacts contributing to groundwater degradation (i.e., from structures/former features). However, effectiveness and reliability of this alternative in mitigating migration of residual impacts towards the river would be questionable when compared to RAA 2 and RAA 3 which both include installation of containment walls along the shoreline.	Given the extent of source removal proposed under this alternative, RAA 4 is considered the most favorable with respect to regulatory compliance associated UCLs/source areas/ NAPLs and groundwater quality. RAA 4 is also considered as effectively compliant as RAA 2 or RAA 3 for direct exposure to soils and leachability concerns. Compliance with respect to NAPL migration however will depend upon the success of removal efforts during implementation.	Significant disruption to the Site would be required during implementation of this alternative and therefore it is considered the least implementable alternative. Given the extent of the proposed excavations (approximately 5 acres over Site at depths ranging from 4 to 35 feet below ground surface), earth support system requirements, NAPL and groundwater management during construction and emission control considerations, implementation of this alternative is significantly more technically complex than the others. Similar to RAA 2 and RAA 3, implementation of RAA 4 will require coordination with CRMC, RIDEM and ACOE.	Significant capital costs are associated with the earthwork activities (capping, excavation and backfilling) included in this alternative compared to the others. Given the extent of proposed excavation and likely handling of significantly impacted material, this alternative would have the highest capital costs associated with engineering requirements (i.e., earth support system, NAPL and GW management) and best management practice controls (i.e., sprung structures, odor controls; extensive air monitoring). Long term costs are associated with groundwater monitoring and potential recovery of residual NAPL and would be considered minimal when compared to other alternatives. Capital Costs:	When compared to RAA 2 and RAA 3, this alternative is considered to have the highest risk associated with addressing potential migration of NAPLs/impacted groundwater to the river given that it does not include a containment wall and relies on the successful implementation of the removal effort. This alternative is considered to have the lowest risk for concern regarding contributions to further degradation in regards to groundwater quality due to the extensive nature of source removal below the water table. This alternative would address both short and long term exposure risks associated with direct contact with impacted soils, as well as erosion of soils to river and off-Site tracking of impacted surface soils in a similar manner when compared to RAA 2 and RAA 3.	Similar to RAA 2 and RAA 3, this alternative utilizes standard and common construction techniques for capping. However, given the extent of proposed soil excavation and handling of significantly impacted material, this alternative is considered to have the highest level of short term implementation risks associated with potential vapor, odor and dust migration both on/off Site and truck traffic to/from Site compared to the other alternatives. Based on the estimated volumes of material to be removed and trenching spoils management, approximately 19,000 truck trips (of which half will contain impacted material) will be necessary. In addition, specific air quality monitoring would be required. Vapor emission modeling	Implementation of this remedy would be on the order of years (approximately 25 months over 3 construction seasons). Given the scope and magnitude of this alternative, it is expected to be the timeliest in mitigating risks associated with source areas and impacted soils (i.e., direct exposure, erosion and off-Site tracking). Groundwater quality concerns would likely be addressed in the long term. Long term monitoring would be required (groundwater and NAPL) to assess achievement of remedial goals.

TABLE 4

Comparative Evaluation of Remedial Alternatives
Former Tidewater MGP and Power Plant
Pawtucket, Rhode Island

Remedial Action Alternative	Description[1]	Comparative Effectiveness/Reliability	Comparative Compliance with Remediation Regulations	Comparative Implementability	Comparative Cost[2]	Comparative Risk	Comparative Implementation Risk	Comparative Timeliness
	This alternative would also include routine groundwater quality monitoring to assess performance (assumes 30 years of monitoring). Groundwater monitoring would be performed semi-annually for the first 5 years and annually thereafter. This alternative includes establishment of an ELUR which would include restrictions on the use of the groundwater at the Site (i.e., not for potable use), restricted use of the property (industrial, commercial and/or passive recreational use) and guidelines on disturbance and maintenance of the engineered cap. The ELUR would include a MMP to address handling of impacted soils during future construction projects. This also includes implementation of annual inspections to assure the long-term maintenance of the engineered soil cap.				$63.4M O&M Costs: $85,000 per year Contingency Costs (20%): $13.2M Total: $78.8M		would be required to assess appropriate air controls during implementation. Given the proximity of the Site to sensitive receptors, testing the effectiveness of the engineered controls prior to implementation may be warranted. Given the high implementation risks associated with RAA 4, this alternative would require extensive engineered controls (containment structures, odor suppressant foams, application of water) and air quality monitoring. Similar to RAA 3, RAA 4 involves moderate to high implementation risks associated with use of sprung structures for the excavation activities.	

Notes

1. Rehabilitation of the manmade shoreline along the FPPA and southern portions of the FGPA (approximately 700 linear feet) has been assumed in each of the presented RAA 2, RAA 3 and RAA 4. For RAA 2 and RAA 3, rehabilitation activities will overlap with containment wall construction along shoreline. Bulkhead rehabilitation will include installation of steel sheetpile wall and associated tie-backs/lateral supports.
2. The costs outlined in this table include a contingency of 20%. Total costs presented assume maintenance and monitoring over a 30 year period.
3. Refer to the following figures depicting conceptual layouts of the remedial alternatives:
    - RAA#1: No Action With Monitored Natural Attenuation and Implementation of Deed Restrictions
    - RAA#2: Engineered Cap and Physical Containment
    - RAA#3A: Limited Source Removal, Physical Containment and Engineered Cap
    - RAA#3B: Source Removal, Physical Containment, Engineered Cap and ISS (SFA area only)
    - RAA#4: Significant Source Removal and Engineered Cap
4. Under each alternative, PCB impacts identified within the fenced substation area on the FPPA will be addressed under the February 2009 *Self-Implementing Plan to Address PCB-Impacted Soils* prepared by VHB, submitted to and approved by the USEPA and RIDEM.

NAPL = Non-Aqueous Phase Liquids; LNAPL = Light Non-Aqueous Phase Liquids; DNAPL = Dense Non-Aqueous Phase Liquids; UCL = Upper Concentration Limit; NFA = North Fill Area; FGPA = Former Gas Plant Area; FPPA = Former Power Plant Area; SFA = South Fill Area

TABLE 5
ESTIMATED REMEDIAL COSTS
Remedial Alternative Evaluation
Former Tidewater Facility
Pawtucket, RI

Item	RAA #1	RAA #2	RAA #3A Wall	RAA #3B ISS	RAA #4
PRE-CONSTRUCTION SERVICES					
Subtotal	**$15,000**	**$425,000**	**$425,000**	**$425,000**	**$425,000**
LIMITED DESIGN INVESTIGATION					
Subtotal	**$0**	**$151,000**	**$102,000**	**$102,000**	**$50,000**
CONSTRUCTION OVERSIGHT					
Subtotal	**$0**	**$1,084,000**	**$1,141,000**	**$1,169,000**	**$1,540,000**
GENERAL CONDITIONS/MOBILIZATION/DEMOBILIZATION					
Subtotal	**$0**	**$452,000**	**$485,000**	**$486,000**	**$623,000**
CONSTRUCTION /REMEDIATION IMPLEMENTATION					
Permeable Soil Cap	$0	$1,136,000	$1,136,000	$1,136,000	$7,184,000
Impermeable Soil Cap	$0	$10,291,000	$10,291,000	$10,291,000	$0
Steel Sheetpiling Wall	$0	$3,444,000	$3,827,000	$3,609,000	$2,970,000
NAPL Recovery	$0	$195,000	$195,000	$195,000	$0
Source Removal	$0	$87,000	$7,057,000	$7,057,000	$49,561,000
In-Situ Solidification	$0	$0	$0	$1,989,000	$0
Check Dams	$0	$0	$50,000	$50,000	$0
Odor Control	$0	$138,000	$146,000	$146,000	$196,000
Air Monitoring	$0	$602,000	$645,000	$645,000	$892,000
Subtotal	**$0**	**$15,893,000**	**$23,347,000**	**$25,118,000**	**$60,803,000**
OPERATION AND MAINTENANCE					
Subtotal	**$2,250,000**	**$2,850,000**	**$2,850,000**	**$2,850,000**	**$2,250,000**
ESTIMATED COSTS	**$2,265,000**	**$20,855,000**	**$28,350,000**	**$30,150,000**	**$65,691,000**
Contingency 20%	**$453,000**	**$4,171,000**	**$5,670,000**	**$6,030,000**	**$13,138,000**
TOTAL ESTIMATED COSTS	**$2,720,000**	**$25,030,000**	**$34,020,000**	**$36,180,000**	**$78,830,000**
ESTIMATED DAYS OF WORK	**0**	**310**	**330**	**340**	**470**
TOTAL ESTIMATED TRUCK TRIPS	**0**	**5,040**	**7,450**	**7,700**	**20,300**
ESTIMATED IMPACTED MATERIAL TRUCK TRIPS	**0**	**140**	**1,450**	**1,700**	**9,500**
ESTIMATED IMPACTED MATERIAL REMOVAL (tons)	**0**	**2,875**	**32,700**	**39,000**	**219,000**

Notes:

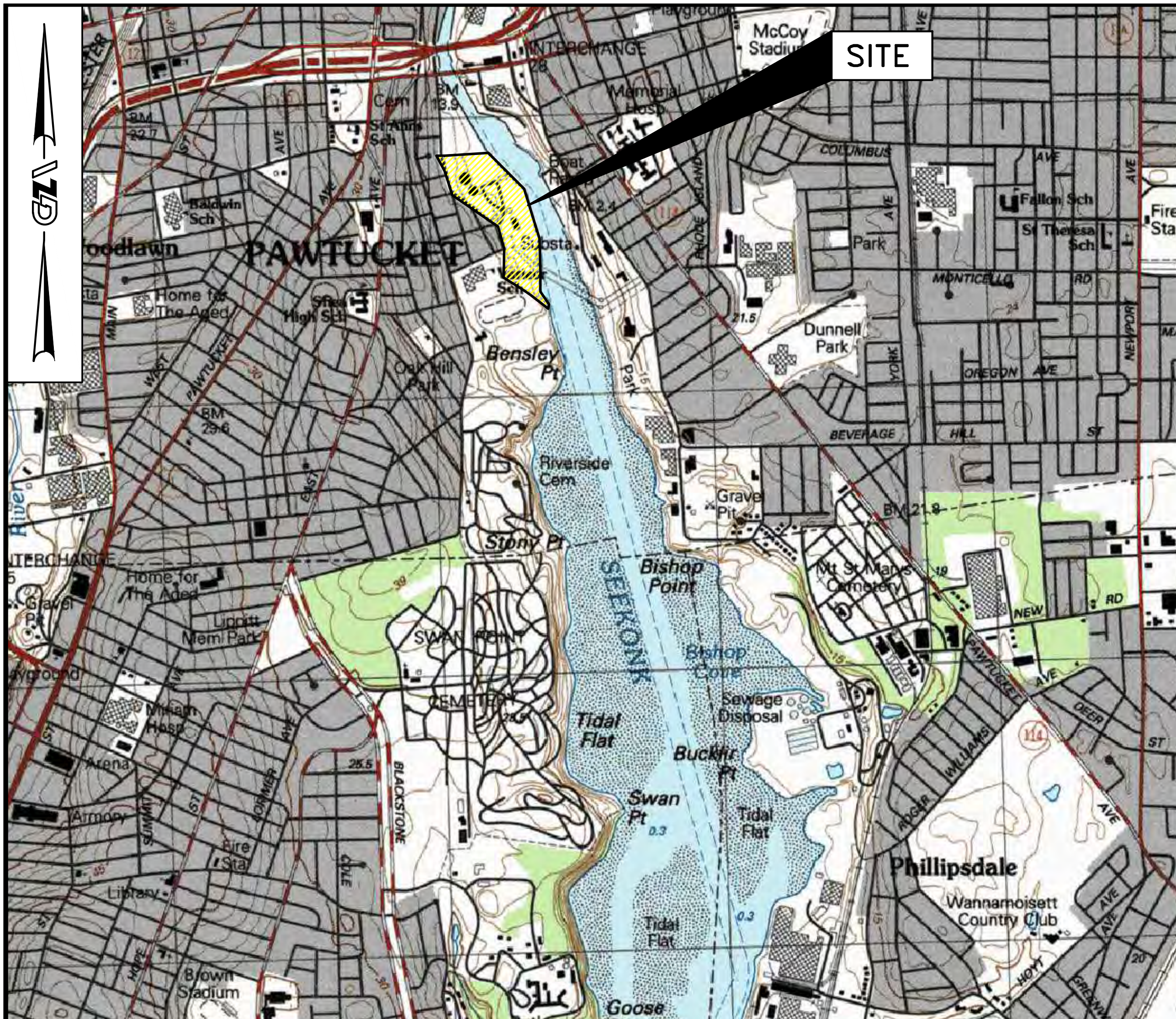
1. Cost estimates provided for comparison purposes only. Total estimated cost rounded to nearest $10,000 and all others are rounded to the nearest $1,000. These cost estimates are subject to our standard Remedial Cost Estimate Limitations.

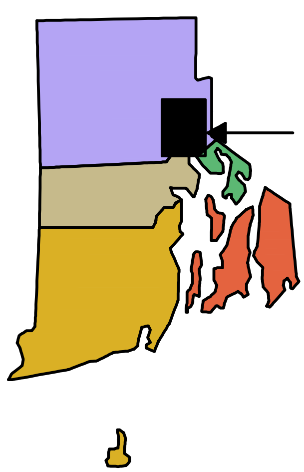
2. Presented costs do not include legal support.

3. Presented costs are based upon 2011 dollars.

4. Total Estimated truck trips are estimated using the total amount of imported material, total amount of non-hazardous disposal and the total amount of hazardous disposal and assumes 23 tons per truck or 15 CY per truck.

FIGURES





BASE MAP FROM THE FOLLOWING USGS QUADRANGLE MAP: PROVIDENCE, RI (2001)

DIGITAL TOPOGRAPHIC MAPS PROVIDED BY MAPTECH. INC.

CONTOUR ELEVATIONS REFERENCE NGVD 29,
CONTOURS ARE SHOWN IN METERS ABOVE NVGD AT 3 METER INTERVALS

APPROXIMATE SCALE IN FEET

0' 500' 1000' 2000'

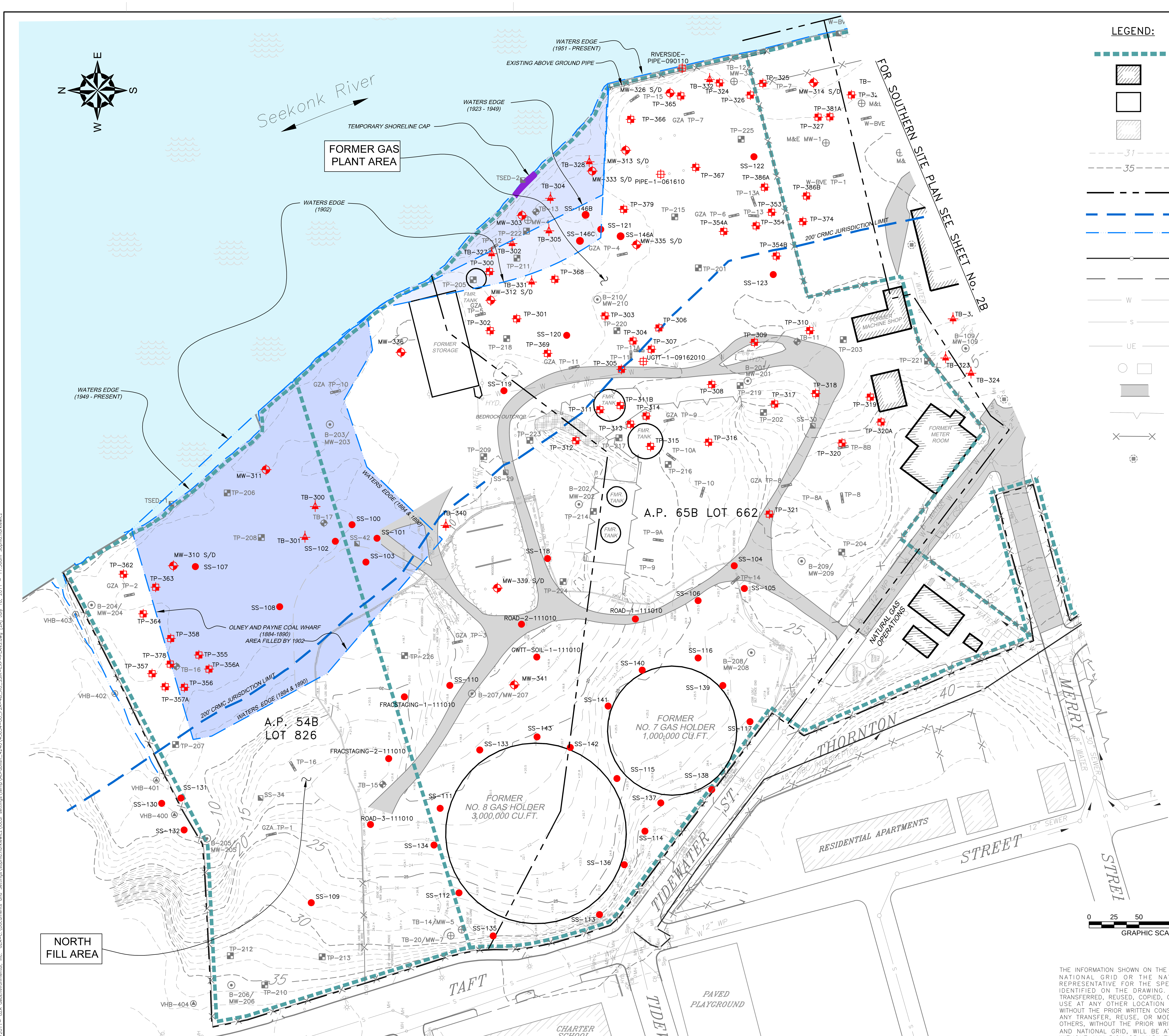
TIDEWATER FACILITY

PAWTUCKET, RHODE ISLAND

LOCUS PLAN

JULY 2011

FIGURE NO. 1



LEGEND:

	SITE AREA BOUNDARIES
	EXISTING BUILDINGS ON-SITE
	EXISTING FOUNDATION/PAD ON-SITE
	EXISTING BUILDINGS/STRUCTURES OFF-SITE
31	EXISTING CONTOUR (MINOR 1 FOOT INTERVAL)
35	EXISTING CONTOUR (MAJOR 5 FOOT INTERVAL)
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	APPROX. 200 FT. CRMC JURISDICTION LIMIT
	APPROX. WATERS EDGE
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	EXISTING CITY OF PAWTUCKET STORM DRAIN
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S	EXISTING STORM/COMBINED SAN. SEWER OVERFLOW
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	EXISTING UNDERGROUND ELECTRIC MH/STRUCTURE
	EXISTING ACCESS ROAD
	EXISTING RETAINING WALLS
	EXISTING FENCE
	EXISTING CATCH BASIN LOCATIONS

SAMPLE LEGEND

SS-9	ATLANTIC SURFACE SOIL SAMPLE LOCATION
TSED-6	ATLANTIC SEDIMENT SAMPLE LOCATION
W-BVE SS-3	WESTON/BLACKSTONE VALLEY ELECTRIC SEDIMENT SAMPLE LOCATION
RIDEM SS-3	RIDEM SURFACE SOIL SAMPLE LOCATION
B-109/ MW-109	MONITORING WELL/BORING (VHB) SURVEYED
TP-3A	ATLANTIC TEST PIT LOCATION
W-BVE	WESTON/BLACKSTONE VALLEY ELECTRIC TEST PIT LOCATION
GZA TP-8	GZA/VALLEY GAS TEST PIT LOCATION
TB-15	ATLANTIC SOIL BORING LOCATION
MW-3	ATLANTIC MONITORING WELL LOCATION
M&E MW-1	METCALF & EDDY MONITORING WELL LOCATION
VHB-400	VHB SURFACE SOIL SAMPLE LOCATION NON-SURVEYED
TP-204	VHB TEST PIT (2006)
GZ-01	GZA TEST PIT (2009)
TB-300	GZA TEST BORING LOCATION (2010)
MW-320 S/D	GZA MONITORING WELL LOCATION (2010)
TP-306	GZA TEST PIT LOCATION (2010)
SS-100	GZA SURFACE SOIL SAMPLE LOCATION (2010)
	ARCADIS SEDIMENT SAMPLE LOCATION (2008)
PIPE-1-061610	GZA RESIDUAL MATERIAL SAMPLE (2010)

GENERAL NOTES:

1. EXISTING CONDITIONS BASE MAP DEVELOPED FROM THE FOLLOWING:
   - ELECTRONIC FILES FROM GEI CONSULTANTS, INC. (FORMERLY AES) ENTITLED "HISTORIC STRUCTURES AND SAMPLE LOCATIONS", ORIGINAL SCALE 1"=80', DATED JULY 1999
   - ELECTRONIC FILES FROM VANASSE HANGEN BRUSTLIN, INC. ENTITLED "SOIL BORING, TEST PIT AND MONITOR WELL LOCATIONS", SCALE: 1"=60', UNDATED
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   - ON-SITE INVESTIGATIONS AND SURVEYS BY GZA PERSONNEL DURING VARIOUS SITE VISITS DURING 2009 AND 2010.
2. PROPERTY LINES AND LOT INFORMATION ESTABLISHED FROM INFORMATION PROVIDED ON A DRAWING ENTITLED "PERIMETER SURVEY OF LAND AT THE TIDEWATER FORMER MGP SITE IN PAWTUCKET, RHODE ISLAND FOR ATLANTIC ENVIRONMENTAL SERVICES INC." DEVELOPED BY LOUIS FEDERICI AND ASSOCIATES AND AN AUTO CAD FILE ENTITLED "MAX READ FIELD TRACK EXPANSION 2007" PROVIDED BY THE CITY OF PAWTUCKET.
3. HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY GEI CONSULTANTS, INC.
4. VERTICAL DATUM IS BASED ON NGVD 1929 (MSL) FROM BASE MAPPING PROVIDED BY GEI CONSULTANTS, INC.
5. REFERENCE SEWER DATA FROM SCANNED IMAGE PROVIDED BY THE CITY OF PAWTUCKET, RHODE ISLAND, ENTITLED "STUDY OF SEWERAGE FACILITIES" BY WATERMAN ENGINEERING CO. & ANDERSON NICHOLS CO. DATED NOV. 1975, ORIGINAL SCALE 1"=400' & SCANNED IMAGES OF HISTORIC PLAN & PROFILE DRAWINGS PROVIDED BY THE CITY OF PAWTUCKET, RHODE ISLAND.
6. SITE UTILITIES TAKEN FROM 1984 SANBORN MAP AND HISTORIC FIGURES PROVIDED BY NATIONAL GRID. ALL UTILITY LOCATIONS ARE APPROXIMATE AND SHOWN FOR REFERENCE ONLY.

0 25 50 100 150
GRAPHIC SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

FORMER TIDEWATER FACILITY

PAWTUCKET, RHODE ISLAND

EXPLORATION LOCATION PLAN
NORTH FILL AREA AND FORMER GAS PLANT AREA

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
530 BROADWAY
PROVIDENCE, RHODE ISLAND 02909
(401) 421-4140

PREPARED FOR:
NATIONAL GRID

PROJ MGR: MSK	REVIEWED BY: MSK	CHECKED BY: MSK	FIGURE
DESIGNED BY: SDN	DRAWN BY: CRD	SCALE: 1"=50'	2A
DATE JULY 2011	PROJECT NO. 43654.00	REVISION NO. 0	SHEET NO. 2 OF 8

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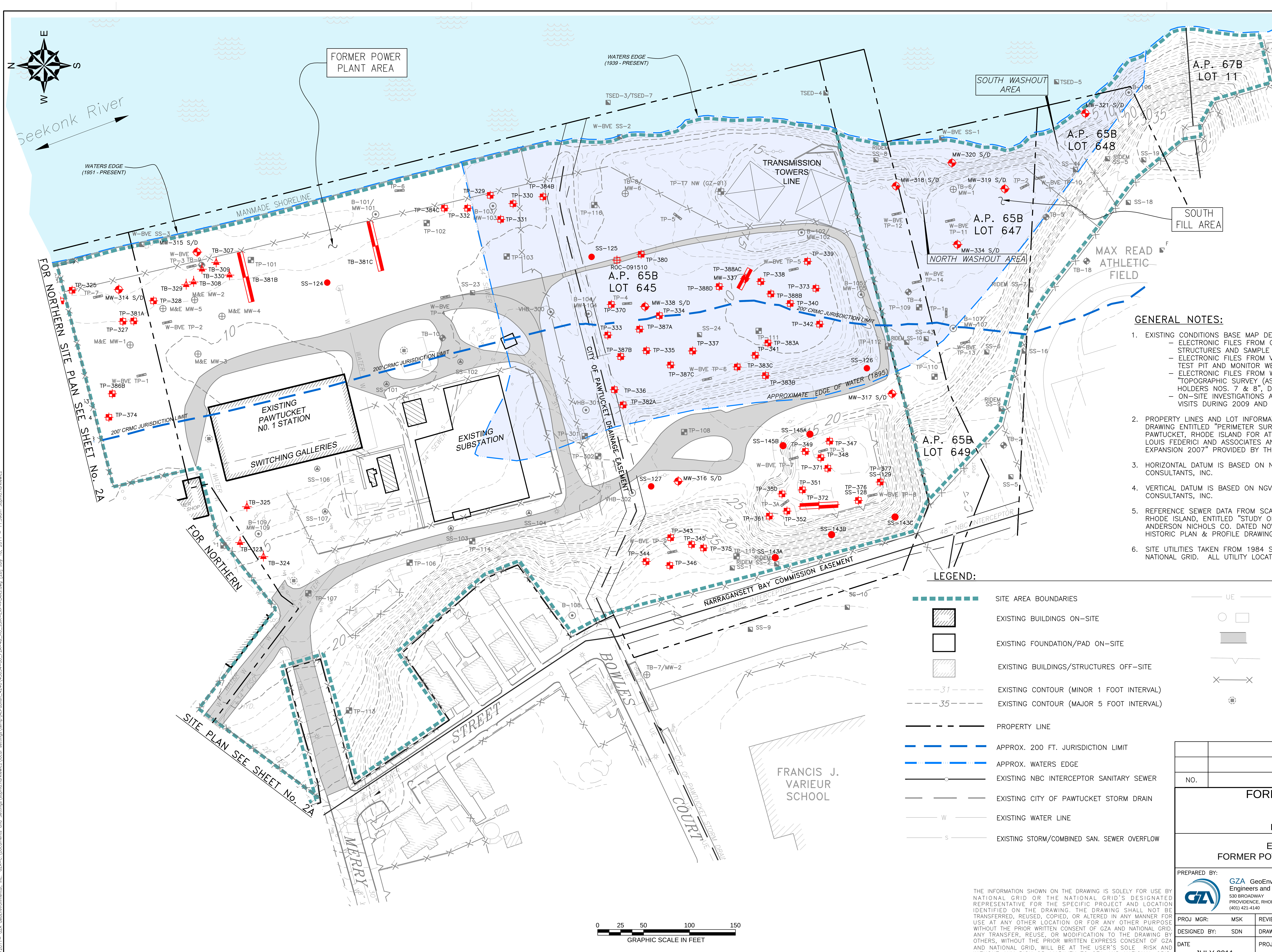

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- EXISTING ACCESS ROAD
- EXISTING RETAINING WALLS
- EXISTING FENCE
- EXISTING CATCH BASIN LOCATIONS

NO.	ISSUE/DESCRIPTION	BY	DATE

FORMER TIDEWATER FACILITY

PAWTUCKET, RHODE ISLAND

EXPLORATION LOCATION PLAN
FORMER POWER PLANT AREA AND SOUTH FILL AREA

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
530 BROADWAY
PROVIDENCE, RHODE ISLAND 02909
(401) 421-4140

PREPARED FOR:
NATIONAL GRID

PROJ MGR: MSK	REVIEWED BY: MSK	CHECKED BY: MSK	FIGURE 2B
DESIGNED BY: SDN	DRAWN BY: CRD	SCALE: 1"=50'	
DATE JULY 2011	PROJECT NO. 43654.00	REVISION NO. 0	SHEET NO. 3 OF 8

LEGEND:

- SITE AREA BOUNDARIES
- EXISTING BUILDINGS ON-SITE
- EXISTING FOUNDATION/PAD ON-SITE
- EXISTING BUILDINGS/STRUCTURES OFF-SITE
- EXISTING NBC INTERCEPTOR SANITARY SEWER
- EXISTING CITY OF PAWTUCKET STORM DRAIN
- EXISTING WATER LINE
- EXISTING STORM/COMBINED SAN. SEWER OVERFLOW
- EXISTING UNDERGROUND ELECTRIC CABLE IN CONDUIT
- EXISTING UNDERGROUND ELECTRIC MH/STRUCTURE
- EXISTING ACCESS ROAD
- EXISTING RETAINING WALLS
- EXISTING FENCE
- EXISTING CATCH BASIN LOCATIONS

REMEDIAL ALTERNATIVE EVALUATION KEY:

EPA-APPROVED SELF IMPLEMENTING CLEAN UP PLAN (NOTE 1)

NOTES:

1. THIS AREA WILL BE ADDRESSED UNDER THE FEBRUARY 2009 SELF-IMPLEMENTING PLAN TO ADDRESS PCB-IMPACTED SOILS SUBMITTED TO AND APPROVED BY THE USEPA AND RIDEM.

0 30 60 120 180
GRAPHIC SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

FORMER TIDEWATER FACILITY

PAWTUCKET, RHODE ISLAND

REMEDIAL ACTION ALTERNATIVE #1
NO ACTION WITH MONITORED NATURAL ATTENTUATION

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists, 530 BROADWAY, PROVIDENCE, RHODE ISLAND 02909, (401) 421-4140

PREPARED FOR: NATIONAL GRID

PROJ MGR: MSK	REVIEWED BY: MSK	CHECKED BY: MSK	FIGURE
DESIGNED BY: SN	DRAWN BY: CRB	SCALE: 1"=60'	3
DATE JULY 2011	PROJECT NO. 43654.00	REVISION NO. 0	SHEET NO. 4 OF 8

LEGEND:

- SITE AREA BOUNDARIES
- EXISTING BUILDINGS ON-SITE
- EXISTING FOUNDATION/PAD ON-SITE
- EXISTING BUILDINGS/STRUCTURES OFF-SITE
- EXISTING NBC INTERCEPTOR SANITARY SEWER
- EXISTING CITY OF PAWTUCKET STORM DRAIN
- EXISTING WATER LINE
- EXISTING STORM/COMBINED SAN. SEWER OVERFLOW
- EXISTING UNDERGROUND ELECTRIC CABLE IN CONDUIT
- EXISTING UNDERGROUND ELECTRIC MH/STRUCTURE
- EXISTING ACCESS ROAD
- EXISTING RETAINING WALLS
- EXISTING FENCE
- EXISTING CATCH BASIN LOCATIONS

REMEDIAL ALTERNATIVE EVALUATION KEY:

- PROPOSED BULKHEAD RESTORATION
- PROPOSED CONTAINMENT WALL
- PROPOSED IMPERMEABLE CAP
- PROPOSED PERMEABLE CAP
- PROPOSED LIMITED SOURCE REMOVAL
- EPA-APPROVED SELF IMPLEMENTING CLEAN UP PLAN (NOTE 2)
- PROPOSED ROADWAY

NOTES:

1. IN AREAS WHERE THE BULKHEAD RESTORATION AND CONTAINMENT WALL COINCIDE, THEY WILL BE MERGED.
2. THIS AREA WILL BE ADDRESSED UNDER THE FEBRUARY 2009 SELF-IMPLEMENTING PLAN TO ADDRESS PCB-IMPACTED SOILS SUBMITTED TO AND APPROVED BY THE USEPA AND RIDEM.

0 30 60 120 180
GRAPHIC SCALE IN FEET

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NO.	ISSUE/DESCRIPTION	BY	DATE

FORMER TIDEWATER FACILITY

PAWTUCKET, RHODE ISLAND

REMEDIAL ACTION ALTERNATIVE #2
ENGINEERED CAP, PHYSICAL CONTAINMENT & LIMITED SOURCE REMOVAL

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists, 530 BROADWAY, PROVIDENCE, RHODE ISLAND 02909, (401) 421-4140

PREPARED FOR: NATIONAL GRID

PROJ MGR: MSK	REVIEWED BY: MSK	CHECKED BY: MSK	FIGURE
DESIGNED BY: SN	DRAWN BY: CRB	SCALE: 1"=60'	4
DATE: JULY 2011	PROJECT NO. 43654.00	REVISION NO. 0	SHEET NO. 5 OF 8

LEGEND:

- SITE AREA BOUNDARIES
- EXISTING BUILDINGS ON-SITE
- EXISTING FOUNDATION/PAD ON-SITE
- EXISTING BUILDINGS/STRUCTURES OFF-SITE
- EXISTING NBC INTERCEPTOR SANITARY SEWER
- EXISTING CITY OF PAWTUCKET STORM DRAIN
- EXISTING WATER LINE
- EXISTING STORM/COMBINED SAN. SEWER OVERFLOW
- EXISTING UNDERGROUND ELECTRIC CABLE IN CONDUIT
- EXISTING UNDERGROUND ELECTRIC MH/STRUCTURE
- EXISTING ACCESS ROAD
- EXISTING RETAINING WALLS
- EXISTING FENCE
- EXISTING CATCH BASIN LOCATIONS

REMEDIAL ALTERNATIVE EVALUATION KEY:

- PROPOSED BULKHEAD RESTORATION
- PROPOSED CONTAINMENT WALL
- PROPOSED IMPERMEABLE CAP
- PROPOSED PERMEABLE CAP
- PROPOSED SOURCE REMOVAL
- PROPOSED ROADWAY
- EPA-APPROVED SELF IMPLEMENTING CLEAN UP PLAN (NOTE 2)

NOTES:

1. IN AREAS WHERE THE BULKHEAD RESTORATION AND CONTAINMENT WALL COINCIDE, THEY WILL BE MERGED.

2. THIS AREA WILL BE ADDRESSED UNDER THE FEBRUARY 2009 SELF-IMPLEMENTING PLAN TO ADDRESS PCB-IMPACTED SOILS SUBMITTED TO AND APPROVED BY THE USEPA AND RIDEM.

0 30 60 120 180
GRAPHIC SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

FORMER TIDEWATER FACILITY

PAWTUCKET, RHODE ISLAND

REMEDIAL ACTION ALTERNATIVE #3A
SOURCE REMOVAL, LOCALIZED PHYSICAL CONTAINMENT & ENGINEERED CAP

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists, 530 BROADWAY, PROVIDENCE, RHODE ISLAND 02909, (401) 421-4140

PREPARED FOR: NATIONAL GRID

PROJ MGR: MSK	REVIEWED BY: MSK	CHECKED BY: MSK	FIGURE
DESIGNED BY: SN	DRAWN BY: CRB	SCALE: 1" = 60'	5A
DATE: JULY 2011	PROJECT NO. 43654.00	REVISION NO. 0	SHEET NO. 6 OF 8


LEGEND:
SITE AREA BOUNDARIES
EXISTING BUILDINGS ON-SITE
EXISTING FOUNDATION/PAD ON-SITE
EXISTING BUILDINGS/STRUCTURES OFF-SITE
EXISTING NBC INTERCEPTOR SANITARY SEWER
EXISTING CITY OF PAWTUCKET STORM DRAIN
EXISTING WATER LINE
EXISTING STORM/COMBINED SAN. SEWER OVERFLOW
EXISTING UNDERGROUND ELECTRIC CABLE IN CONDUIT
EXISTING UNDERGROUND ELECTRIC MH/STRUCTURE
EXISTING ACCESS ROAD
EXISTING RETAINING WALLS
EXISTING FENCE
EXISTING CATCH BASIN LOCATIONS
FORMER POWER PLANT AREA
SOUTH FILL AREA
FORMER GAS PLANT AREA
NORTH FILL AREA
MANMADE SHORELINE
TRANSMISSION TOWERS LINE
MAX READ ATHLETIC FIELD
A.P. 65B LOT 648
A.P. 65B LOT 647
A.P. 65B LOT 645
A.P. 65B LOT 649
A.P. 65B LOT 662
A.P. 54B LOT 826
A.P. 67B LOT 11
EXISTING PAWTUCKET NO. 1 STATION
SWITCHING GALLERIES
EXISTING SUBSTATION
CITY OF PAWTUCKET DRAINAGE EASEMENT
NARRAGANSETT BAY COMMISSION EASEMENT
48" NBC INTERCEPTOR
NATURAL GAS OPERATIONS
BEDROCK OUTCROP
Excavation Depth = 12'
Excavation Depth = 10'
Excavation Depth = 10'
Excavation Depth = 8'
Excavation Depth = 7'
Excavation Depth = 9'
Excavation Depth = 8'
Excavation Depth = 6'
Excavation Depth = 4'
SEE THIS SHEET MATCH LINE A
MATCH LINE A SEE THIS SHEET
BOWLES STREET
MERRY STREET
COURT
THORNTON
TIDEWATER ST
TAFT
RESIDENTIAL APARTMENTS
PAVED PLAYGROUND
CHARTER SCHOOL
REMEDIAL ALTERNATIVE EVALUATION KEY:
PROPOSED BULKHEAD RESTORATION
PROPOSED CONTAINMENT WALL
PROPOSED ROADWAY
EPA-APPROVED SELF IMPLEMENTING CLEAN UP PLAN (NOTE 2)
PROPOSED IMPERMEABLE CAP
PROPOSED SOURCE REMOVAL
PROPOSED PERMEABLE CAP
PROPOSED IN-SITU STABILIZATION
NOTES:
1. IN AREAS WHERE THE BULKHEAD RESTORATION AND CONTAINMENT WALL COINCIDE, THEY WILL BE MERGED.
2. THIS AREA WILL BE ADDRESSED UNDER THE FEBRUARY 2009 SELF-IMPLEMENTING PLAN TO ADDRESS PCB-IMPACTED SOILS SUBMITTED TO AND APPROVED BY THE USEPA AND RIDEM.
0 30 60 120 180
GRAPHIC SCALE IN FEET
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NO. ISSUE/DESCRIPTION BY DATE
FORMER TIDEWATER FACILITY
PAWTUCKET, RHODE ISLAND
REMEDIAL ACTION ALTERNATIVE #3B
SOURCE REMOVAL, STABILIZATION,
LOCALIZED PHYSICAL CONTAINMENT & ENGINEERED CAP
PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
530 BROADWAY
PROVIDENCE, RHODE ISLAND 02909
(401) 421-4140
PREPARED FOR:
NATIONAL GRID
PROJ MGR: MSK
REVIEWED BY: MSK
CHECKED BY: MSK
DESIGNED BY: SN
DRAWN BY: CRB
SCALE: 1"=60'
DATE JULY 2011
PROJECT NO. 43654.00
REVISION NO. 0
FIGURE 5B
SHEET NO. 7 OF 8

NOTES:

1. THIS AREA WILL BE ADDRESSED UNDER THE FEBRUARY 2009 SELF-IMPLEMENTING PLAN TO ADDRESS PCB-IMPACTED SOILS SUBMITTED TO AND APPROVED BY THE USEPA AND RIDEM.

REMEDIAL ALTERNATIVE EVALUATION KEY:

- PROPOSED BULKHEAD RESTORATION
- PROPOSED PERMEABLE CAP
- PROPOSED SIGNIFICANT SOURCE REMOVAL
- EPA-APPROVED SELF IMPLEMENTING CLEAN UP PLAN (NOTE 1)
- PROPOSED ROADWAY

0 30 60 120 180
GRAPHIC SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

FORMER TIDEWATER FACILITY

PAWTUCKET, RHODE ISLAND

REMEDIAL ACTION ALTERNATIVE #4

SIGNIFICANT SOURCE REMOVAL & ENGINEERED CAP

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists, 530 BROADWAY, PROVIDENCE, RHODE ISLAND 02909, (401) 421-4140

PREPARED FOR: NATIONAL GRID

PROJ MGR: MSK	REVIEWED BY: MSK	CHECKED BY: MSK	FIGURE
DESIGNED BY: SN	DRAWN BY: CRB	SCALE: 1"=60'	6
DATE: JULY 2011	PROJECT NO. 43654.00	REVISION NO. 0	SHEET NO. 8 OF 8

APPENDIX A

LIMITATIONS

LIMITATIONS

1. This Remedial Alternative Evaluation Report has been prepared on behalf of and for the exclusive use of The Narragansett Electric Company d/b/a National Grid (National Grid), solely for documenting the evaluation completed as described herein at the Former Tidewater MGP and Power Plant Site ("Site") under the applicable provisions of the State of Rhode Island Department of Environmental Management Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (Remediation Regulations). This report and the findings contained herein shall not, in whole or in part, be disseminated or conveyed to any other party, nor used by any other party in whole or in part, without the prior written consent of GZA GeoEnvironmental, Inc.(GZA) or National Grid.

2. GZA's work was performed in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same geographical area, and GZA observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. GZA's findings and conclusions must be considered not as scientific certainties, but rather as our professional opinion concerning the significance of the limited data gathered during the course of the study. No other warranty, express or implied is made. Specifically, GZA does not and cannot represent that the Site contains no hazardous material, oil, or other latent condition beyond that observed by GZA during the work described herein.

3. The observations described in this report were made under the conditions stated therein. The conclusions presented in the report were based upon services performed and observations made by GZA.

4. In the event that National Grid or others authorized to use this report obtain information on environmental or hazardous waste issues at the Site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this report.

5. The conclusions and recommendations contained in this report are based in part upon the data obtained from environmental samples obtained from relatively widely spread subsurface explorations. The nature and extent of variations between these explorations may not become evident until further exploration. If variations or other latent conditions then appear evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the boring logs.

7. In the event this work included the collection of water level data, these readings have been made in the test pits, borings and/or observation wells at times and under conditions stated on the exploration logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall and other factors different from those prevailing at the time measurements were made.

8. The conclusions contained in this report are based in part upon various types of chemical data and are contingent upon their validity. These data have been reviewed and interpretations made in the report. Moreover, it should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time, and other factors. Should additional chemical data become available in the future, these data should be reviewed by GZA and the conclusions and recommendations presented herein modified accordingly.

9. The costs on which the preliminary remediation estimates are based are limited to those conditions which were discovered in carrying out the assessment of subsurface impacts identified in this report. Actual quantities and unit costs will vary. While the preliminary estimates represent our best professional judgment in this matter, it does not represent an absolute worst-case remedial cost estimate.

10. Governmental agencies' interpretations, requirements, and enforcement policies vary from district office to district office, from state to state, and between federal and state agencies. In addition, statutes, rules, standards, and regulations may be legislatively changed and inter-agency and intra-agency policies may be changed from present practices. GZA has used its experience and judgment in making assumptions as to how anticipated changes in enforcement policies may affect remediation costs.

11. This report contains approximate cost estimates for purposes of evaluating alternative remedial programs. These estimates involve approximate quantity evaluations. A preliminary estimate of this nature is likely to vary substantially from Contractors' Bid Prices and is not to be considered the equivalent of nor as reliable as Contractors' Bid Prices. Prices for similar work undertaken in the future will be subject to general and sometimes erratic price increases.

APPENDIX B

SIR CHECKLIST

Section 7 of the "Remediation Regulations"
Site Investigation Report (SIR) Checklist

Contact Name: Margaret Kilpatrick
Contact Address:
530 Broadway
Providence, RI 02909
Contact Telephone: 401-421-4140

Site Name:
Former Tidewater MGP and Power Plant
(Case No. 95-022)

Site Address:
1 Tidewater Street,
Pawtucket, Rhode Island

OFFICE USE ONLY
SITE INVESTIGATION REPORT (SIR) SITE: PROJECT CODE: SIR SUBMITTAL DATE: CHECKLIST SUBMITTAL DATE:

DIRECTIONS: *The box to the left of each item listed below is for the administrative review of the SIR submission and is for* ***RIDEM USE ONLY****. Under each item listed below, cross-reference the specific sections and pages in the SIR that provide detailed information that addresses each stated requirement. Failure to include cross-references may delay review and approval. If an item is not applicable, simply state that it is not applicable and provide an explanation in the SIR.*

□ 7.03.A. List specific objectives of the SIR related to characterization of the release, impacts of the release and remedy.

January 2011 Site Investigation Data Report (SIDR), Section 1.10 Project Objectives, Pages 2 – 3
July 2011 (Remedial Alternative Evaluation (RAE), Section 4.00, Remedial Objectives, Page 25

□ 7.03.B. Include information reported in the Notification Of Release. A copy of the release notification form should be included in the SIR. Include information relating to short-term response, if applicable.

January 2011 SIDR, Section 4.10 Documented Spills and Releases, Pages 21 – 24

□ 7.03.C. Include documentation of any past incidents or releases.

January 2011 SIDR, Section 4.10 Documented Spills and Releases, Pages 21 – 24

□ 7.03.D. Include list of prior property owners and operators, as well as sequencing of property transfers and time periods of occupancy.

January 2011 SIDR, Section 3.10 Site History, Pages 14 – 15

□7.03.E. Include previously existing environmental information which characterizes the contaminated-site and all information that led to the discovery of the contaminated-site.

January 2011 SIDR, Section 4.30 Previous Environmental Investigations and Remedial Actions, Pages 24 - 34

□ 7.03.F. Include current uses and zoning of the contaminated site, including brief statements of operations, processes employed, waste generated, hazardous materials handled, and any residential activities on the site, if applicable. (This section should be linked to the specific objectives section demonstrating how the compounds of concern in the investigation are those that are used or may have been used on the site or are those that may have impacted the site from an off-site source.)

January 2011 SIDR, Section 2.10 Site Location and General Description, Pages 5 – 7
January 2011 SIDR, Section 2.20 Adjoining Area and Property Use, Page 7
January 2011 SIDR, Section 2.30 Site Utilities, Page 7
January 2011 SIDR, Section 2.40 Environmental Setting, Pages 8 – 10
January 2011 SIDR, Section 3.00 Historical Use Information, Pages 10 - 21

□ 7.03.G. Include a locus map showing the location of the site using US Geological Survey 7.5-min quadrangle map or a copy of a section of that USGS map.

January 2011 SIDR, Figure 1, Locus Plan

□ 7.03.H. Include a site plan, to scale, showing:

□ Buildings:
January 2011 SIDR, Figures 2A and 2B, Exploration Location Plans

□ Activities:
Not Applicable

□ Structures:
January 2011 SIDR, Figures 2A and 2B, Exploration Location Plans

□ North Arrow:
January 2011 SIDR, Figures 2A and 2B, Exploration Location Plans

□ Wells:

January 2011 SIDR, Figures 2A and 2B, Exploration Location Plans

□ UIC Systems, septic tanks, UST, piping and other underground structures:
January 2011 SIDR, Figures 2A and 2B, Exploration Location Plans
January 2011 SIDR, Figures 3A and 3B, Historical Site Features Plans

□ Outdoor hazardous materials storage and handling areas:
Not Applicable

□ Extent of paved areas:
January 2011 SIDR, Figures 2A and 2B, Exploration Location Plans

□ Location of environmental samples previously taken with analytical results:
January 2011 SIDR, Figures 2A and 2B, Exploration Location Plans
January 2011 SIDR, Figures 12A and 12B, Shallow Surface Soil Distribution Plans – TPH, VOCs and PAHs Impacts
January 2011 SIDR, Figures 13A and 13B, Subsurface Soil Distribution Plans – TPH, VOCs and PAHs Impacts
January 2011 SIDR, Figures 14A and 14B, Shallow Surface Soil Distribution Plans – Inorganic Impacts
January 2011 SIDR, Figures 15A and 15B, Subsurface Soil Distribution Plans – Inorganic Impacts
January 2011 SIDR, Figures 16A and 16B, Distribution of Groundwater Impacts
January 2011 SIDR, Appendix B, Historic Soil and Groundwater Analytical Data

□ Waste management and disposal areas:
Not Applicable

□ Property lines:
January 2011 SIDR, Figures 2A and 2B, Exploration Location Plans

□ 7.03.I. Include a general characterization of the property surrounding the area including, but not limited to:

□ Location and distance to any surface water bodies within 500 ft of the site:
January 2011 SIDR, Section 2.40 Environmental Setting, Pages 8 – 10

□ Location and distance to any environmentally sensitive areas within 500 ft of the site:
January 2011 SIDR, Section 2.40 Environmental Setting, Pages 8 – 10

□ Actual sources of potable water for all properties immediately abutting the site
January 2011 SIDR, Section 2.40 Environmental Setting, Page 9

□ Location and distance to all public water supplies, which have been active within the previous 2 years and within one mile of the site
January 2011 SIDR, Section 2.40 Environmental Setting, Page 9

□ Determination as to whether the release impacts any off-site area utilized for residential or industrial/commercial property or both

January 2011 SIDR, Section 8.00 Potential Exposure Pathways and Receptors, Pages 99 – 105

□ Determination of the underlying groundwater classification and if the classification is GB, the distance to the nearest GA area

January 2011 SIDR, Section 2.40 Environmental Setting, Page 9

□ 7.03.J. Include classifications of surface and ground water at and surrounding the site that could be impacted by a release.

January 2011 SIDR, Section 2.40 Environmental Setting, Pages 8 – 10

□ 7.03.K. Include a description of the contamination from the release, including:

□ Free liquids on the surface:

Not Applicable

□ LNAPL and DNAPL:

January 2011 SIDR, Section 6.50 Non-Aqueous Phase Liquids, Pages 66 – 68
January 2011 SIDR, Sections 7.50 NAPL Observations and Sampling Results and 7.60 Residual Material Sampling Results, Pages 92 – 95
January 2011 SIDR, Figures 17A and 17B, LNAPL/DNAPL Distribution

□ Concentrations of hazardous substances which can be shown to present an actual or potential threat to human health and any concentrations in excess of any of the remedial objectives:

January 2011 SIDR, Section 7.00 Nature and Extent of Observed Impacts, Pages 68 – 98
January 2011 SIDR, Figures 12A and 12B, Shallow Surface Soil Distribution Plans – TPH, VOCs and PAHs Impacts
January 2011 SIDR, Figures 13A and 13B, Subsurface Soil Distribution Plans – TPH, VOCs and PAHs Impacts
January 2011 SIDR, Figures 14A and 14B, Shallow Surface Soil Distribution Plans – Inorganic Impacts
January 2011 SIDR, Figures 15A and 15B, Subsurface Soil Distribution Plans – Inorganic Impacts
January 2011 SIDR, Figures 16A and 16B, Distribution of Groundwater Impacts
January 2011 SIDR, Figures 17A and 17B, LNAPL/DNAPL Distribution

□ Impact to environmentally sensitive areas:

January 2011 SIDR, Appendix D, June 2009 Arcadis Sediment Data Report

□ Contamination of man-made structures:

Not applicable

□ Odors or stained soil:

January 2011 SIDR, Section 7.10 Field Screening and Observations of Impacted Soils, Pages 69 - 74
January 2011 SIDR, Figure 5 Cross Section Profile A-A’
January 2011 SIDR, Figure 6 Cross Section Profile B-B’
January 2011 SIDR, Figure 7 Cross Section Profile C-C’
January 2011 SIDR, Figure 8 Cross Section Profile D-D’
January 2011 SIDR, Figure 9 Cross Section Profile E-E’
January 2011 SIDR, Figure 10 Cross Section Profile F-F’
January 2011 SIDR, Figure 11 Cross Section Profile G-G’

□ Stressed vegetation:
Not Applicable

□ Presence of excavated or stockpiled material and an estimate of its total volume:
Not Applicable

□ Environmental sampling locations, procedures and copies of the results of any analytical testing at the site[1]:
January 2011 SIDR, Figures 2A and 2B, Exploration Location Plans
January 2011 SIDR, Sections 5.80 Analytical Testing and 5.90 Quality Assurance / Quality Control Procedures and Samples, Page 48 – 53
January 2011 SIDR, Appendix I, Soil Analytical Laboratory Data
January 2011 SIDR, Appendix J, Groundwater Analytical Laboratory Data
January 2011 SIDR, Appendix K, NAPL Analytical Laboratory Data
January 2011 SIDR, Appendix M, Residual Material Analytical Laboratory Data
January 2011 SIDR, Appendix O, Sheen Analytical Laboratory Data

□ List of hazardous substances at the site:
January 2011 SIDR, Table 2A, Summary of Surface Soil Information (SS-100 Series)
January 2011 SIDR, Table 2B, Summary of Surface Soil VOC Analytical Results
January 2011 SIDR, Table 3A, Summary of Surface Soil, TPH, PAHs and Inorganics Analytical Results
January 2011 SIDR, Table 3B, Summary of Subsurface Soil, TPH, PAH and Inorganic Analytical Results
January 2011 SIDR, Table 4A, Summary of Groundwater VOC Analytical Results
January 2011 SIDR, Table 4B, Summary of Groundwater, TPH, PAH and Inorganics Analytical Results
January 2011 SIDR, Table 7A, Summary of Monitoring Well NAPL Analytical Results
January 2011 SIDR, Table 8A, Summary of Residual Material Analytical Results – Product
January 2011 SIDR, Table 8B, Summary of Residual Material Analytical Results – Aqueous
January 2011 SIDR, Table 8C, Summary of Residual Material Analytical Results – Solid
January 2011 SIDR, Appendix B, Historic Soil and Groundwater Analytical Data

[1] This listing does not include historic data collected by VHB, Atlantic/GEI and others. All available historic data is summarized in Appendix B of the January 2011 SIDR.

□ Discuss if the contamination falls outside of the jurisdiction of the Remediation Regulations, including but not limited to USTs, UICs, and wetlands:

Certain site investigation and remediation activities related to Polychlorinated Biphenyl (PCB) impacted materials within the electrical substation and natural gas regulator station areas have/will be performed consistent with the requirements of the federal Toxic Substance Control Act (TSCA). Closure of the former tank UGGT-1 located on the FGPA will be performed consistent with RIDEM's Rules and Regulations for Underground Storage Facilities Used for Petroleum Products and Hazardous Materials (UST Regulations).

□7.03.L. Include the concentration gradients of hazardous substances throughout the site for each media impacted by the release.

January 2011 SIDR, Section 7.00 Nature and Extent of Observed Impacts, Pages 68 – 98
January 2011 SIDR, Figures 12A and 12B, Shallow Surface Soil Distribution Plans – TPH, VOCs and PAHs Impacts
January 2011 SIDR, Figures 13A and 13B, Subsurface Soil Distribution Plans – TPH, VOCs and PAHs Impacts
January 2011 SIDR, Figures 14A and 14B, Shallow Surface Soil Distribution Plans – Inorganic Impacts
January 2011 SIDR, Figures 15A and 15B, Subsurface Soil Distribution Plans – Inorganic Impacts
January 2011 SIDR, Figures 16A and 16B, Distribution of Groundwater Impacts
January 2011 SIDR, Figures 17A and 17B, LNAPL/DNAPL Distribution

□ 7.03.M. Include the methodology and results of any investigation conducted to determine background concentrations of hazardous substances identified at the contaminated site.

Not Applicable

□7.03.N. Include a listing and evaluation of the site specific hydrogeological properties which could influence the migration of hazardous substances throughout and away from the site, including but not limited to, where appropriate:

□ Depth to GW:

January 2011 SIDR, Section 6.40, Groundwater Elevations 64 – 66

□ Presence and effects of both the natural and man-made barriers to and conduits for contaminant Migration:

January 2011 SIDR, Section 6.30, Surface Water and Drainage, Page 64
January 2011 SIDR, Section 8.30, Exposure Pathways, Pages 102 – 105

□ Characterization of bedrock:

January 2011 SIDR, Section 6.20 Site Geology, Pages 63 – 64

□ Groundwater contours, flow rates and gradients throughout the site:

January 2011 SIDR, Section 6.40, Groundwater Elevations 64 – 66
January 2011 SIDR, Figure 4, Groundwater Contour Plan

□ 7.03.O. Include a characterization of the topography, surface water and run-off flow patterns, including the flooding potential, of the site

January 2011 SIDR, Sections 6.10 Topography, Page 53 – 54
January 2011 SIDR, Section 6.30, Surface Water and Drainage, Page 64

□ 7.03.P. Include the potential for hazardous substances from the site to volatilize and any and all potential impacts of the volatilization to structures within the site.

Not Applicable under current site conditions

□ 7.03.Q. Include the potential for entrainment of hazardous substances from the site by wind or erosion actions.

July 2011 RAE, Sections 3.00 and 4.00, Pages 19 - 25

□ 7.03.R. Include detailed protocols for all fate and transport models used in the Site Investigation.

July 2011 RAE, Section 6.30 Limited Design Investigation, Page 35
July 2011 RAE, Section 3.00 Conceptual Site Model Summary, Pages 19 - 24
January 2011 SIDR, Section 8.00 Potential Exposure Pathways and Receptors, Pages 99 – 105

□ 7.03.S. Include a complete list of all samples taken, the location of all samples, parameters tested for and analytical methods used during the Site Investigation. (Be sure to include the samples locations and analytical results on a site figure).

January 2011 SIDR, Section 5.00 Supplemental Site Investigation Program, Pages 34 – 53
January 2011 SIDR, Figures 12A and 12B, Shallow Surface Soil Distribution Plans – TPH, VOCs and PAHs Impacts
January 2011 SIDR, Figures 13A and 13B, Subsurface Soil Distribution Plans – TPH, VOCs and PAHs Impacts
January 2011 SIDR, Figures 14A and 14B, Shallow Surface Soil Distribution Plans – Inorganics
January 2011 SIDR, Figures 15A and 15B, Subsurface Soil Distribution Plans – Inorganics
January 2011 SIDR, Figures 16A and 16B, Distribution of Groundwater Impacts
January 2011 SIDR, Figures 17A and 17B, LNAPL/DNAPL Distribution
January 2011 SIDR, Table 2A, Summary of Surface Soil Information (SS-100 Series)
January 2011 SIDR, Table 2B, Summary of Surface Soil VOC Analytical Results
January 2011 SIDR, Table 3A, Summary of Surface Soil, TPH, PAHs and Inorganics Analytical Results
January 2011 SIDR, Table 3B, Summary of Subsurface Soil, TPH, PAH and Inorganic Analytical Results
January 2011 SIDR, Table 4A, Summary of Groundwater VOC Analytical Results
January 2011 SIDR, Table 4B, Summary of Groundwater, TPH, PAH and Inorganics Analytical Results
January 2011 SIDR, Table 7A, Summary of Monitoring Well NAPL Analytical Results
January 2011 SIDR, Table 8A, Summary of Residual Material Analytical Results – Product
January 2011 SIDR, Table 8B, Summary of Residual Material Analytical Results – Aqueous
January 2011 SIDR, Table 8C, Summary of Residual Material Analytical Results – Solid
January 2011 SIDR, Appendix B, Historic Soil and Groundwater Analytical Data

□ 7.03.T. Include construction plans and development procedures for all monitoring wells. Well construction must be consistent with the requirements of Appendix I of the Groundwater Quality Regulations.

January 2011 SIDR, Section 5.40.2 Monitoring Well Installation, Pages 40 – 41

January 2011 SIDR, Appendix H, Boring Logs

□ 7.03.U. Include procedures for the handling, storage and disposal of wastes derived from and during the investigation.

January 2011 SIDR, Section 5.40.1 Soil Boring and Field Screening, Pages 37 – 40
January 2011 SIDR, Section 5.40.2 Monitoring Well Installation, Pages 40 – 41
January 2011 SIDR, Section 5.40.6 NAPL Gauging, Sampling and Analysis, Pages 43 – 44
January 2011 SIDR, Appendix G, Disposal Certificates

□ 7.03.V. Include a quality assurance and quality control evaluation summary report for sample handling and analytical procedures, including, but not limited to, chain-of-custody procedures and sample preservation techniques.

January 2011 SIDR, 5.90 Quality Assurance / Quality Control Procedures and Samples, Page 48 – 53

□7.03.W. Include any other site-specific factor, that the Director believes, is necessary to make an accurate decision as to the appropriate remedial action to be taken at the site.

July 2011 RAE, Section 5.00 Remedial Action Alternative Evaluation, Pages 26 - 30
July 2011 RAE, Section 6.00, Recommended Remedial Action Alternative, Pages 30 – 35
July 2011 RAE, Table 4, Comparative Evaluation of Remedial Alternatives

□7.04 Include Remedial Alternatives. The Site Investigation Report **must** contain a minimum of **2** remedial alternatives other than no action/natural attenuation alternative, unless this requirement is waived by the Department. It should be clear which of these alternatives is most preferable. All alternatives must be supported by relevant data contained in the Site Investigation Report and consistent with the current and reasonably forseeable land usage, and documentation of the following:

□ Compliance with Section 8 (RISK MANAGEMENT);

July 2011 RAE, Sections 6.10 Justification of Selection of Preferred Remedial Action, Pages 30 – 33
July 2011 RAE, Sections 6.20 Details of Preferred Remedial Action Alternative, Pages 33 – 34
July 2011 RAE, Table 4, Comparative Evaluation of Remedial Alternatives

□ Technical feasibility of the preferred remedial alternative;

July 2011 RAE, Sections 6.10 Justification of Selection of Preferred Remedial Action, Pages 30 – 33
July 2011 RAE, Sections 6.20 Details of Preferred Remedial Action Alternative, Pages 33 – 34
July 2011 RAE, Table 4, Comparative Evaluation of Remedial Alternatives

□ Compliance with Federal, State and local laws or other public concerns; and

July 2011 RAE, Sections 6.10 Justification of Selection of Preferred Remedial Action, Pages 30 – 33
July 2011 RAE, Sections 6.20 Details of Preferred Remedial Action Alternative, Pages 33 – 34
July 2011 RAE, Table 4, Comparative Evaluation of Remedial Alternatives

□ The ability of the performing party to perform the preferred remedial alternative
July 2011 RAE, Section 7.00 Anticipated Schedule, Page 35

□ 7.05 **Certification Requirements:** The Site Investigation Report and all associated progress reports must include the following statements signed by an authorized representative of the party specified:

□ A statement signed by an authorized representative of the person who prepared the Site Investigation Report certifying the completeness and accuracy of the information contained in that report to the best of their knowledge; and
July 2011 RAE, Section 8.00 Certification, Page 36

□ A statement signed by the performing party responsible for the submittal of the Site Investigation Report certifying that the report is a complete and accurate representation of the site and release and contains all known facts surrounding the release to the best of their knowledge
July 2011 RAE, Section 8.00 Certification, Page 36

□ 7.06 **Progress Reports:** If the Site Investigation is not complete, include a schedule for the submission of periodic progress reports on the status of the investigation and interim reports on any milestones achieved in the project
Not Applicable

□ 7.07 **Public Notice:** Be prepared to implement public notice requirements per Section 7.07 and 7.09 of the Remediation Regulations when the Department deems the Site Investigation Report to be complete.

APPENDIX C

HYDROCARBON FINGERPRINT ANALYSIS REPORT

June 17, 2011

Meg Kilpatrick, P.E.
GZA GeoEnvironmental, Inc.
Senior Project Manager
530 Broadway
Providence, Rhode Island 02909
Phone: 401.421.4140
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Re: Second Addendum to Hydrocarbon Characterization of Sheen and NAPL Samples At The Former Tidewater Facility, Pawtucket, RI

Dear Ms. Kilpatrick,

This letter summarizes the hydrocarbons composition of two sheen samples collected from a discharge pipe discussed in the original report dated December 13, 2010, three non-aqueous phase liquids (NAPLs) from onsite monitoring wells in the first addendum to the original report dated March 21, 2011 and most recently an additional monitoring well NAPL sampled at the Former Tidewater Facility in Pawtucket, RI.

Methods

Two samples were collected on Teflon nets designed by the US Coast Guard for oil spill sampling (Table 1). An unused net was retained as the field blank to demonstrate the cleanliness of the sampling media. The nets were spiked with surrogates and extracted with dichloromethane (DCM). The sample extracts were concentrated and spiked with internal standards. The NAPL samples were separately diluted in dichloromethane and spiked with surrogates / internal standards.

High resolution hydrocarbon fingerprints were generated from each extract using a gas chromatograph equipped with a flame ionization detector (GC/FID). The instrument was calibrated with a multilevel calibration curve and continuing calibration standards. These fingerprints are capable of revealing the presence of fuels, lubricating oils, MGP tar, plant waxes, and other hydrocarbon materials.

Selected sample extracts with petroleum hydrocarbon patterns were also measured for polycyclic aromatic hydrocarbons (Table 2) and geochemical biomarkers (Table 3) using a gas chromatograph equipped with a mass spectrometer operated in the selected ion monitoring mode (GC/MS SIM). The instrument was calibrated with a multilevel calibration curve and continuing calibration standards. These data helped confirm the hydrocarbon type and PAH origin.

RESULTS

The complete Alpha analytical reports (GC/FID dated October 13, 2010; ETR #1009123 / GC/MS PAH and BIO November 18, 2010; ETR #1102037 / March 10, 2011; ETR #1102037; ETR #1105069 / June 2, 2011) including all raw sample analysis data, quality control data, and gas chromatograms is maintained on file by NewFields. The pertinent GC/FID chromatograms can be found in Attachment 1. The tabulated results from the FID, PAH and Biomarker data can be found in Attachment 2. Chain-of-custody documents are presented in Attachment 3. A site map with sampling locations can be found in Figure 4.

Sheen Sample Results

The Field Blank (FB-083010) contained no detectable hydrocarbons (<77,200 mg/kg, Table 4) and its high resolution hydrocarbon fingerprint demonstrated absence of any significant hydrocarbon pattern (Figure 1a). The field sample Sheen-1-083010 contained 491,000 mg/kg of total extractable material; however, it exhibited no significant hydrocarbon pattern (Figure 1b). The main difference between the FB-083010 and Sheen-1-083010 was the presence of early eluting peaks with an unidentified pattern and unknown origin. The field sample Sheen-2-083010 contained 721,000 mg/kg of total extractable material (Table 4). The extractable material consisted primarily of hydrocarbons that eluted between *n*-hexadecane (n-C_{16}) and *n*-hexatriacontane (n-C_{36}) (Figure 1c). This pattern most closely resembled a middle petroleum distillate attributable to weathered diesel, No. 2 fuel oil, or gas oil. The sample also contained early eluting peaks of unknown origin, like those observed in Sheen1-083010. The GC/MS data discussed in greater detail below demonstrated that these unidentified compounds were not saturated or aromatic hydrocarbons.

The hydrocarbon pattern in Sheen-2-083010 was further analyzed for PAHs and biomarkers (GC/MS SIM). The PAH pattern demonstrated petrogenic 2- to 3-ring PAHs mixed with pyrogenic 4- to 6-ring PAHs (Figure 2a). The petrogenic PAHs originated from the petroleum while the pyrogenic PAHs may have been soot or a small portion of tar product. The saturated hydrocarbon fingerprint confirmed the presence of middle distillate range petroleum eluting from approximately *n*-hexadecane (n-C_{16}) and *n*-hexatriacontane (n-C_{36}) (Figure2b). The normal alkanes were approximately equivalent to the isoprenoid hydrocarbons and in some cases less abundant than then adjacent isoprenoid hydrocarbons. This feature indicated a moderate degree of microbial degradation. The strong triterpane pattern indicated the presence of heavy petroleum (Figure 2c). The heavy petroleum suggested the petroleum was likely a gas oil product or a mixture of diesel/No. 2 fuel oil and a heavier petroleum product.

NAPL Sample Results

Monitoring Well MW-3P contained 800,000 mg/kg of total extractable material (Table 4). The hydrocarbons primarily eluted between *n*-nonane (n-C_9) and *n*-hexatriacontane (n-C_{36}) (Figure 3a). This pattern most closely resembled a weathered diesel, No. 2 fuel oil, or gas oil product. The petroleum was very weathered as evidenced by the low proportion of normal alkanes relative to isoprenoid hydrocarbons. The MW-3P sample most closely resembled Sheen-2-083010, which was collected proximal to this sampling location.

Monitoring Well MW-313P contained 772,000 mg/kg of total extractable material (Table 4). The hydrocarbons primarily eluted between *n*-nonane (n-C_9) and *n*-hexatriacontane (n-C_{36}) (Figure

3b). This pattern most closely resembled a weathered diesel, No. 2 fuel oil, or gas oil product similar to what is being seen chromatographically in MW-3P. The sample also contained pyrogenic PAHs attributable to MGP tar (Figure 3b).

Monitoring Well MW-341P contained 657,000 mg/kg of total extractable material (Table 4). The hydrocarbons primarily eluted between *n*-nonane (n-C_9) and *n*-hexatriacontane (n-C_{36}) (Figure 3c). The hydrocarbon pattern consisted of 2- to 6-ring pyrogenic PAHs attributed to MGP tar. The high proportion of naphthalene relative to other PAHs indicated the tar was lightly weathered (Figure 3c).

The most recent Monitoring Well sampled ME-MW-5P contained 861,000 mg/kg of total extractable material (Table 4). The hydrocarbons primarily eluted between *n*-nonane (n-C_9) and *n*-hexatriacontane (n-C_{36}) (Figure 3a). This pattern most closely resembled a weathered diesel, No. 2 fuel oil, or gas oil product. The petroleum was very weathered as evidenced by the low proportion of normal alkanes relative to isoprenoid hydrocarbons. The ME-MW-5P NAPL sample most closely resembles the NAPL at MW-3P, which was collected approximately 100 feet from this sampling location.

Please contact me if you have any questions or comments about this evaluation.

Sincerely,

Stephen Emsbo-Mattingly
Senior Scientist

Table 1. Sample Information.

Sample ID	Lab ID	Matrix	Date Collected	Date Received	High Resolution Hydrocarbon Fingerprint EPA8015 GC/FID	Parent & Alkylated PAHs EPA8270 GC/MS SIM	Geochemical Biomarkers EPA8270 GC/MS SIM
Sheen-1-083010	1009123-01	Sheen	8/30/2010	9/1/2010	X		
Sheen-2-083010	1009123-02	Sheen	8/30/2010	9/1/2010	X	X	X
FB-083010	1009123-03	Sheen	8/30/2010	9/1/2010	X		
MW-3P	1102037-01	NAPL	2/18/2011	2/19/2011	X		
MW-313P	1102037-02	NAPL	2/18/2011	2/19/2011	X		
MW-341P	1102037-03	NAPL	2/18/2011	2/19/2011	X		
ME MW-5P	1105069-01	NAPL	5/5/2011	5/10/2011	X		
Total					**7**	**1**	**1**

Table 2. PAH Target Analytes (GC/MS SIM).

Analytes	Abbrev	Rings	TPAHs	EPAPAHs	Parent PAHs	Alkyl PAHs	Diagenetic PAHs
Naphthalene	N0	2	X	X	X		
C1-Naphthalenes	N1	2	X			X	
C2-Naphthalenes	N2	2	X			X	
C3-Naphthalenes	N3	2	X			X	
C4-Naphthalenes	N4	2	X			X	
Biphenyl	B	2	X		X		
Dibenzofuran	DF	3	X		X		
Acenaphthylene	AY	3	X	X	X		
Acenaphthene	AE	3	X	X	X		
Fluorene	F0	3	X	X	X		
C1-Fluorenes	F1	3	X			X	
C2-Fluorenes	F2	3	X			X	
C3-Fluorenes	F3	3	X			X	
Anthracene	A0	3	X	X	X		
Phenanthrene	P0	3	X	X	X		
C1-Phenanthrenes/Anthracenes	PA1	3	X			X	
C2-Phenanthrenes/Anthracenes	PA2	3	X			X	
C3-Phenanthrenes/Anthracenes	PA3	3	X			X	
C4-Phenanthrenes/Anthracenes	PA4	3	X			X	
Dibenzothiophene	DBT0	3	X		X		
C1-Dibenzothiophenes	DBT1	3	X			X	
C2-Dibenzothiophenes	DBT2	3	X			X	
C3-Dibenzothiophenes	DBT3	3	X			X	
C4-Dibenzothiophenes	DBT4	3	X			X	
Benzo(b)fluorene	BF	4	X		X		
Fluoranthene	FL0	4	X	X	X		
Pyrene	PY0	4	X	X	X		
C1-Fluoranthenes/Pyrenes	FP1	4	X			X	
C2-Fluoranthenes/Pyrenes	FP2	4	X			X	
C3-Fluoranthenes/Pyrenes	FP3	4	X			X	
Benz[a]anthracene	BA0	4	X	X	X		
Chrysene/Triphenylene	C0	4	X	X	X		
C1-Chrysenes	BC1	4	X			X	
C2-Chrysenes	BC2	4	X			X	
C3-Chrysenes	BC3	4	X			X	
C4-Chrysenes	BC4	4	X			X	
Benzo[b]fluoranthene	BBF	5	X	X	X		
Benzo[k]fluoranthene	BJKF	5	X	X	X		
Benzo[a]fluoranthene	BAF	5	X		X		
Benzo[e]pyrene	BEP	5	X		X		
Benzo[a]pyrene	BAP	5	X	X	X		
Perylene	PER	5	X		X		X
Indeno[1,2,3-cd]pyrene	IND	6	X	X	X		
Dibenz[a,h]anthracene	DA	5	X	X	X		
Benzo[g,h,i]perylene	GHI	6	X	X	X		
Count	**45**		**45**	**16**	**23**	**22**	**1**

Table 3. Geochemical Biomarker Target Analytes (GC/MS SIM).

Analytes	Abbrev	Saturated Rings	Total Hopanes	Total Steranes
C23 Tricyclic Terpane	t23	3	X	
C24 Tricyclic Terpane	t24	3	X	
C25 Tricyclic Terpane	t25	3	X	
C24 Tetracyclic Terpane	te24	4	X	
C26 Tricyclic Terpane-22S	t26S	3	X	
C26 Tricyclic Terpane-22R	t26R	3	X	
C28 Tricyclic Terpane-22S	t28S	3	X	
C28 Tricyclic Terpane-22R	t28R	3	X	
C29 Tricyclic Terpane-22S	t29S	3	X	
C29 Tricyclic Terpane-22R	t29R	3	X	
18a-22,29,30-Trisnorneohopane	Ts	5	X	
C30 Tricyclic Terpane-22S	t30S	5	X	
C30 Tricyclic Terpane-22R	t30R	5	X	
17a(H)-22,29,30-Trisnorhopane	Tm	5	X	
17a/b,21b/a 28,30-Bisnorhopane	BNH	5	X	
17a(H),21b(H)-25-Norhopane	25N	5	X	
30-Norhopane	NH	5	X	
18a(H)-30-Norneohopane-C29Ts	C29Ts	5	X	
17a(H)-Diahopane	X	5	X	
30-Normoretane	M29	5	X	
18a(H)&18b(H)-Oleananes	O	5	X	
Hopane	HOP	5	X	
Moretane	M	5	X	
30-Homohopane-22S	H31S	5	X	
30-Homohopane-22R	H31R	5	X	
30,31-Bishomohopane-22S	H32S	5	X	
30,31-Bishomohopane-22R	H32R	5	X	
30,31-Trishomohopane-22S	H33R	5	X	
30,31-Trishomohopane-22R	H33S	5	X	
Tetrakishomohopane-22S	H34R	5	X	
Tetrakishomohopane-22R	H34S	5	X	
Pentakishomohopane-22S	H35S	5	X	
Pentakishomohopane-22R	H35R	5	X	
13b(H),17a(H)-20S-Diacholestane	d27S	4		X
13b(H),17a(H)-20R-Diacholestane	d27R	4		X
13b,17a-20S-Methyldiacholestane	d28S	4		X
14a(H),17a(H)-20S-Cholestane	aa27S	4		X
14a(H),17a(H)-20R-Cholestane	aa27R	4		X
13b,17a-20R-Ethyldiacholestane	d29R	4		X
13a,17b-20S-Ethyldiacholestane	d29S	4		X
14a,17a-20S-Methylcholestane	aa28S	4		X
14a,17a-20R-Methylcholestane	aa28R	4		X
14a(H),17a(H)-20S-Ethylcholestane	aa29S	4		X
14a(H),17a(H)-20R-Ethylcholestane	aa29R	4		X
14b(H),17b(H)-20R-Cholestane	bb27R	4		X
14b(H),17b(H)-20S-Cholestane	bb27S	4		X
14b,17b-20R-Methylcholestane	bb28R	4		X
14b,17b-20S-Methylcholestane	bb28S	4		X
14b(H),17b(H)-20R-Ethylcholestane	bb29R	4		X
14b(H),17b(H)-20S-Ethylcholestane	bb29S	4		X
Count	**50**		**33**	**17**

Table 4. Summary of Results.

Sample	Units	TPH	EPAPAH	Biomarkers
Sheen-1-083010	mg/kg	491000	-	-
Sheen-2-083010	mg/kg	721000	905	504
FB-083010	mg/kg	<77200	-	-
Alaska North Slope Crude	mg/kg	539000	-	-
MW-3P	mg/kg	800000	-	-
MW-313P	mg/kg	772000	-	-
MW-341P	mg/kg	657000	-	-
Alaska North Slope Crude	mg/kg	553000	-	-
ME MW-5P	mg/kg	861000	-	-
Alaska North Slope Crude	mg/kg	529000	-	-

Figure 1. High Resolution Hydrocarbon Fingerprints (Sheen Samples).

a. FB-083010

b. Sheen-1-083010

c. Sheen-2-083010

d. Crude Oil
Lab Reference Sample

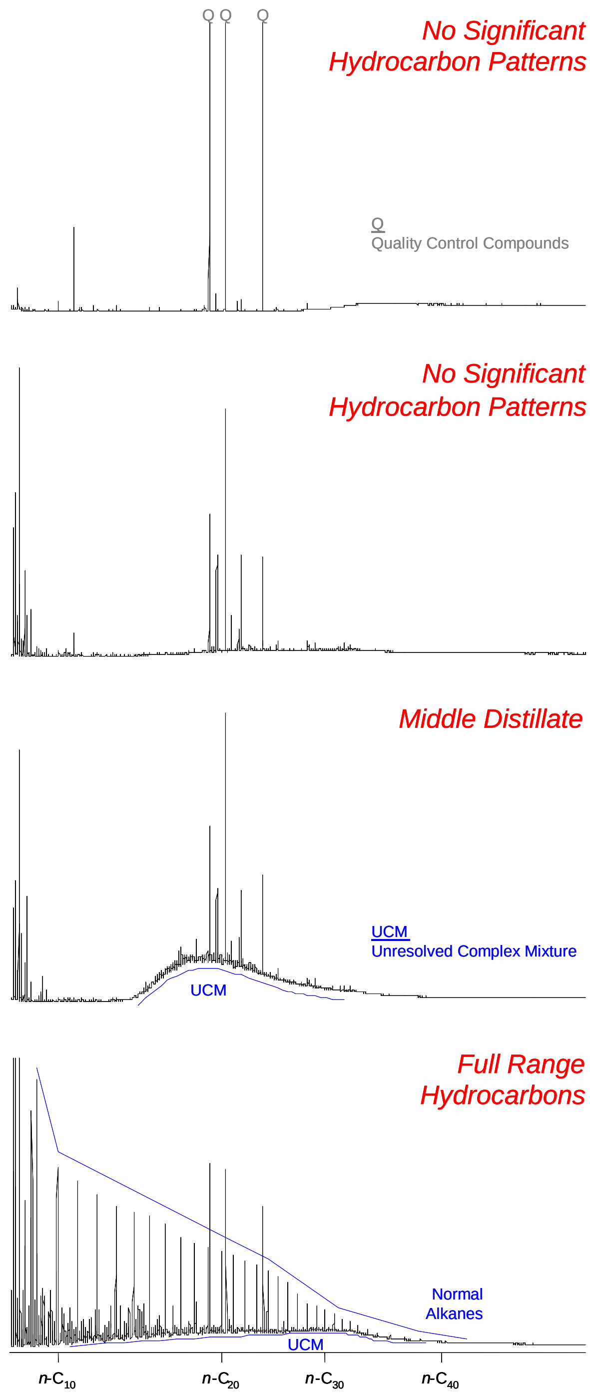
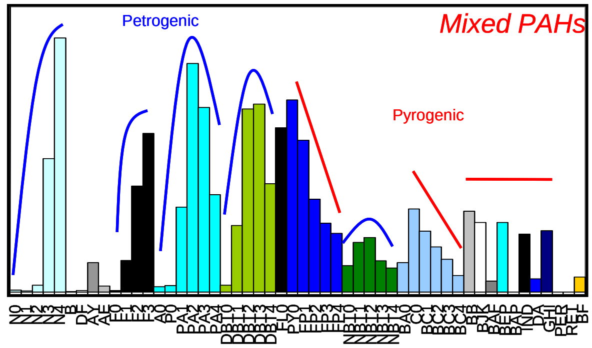
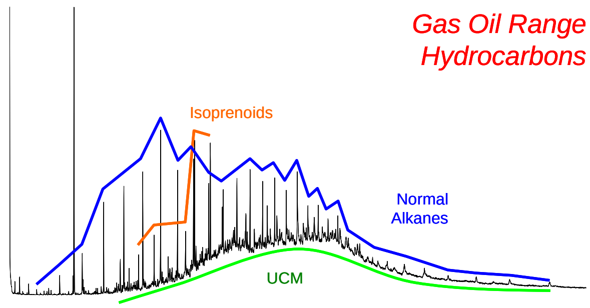


Figure 2. Sheen-2-083010 PAH, Saturated Hydrocarbon, and Biomarker Fingerprints.

a. PAH Histogram
(Full Analyte IDs in Table 2)



b. Saturated Hydrocarbon Fingerprint
(m/z 85)



c. Triterpane Biomarker Fingerprint
(m/z 191)

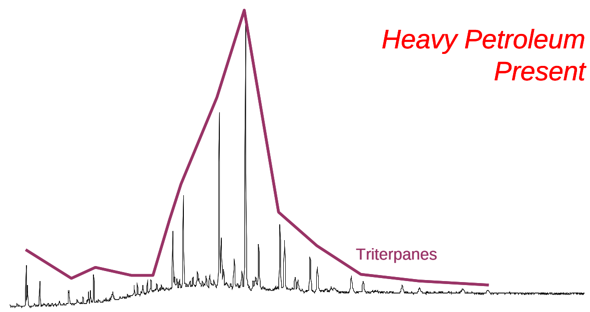
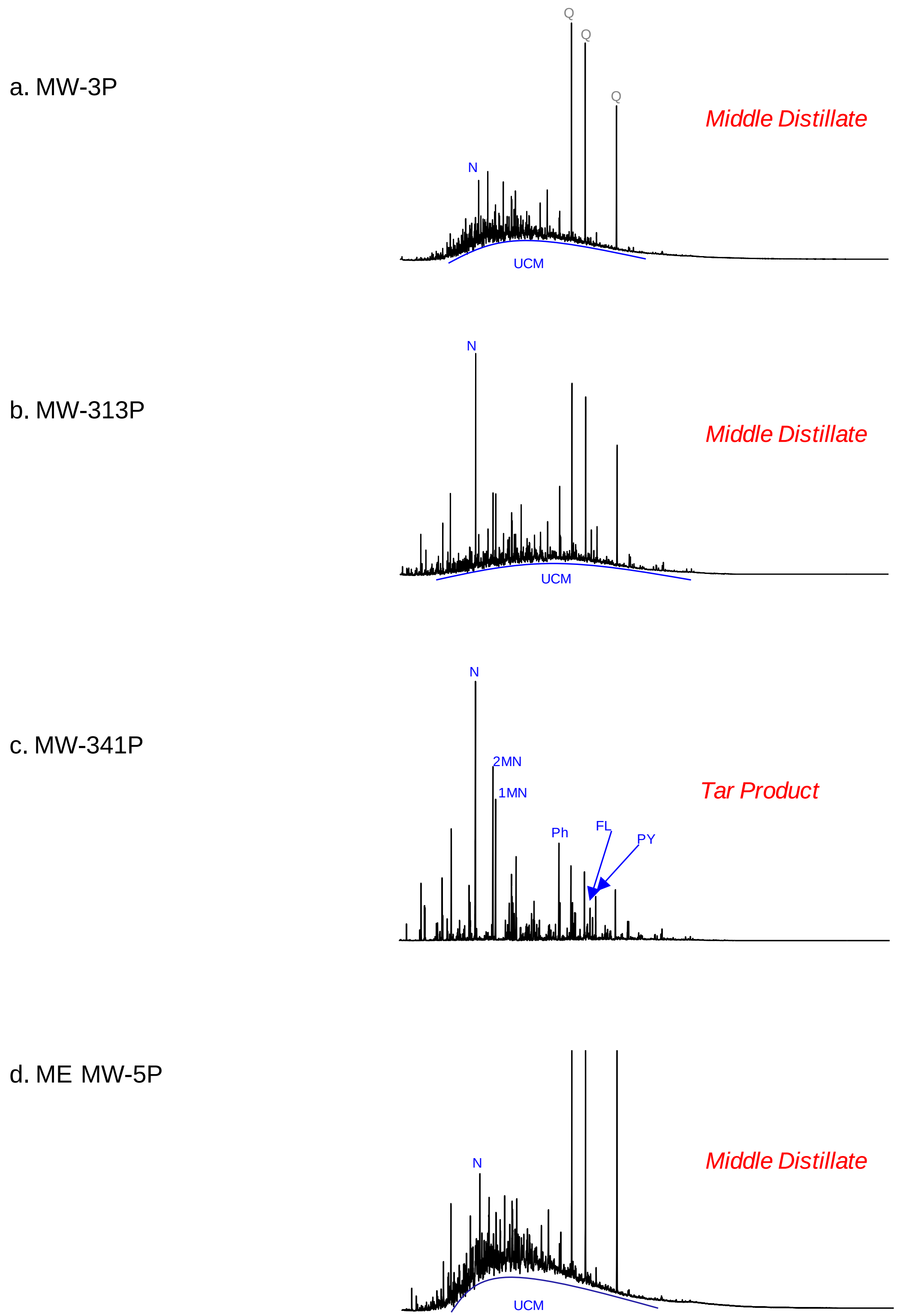


Figure 3. High Resolution Hydrocarbon Fingerprints (NAPL Samples).



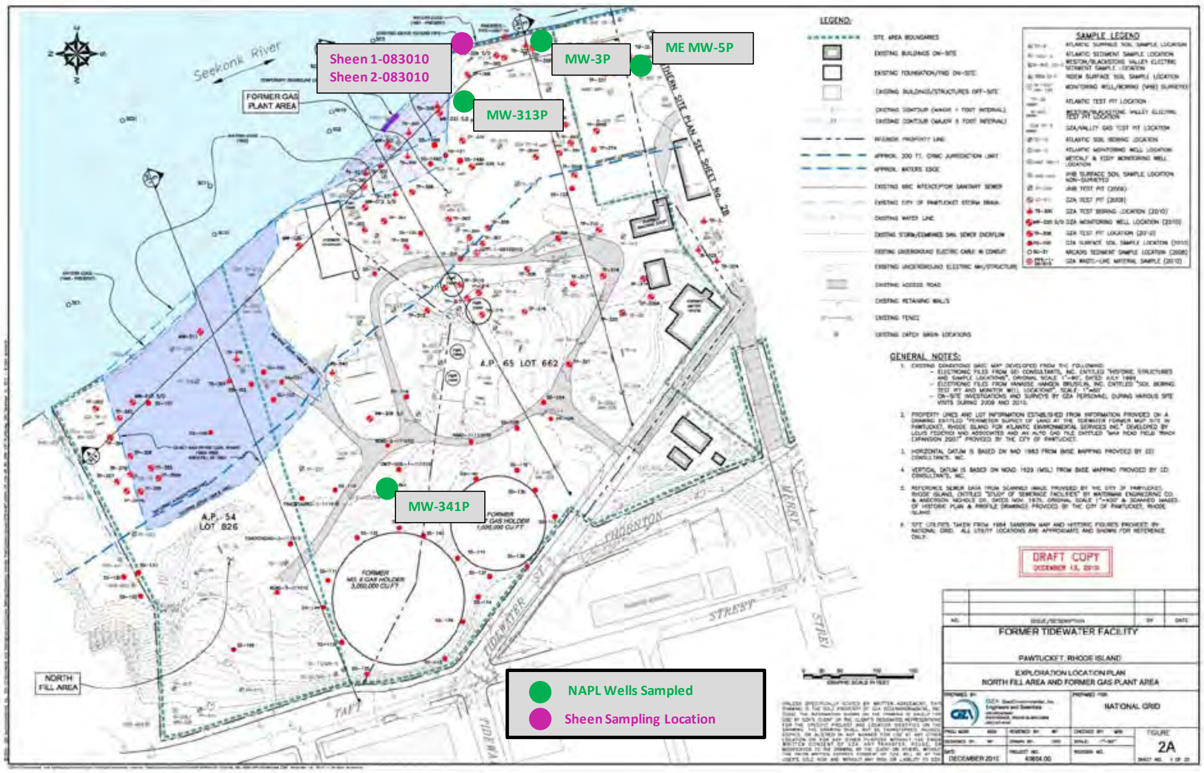
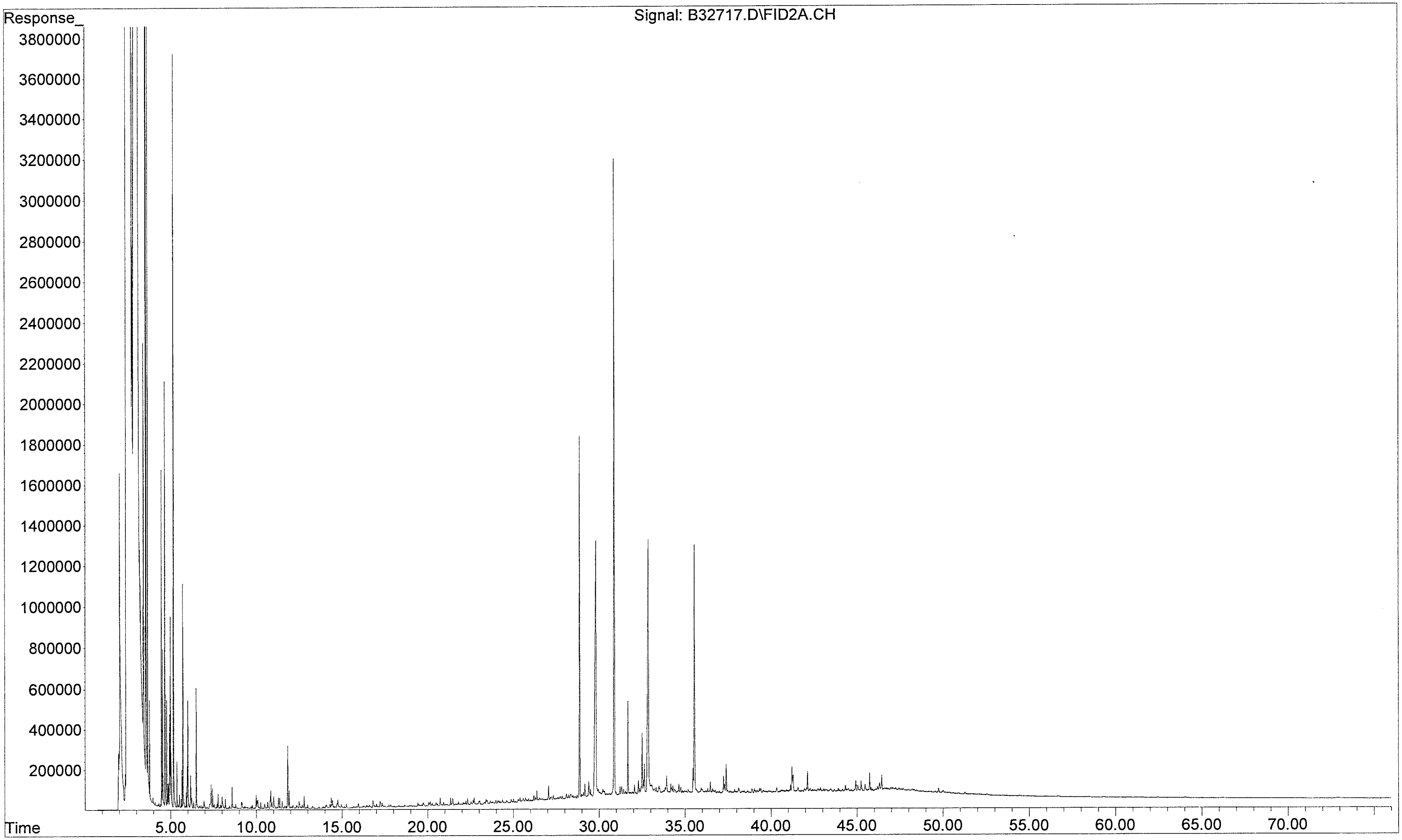


Figure 4. Former Tidewater Facility, Pawtucket, RI
Site Map with Sheen and NAPL Sampling Locations.

Attachments

File   :U:\2010 AWHL Data\GZA-NationalGrid\1009123\B32717.D
Operator   : AC
Acquired   : 03 Oct 2010 10:44 am using AcqMethod FRNC3ACOR.M
Instrument :   PAH 3
Sample Name: 1009123-01-AFID
Misc Info   : 1X
Vial Number: 86

Sheen-1-083010
1009123-01



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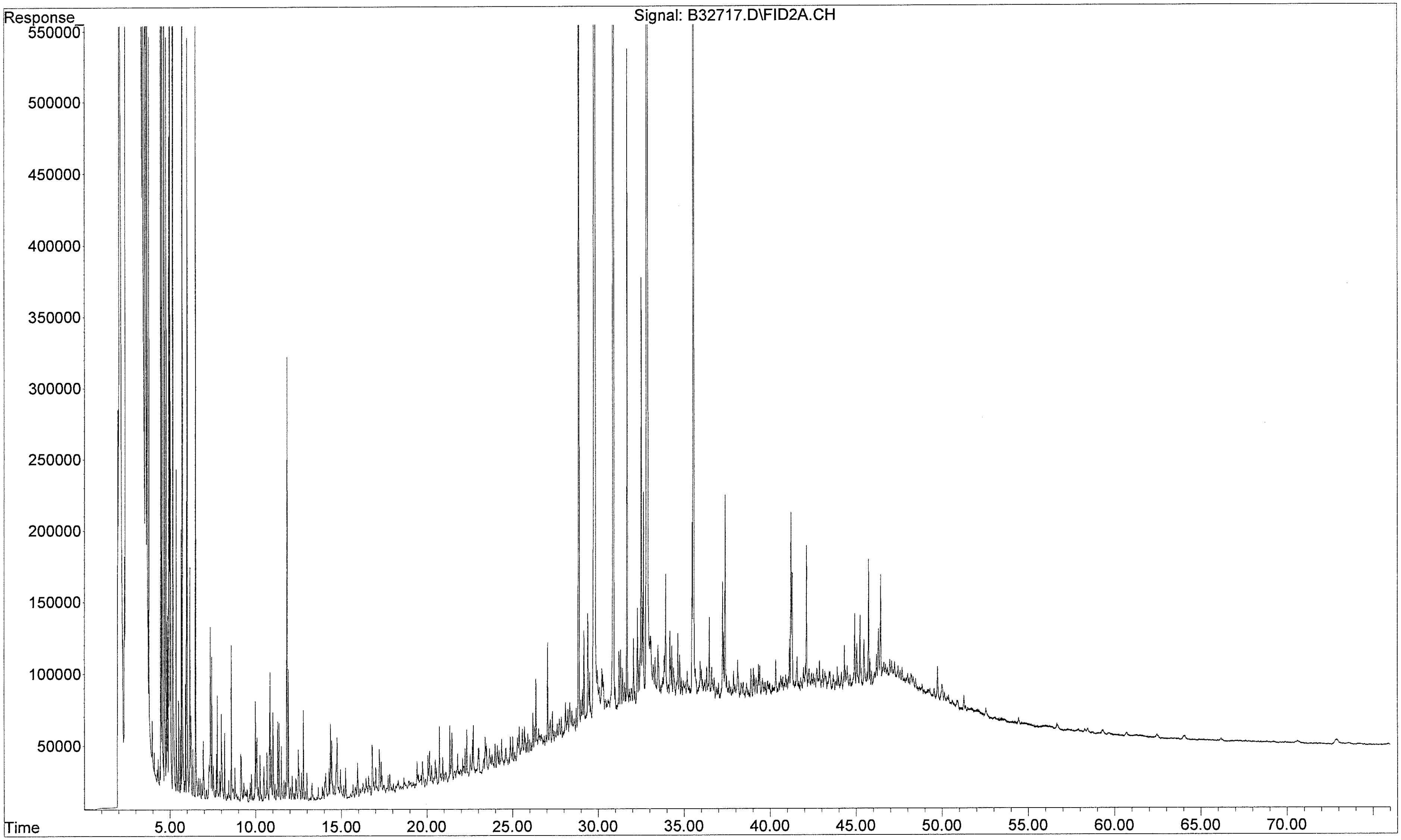
Misc Info   : 1X
Vial Number: 86

Sheen-1-083010
1009123-01



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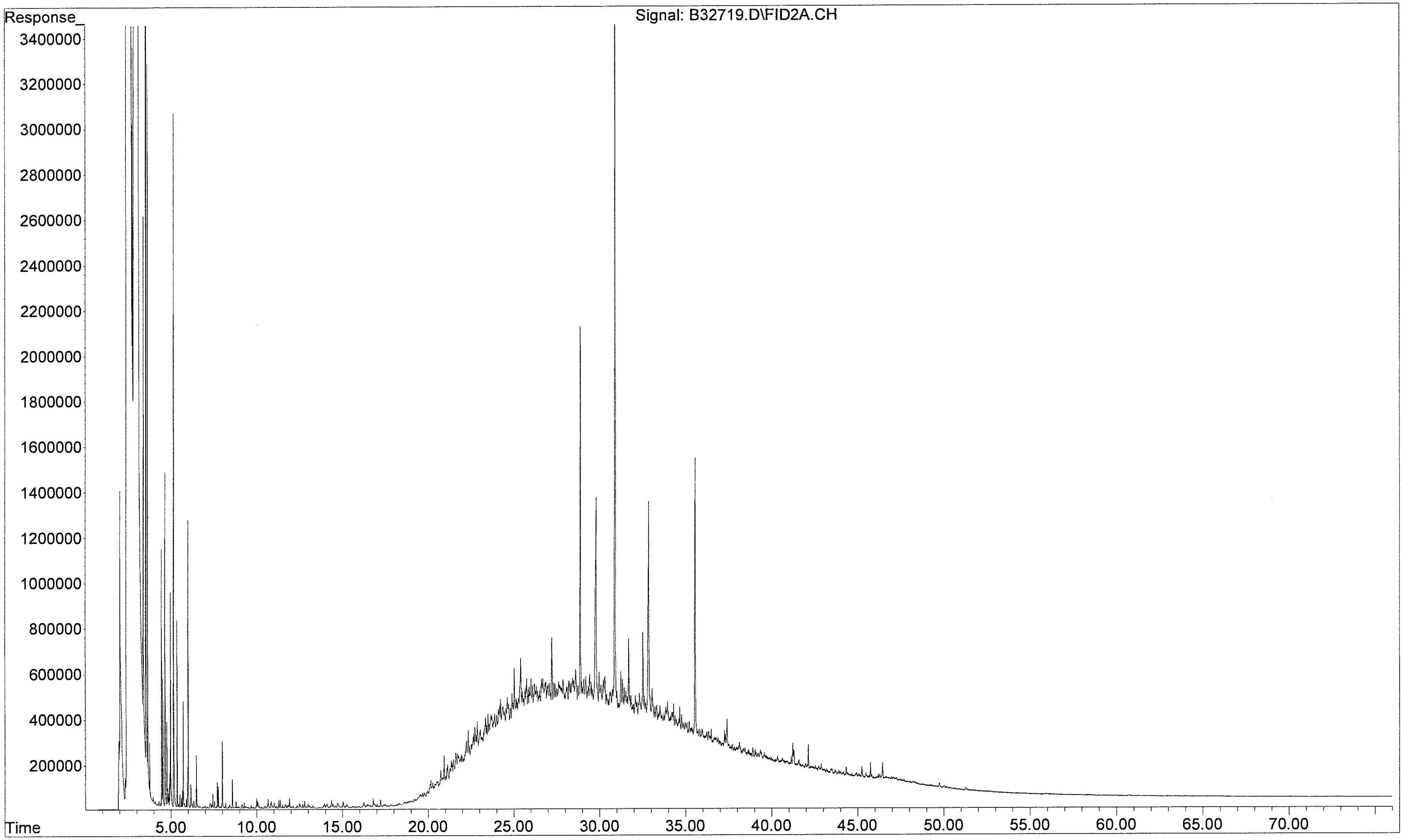
Vial Number: 87

Sheen-2-083010
1009123-02



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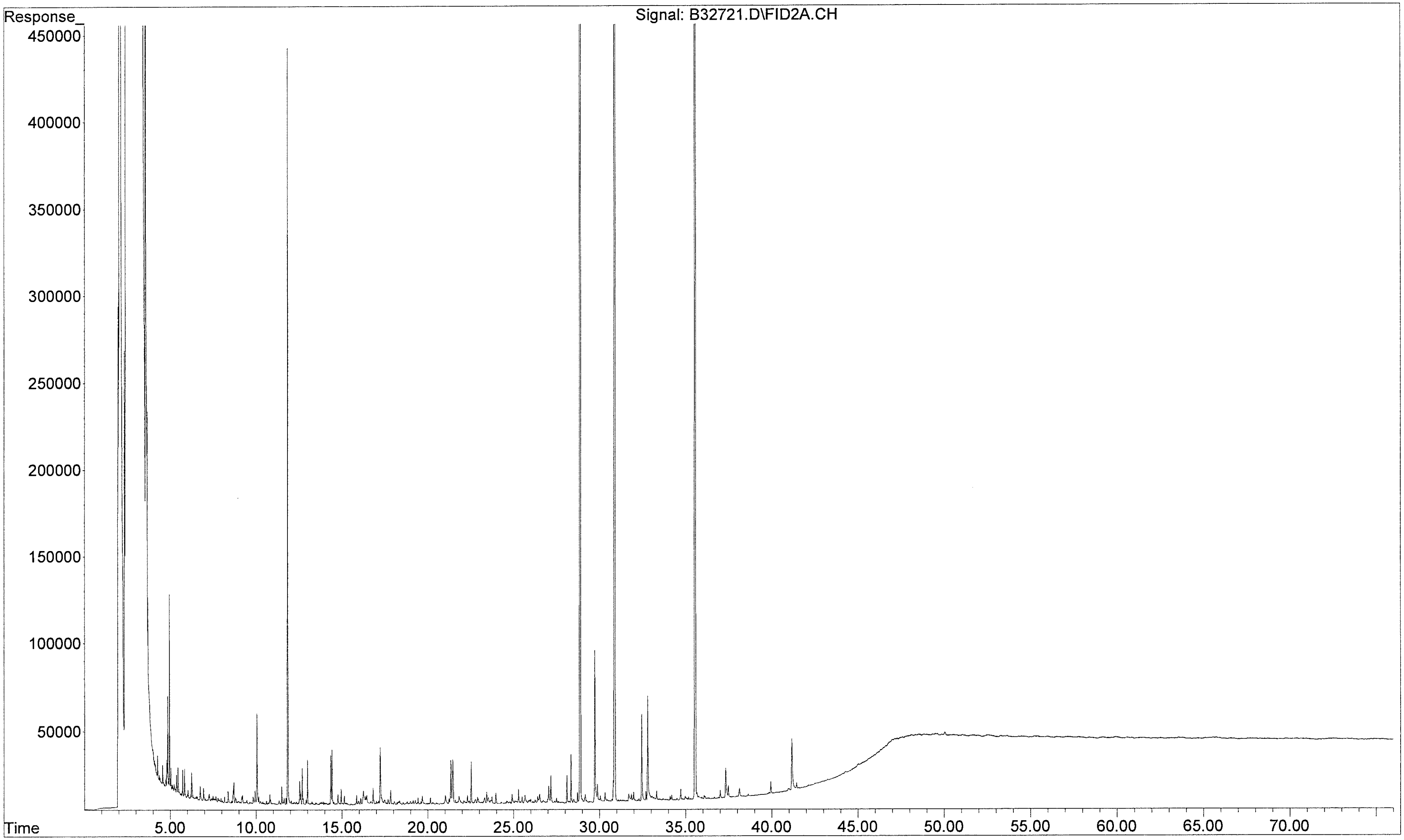
Instrument :   PAH 3
Sample Name: 1009123-03-AFID
Misc Info   : 1X
Vial Number: 88

FB-083010
1009123-03



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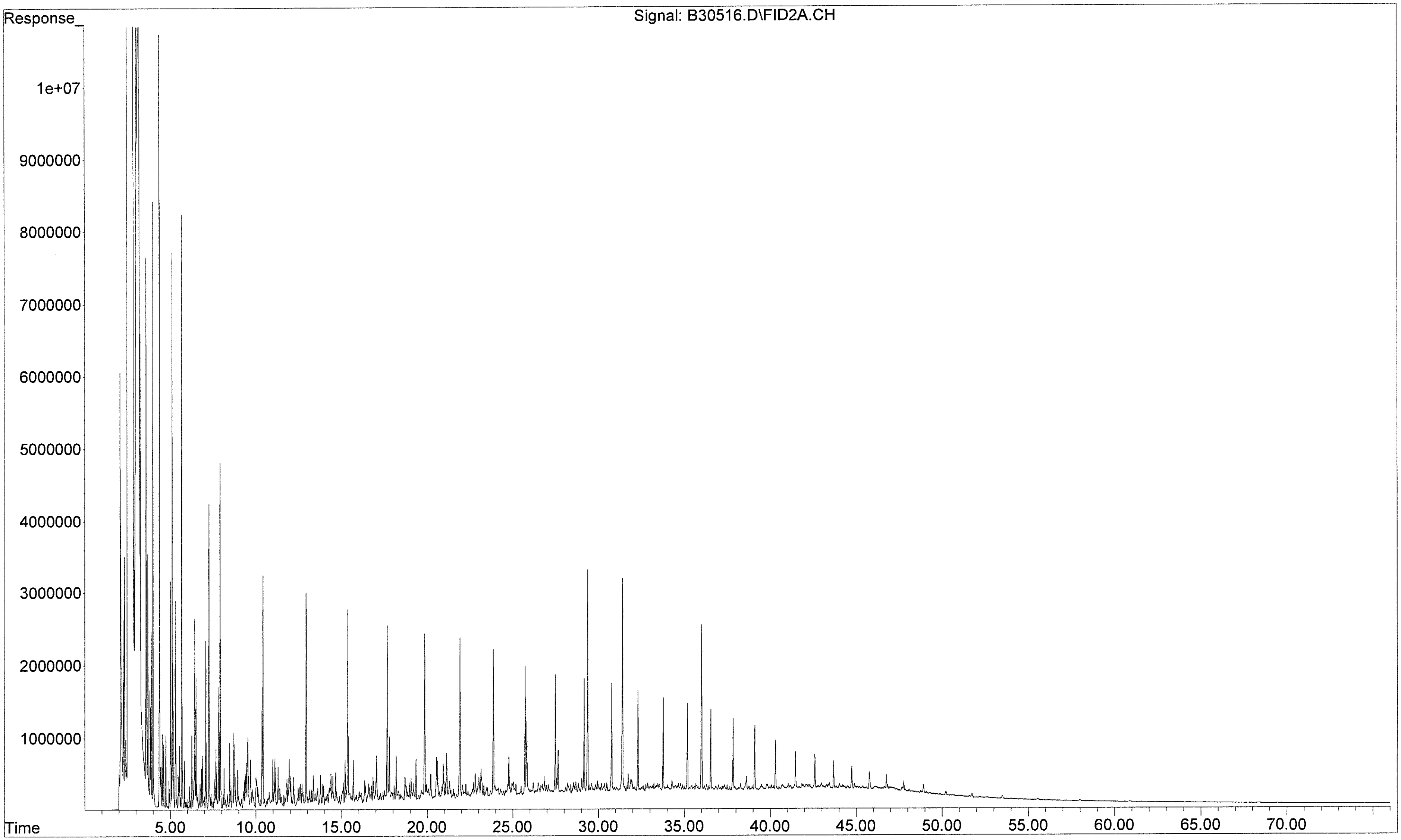
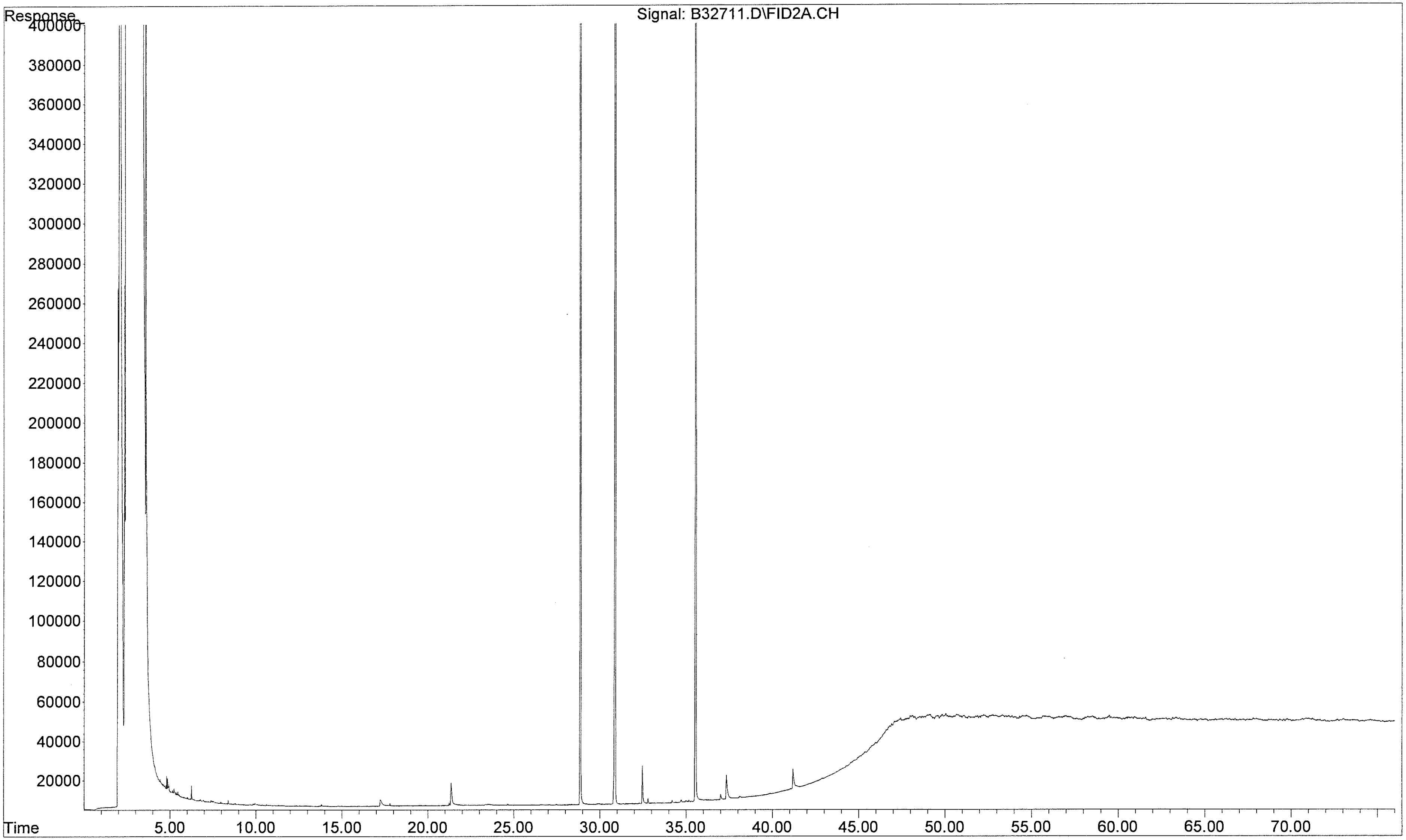
Operator   : ac
Acquired   : 21 Jul 2010   5:00 pm using AcqMethod FRNC3ACOR.M
Instrument :   PAH 3
Sample Name: TW081910AWS01
Misc Info   : ANS WHAK13
Vial Number: 64

Reference Standard
North Slope Crude



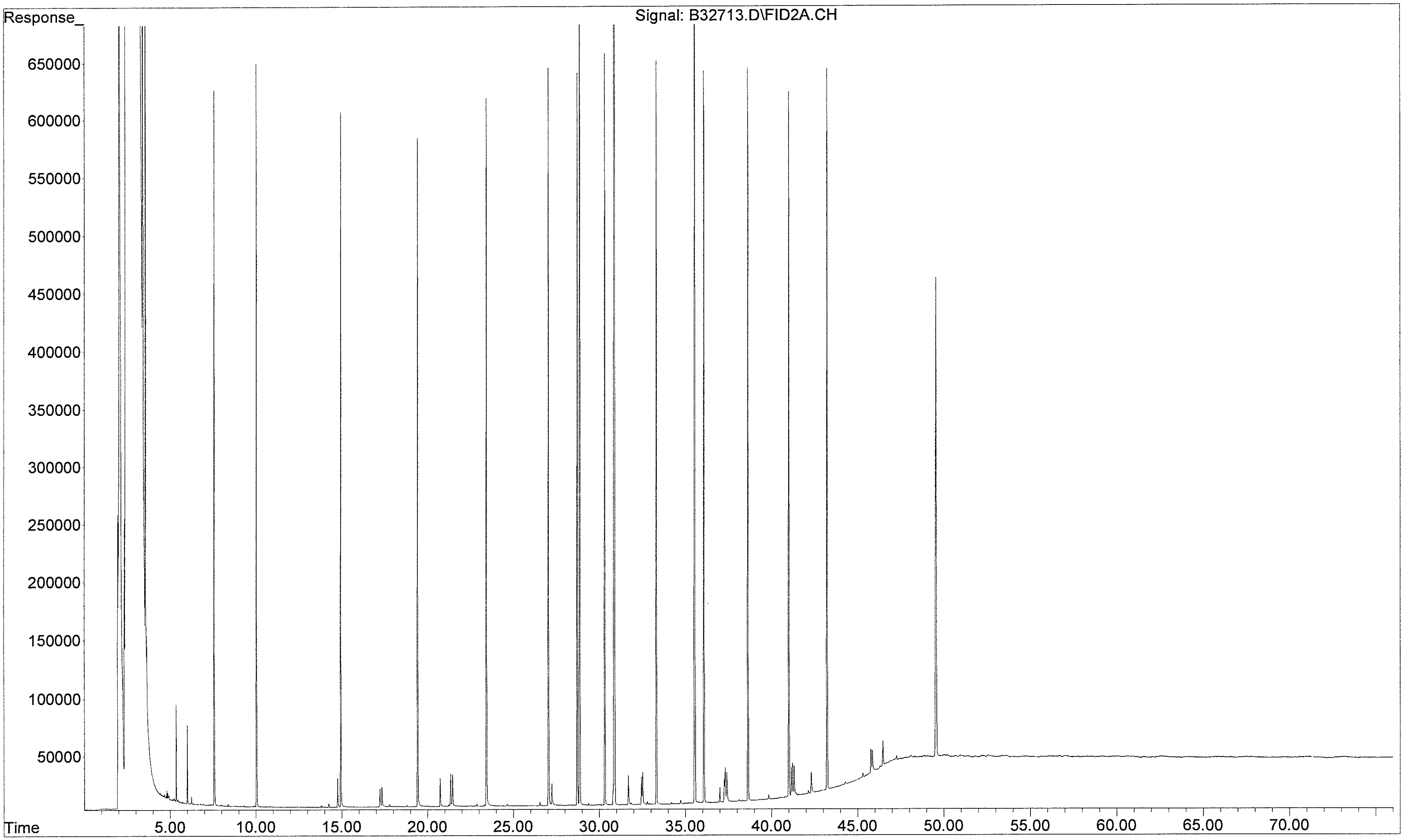
```
File        :U:\2010 AWHL Data\GZA-NationalGrid\1009123\B32711.D
Operator    : AC
Acquired    : 03 Oct 2010   4:36 am using AcqMethod FRNC3ACOR.M
Instrument  :    PAH 3
Sample Name: TS091710B09
Misc Info   :
Vial Number: 83
```

TS09170B09
Methond Blank



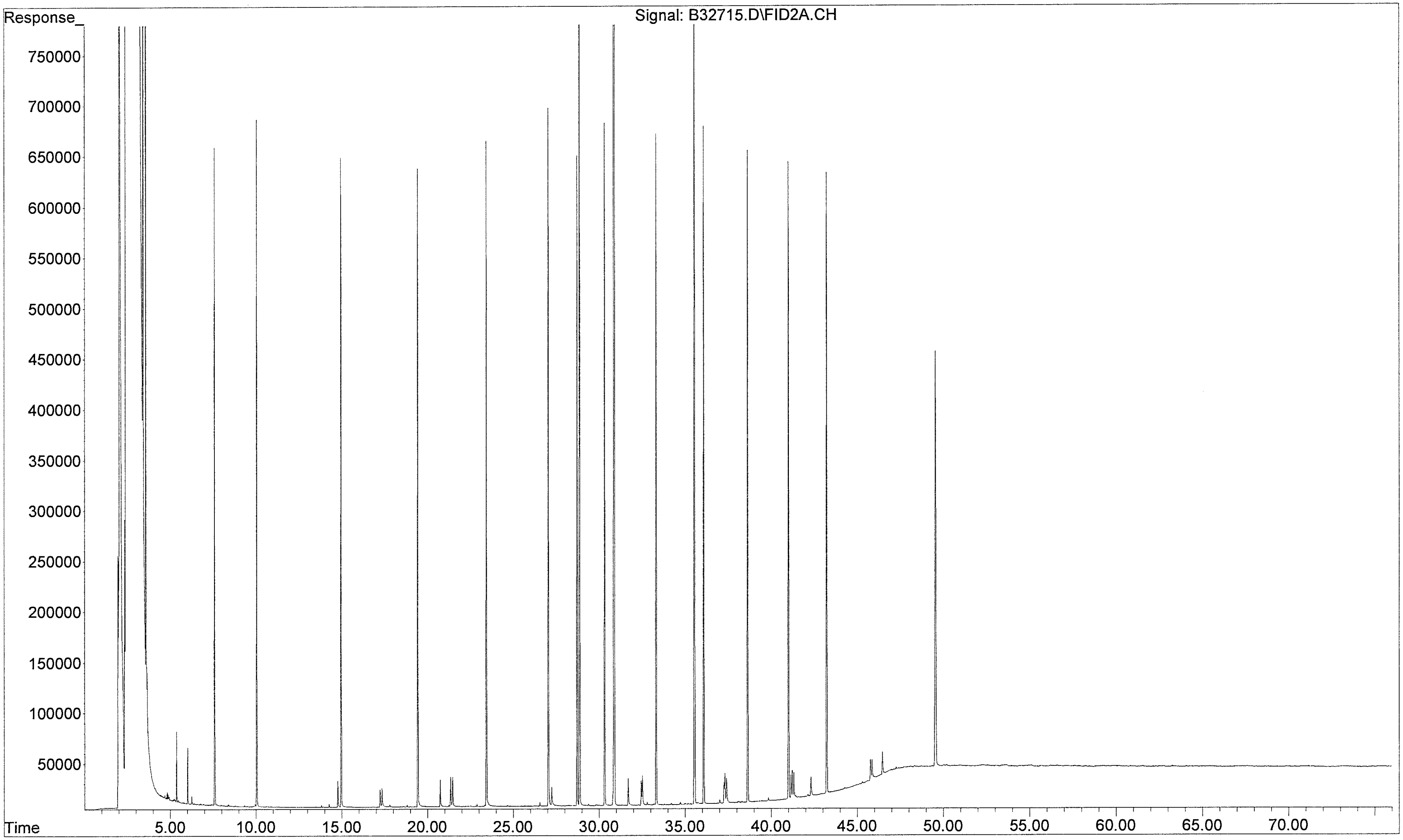
File   :U:\2010 AWHL Data\GZA-NationalGrid\1009123\B32713.D
Operator   : AC
Acquired   : 03 Oct 2010   7:44 am using AcqMethod FRNC3ACOR.M
Instrument :   PAH 3
Sample Name: TS091710LCS07
Misc Info   :
Vial Number: 84

TS09170LCS07
Lab Control Sample



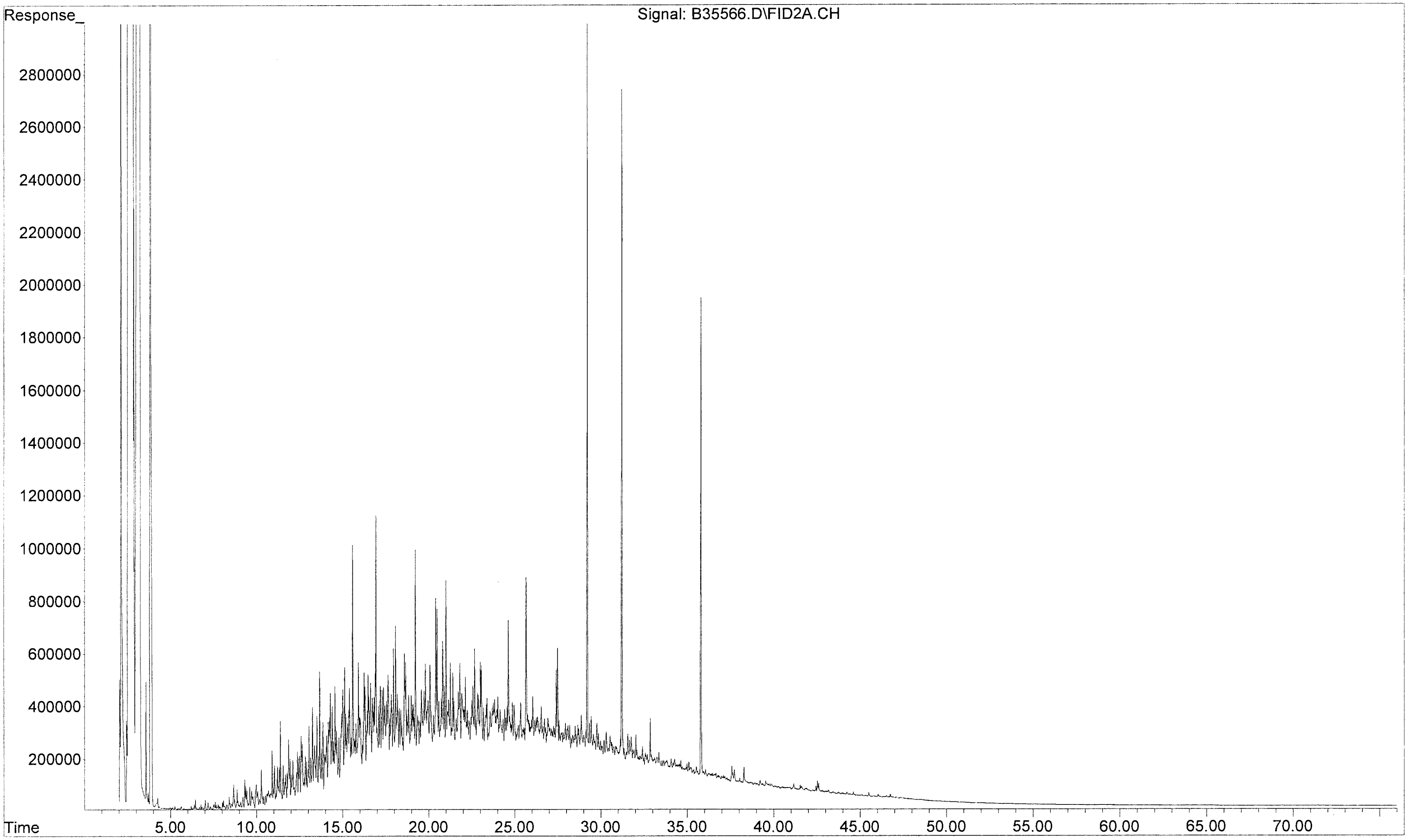
File   :U:\2010 AWHL Data\GZA-NationalGrid\1009123\B32715.D
Operator   : AC
Acquired   : 03 Oct 2010   9:13 am using AcqMethod FRNC3ACOR.M
Instrument :   PAH 3
Sample Name: TS091710LCSD07-AFID
Misc Info   : 1X
Vial Number: 85

TS09170LCSD07
Lab Control Sample Duplicate



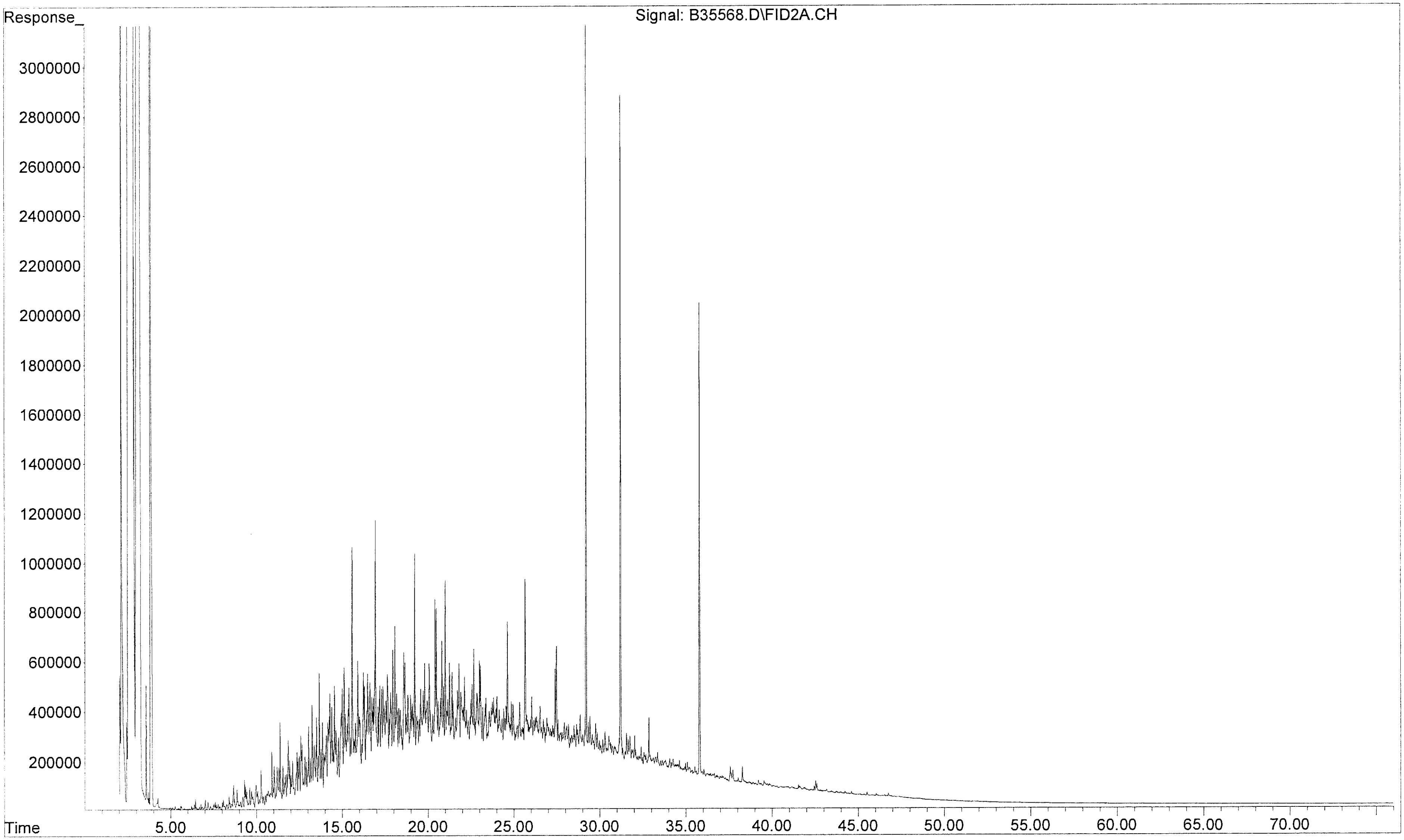
File   :U:\2011 AWHL Data\GZA Tidewater\1102037\FID\B35566.D
Operator   : AS
Acquired   : 24 Feb 2011 11:22 pm using AcqMethod FRNC3A.M
Instrument :   PAH 3
Sample Name: 1102037-01
Misc Info   : 1X
Vial Number: 89

MW-3P
1102037-01



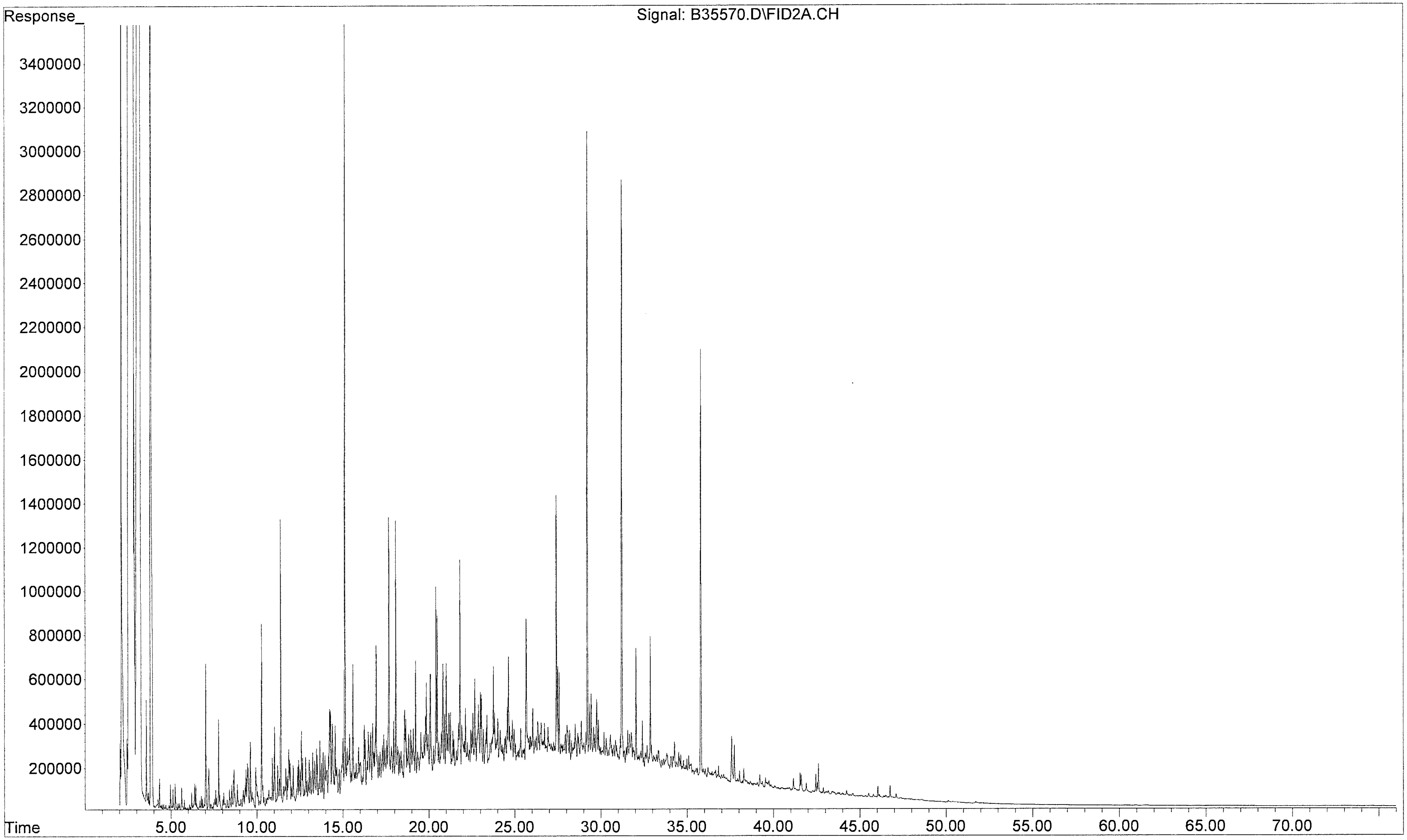
File   :U:\2011 AWHL Data\GZA Tidewater\1102037\FID\B35568.D
Operator   : AS
Acquired   : 25 Feb 2011 12:52 am using AcqMethod FRNC3A.M
Instrument   :   PAH 3
Sample Name: 1102037-01D
Misc Info   : 1X
Vial Number: 90

MW-3P
1102037-01D



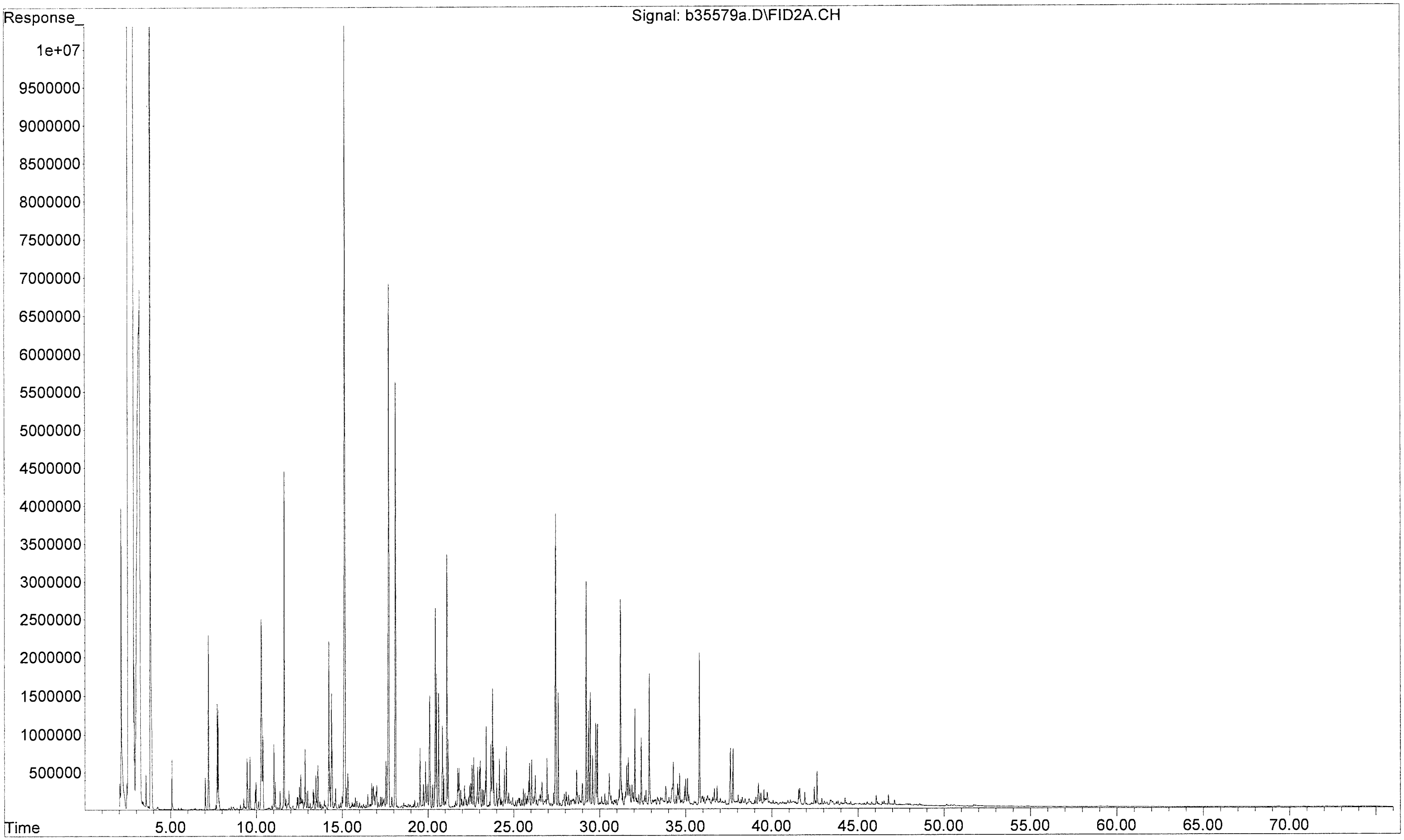
File   :U:\2011 AWHL Data\GZA Tidewater\1102037\FID\B35570.D
Operator   : AS
Acquired   : 25 Feb 2011   2:22 am using AcqMethod FRNC3A.M
Instrument :   PAH 3
Sample Name: 1102037-02
Misc Info : 1X
Vial Number: 91

MW-313P
1102037-02



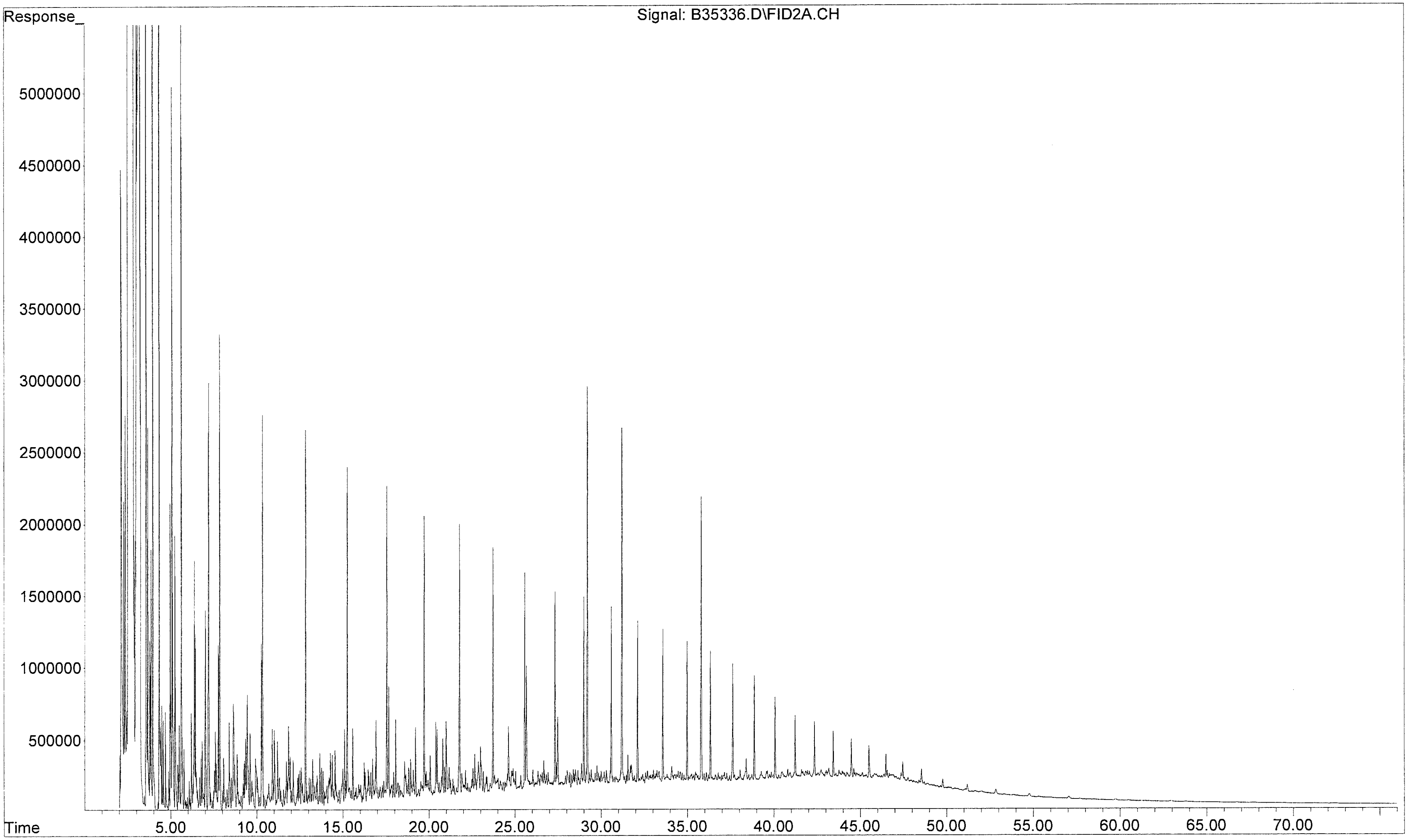
File   :U:\2011 AWHL Data\GZA Tidewater\1102037\FID\b35579a.D
Operator   : AS
Acquired   : 25 Feb 2011 10:10 am using AcqMethod FRNC3A.M
Instrument :   PAH 3
Sample Name: 1102037-03
Misc Info   : 1X
Vial Number: 92

MW-341P
1102037-03



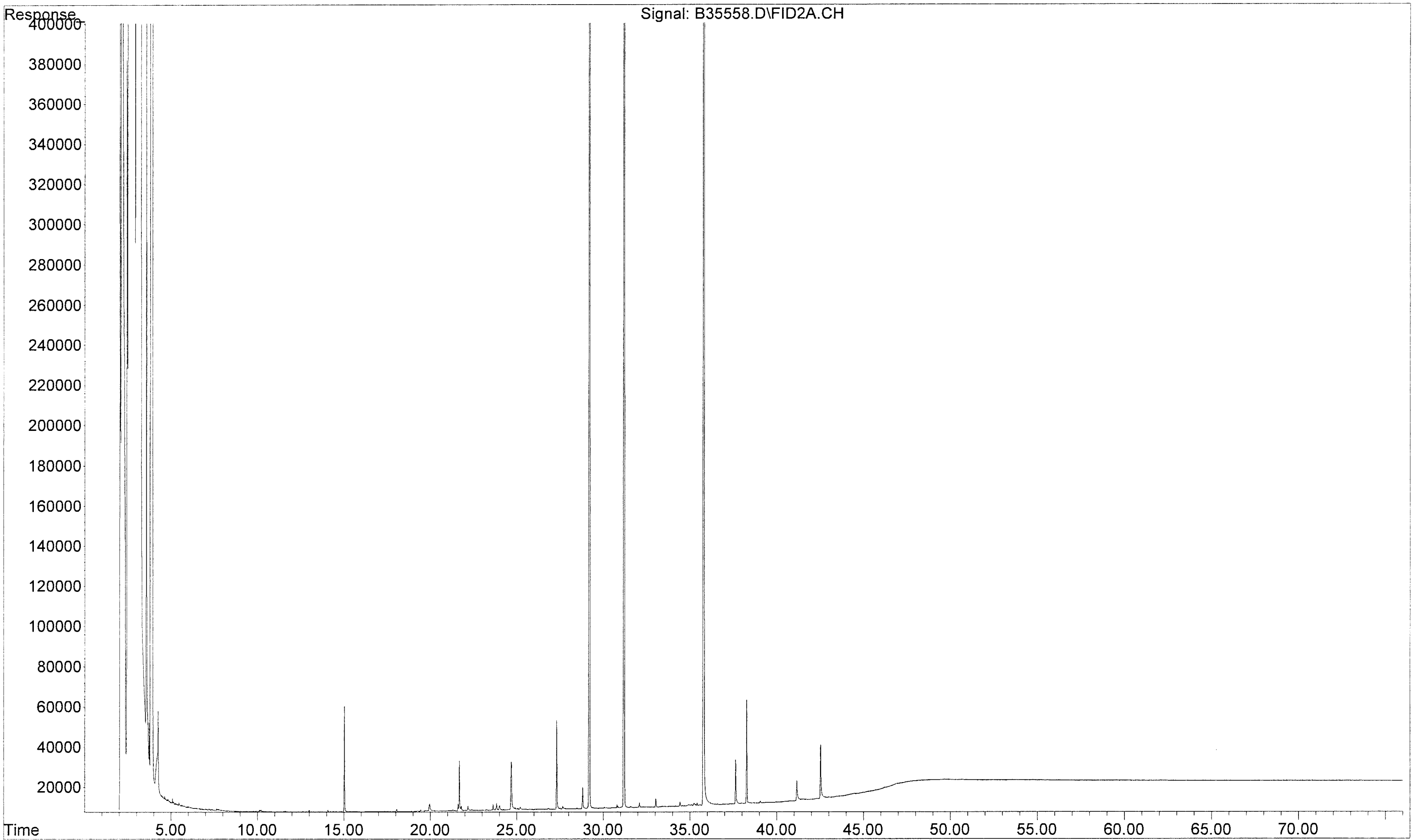
File   :U:\2011 AWHL Data\GZA Tidewater\1102037\FID\HC3021811R Data
...   Files & Method\B35336.D
Operator   : NPS
Instrument :   PAH 3
Acquired   : 17 Feb 2011   6:44 am using AcqMethod FRNC3A.M
Sample Name: TS021911AWS01
Misc Info   : WHAL14

Reference Standard
North Slope Crude



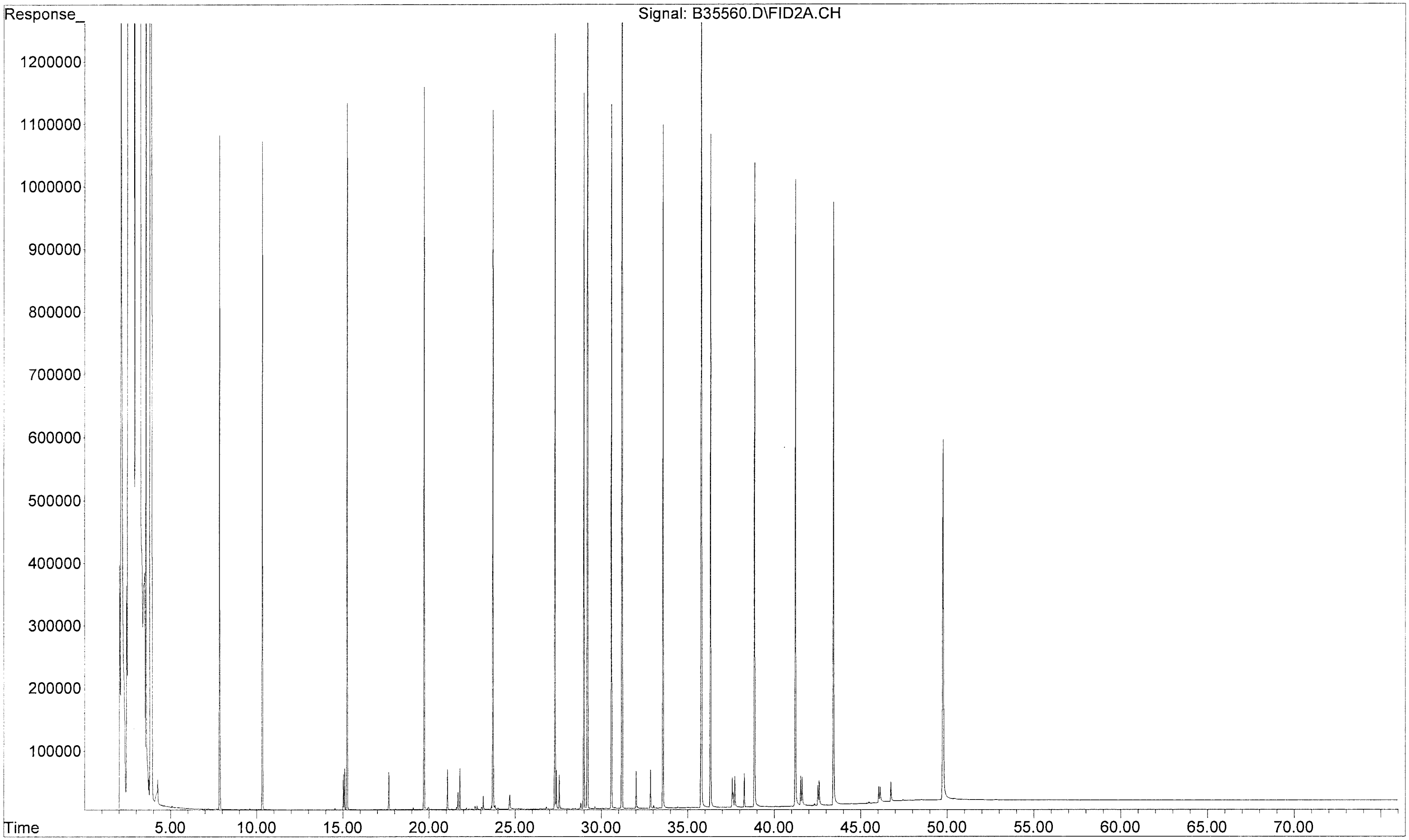
Method Blank
TO022211B02

```
File        :U:\2011 AWHL Data\GZA Tidewater\1102037\FID\B35558.D
Operator    : AS
Acquired    : 24 Feb 2011   5:22 pm using AcqMethod FRNC3A.M
Instrument  :   PAH 3
Sample Name: TO022211B02
Misc Info   : 1X
Vial Number: 85
```



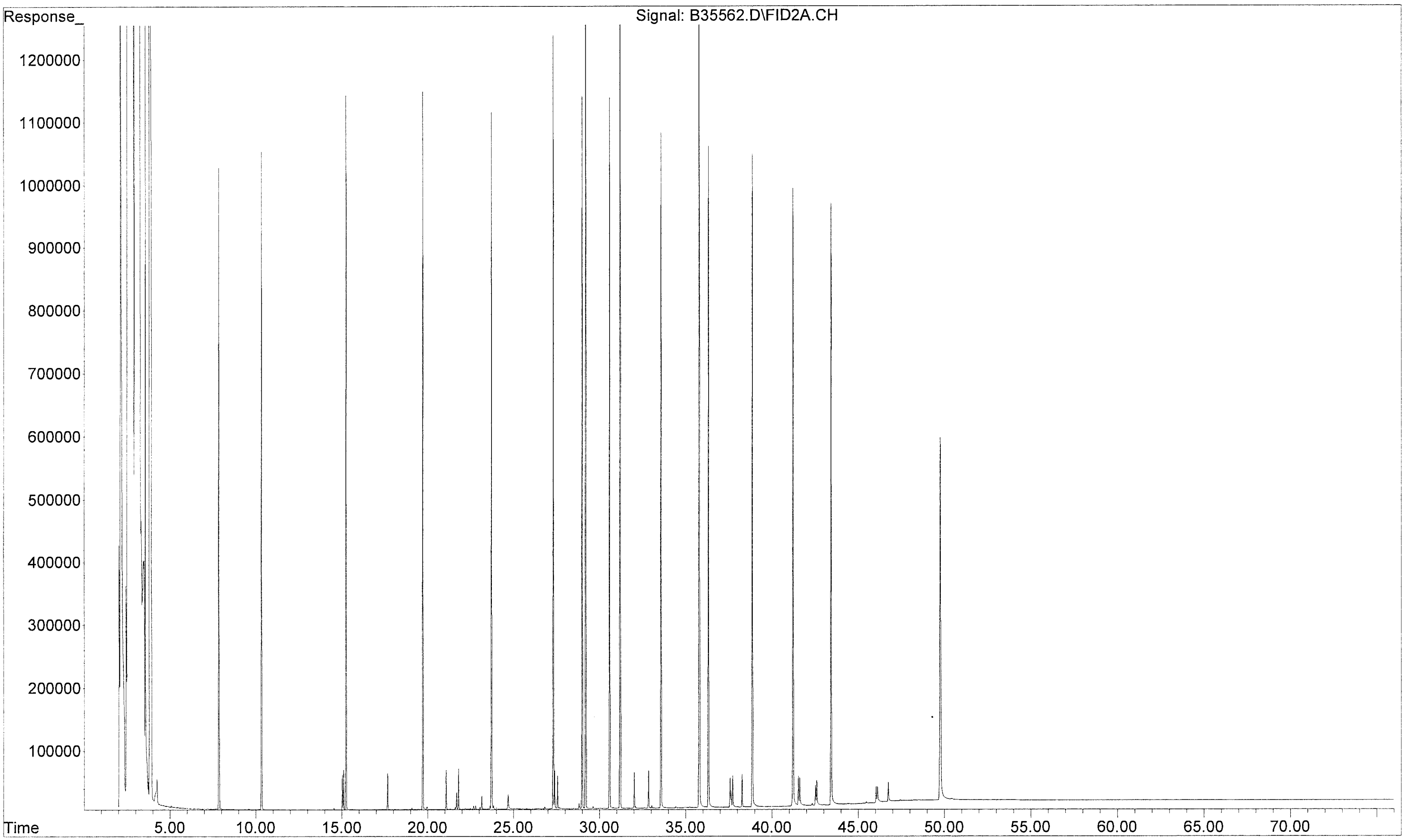
```
File        :U:\2011 AWHL Data\GZA Tidewater\1102037\FID\B35560.D
Operator    : AS
Acquired    : 24 Feb 2011   6:53 pm using AcqMethod FRNC3A.M
Instrument  :   PAH 3
Sample Name: TO022211LCS02
Misc Info   : 1X
Vial Number: 86
```

Laboratory Control Sample
TO022211LCS02



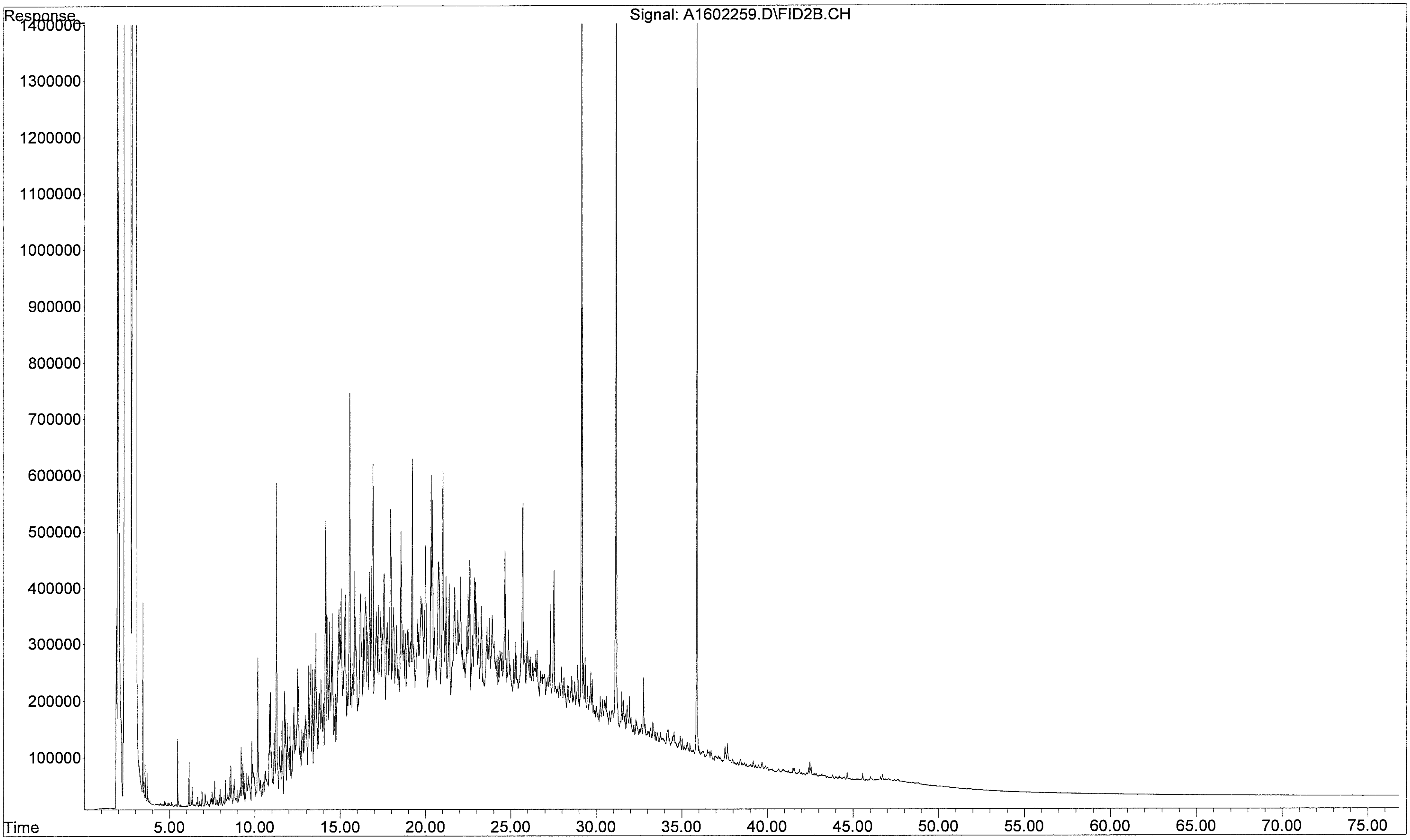
File   :U:\2011 AWHL Data\GZA Tidewater\1102037\FID\B35562.D
Operator   : AS
Acquired   : 24 Feb 2011   8:23 pm using AcqMethod FRNC3A.M
Instrument :   PAH 3
Sample Name: TO022211LCSD02
Misc Info : 1X
Vial Number: 87

Laboratory Control Sample Dup
TO022211LCSD02



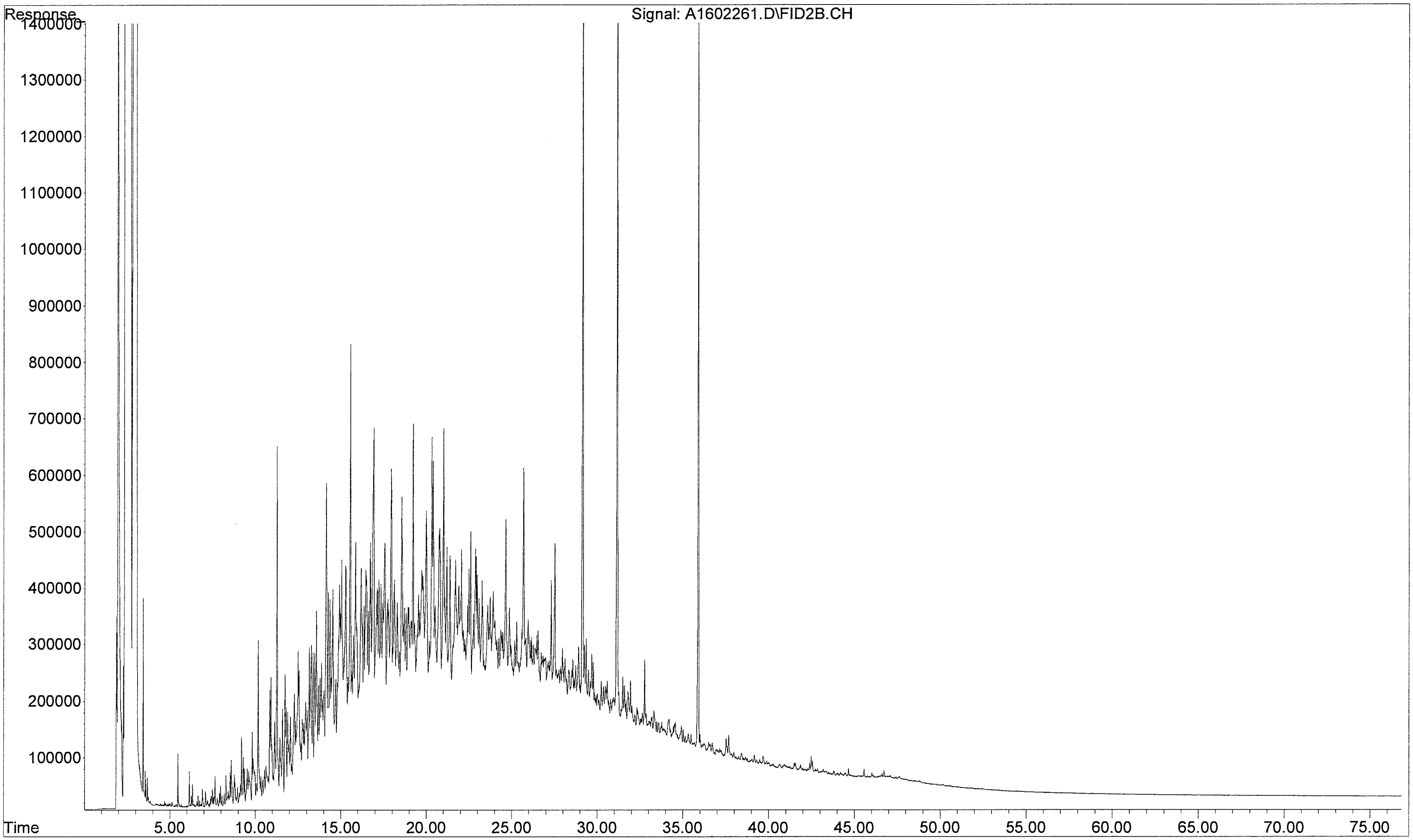
File :U:\2011 AWHL Data\GZA Tidewater\1105069\FID\A1602259.D
Operator : NPS
Acquired : 22-May-11, 12:13:48 using AcqMethod FID16.M
Instrument : FID16
Sample Name: 1105069-01
Misc Info : 1X
Vial Number: 60

ME MW-5P
1105069-01



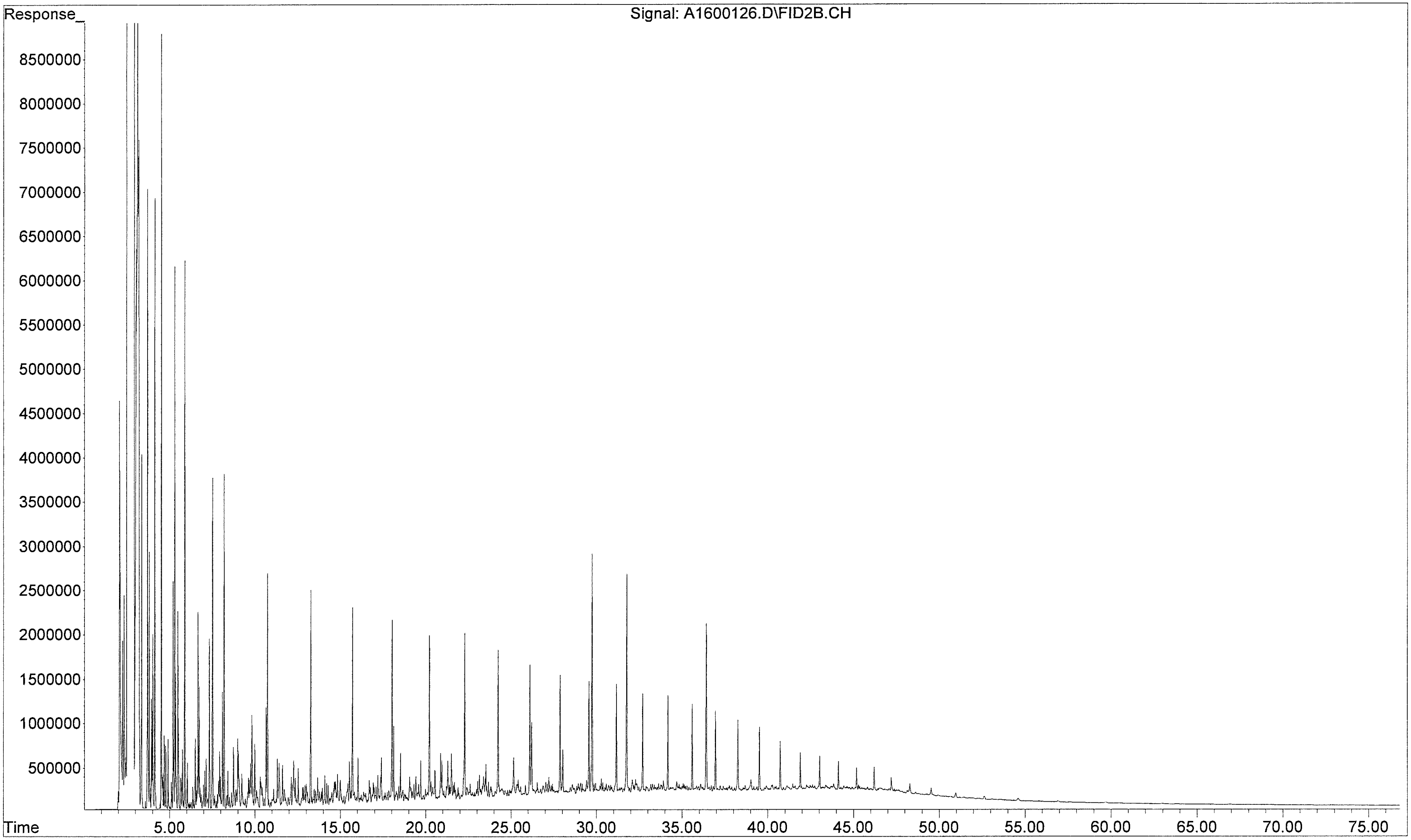
```
File        :U:\2011 AWHL Data\GZA Tidewater\1105069\FID\A1602261.D
Operator    : NPS
Acquired    : 22-May-11, 13:43:13 using AcqMethod FID16.M
Instrument  :   FID16
Sample Name: 1105069-01D
Misc Info   : 1X
Vial Number: 61
```

ME MW-5P
1105069-01D



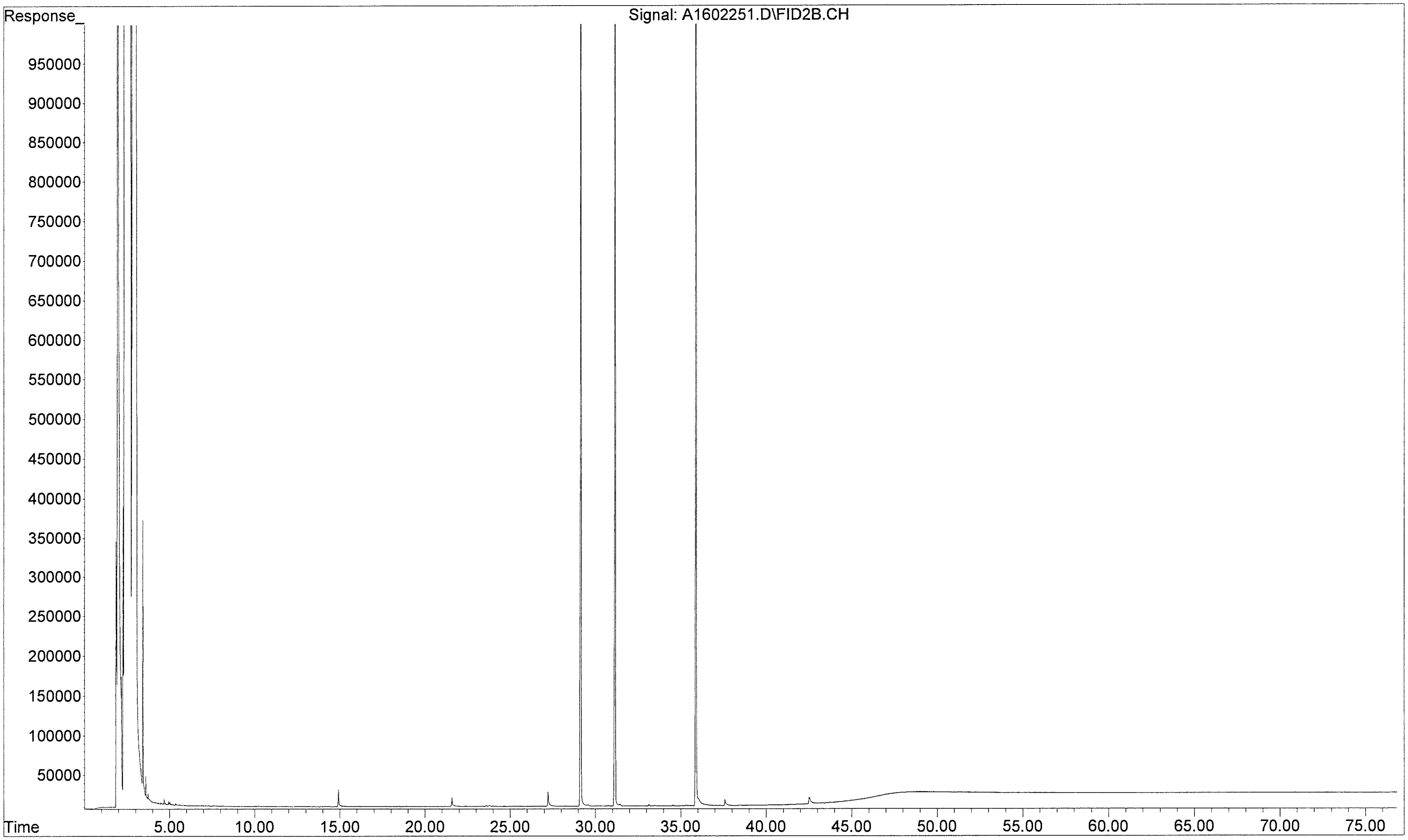
```
File        :U:\2011 AWHL Data\GZA Tidewater\1105069\FID\HC16021711R Meth
...          od & Data Files\A1600126.D
Operator    : NPS
Instrument  :   FID16
Acquired    : 16-Feb-11, 23:48:48 using AcqMethod FID16.M
Sample Name: TS021811AWS03
Misc Info   : 1X, WHAL14
```

Reference Standard
North Slope Crude



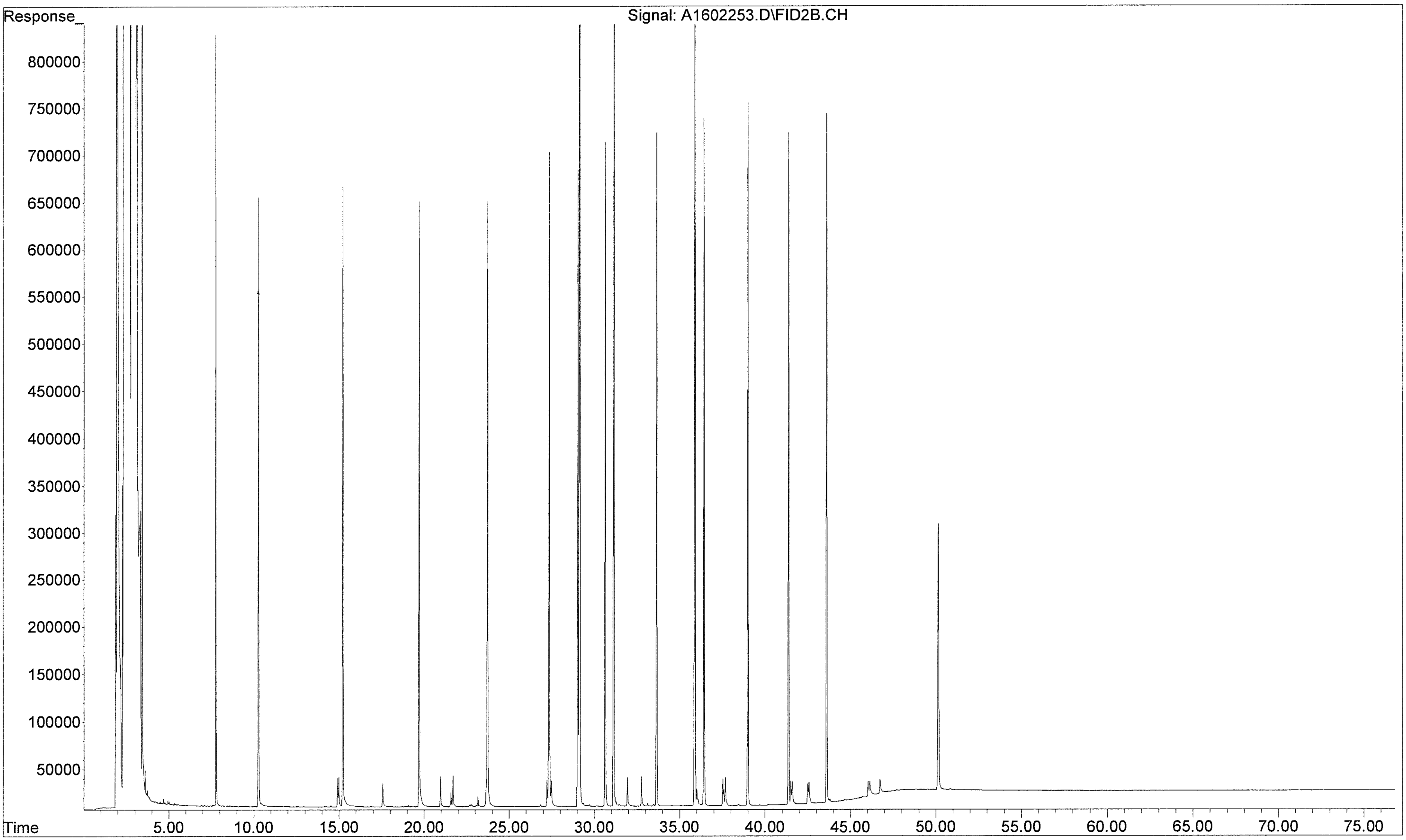
Method Blank
TO051611B07

```
File        :U:\2011 AWHL Data\GZA Tidewater\1105069\FID\A1602251.D
Operator    : NPS
Acquired    : 20-May-11, 11:49:42 using AcqMethod FID16.M
Instrument  :   FID16
Sample Name: TO051611B07
Misc Info   : 1X
Vial Number: 56
```



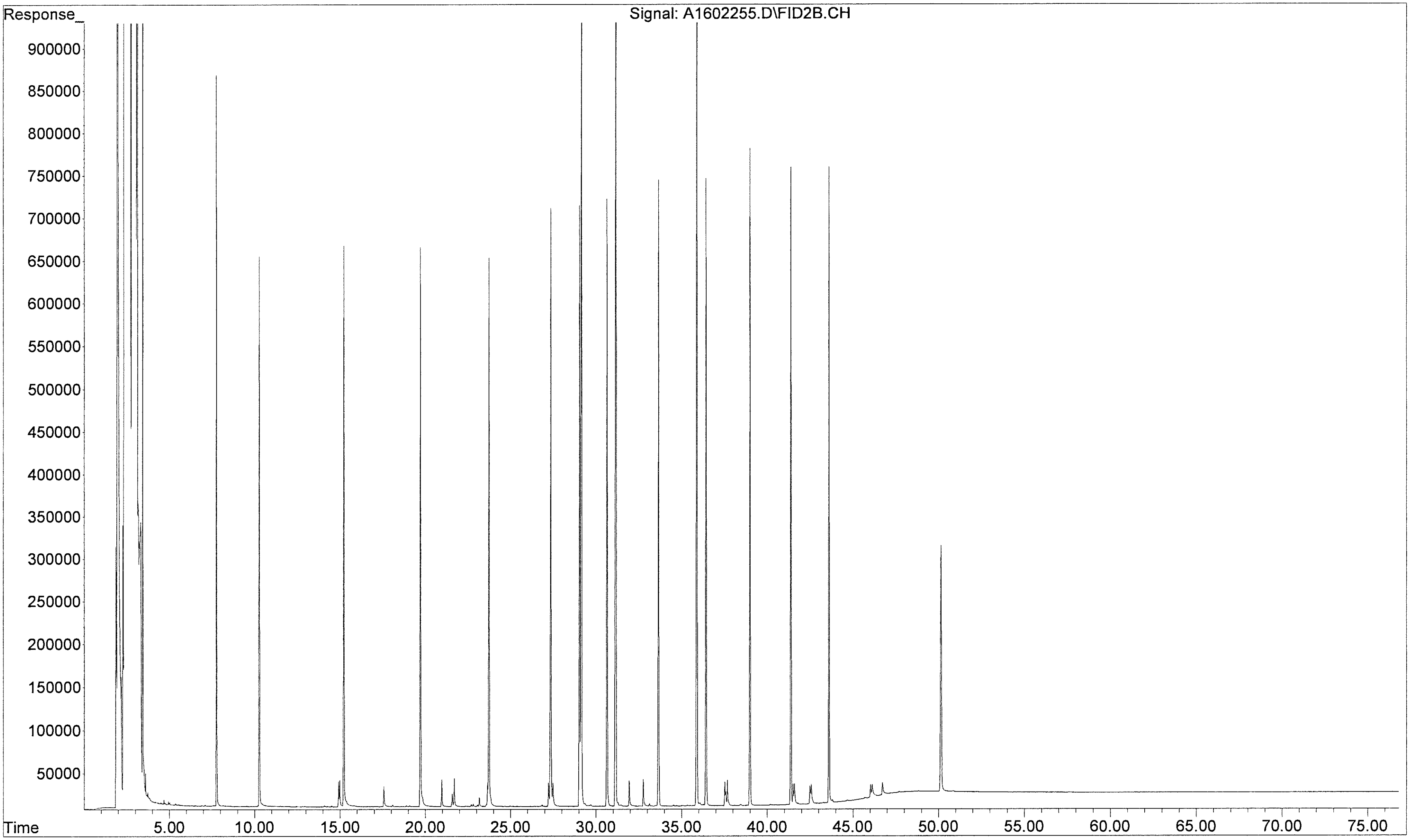
File :U:\2011 AWHL Data\GZA Tidewater\1105069\FID\A1602253.D
Operator : NPS
Acquired : 20-May-11, 13:20:36 using AcqMethod FID16.M
Instrument : FID16
Sample Name: TO051611LCS07
Misc Info : 1X
Vial Number: 57

Laboratory Control Sample
TO051611LCS07



Laboratory Control Sample Dup
TO051611LCSD07

```
File        :U:\2011 AWHL Data\GZA Tidewater\1105069\FID\A1602255.D
Operator    : NPS
Acquired    : 20-May-11, 14:51:59 using AcqMethod FID16.M
Instrument  :    FID16
Sample Name: TO051611LCSD07
Misc Info   : 1X
Vial Number: 58
```



NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Method Blank
Lab ID	TS091710B09
Matrix	Solid
Reference Method	SHC
Batch ID	TS091710B09
Date Collected	N/A
Date Received	N/A
Date Prepped	09/17/2010
Date Analyzed	10/03/2010
Sample Size (wet)	0.005
% Solid	100
File ID	B32711.D
Units	mg/Kg
Final Volume	2
Dilution	1
Reporting Limit	13200

Class	Abbrev	Analytes	Result		SSRL
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)		U	13200

Surrogates (% Recovery)	
ortho-Terphenyl	81
d50-Tetracosane	81

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Laboratory Control Sample
Lab ID	TS091710LCS07
Matrix	Solid
Reference Method	SHC
Batch ID	TS091710B09
Date Collected	N/A
Date Received	N/A
Date Prepped	09/17/2010
Date Analyzed	10/03/2010
Sample Size (wet)	0.005
% Solid	100
File ID	B32713.D
Units	mg/Kg
Final Volume	2
Dilution	1
Reporting Limit	13200

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit
SHC	C9	n-Nonane (C9)	2870	S	400	72	4000	50	130
SHC	C10	n-Decane (C10)	3180	S	400	80	4000	50	130
SHC	C12	n-Dodecane (C12)	3300	S	400	82	4000	50	130
SHC	C14	n-Tetradecane (C14)	3380	S	400	84	4000	50	130
SHC	C16	n-Hexadecane (C16)	3740	S	400	94	4000	50	130
SHC	C18	n-Octadecane (C18)	3780	S	400	94	4000	50	130
SHC	C19	n-Nonadecane (C19)	3670	S	400	92	4000	50	130
SHC	C20	n-Eicosane (C20)	3740	S	400	93	4000	50	130
SHC	C22	n-Docosane (C22)	3910	S	400	98	4000	50	130
SHC	C24	n-Tetracosane (C24)	3800	S	400	95	4000	50	130
SHC	C26	n-Hexacosane (C26)	3760	S	400	94	4000	50	130
SHC	C28	n-Octacosane (C28)	3830	S	400	96	4000	50	130
SHC	C30	n-Triacontane (C30)	3810	S	400	95	4000	50	130
SHC	C36	n-Hexatriacontane (C36)	3840	S	400	96	4000	50	130
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	21800		13200				

Surrogates (% Recovery)	
ortho-Terphenyl	81
d50-Tetracosane	80

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Laboratory Control Sample Dup
Lab ID	TS091710LCSD07
Matrix	Solid
Reference Method	SHC
Batch ID	TS091710B09
Date Collected	N/A
Date Received	N/A
Date Prepped	09/17/2010
Date Analyzed	10/03/2010
Sample Size (wet)	0.005
% Solid	100
File ID	B32715.D
Units	mg/Kg
Final Volume	2
Dilution	1
Reporting Limit	13200

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit	RPD	RPD Limit
SHC	C9	n-Nonane (C9)	2990	S	400	75	4000	50	130	4	30
SHC	C10	n-Decane (C10)	3340	S	400	84	4000	50	130	5	30
SHC	C12	n-Dodecane (C12)	3460	S	400	86	4000	50	130	5	30
SHC	C14	n-Tetradecane (C14)	3550	S	400	89	4000	50	130	5	30
SHC	C16	n-Hexadecane (C16)	3900	S	400	97	4000	50	130	4	30
SHC	C18	n-Octadecane (C18)	3900	S	400	98	4000	50	130	3	30
SHC	C19	n-Nonadecane (C19)	3780	S	400	95	4000	50	130	3	30
SHC	C20	n-Eicosane (C20)	3850	S	400	96	4000	50	130	3	30
SHC	C22	n-Docosane (C22)	4010	S	400	100	4000	50	130	3	30
SHC	C24	n-Tetracosane (C24)	3900	S	400	98	4000	50	130	3	30
SHC	C26	n-Hexacosane (C26)	3860	S	400	96	4000	50	130	3	30
SHC	C28	n-Octacosane (C28)	3940	S	400	99	4000	50	130	3	30
SHC	C30	n-Triacontane (C30)	3920	S	400	98	4000	50	130	3	30
SHC	C36	n-Hexatriacontane (C36)	3960	S	400	99	4000	50	130	3	30
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	18800		13200						

Surrogates (% Recovery)	
ortho-Terphenyl	83
d50-Tetracosane	83

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Alaska North Slope Crude
Lab ID	TW081910AWS01
Matrix	Oil
Reference Method	SHC
Batch ID	TW081910AWS01
Date Collected	N/A
Date Received	N/A
Date Prepped	N/A
Date Analyzed	07/21/2010
Sample Size (wet)	0.10122
% Solid	100
File ID	B30516.D
Units	mg/Kg
Final Volume	10
Dilution	1
Reporting Limit	3260

Class	Abbrev	Analytes	Result	SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	539000	3260	74	727695.00	65	135

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

		Client ID	Sheen-1-083010		Sheen-2-083010		FB-083010
		Lab ID	1009123-01		1009123-02		1009123-03
		Matrix	Solid		Solid		Solid
		Reference Method	SHC		SHC		SHC
		Batch ID	TS091710B09		TS091710B09		TS091710B09
		Date Collected	08/30/2010		08/30/2010		08/30/2010
		Date Received	09/01/2010		09/01/2010		09/01/2010
		Date Prepped	09/17/2010		09/17/2010		09/17/2010
		Date Analyzed	10/03/2010		10/03/2010		10/03/2010
		Sample Size (wet)	0.0039		0.0113		0.0004
		% Solid	100		100		100
		File ID	B32717.D		B32719.D		B32721.D
		Units	mg/Kg		mg/Kg		mg/Kg
		Final Volume	2		2.22		1.03
		Dilution	1		1		1
		Reporting Limit	16800		6470		77200
Class	Abbrev	Analytes	Result	SSRL	Result	SSRL	Result	SSRL
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	491000	16800	721000	6470	U	77200
		Surrogates (% Recovery)						
		ortho-Terphenyl	91		84		86	
		d50-Tetracosane	88		90		85	

U: The analyte was analyzed for but not detected at the sample specific level reported.
B: Found in associated blank as well as sample.
J: Estimated value, below quantitation limit.
E: Estimated value, exceeds the upper limit of calibration.
NA: Not Applicable
D: Secondary Dilution Performed
D1: Tertiary Dilution Performed
a: Value outside of QC Limits.
§: Surrogate value outside of acceptable range.
X: It is not possible to calculate RPD, one result is below the detection limit, the other is above reporting limit.
G: Matrix Interference.
P: Greater than 40% RPD between the two columns, the higher value is reported according to the method.
I: Due to interference, the lower value is reported.
N: Spike recovery outside control limits.
E: Estimated due to Interference. (Metals)
¤: Duplicate outside control limits.
P: Spike compound. (Metals)
J: Below CRDL, Project DL, or RL but greater than or equal to MDL
C: Sample concentration is > 4 times the spike level, recovery limits do not apply. (Metals)
S: Spike Compound. (Organics)
§: RPD criteria not applicable to results less than 5 times the reporting limit. (Metals)
T: Tentatively identified corexit compound.
C: Co-elution.

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Method Blank
Lab ID	TS091710B09
Matrix	Solid
Reference Method	8270
Batch ID	TS091710B09
Date Collected	N/A
Date Received	N/A
Date Prepped	09/17/2010
Date Analyzed	11/05/2010
Sample Size (wet)	0.005
% Solid	100
File ID	C27546.D
Units	mg/Kg
Final Volume	2
Dilution	1
Reporting Limit	4.00

Class	Abbrev	Analytes	Result		SSRL
t23	T4	C23 Tricyclic Terpane		U	4.00
t24	T5	C24 Tricyclic Terpane		U	4.00
t25	T6	C25 Tricyclic Terpane		U	4.00
te24	T6a	C24 Tetracyclic Terpane		U	4.00
t26S	T6b	C26 Tricyclic Terpane-22S		U	4.00
t26R	T6c	C26 Tricyclic Terpane-22R		U	4.00
t28S	T7	C28 Tricyclic Terpane-22S		U	4.00
t28R	T8	C28 Tricyclic Terpane-22R		U	4.00
t29S	T9	C29 Tricyclic Terpane-22S		U	4.00
t29R	T10	C29 Tricyclic Terpane-22R		U	4.00
Ts	T11	18a-22,29,30-Trisnorneohopane-TS		U	4.00
t30S	T11a	C30 Tricyclic Terpane-22S		U	4.00
t30R	T11b	C30 Tricyclic Terpane-22R		U	4.00
Tm	T12	17a(H)-22,29,30-Trisnorhopane-TM		U	4.00
BNH	T14a	17a/b,21b/a 28,30-Bisnorhopane		U	4.00
25N	T14b	17a(H),21b(H)-25-Norhopane		U	4.00
H29	T15	30-Norhopane		U	4.00
C29Ts	T16	18a(H)-30-Norneohopane-C29Ts		U	4.00
X	X	17a(H)-Diahopane		U	4.00
M29	T17	30-Normoretane		U	4.00
OL	T18	18a(H)&18b(H)-Oleananes		U	4.00
H30	T19	Hopane		U	4.00
M30	T20	Moretane		U	4.00
H31S	T21	30-Homohopane-22S		U	4.00
H31R	T22	30-Homohopane-22R		U	4.00
H32S	T26	30,31-Bishomohopane-22S		U	4.00
H32R	T27	30,31-Bishomohopane-22R		U	4.00
H33R	T30	30,31-Trishomohopane-22S		U	4.00
H33S	T31	30,31-Trishomohopane-22R		U	4.00
H34R	T32	Tetrakishomohopane-22S		U	4.00
H34S	T33	Tetrakishomohopane-22R		U	4.00
H35S	T34	Pentakishomohopane-22S		U	4.00
H35R	T35	Pentakishomohopane-22R		U	4.00
d27S	S4	13b(H),17a(H)-20S-Diacholestane		U	4.00
d27R	S5	13b(H),17a(H)-20R-Diacholestane		U	4.00
d28S	S8	13b,17a-20S-Methyldiacholestane		U	4.00
aa27S	S12	14a(H),17a(H)-20S-Cholestane		U	4.00
aa27R	S17	14a(H),17a(H)-20R-Cholestane		U	4.00
d29R	S18	13b,17a-20R-Ethyldiacholestane		U	4.00
d29S	S19	13a,17b-20S-Ethyldiacholestane		U	4.00
aa28S	S20	14a,17a-20S-Methylcholestane		U	4.00
aa28R	S24	14a,17a-20R-Methylcholestane		U	4.00
aa29S	S25	14a(H),17a(H)-20S-Ethylcholestane		U	4.00
aa29R	S28	14a(H),17a(H)-20R-Ethylcholestane		U	4.00
bb27R	S14	14b(H),17b(H)-20R-Cholestane		U	4.00
bb27S	S15	14b(H),17b(H)-20S-Cholestane		U	4.00
bb28R	S22	14b,17b-20R-Methylcholestane		U	4.00
bb28S	S23	14b,17b-20S-Methylcholestane		U	4.00
bb29R	S26	14b(H),17b(H)-20R-Ethylcholestane		U	4.00
bb29S	S27	14b(H),17b(H)-20S-Ethylcholestane		U	4.00

Surrogates (% Recovery)	
5B(H)Cholane	89

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Sheen-2-083010
Lab ID	1009123-02F1
Matrix	Solid
Reference Method	8270
Batch ID	TS091710B09
Date Collected	08/30/2010
Date Received	09/01/2010
Date Prepped	09/17/2010
Date Analyzed	11/05/2010
Sample Size (wet)	0.0113
% Solid	100
File ID	C27550.D
Units	mg/Kg
Final Volume	1.82
Dilution	1
Reporting Limit	1.61

Class	Abbrev	Analytes	Result		SSRL
t23	T4	C23 Tricyclic Terpane	8.81		1.61
t24	T5	C24 Tricyclic Terpane	5.10		1.61
t25	T6	C25 Tricyclic Terpane	4.51		1.61
te24	T6a	C24 Tetracyclic Terpane	5.11		1.61
t26S	T6b	C26 Tricyclic Terpane-22S	2.41		1.61
t26R	T6c	C26 Tricyclic Terpane-22R	2.28		1.61
t28S	T7	C28 Tricyclic Terpane-22S	2.59		1.61
t28R	T8	C28 Tricyclic Terpane-22R	2.99		1.61
t29S	T9	C29 Tricyclic Terpane-22S	2.59		1.61
t29R	T10	C29 Tricyclic Terpane-22R	2.30		1.61
Ts	T11	18a-22,29,30-Trisnorneohopane-TS	13.0		1.61
t30S	T11a	C30 Tricyclic Terpane-22S	2.21		1.61
t30R	T11b	C30 Tricyclic Terpane-22R	1.46	J	1.61
Tm	T12	17a(H)-22,29,30-Trisnorhopane-TM	20.2		1.61
BNH	T14a	17a/b,21b/a 28,30-Bisnorhopane	3.35		1.61
25N	T14b	17a(H),21b(H)-25-Norhopane	1.29	J	1.61
H29	T15	30-Norhopane	45.7		1.61
C29Ts	T16	18a(H)-30-Norneohopane-C29Ts	12.4		1.61
X	X	17a(H)-Diahopane	3.75		1.61
M29	T17	30-Normoretane	9.93		1.61
OL	T18	18a(H)&18b(H)-Oleananes	4.55		1.61
H30	T19	Hopane	77.9		1.61
M30	T20	Moretane	14.1		1.61
H31S	T21	30-Homohopane-22S	19.9		1.61
H31R	T22	30-Homohopane-22R	15.8		1.61
H32S	T26	30,31-Bishomohopane-22S	14.2		1.61
H32R	T27	30,31-Bishomohopane-22R	10.1		1.61
H33R	T30	30,31-Trishomohopane-22S	8.71		1.61
H33S	T31	30,31-Trishomohopane-22R	4.51		1.61
H34R	T32	Tetrakishomohopane-22S	4.33		1.61
H34S	T33	Tetrakishomohopane-22R	3.38		1.61
H35S	T34	Pentakishomohopane-22S	2.62		1.61
H35R	T35	Pentakishomohopane-22R	2.55		1.61
d27S	S4	13b(H),17a(H)-20S-Diacholestane	11.4		1.61
d27R	S5	13b(H),17a(H)-20R-Diacholestane	6.10		1.61
d28S	S8	13b,17a-20S-Methyldiacholestane	7.57		1.61
aa27S	S12	14a(H),17a(H)-20S-Cholestane	17.2		1.61
aa27R	S17	14a(H),17a(H)-20R-Cholestane	19.1		1.61
d29R	S18	13b,17a-20R-Ethyldiacholestane	2.97		1.61
d29S	S19	13a,17b-20S-Ethyldiacholestane	1.03	J	1.61
aa28S	S20	14a,17a-20S-Methylcholestane	7.91		1.61
aa28R	S24	14a,17a-20R-Methylcholestane	10.3		1.61
aa29S	S25	14a(H),17a(H)-20S-Ethylcholestane	7.47		1.61
aa29R	S28	14a(H),17a(H)-20R-Ethylcholestane	10.3		1.61
bb27R	S14	14b(H),17b(H)-20R-Cholestane	9.12		1.61
bb27S	S15	14b(H),17b(H)-20S-Cholestane	8.98		1.61
bb28R	S22	14b,17b-20R-Methylcholestane	12.0		1.61
bb28S	S23	14b,17b-20S-Methylcholestane	13.6		1.61
bb29R	S26	14b(H),17b(H)-20R-Ethylcholestane	14.4		1.61
bb29S	S27	14b(H),17b(H)-20S-Ethylcholestane	9.80		1.61

Surrogates (% Recovery)	
5B(H)Cholane	91

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Method Blank
Lab ID	TS091710B09
Matrix	Solid
Reference Method	Modified 8270C
Batch ID	TS091710B09
Date Collected	N/A
Date Received	N/A
Date Prepped	09/17/2010
Date Analyzed	11/05/2010
Sample Size (wet)	0.005
% Solid	100
File ID	C27532.D
Units	mg/Kg
Final Volume	2
Dilution	1
Reporting Limit	4.00

Class	Abbrev	Analytes	Result		SSRL
2	N0	Naphthalene	0.365	J	4.00
2	N1	C1-Naphthalenes	0.424	J	4.00
2	N2	C2-Naphthalenes		U	4.00
2	N3	C3-Naphthalenes		U	4.00
2	N4	C4-Naphthalenes		U	4.00
2	B	Biphenyl	0.292	J	4.00
3	DF	Dibenzofuran		U	4.00
3	AY	Acenaphthylene		U	4.00
3	AE	Acenaphthene		U	4.00
3	F0	Fluorene	0.104	J	4.00
3	F1	C1-Fluorenes		U	4.00
3	F2	C2-Fluorenes		U	4.00
3	F3	C3-Fluorenes		U	4.00
3	A0	Anthracene		U	4.00
3	P0	Phenanthrene	0.254	J	4.00
3	PA1	C1-Phenanthrenes/Anthracenes		U	4.00
3	PA2	C2-Phenanthrenes/Anthracenes		U	4.00
3	PA3	C3-Phenanthrenes/Anthracenes		U	4.00
3	PA4	C4-Phenanthrenes/Anthracenes		U	4.00
3	RET	Retene		U	4.00
3	DBT0	Dibenzothiophene	0.0872	J	4.00
3	DBT1	C1-Dibenzothiophenes		U	4.00
3	DBT2	C2-Dibenzothiophenes		U	4.00
3	DBT3	C3-Dibenzothiophenes		U	4.00
3	DBT4	C4-Dibenzothiophenes		U	4.00
4	BF	Benzo(b)fluorene		U	4.00
4	FL0	Fluoranthene	0.0740	J	4.00
4	PY0	Pyrene	0.120	J	4.00
4	FP1	C1-Fluoranthenes/Pyrenes		U	4.00
4	FP2	C2-Fluoranthenes/Pyrenes		U	4.00
4	FP3	C3-Fluoranthenes/Pyrenes		U	4.00
4	FP4	C4-Fluoranthenes/Pyrenes		U	4.00
4	NBT0	Naphthobenzothiophenes		U	4.00
4	NBT1	C1-Naphthobenzothiophenes		U	4.00
4	NBT2	C2-Naphthobenzothiophenes		U	4.00
4	NBT3	C3-Naphthobenzothiophenes		U	4.00
4	NBT4	C4-Naphthobenzothiophenes		U	4.00
4	BA0	Benz[a]anthracene		U	4.00
4	C0	Chrysene/Triphenylene		U	4.00
4	BC1	C1-Chrysenes		U	4.00
4	BC2	C2-Chrysenes		U	4.00
4	BC3	C3-Chrysenes		U	4.00
4	BC4	C4-Chrysenes		U	4.00
5	BBF	Benzo[b]fluoranthene		U	4.00
5	BJKF	Benzo[k]fluoranthene		U	4.00
5	BAF	Benzo[a]fluoranthene		U	4.00
5	BEP	Benzo[e]pyrene		U	4.00
5	BAP	Benzo[a]pyrene		U	4.00
5	PER	Perylene		U	4.00
6	IND	Indeno[1,2,3-cd]pyrene		U	4.00
5	DA	Dibenz[a,h]anthracene		U	4.00
6	GHI	Benzo[g,h,i]perylene		U	4.00
3	4MDT	4-Methyldibenzothiophene		U	4.00
3	2MDT	2/3-Methyldibenzothiophene		U	4.00
3	1MDT	1-Methyldibenzothiophene		U	4.00
3	3MP	3-Methylphenanthrene		U	4.00
3	2MP	2/4-Methylphenanthrene		U	4.00
3	2MA	2-Methylanthracene		U	4.00
3	9MP	9-Methylphenanthrene		U	4.00
3	1MP	1-Methylphenanthrene		U	4.00

Surrogates (% Recovery)	
2-Methylnaphthalene-d10	66
Pyrene-d10	77
Benzo[b]fluoranthene-d12	79

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Laboratory Control Sample
Lab ID	TS091710LCS07
Matrix	Solid
Reference Method	Modified 8270C
Batch ID	TS091710B09
Date Collected	N/A
Date Received	N/A
Date Prepped	09/17/2010
Date Analyzed	11/05/2010
Sample Size (wet)	0.005
% Solid	100
File ID	C27534.D
Units	mg/Kg
Final Volume	2
Dilution	1
Reporting Limit	4.00

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit
2	N0	Naphthalene	175	S	4.00	88	200	50	130
2	N1	C1-Naphthalenes		U	4.00				
2	N2	C2-Naphthalenes		U	4.00				
2	N3	C3-Naphthalenes		U	4.00				
2	N4	C4-Naphthalenes		U	4.00				
2	B	Biphenyl		U	4.00				
3	DF	Dibenzofuran		U	4.00				
3	AY	Acenaphthylene	183	S	4.00	91	200	50	130
3	AE	Acenaphthene	192	S	4.00	96	200	50	130
3	F0	Fluorene	194	S	4.00	97	200	50	130
3	F1	C1-Fluorenes		U	4.00				
3	F2	C2-Fluorenes		U	4.00				
3	F3	C3-Fluorenes		U	4.00				
3	A0	Anthracene	218	S	4.00	109	200	50	130
3	P0	Phenanthrene	198	S	4.00	99	200	50	130
3	PA1	C1-Phenanthrenes/Anthracenes		U	4.00				
3	PA2	C2-Phenanthrenes/Anthracenes		U	4.00				
3	PA3	C3-Phenanthrenes/Anthracenes		U	4.00				
3	PA4	C4-Phenanthrenes/Anthracenes		U	4.00				
3	RET	Retene		U	4.00				
3	DBT0	Dibenzothiophene		U	4.00				
3	DBT1	C1-Dibenzothiophenes		U	4.00				
3	DBT2	C2-Dibenzothiophenes		U	4.00				
3	DBT3	C3-Dibenzothiophenes		U	4.00				
3	DBT4	C4-Dibenzothiophenes		U	4.00				
4	BF	Benzo(b)fluorene		U	4.00				
4	FL0	Fluoranthene	168	S	4.00	84	200	50	130
4	PY0	Pyrene	190	S	4.00	95	200	50	130
4	FP1	C1-Fluoranthenes/Pyrenes		U	4.00				
4	FP2	C2-Fluoranthenes/Pyrenes		U	4.00				
4	FP3	C3-Fluoranthenes/Pyrenes		U	4.00				
4	FP4	C4-Fluoranthenes/Pyrenes		U	4.00				
4	NBT0	Naphthobenzothiophenes		U	4.00				
4	NBT1	C1-Naphthobenzothiophenes		U	4.00				
4	NBT2	C2-Naphthobenzothiophenes		U	4.00				
4	NBT3	C3-Naphthobenzothiophenes		U	4.00				
4	NBT4	C4-Naphthobenzothiophenes		U	4.00				
4	BA0	Benz[a]anthracene	176	S	4.00	88	200	50	130
4	C0	Chrysene/Triphenylene	181	S	4.00	91	200	50	130
4	BC1	C1-Chrysenes		U	4.00				
4	BC2	C2-Chrysenes		U	4.00				
4	BC3	C3-Chrysenes		U	4.00				
4	BC4	C4-Chrysenes		U	4.00				
5	BBF	Benzo[b]fluoranthene	179	S	4.00	89	200	50	130
5	BJKF	Benzo[k]fluoranthene	193	S	4.00	97	200	50	130
5	BAF	Benzo[a]fluoranthene		U	4.00				
5	BEP	Benzo[e]pyrene		U	4.00				
5	BAP	Benzo[a]pyrene	186	S	4.00	93	200	50	130
5	PER	Perylene		U	4.00				
6	IND	Indeno[1,2,3-cd]pyrene	178	S	4.00	89	200	50	130
5	DA	Dibenz[a,h]anthracene	173	S	4.00	86	200	50	130
6	GHI	Benzo[g,h,i]perylene	176	S	4.00	88	200	50	130
3	4MDT	4-Methyldibenzothiophene		U	4.00				
3	2MDT	2/3-Methyldibenzothiophene		U	4.00				
3	1MDT	1-Methyldibenzothiophene		U	4.00				
3	3MP	3-Methylphenanthrene		U	4.00				
3	2MP	2/4-Methylphenanthrene		U	4.00				
3	2MA	2-Methylanthracene		U	4.00				
3	9MP	9-Methylphenanthrene		U	4.00				
3	1MP	1-Methylphenanthrene		U	4.00				

Surrogates (% Recovery)	
2-Methylnaphthalene-d10	77
Pyrene-d10	80
Benzo[b]fluoranthene-d12	83

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Laboratory Control Sample Dup
Lab ID	TS091710LCSD07
Matrix	Solid
Reference Method	Modified 8270C
Batch ID	TS091710B09
Date Collected	N/A
Date Received	N/A
Date Prepped	09/17/2010
Date Analyzed	11/05/2010
Sample Size (wet)	0.005
% Solid	100
File ID	C27536.D
Units	mg/Kg
Final Volume	2
Dilution	1
Reporting Limit	4.00

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit	RPD	RPD Limit
2	N0	Naphthalene	189	S	4.00	94	200	50	130	8	30
2	N1	C1-Naphthalenes		U	4.00						
2	N2	C2-Naphthalenes		U	4.00						
2	N3	C3-Naphthalenes		U	4.00						
2	N4	C4-Naphthalenes		U	4.00						
2	B	Biphenyl		U	4.00						
3	DF	Dibenzofuran		U	4.00						
3	AY	Acenaphthylene	193	S	4.00	97	200	50	130	6	30
3	AE	Acenaphthene	202	S	4.00	101	200	50	130	5	30
3	F0	Fluorene	203	S	4.00	102	200	50	130	5	30
3	F1	C1-Fluorenes		U	4.00						
3	F2	C2-Fluorenes		U	4.00						
3	F3	C3-Fluorenes		U	4.00						
3	A0	Anthracene	220	S	4.00	110	200	50	130	1	30
3	P0	Phenanthrene	209	S	4.00	104	200	50	130	5	30
3	PA1	C1-Phenanthrenes/Anthracenes		U	4.00						
3	PA2	C2-Phenanthrenes/Anthracenes		U	4.00						
3	PA3	C3-Phenanthrenes/Anthracenes		U	4.00						
3	PA4	C4-Phenanthrenes/Anthracenes		U	4.00						
3	RET	Retene		U	4.00						
3	DBT0	Dibenzothiophene		U	4.00						
3	DBT1	C1-Dibenzothiophenes		U	4.00						
3	DBT2	C2-Dibenzothiophenes		U	4.00						
3	DBT3	C3-Dibenzothiophenes		U	4.00						
3	DBT4	C4-Dibenzothiophenes		U	4.00						
4	BF	Benzo(b)fluorene		U	4.00						
4	FL0	Fluoranthene	178	S	4.00	89	200	50	130	6	30
4	PY0	Pyrene	199	S	4.00	99	200	50	130	5	30
4	FP1	C1-Fluoranthenes/Pyrenes		U	4.00						
4	FP2	C2-Fluoranthenes/Pyrenes		U	4.00						
4	FP3	C3-Fluoranthenes/Pyrenes		U	4.00						
4	FP4	C4-Fluoranthenes/Pyrenes		U	4.00						
4	NBT0	Naphthobenzothiophenes		U	4.00						
4	NBT1	C1-Naphthobenzothiophenes		U	4.00						
4	NBT2	C2-Naphthobenzothiophenes		U	4.00						
4	NBT3	C3-Naphthobenzothiophenes		U	4.00						
4	NBT4	C4-Naphthobenzothiophenes		U	4.00						
4	BA0	Benz[a]anthracene	181	S	4.00	90	200	50	130	3	30
4	C0	Chrysene/Triphenylene	186	S	4.00	93	200	50	130	2	30
4	BC1	C1-Chrysenes		U	4.00						
4	BC2	C2-Chrysenes		U	4.00						
4	BC3	C3-Chrysenes		U	4.00						
4	BC4	C4-Chrysenes		U	4.00						
5	BBF	Benzo[b]fluoranthene	185	S	4.00	92	200	50	130	3	30
5	BJKF	Benzo[k]fluoranthene	202	S	4.00	101	200	50	130	4	30
5	BAF	Benzo[a]fluoranthene		U	4.00						
5	BEP	Benzo[e]pyrene		U	4.00						
5	BAP	Benzo[a]pyrene	181	S	4.00	90	200	50	130	3	30
5	PER	Perylene		U	4.00						
6	IND	Indeno[1,2,3-cd]pyrene	186	S	4.00	93	200	50	130	5	30
5	DA	Dibenz[a,h]anthracene	174	S	4.00	87	200	50	130	1	30
6	GHI	Benzo[g,h,i]perylene	179	S	4.00	89	200	50	130	1	30
3	4MDT	4-Methyldibenzothiophene		U	4.00						
3	2MDT	2/3-Methyldibenzothiophene		U	4.00						
3	1MDT	1-Methyldibenzothiophene		U	4.00						
3	3MP	3-Methylphenanthrene		U	4.00						
3	2MP	2/4-Methylphenanthrene		U	4.00						
3	2MA	2-Methylanthracene		U	4.00						
3	9MP	9-Methylphenanthrene		U	4.00						
3	1MP	1-Methylphenanthrene		U	4.00						

Surrogates (% Recovery)	
2-Methylnaphthalene-d10	83
Pyrene-d10	84
Benzo[b]fluoranthene-d12	86

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Alaska North Slope Crude
Lab ID	SW110810AWS01
Matrix	Oil
Reference Method	Modified 8270C
Batch ID	SW110810AWS01
Date Collected	N/A
Date Received	N/A
Date Prepped	N/A
Date Analyzed	10/21/2010
Sample Size (wet)	0.04908
% Solid	100
File ID	C27090.D
Units	mg/Kg
Final Volume	10
Dilution	1
Reporting Limit	2.04

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit
2	N0	Naphthalene	567		2.04	100	565.20	65	135
2	N1	C1-Naphthalenes	1120		2.04	92	1208.90	65	135
2	N2	C2-Naphthalenes	1280		2.04	84	1532.50	65	135
2	N3	C3-Naphthalenes	923		2.04	80	1149.20	65	135
2	N4	C4-Naphthalenes	504		2.04	76	658.30	65	135
2	B	Biphenyl	146		2.04	97	150.45	65	135
3	DF	Dibenzofuran	47.8		2.04	92	51.75	65	135
3	AY	Acenaphthylene	6.47		2.04	96	6.72	65	135
3	AE	Acenaphthene	15.9		2.04	113	14.11	65	135
3	F0	Fluorene	67.7		2.04	91	74.49	65	135
3	F1	C1-Fluorenes	169		2.04	95	177.55	65	135
3	F2	C2-Fluorenes	231		2.04	89	260.50	65	135
3	F3	C3-Fluorenes	216		2.04	88	245.65	65	135
3	A0	Anthracene		U	2.04				
3	P0	Phenanthrene	186		2.04	88	212.05	65	135
3	PA1	C1-Phenanthrenes/Anthracenes	358		2.04	82	438.70	65	135
3	PA2	C2-Phenanthrenes/Anthracenes	428		2.04	87	492.95	65	135
3	PA3	C3-Phenanthrenes/Anthracenes	319		2.04	92	346.35	65	135
3	PA4	C4-Phenanthrenes/Anthracenes	124		2.04	87	142.00	65	135
3	RET	Retene		U	2.04				
3	DBT0	Dibenzothiophene	123		2.04	90	137.25	65	135
3	DBT1	C1-Dibenzothiophenes	258		2.04	91	282.45	65	135
3	DBT2	C2-Dibenzothiophenes	335		2.04	84	397.40	65	135
3	DBT3	C3-Dibenzothiophenes	306		2.04	84	363.70	65	135
3	DBT4	C4-Dibenzothiophenes	172		2.04	84	204.20	65	135
4	BF	Benzo(b)fluorene	6.14		2.04				
4	FL0	Fluoranthene	3.77		2.04	89	4.24	65	135
4	PY0	Pyrene	12.3		2.04	103	11.92	65	135
4	FP1	C1-Fluoranthenes/Pyrenes	56.3		2.04	87	65.01	65	135
4	FP2	C2-Fluoranthenes/Pyrenes	92.2		2.04	85	108.52	65	135
4	FP3	C3-Fluoranthenes/Pyrenes	109		2.04	90	122.26	65	135
4	FP4	C4-Fluoranthenes/Pyrenes	97.8		2.04	94	104.53	65	135
4	NBT0	Naphthobenzothiophenes	36.7		2.04	89	41.18	65	135
4	NBT1	C1-Naphthobenzothiophenes	100		2.04	89	113.34	65	135
4	NBT2	C2-Naphthobenzothiophenes	133		2.04	86	154.80	65	135
4	NBT3	C3-Naphthobenzothiophenes	107		2.04	86	123.90	65	135
4	NBT4	C4-Naphthobenzothiophenes	71.4		2.04	84	85.03	65	135
4	BA0	Benz[a]anthracene	1.88	J	2.04	95	1.99	65	135
4	C0	Chrysene/Triphenylene	31.8		2.04	87	36.47	65	135
4	BC1	C1-Chrysenes	61.6		2.04	90	68.13	65	135
4	BC2	C2-Chrysenes	83.2		2.04	94	88.97	65	135
4	BC3	C3-Chrysenes	86.8		2.04	90	96.77	65	135
4	BC4	C4-Chrysenes	55.4		2.04	93	59.82	65	135
5	BBF	Benzo[b]fluoranthene	4.86		2.04	94	5.18	65	135
5	BJKF	Benzo[k]fluoranthene		U	2.04				
5	BAF	Benzo[a]fluoranthene		U	2.04				
5	BEP	Benzo[e]pyrene	9.81		2.04	100	9.80	65	135
5	BAP	Benzo[a]pyrene	2.43		2.04	108	2.24	65	135
5	PER	Perylene	2.82		2.04	99	2.85		
6	IND	Indeno[1,2,3-cd]pyrene	0.608	J	2.04	95	0.64		
5	DA	Dibenz[a,h]anthracene	0.983	J	2.04	113	0.87	65	135
6	GHI	Benzo[g,h,i]perylene	3.26		2.04	98	3.33	65	135
3	4MDT	4-Methyldibenzothiophene	127		2.04	93	135.86	65	135
3	2MDT	2/3-Methyldibenzothiophene	90.8		2.04	93	97.63	65	135
3	1MDT	1-Methyldibenzothiophene	35.0		2.04	80	43.88	65	135
3	3MP	3-Methylphenanthrene	71.9		2.04	79	90.67	65	135
3	2MP	2/4-Methylphenanthrene	79.4		2.04	81	98.47	65	135
3	2MA	2-Methylanthracene	2.94		2.04	89	3.31	65	135
3	9MP	9-Methylphenanthrene	118		2.04	83	142.15	65	135
3	1MP	1-Methylphenanthrene	84.6		2.04	85	100.07	65	135

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Alaska North Slope Crude
Lab ID	SW110810AWS01
Matrix	Oil
Reference Method	Modified 8270C
Batch ID	SW110810AWS01
Date Collected	N/A
Date Received	N/A
Date Prepped	N/A
Date Analyzed	10/21/2010
Sample Size (wet)	0.04908
% Solid	100
File ID	C27090.D
Units	mg/Kg
Final Volume	10
Dilution	1
Reporting Limit	2.04

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit
t23	T4	C23 Tricyclic Terpane	67.6		2.04	102	64.82	65	135
t24	T5	C24 Tricyclic Terpane	38.9		2.04	94	40.77	65	135
t25	T6	C25 Tricyclic Terpane	38.8		2.04	102	37.57	65	135
te24	T6a	C24 Tetracyclic Terpane	13.8		2.04	101	13.58	65	135
t26S	T6b	C26 Tricyclic Terpane-22S	16.0		2.04	107	14.97	65	135
t26R	T6c	C26 Tricyclic Terpane-22R	14.9		2.04	105	14.17	65	135
t28S	T7	C28 Tricyclic Terpane-22S	15.1		2.04	100	14.43	65	135
t28R	T8	C28 Tricyclic Terpane-22R	16.9		2.04	104	16.15	65	135
t29S	T9	C29 Tricyclic Terpane-22S	17.2		2.04	89	19.16	65	135
t29R	T10	C29 Tricyclic Terpane-22R	17.7		2.04	88	19.69	65	135
Ts	T11	18a-22,29,30-Trisnorneohopane-TS	27.0		2.04	97	27.66	65	135
t30S	T11a	C30 Tricyclic Terpane-22S	14.3		2.04	103	12.61	65	135
t30R	T11b	C30 Tricyclic Terpane-22R	14.1		2.04	104	13.12	65	135
Tm	T12	17a(H)-22,29,30-Trisnorhopane-TM	33.7		2.04	100	33.11	65	135
BNH	T14a	17a/b,21b/a 28,30-Bisnorhopane	7.22		2.04	112	5.96	65	135
25N	T14b	17a(H),21b(H)-25-Norhopane	7.07		2.04	91	7.73	65	135
H29	T15	30-Norhopane	86.8		2.04	99	87.28	65	135
C29Ts	T16	18a(H)-30-Norneohopane-C29Ts	20.0		2.04	89	20.24	65	135
X	X	17a(H)-Diahopane	13.2		2.04	103	12.37	65	135
M29	T17	30-Normoretane	11.2		2.04	103	10.74	65	135
OL	T18	18a(H)&18b(H)-Oleananes		U	2.04				
H30	T19	Hopane	165		2.04	105	155.05	65	135
M30	T20	Moretane	17.9		2.04	118	14.15	65	135
H31S	T21	30-Homohopane-22S	72.3		2.04	107	67.25	65	135
H31R	T22	30-Homohopane-22R	60.3		2.04	106	56.31	65	135
H32S	T26	30,31-Bishomohopane-22S	53.7		2.04	111	48.03	65	135
H32R	T27	30,31-Bishomohopane-22R	38.4		2.04	109	35.10	65	135
H33R	T30	30,31-Trishomohopane-22S	41.2		2.04	114	35.66	65	135
H33S	T31	30,31-Trishomohopane-22R	26.1		2.04	110	23.62	65	135
H34R	T32	Tetrakishomohopane-22S	31.0		2.04	112	27.54	65	135
H34S	T33	Tetrakishomohopane-22R	21.4		2.04	111	18.94	65	135
H35S	T34	Pentakishomohopane-22S	33.2		2.04	121	27.08	65	135
H35R	T35	Pentakishomohopane-22R	22.6		2.04	109	20.61	65	135
d27S	S4	13b(H),17a(H)-20S-Diacholestane	47.1		2.04	88	53.08	65	135
d27R	S5	13b(H),17a(H)-20R-Diacholestane	25.3		2.04	94	26.72	65	135
d28S	S8	13b,17a-20S-Methyldiacholestane	18.1		2.04	83	21.13	65	135
aa27S	S12	14a(H),17a(H)-20S-Cholestane	64.0		2.04	92	68.04	65	135
aa27R	S17	14a(H),17a(H)-20R-Cholestane	72.7		2.04	91	79.11	65	135
d29R	S18	13b,17a-20R-Ethyldiacholestane	22.2		2.04	110	18.28	65	135
d29S	S19	13a,17b-20S-Ethyldiacholestane	2.96		2.04	69	4.31	65	135
aa28S	S20	14a,17a-20S-Methylcholestane	35.2		2.04	88	39.14	65	135
aa28R	S24	14a,17a-20R-Methylcholestane	35.6		2.04	100	35.82	65	135
aa29S	S25	14a(H),17a(H)-20S-Ethylcholestane	54.5		2.04	93	52.36	65	135
aa29R	S28	14a(H),17a(H)-20R-Ethylcholestane	39.7		2.04	93	39.85	65	135
bb27R	S14	14b(H),17b(H)-20R-Cholestane	43.7		2.04	103	42.22	65	135
bb27S	S15	14b(H),17b(H)-20S-Cholestane	43.2		2.04	101	42.99	65	135
bb28R	S22	14b,17b-20R-Methylcholestane	47.1		2.04	98	47.55	65	135
bb28S	S23	14b,17b-20S-Methylcholestane	55.9		2.04	95	56.98	65	135
bb29R	S26	14b(H),17b(H)-20R-Ethylcholestane	67.4		2.04	103	65.21	65	135
bb29S	S27	14b(H),17b(H)-20S-Ethylcholestane	39.4		2.04	91	42.46	65	135
RC26/SC27TA	RC26/SC27TA	C26,20R- +C27,20S- triaromatic steroid	305		2.04	91	335.70	65	135
SC28TA	SC28TA	C28,20S-triaromatic steroid	197		2.04	93	211.55	65	135
RC27TA	RC27TA	C27,20R-triaromatic steroid	185		2.04	90	204.30	65	135
RC28TA	RC28TA	C28,20R-triaromatic steroid	162		2.04	94	172.85	65	135

NEWFIELDS

Project Name: GZA-National Grid (Pawtucket, RI)
Project Number:

Client ID	Sheen-2-083010
Lab ID	1009123-02
Matrix	Solid
Reference Method	Modified 8270C
Batch ID	TS091710B09
Date Collected	08/30/2010
Date Received	09/01/2010
Date Prepped	09/17/2010
Date Analyzed	11/05/2010
Sample Size (wet)	0.0113
% Solid	100
File ID	C27538.D
Units	mg/Kg
Final Volume	2.22
Dilution	1
Reporting Limit	1.96

Class	Abbrev	Analytes	Result		SSRL
2	N0	Naphthalene	6.79		1.96
2	N1	C1-Naphthalenes	4.04		1.96
2	N2	C2-Naphthalenes	23.7		1.96
2	N3	C3-Naphthalenes	469		1.96
2	N4	C4-Naphthalenes	891		1.96
2	B	Biphenyl	0.930	JB	1.96
3	DF	Dibenzofuran	6.08		1.96
3	AY	Acenaphthylene	103		1.96
3	AE	Acenaphthene	21.5		1.96
3	F0	Fluorene	5.61		1.96
3	F1	C1-Fluorenes	111		1.96
3	F2	C2-Fluorenes	372		1.96
3	F3	C3-Fluorenes	557		1.96
3	A0	Anthracene	18.8		1.96
3	P0	Phenanthrene	22.6		1.96
3	PA1	C1-Phenanthrenes/Anthracenes	299		1.96
3	PA2	C2-Phenanthrenes/Anthracenes	802		1.96
3	PA3	C3-Phenanthrenes/Anthracenes	648		1.96
3	PA4	C4-Phenanthrenes/Anthracenes	342		1.96
3	RET	Retene		U	1.96
3	DBT0	Dibenzothiophene	24.4		1.96
3	DBT1	C1-Dibenzothiophenes	234		1.96
3	DBT2	C2-Dibenzothiophenes	642		1.96
3	DBT3	C3-Dibenzothiophenes	659		1.96
3	DBT4	C4-Dibenzothiophenes	380		1.96
4	BF	Benzo(b)fluorene	53.9		1.96
4	FL0	Fluoranthene	577		1.96
4	PY0	Pyrene	674		1.96
4	FP1	C1-Fluoranthenes/Pyrenes	533		1.96
4	FP2	C2-Fluoranthenes/Pyrenes	326		1.96
4	FP3	C3-Fluoranthenes/Pyrenes	242		1.96
4	FP4	C4-Fluoranthenes/Pyrenes	206		1.96
4	NBT0	Naphthobenzothiophenes	92.4		1.96
4	NBT1	C1-Naphthobenzothiophenes	174		1.96
4	NBT2	C2-Naphthobenzothiophenes	192		1.96
4	NBT3	C3-Naphthobenzothiophenes	110		1.96
4	NBT4	C4-Naphthobenzothiophenes	84.3		1.96
4	BA0	Benz[a]anthracene	104		1.96
4	C0	Chrysene/Triphenylene	292		1.96
4	BC1	C1-Chrysenes	214		1.96
4	BC2	C2-Chrysenes	159		1.96
4	BC3	C3-Chrysenes	115		1.96
4	BC4	C4-Chrysenes	58.2		1.96
5	BBF	Benzo[b]fluoranthene	284		1.96
5	BJKF	Benzo[k]fluoranthene	244		1.96
5	BAF	Benzo[a]fluoranthene	38.9		1.96
5	BEP	Benzo[e]pyrene	245		1.96
5	BAP	Benzo[a]pyrene		U	1.96
5	PER	Perylene		U	1.96
6	IND	Indeno[1,2,3-cd]pyrene	203		1.96
5	DA	Dibenz[a,h]anthracene	46.4		1.96
6	GHI	Benzo[g,h,i]perylene	216		1.96
3	4MDT	4-Methyldibenzothiophene	96.8		1.96
3	2MDT	2/3-Methyldibenzothiophene	66.2		1.96
3	1MDT	1-Methyldibenzothiophene	53.1		1.96
3	3MP	3-Methylphenanthrene	66.3		1.96
3	2MP	2/4-Methylphenanthrene	26.3		1.96
3	2MA	2-Methylanthracene	7.61		1.96
3	9MP	9-Methylphenanthrene	104		1.96
3	1MP	1-Methylphenanthrene	76.0		1.96

Surrogates (% Recovery)	
2-Methylnaphthalene-d10	110
Pyrene-d10	97
Benzo[b]fluoranthene-d12	105

NEWFIELDS

U: The analyte was analyzed for but not detected at the sample specific level reported.
B: Found in associated blank as well as sample.
J: Estimated value, below quantitation limit.
E: Estimated value, exceeds the upper limit of calibration.
NA: Not Applicable
D: Secondary Dilution Performed
D1: Tertiary Dilution Performed
ª: Value outside of QC Limits.
§: Surrogate value outside of acceptable range.
X: It is not possible to calculate RPD, one result is below the detection limit, the other is above reporting limit.
G: Matrix Interference.
P: Greater than 40% RPD between the two columns, the higher value is reported according to the method.
I: Due to interference, the lower value is reported.
N: Spike recovery outside control limits.
E: Estimated due to Interference. (Metals)
¤: Duplicate outside control limits.
P: Spike compound. (Metals)
J: Below CRDL, Project DL, or RL but greater than or equal to MDL
C: Sample concentration is > 4 times the spike level, recovery limits do not apply. (Metals)
S: Spike Compound. (Organics)
§: RPD criteria not applicable to results less than 5 times the reporting limit. (Metals)
T: Tenatively identified corexit compound.

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	Method Blank
Lab ID	TO022211B02B
Matrix	NAPL
Reference Method	SHC
Batch ID	TO022211B02
Date Collected	N/A
Date Received	N/A
Date Prepped	02/22/2011
Date Analyzed	02/24/2011
Sample Size (wet)	0.1
% Solid	100
File ID	B35558.D
Units	mg/Kg
Final Volume	1
Dilution	1
Reporting Limit	10.0

Class	Abbrev	Analytes	Result		SSRL
SHC	C9	n-Nonane (C9)		U	10.0
SHC	C10	n-Decane (C10)		U	10.0
SHC	C11	n-Undecane (C11)	0.0500	J	10.0
SHC	C12	n-Dodecane (C12)		U	10.0
SHC	C13	n-Tridecane (C13)	0.0500	J	10.0
SHC	1380	2,6,10 Trimethyldodecane (1380)		U	10.0
SHC	C14	n-Tetradecane (C14)		U	10.0
SHC	1470	2,6,10 Trimethyltridecane (1470)		U	10.0
SHC	C15	n-Pentadecane (C15)	0.660	J	10.0
SHC	C16	n-Hexadecane (C16)		U	10.0
SHC	1650	Norpristane (1650)		U	10.0
SHC	C17	n-Heptadecane (C17)		U	10.0
SHC	Pr	Pristane		U	10.0
SHC	C18	n-Octadecane (C18)	9.04	JC	10.0
SHC	Ph	Phytane	0.150	J	10.0
SHC	C19	n-Nonadecane (C19)		U	10.0
SHC	C20	n-Eicosane (C20)		U	10.0
SHC	C21	n-Heneicosane (C21)	0.550	J	10.0
SHC	C22	n-Docosane (C22)		U	10.0
SHC	C23	n-Tricosane (C23)		U	10.0
SHC	C24	n-Tetracosane (C24)		U	10.0
SHC	C25	n-Pentacosane (C25)	5.14	JC	10.0
SHC	C26	n-Hexacosane (C26)		U	10.0
SHC	C27	n-Heptacosane (C27)		U	10.0
SHC	C28	n-Octacosane (C28)		U	10.0
SHC	C29	n-Nonacosane (C29)		U	10.0
SHC	C30	n-Triacontane (C30)		U	10.0
SHC	C31	n-Hentriacontane (C31)		U	10.0
SHC	C32	n-Dotriacontane (C32)		U	10.0
SHC	C33	n-Tritriacontane (C33)		U	10.0
SHC	C34	n-Tetratriacontane (C34)		U	10.0
SHC	C35	n-Pentatriacontane (C35)		U	10.0
SHC	C36	n-Hexatriacontane (C36)		U	10.0
SHC	C37	n-Heptatriacontane (C37)		U	10.0
SHC	C38	n-Octatriacontane (C38)		U	10.0
SHC	C39	n-Nonatriacontane (C39)		U	10.0
SHC	C40	n-Tetracontane (C40)		U	10.0
SHC	TSH	Total Saturated Hydrocarbons	15.6		10.0
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)		U	330

Surrogates (% Recovery)	
ortho-Terphenyl	97
d50-Tetracosane	93

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	Laboratory Control Sample
Lab ID	TO022211LCS02
Matrix	NAPL
Reference Method	SHC
Batch ID	TO022211B02
Date Collected	N/A
Date Received	N/A
Date Prepped	02/22/2011
Date Analyzed	02/24/2011
Sample Size (wet)	0.1
% Solid	100
File ID	B35560.D
Units	mg/Kg
Final Volume	1
Dilution	1
Reporting Limit	10.0

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit
SHC	C9	n-Nonane (C9)	192	S	10.0	96	200	50	130
SHC	C10	n-Decane (C10)	195	S	10.0	98	200	50	130
SHC	C11	n-Undecane (C11)		U	10.0				
SHC	C12	n-Dodecane (C12)	200	S	10.0	100	200	50	130
SHC	C13	n-Tridecane (C13)		U	10.0				
SHC	1380	2,6,10 Trimethyldodecane (1380)		U	10.0				
SHC	C14	n-Tetradecane (C14)	203	S	10.0	101	200	50	130
SHC	1470	2,6,10 Trimethyltridecane (1470)		U	10.0				
SHC	C15	n-Pentadecane (C15)		U	10.0				
SHC	C16	n-Hexadecane (C16)	205	S	10.0	102	200	50	130
SHC	1650	Norpristane (1650)		U	10.0				
SHC	C17	n-Heptadecane (C17)		U	10.0				
SHC	Pr	Pristane		U	10.0				
SHC	C18	n-Octadecane (C18)	215	S	10.0	107	200	50	130
SHC	Ph	Phytane		U	10.0				
SHC	C19	n-Nonadecane (C19)	201	S	10.0	101	200	50	130
SHC	C20	n-Eicosane (C20)	202	S	10.0	101	200	50	130
SHC	C21	n-Heneicosane (C21)		U	10.0				
SHC	C22	n-Docosane (C22)	205	S	10.0	102	200	50	130
SHC	C23	n-Tricosane (C23)		U	10.0				
SHC	C24	n-Tetracosane (C24)	198	S	10.0	99	200	50	130
SHC	C25	n-Pentacosane (C25)		U	10.0				
SHC	C26	n-Hexacosane (C26)	192	S	10.0	96	200	50	130
SHC	C27	n-Heptacosane (C27)		U	10.0				
SHC	C28	n-Octacosane (C28)	190	S	10.0	95	200	50	130
SHC	C29	n-Nonacosane (C29)		U	10.0				
SHC	C30	n-Triacontane (C30)	185	S	10.0	92	200	50	130
SHC	C31	n-Hentriacontane (C31)		U	10.0				
SHC	C32	n-Dotriacontane (C32)		U	10.0				
SHC	C33	n-Tritriacontane (C33)		U	10.0				
SHC	C34	n-Tetratriacontane (C34)		U	10.0				
SHC	C35	n-Pentatriacontane (C35)		U	10.0				
SHC	C36	n-Hexatriacontane (C36)	175	S	10.0	87	200	50	130
SHC	C37	n-Heptatriacontane (C37)		U	10.0				
SHC	C38	n-Octatriacontane (C38)		U	10.0				
SHC	C39	n-Nonatriacontane (C39)		U	10.0				
SHC	C40	n-Tetracontane (C40)		U	10.0				
SHC	TSH	Total Saturated Hydrocarbons	2760		10.0				
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	2630		330				

Surrogates (% Recovery)	
ortho-Terphenyl	96
d50-Tetracosane	92

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	Laboratory Control Sample Dup
Lab ID	TO022211LCSD02
Matrix	NAPL
Reference Method	SHC
Batch ID	TO022211B02
Date Collected	N/A
Date Received	N/A
Date Prepped	02/22/2011
Date Analyzed	02/24/2011
Sample Size (wet)	0.1
% Solid	100
File ID	B35562.D
Units	mg/Kg
Final Volume	1
Dilution	1
Reporting Limit	10.0

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit	RPD	RPD Limit
SHC	C9	n-Nonane (C9)	192	S	10.0	96	200	50	130	0	30
SHC	C10	n-Decane (C10)	194	S	10.0	97	200	50	130	0	30
SHC	C11	n-Undecane (C11)		U	10.0						
SHC	C12	n-Dodecane (C12)	200	S	10.0	100	200	50	130	0	30
SHC	C13	n-Tridecane (C13)		U	10.0						
SHC	1380	2,6,10 Trimethyldodecane (1380)		U	10.0						
SHC	C14	n-Tetradecane (C14)	203	S	10.0	102	200	50	130	0	30
SHC	1470	2,6,10 Trimethyltridecane (1470)		U	10.0						
SHC	C15	n-Pentadecane (C15)		U	10.0						
SHC	C16	n-Hexadecane (C16)	206	S	10.0	103	200	50	130	1	30
SHC	1650	Norpristane (1650)		U	10.0						
SHC	C17	n-Heptadecane (C17)		U	10.0						
SHC	Pr	Pristane		U	10.0						
SHC	C18	n-Octadecane (C18)	217	S	10.0	109	200	50	130	1	30
SHC	Ph	Phytane		U	10.0						
SHC	C19	n-Nonadecane (C19)	204	S	10.0	102	200	50	130	1	30
SHC	C20	n-Eicosane (C20)	205	S	10.0	102	200	50	130	1	30
SHC	C21	n-Heneicosane (C21)		U	10.0						
SHC	C22	n-Docosane (C22)	208	S	10.0	104	200	50	130	2	30
SHC	C23	n-Tricosane (C23)		U	10.0						
SHC	C24	n-Tetracosane (C24)	201	S	10.0	101	200	50	130	2	30
SHC	C25	n-Pentacosane (C25)		U	10.0						
SHC	C26	n-Hexacosane (C26)	196	S	10.0	98	200	50	130	2	30
SHC	C27	n-Heptacosane (C27)		U	10.0						
SHC	C28	n-Octacosane (C28)	195	S	10.0	98	200	50	130	3	30
SHC	C29	n-Nonacosane (C29)		U	10.0						
SHC	C30	n-Triacontane (C30)	190	S	10.0	95	200	50	130	2	30
SHC	C31	n-Hentriacontane (C31)		U	10.0						
SHC	C32	n-Dotriacontane (C32)		U	10.0						
SHC	C33	n-Tritriacontane (C33)		U	10.0						
SHC	C34	n-Tetratriacontane (C34)		U	10.0						
SHC	C35	n-Pentatriacontane (C35)		U	10.0						
SHC	C36	n-Hexatriacontane (C36)	180	S	10.0	90	200	50	130	3	30
SHC	C37	n-Heptatriacontane (C37)		U	10.0						
SHC	C38	n-Octatriacontane (C38)		U	10.0						
SHC	C39	n-Nonatriacontane (C39)		U	10.0						
SHC	C40	n-Tetracontane (C40)		U	10.0						
SHC	TSH	Total Saturated Hydrocarbons	2790		10.0						
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	2540		330						

Surrogates (% Recovery)	
ortho-Terphenyl	96
d50-Tetracosane	93

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	MW-3P	MW-3P
Lab ID	1102037-01	1102037-01D
Matrix	NAPL	NAPL
Reference Method	SHC	SHC
Batch ID	TO022211B02	TO022211B02
Date Collected	02/17/2011	02/17/2011
Date Received	02/19/2011	02/19/2011
Date Prepped	02/22/2011	02/22/2011
Date Analyzed	02/24/2011	02/25/2011
Sample Size (wet)	0.1006	0.0982
% Solid	100	100
File ID	B35566.D	B35568.D
Units	mg/Kg	mg/Kg
Final Volume	20	20
Dilution	1	1
Reporting Limit	199	204

Class	Abbrev	Analytes	Result		SSRL	Result		SSRL	RPD	RPD Limit	
SHC	C9	n-Nonane (C9)	55.1	J	199	58.0	J	204	5	30	
SHC	C10	n-Decane (C10)		U	199		U	204		30	N/A
SHC	C11	n-Undecane (C11)	780		199	797		204	2	30	
SHC	C12	n-Dodecane (C12)	502		199	595		204	17	30	
SHC	C13	n-Tridecane (C13)	912		199	1150		204	23	30	
SHC	1380	2,6,10 Trimethyldodecane (1380)	3080		199	3100		204	1	30	
SHC	C14	n-Tetradecane (C14)	1040		199	1070		204	3	30	
SHC	1470	2,6,10 Trimethyltridecane (1470)	2510		199	2530		204	1	30	
SHC	C15	n-Pentadecane (C15)		U	199		U	204		30	N/A
SHC	C16	n-Hexadecane (C16)		U	199		U	204		30	N/A
SHC	1650	Norpristane (1650)	2300		199	2420		204	5	30	
SHC	C17	n-Heptadecane (C17)	179	J	199	191	J	204	7	30	
SHC	Pr	Pristane	3360		199	3460		204	3	30	
SHC	C18	n-Octadecane (C18)	259		199	242		204	7	30	
SHC	Ph	Phytane	2060		199	2060		204	0	30	
SHC	C19	n-Nonadecane (C19)	215		199	243		204	12	30	
SHC	C20	n-Eicosane (C20)	207		199	212		204	2	30	
SHC	C21	n-Heneicosane (C21)		U	199		U	204		30	N/A
SHC	C22	n-Docosane (C22)		U	199		U	204		30	N/A
SHC	C23	n-Tricosane (C23)	128	J	199	125	J	204	2	30	
SHC	C24	n-Tetracosane (C24)		U	199		U	204		30	N/A
SHC	C25	n-Pentacosane (C25)	154	J	199	160	J	204	3	30	
SHC	C26	n-Hexacosane (C26)		U	199		U	204		30	N/A
SHC	C27	n-Heptacosane (C27)		U	199		U	204		30	N/A
SHC	C28	n-Octacosane (C28)	25.0	J	199	17.9	J	204	33	30	¤
SHC	C29	n-Nonacosane (C29)	22.9	J	199	21.0	J	204	9	30	
SHC	C30	n-Triacontane (C30)	30.2	J	199	31.4	J	204	4	30	
SHC	C31	n-Hentriacontane (C31)		U	199		U	204		30	N/A
SHC	C32	n-Dotriacontane (C32)	64.8	J	199	61.7	J	204	5	30	
SHC	C33	n-Tritriacontane (C33)		U	199		U	204		30	N/A
SHC	C34	n-Tetratriacontane (C34)		U	199		U	204		30	N/A
SHC	C35	n-Pentatriacontane (C35)	7.56	J	199	9.78	J	204	26	30	
SHC	C36	n-Hexatriacontane (C36)		U	199		U	204		30	N/A
SHC	C37	n-Heptatriacontane (C37)		U	199		U	204		30	N/A
SHC	C38	n-Octatriacontane (C38)		U	199		U	204		30	N/A
SHC	C39	n-Nonatriacontane (C39)		U	199		U	204		30	N/A
SHC	C40	n-Tetracontane (C40)		U	199		U	204		30	N/A
SHC	TSH	Total Saturated Hydrocarbons	17900		199	18500		204	4	30	
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	800000		6560	820000		6720	2	30	

Surrogates (% Recovery)		
ortho-Terphenyl	97	97
d50-Tetracosane	90	90

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	Alaska North Slope Crude
Lab ID	TS021911AWS01
Matrix	Oil
Reference Method	SHC
Batch ID	TS021911AWS01
Date Collected	N/A
Date Received	N/A
Date Prepped	N/A
Date Analyzed	02/17/2011
Sample Size (wet)	0.10042
% Solid	100
File ID	B35336.D
Units	mg/Kg
Final Volume	10
Dilution	1
Reporting Limit	99.6

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit
SHC	C9	n-Nonane (C9)	6600		99.6	92	7199.78	65	135
SHC	C10	n-Decane (C10)	5290		99.6	91	5833.13	65	135
SHC	C11	n-Undecane (C11)	4760		99.6	91	5250.75	65	135
SHC	C12	n-Dodecane (C12)	4380		99.6	91	4836.53	65	135
SHC	C13	n-Tridecane (C13)	4050		99.6	92	4404.33	65	135
SHC	1380	2,6,10 Trimethyldodecane (1380)	1020		99.6	104	986.28	65	135
SHC	C14	n-Tetradecane (C14)	3690		99.6	91	4073.29	65	135
SHC	1470	2,6,10 Trimethyltridecane (1470)	1440		99.6	91	1573.12	65	135
SHC	C15	n-Pentadecane (C15)	3880		99.6	97	4012.46	65	135
SHC	C16	n-Hexadecane (C16)	3300		99.6	92	3603.09	65	135
SHC	1650	Norpristane (1650)	1040		99.6	81	1297.77	65	135
SHC	C17	n-Heptadecane (C17)	2800		99.6	84	3341.69	65	135
SHC	Pr	Pristane	2110		99.6	94	2245.61	65	135
SHC	C18	n-Octadecane (C18)	2380		99.6	82	2891.35	65	135
SHC	Ph	Phytane	1270		99.6	95	1337.78	65	135
SHC	C19	n-Nonadecane (C19)	2410		99.6	92	2615.78	65	135
SHC	C20	n-Eicosane (C20)	2270		99.6	91	2502.55	65	135
SHC	C21	n-Heneicosane (C21)	2130		99.6	96	2216.50	65	135
SHC	C22	n-Docosane (C22)	2010		99.6	92	2194.34	65	135
SHC	C23	n-Tricosane (C23)	1770		99.6	92	1928.46	65	135
SHC	C24	n-Tetracosane (C24)	1660		99.6	93	1788.80	65	135
SHC	C25	n-Pentacosane (C25)	1580		99.6	93	1700.43	65	135
SHC	C26	n-Hexacosane (C26)	1360		99.6	91	1493.83	65	135
SHC	C27	n-Heptacosane (C27)	1130		99.6	98	1153.73	65	135
SHC	C28	n-Octacosane (C28)	820		99.6	95	864.09	65	135
SHC	C29	n-Nonacosane (C29)	817		99.6	108	759.11	65	135
SHC	C30	n-Triacontane (C30)	617		99.6	95	648.96	65	135
SHC	C31	n-Hentriacontane (C31)	543		99.6	94	577.38	65	135
SHC	C32	n-Dotriacontane (C32)	587		99.6	127	461.32	65	135
SHC	C33	n-Tritriacontane (C33)	308		99.6	82	375.24	65	135
SHC	C34	n-Tetratriacontane (C34)	319		99.6	87	366.50	65	135
SHC	C35	n-Pentatriacontane (C35)	284		99.6	89	318.57	65	135
SHC	C36	n-Hexatriacontane (C36)	182		99.6	86	212.92	65	135
SHC	C37	n-Heptatriacontane (C37)	160		99.6	99	161.39	65	135
SHC	C38	n-Octatriacontane (C38)	138		99.6	90	152.45	65	135
SHC	C39	n-Nonatriacontane (C39)	101		99.6	109	92.99	65	135
SHC	C40	n-Tetracontane (C40)	93.3	J	99.6	104	90.11	65	135
SHC	TSH	Total Saturated Hydrocarbons	69300		99.6	92	75562.40	65	135
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	553000		3290	76	727695.00	65	135

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

	MW-3P	MW-313P	MW-341P
Client ID	MW-3P	MW-313P	MW-341P
Lab ID	1102037-01	1102037-02	1102037-03
Matrix	NAPL	NAPL	NAPL
Reference Method	SHC	SHC	SHC
Batch ID	TO022211B02	TO022211B02	TO022211B02
Date Collected	02/17/2011	02/17/2011	02/17/2011
Date Received	02/19/2011	02/19/2011	02/19/2011
Date Prepped	02/22/2011	02/22/2011	02/22/2011
Date Analyzed	02/24/2011	02/25/2011	02/25/2011
Sample Size (wet)	0.1006	0.0992	0.0966
% Solid	100	100	100
File ID	B35566.D	B35570.D	b35579a.D
Units	mg/Kg	mg/Kg	mg/Kg
Final Volume	20	20	20
Dilution	1	1	1
Reporting Limit	199	202	207

Class	Abbrev	Analytes	Result		SSRL	Result		SSRL	Result		SSRL
SHC	C9	n-Nonane (C9)	55.1	J	199	268		202	450		207
SHC	C10	n-Decane (C10)		U	199	394		202	1740	G	207
SHC	C11	n-Undecane (C11)	780		199	808		202	2810	G	207
SHC	C12	n-Dodecane (C12)	502		199	1060		202	1020		207
SHC	C13	n-Tridecane (C13)	912		199	860		202	2520	G	207
SHC	1380	2,6,10 Trimethyldodecane (1380)	3080		199	1980		202	464		207
SHC	C14	n-Tetradecane (C14)	1040		199	892		202	1520	G	207
SHC	1470	2,6,10 Trimethyltridecane (1470)	2510		199	2210		202	430		207
SHC	C15	n-Pentadecane (C15)		U	199		U	202	683		207
SHC	C16	n-Hexadecane (C16)		U	199		U	202		U	207
SHC	1650	Norpristane (1650)	2300		199	2220		202	371		207
SHC	C17	n-Heptadecane (C17)	179	J	199	201	J	202	866		207
SHC	Pr	Pristane	3360		199	3460		202	739		207
SHC	C18	n-Octadecane (C18)	259		199	127	J	202	688		207
SHC	Ph	Phytane	2060		199	2130		202		U	207
SHC	C19	n-Nonadecane (C19)	215		199	255		202	1770	G	207
SHC	C20	n-Eicosane (C20)	207		199		U	202		U	207
SHC	C21	n-Heneicosane (C21)		U	199		U	202		U	207
SHC	C22	n-Docosane (C22)		U	199		U	202		U	207
SHC	C23	n-Tricosane (C23)	128	J	199	221		202	1220		207
SHC	C24	n-Tetracosane (C24)		U	199		U	202		U	207
SHC	C25	n-Pentacosane (C25)	154	J	199	173	J	202		U	207
SHC	C26	n-Hexacosane (C26)		U	199		U	202		U	207
SHC	C27	n-Heptacosane (C27)		U	199	54.6	J	202	207		207
SHC	C28	n-Octacosane (C28)	25.0	J	199	67.7	J	202		U	207
SHC	C29	n-Nonacosane (C29)	22.9	J	199	34.3	J	202		U	207
SHC	C30	n-Triacontane (C30)	30.2	J	199	67.5	J	202	290		207
SHC	C31	n-Hentriacontane (C31)		U	199		U	202	132	J	207
SHC	C32	n-Dotriacontane (C32)	64.8	J	199	82.9	J	202	230		207
SHC	C33	n-Tritriacontane (C33)		U	199	37.7	J	202	263		207
SHC	C34	n-Tetratriacontane (C34)		U	199		U	202	32.1	J	207
SHC	C35	n-Pentatriacontane (C35)	7.56	J	199	35.1	J	202	156	J	207
SHC	C36	n-Hexatriacontane (C36)		U	199		U	202		U	207
SHC	C37	n-Heptatriacontane (C37)		U	199		U	202		U	207
SHC	C38	n-Octatriacontane (C38)		U	199		U	202		U	207
SHC	C39	n-Nonatriacontane (C39)		U	199		U	202	18.8	J	207
SHC	C40	n-Tetracontane (C40)		U	199		U	202		U	207
SHC	TSH	Total Saturated Hydrocarbons	17900		199	17600		202	18600		207
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	800000		6560	772000		6650	657000		6830

Surrogates (% Recovery)			
ortho-Terphenyl	97	94	96
d50-Tetracosane	90	90	94

NEWFIELDS

U: The analyte was analyzed for but not detected at the sample specific level reported.
B: Found in associated blank as well as sample.
J: Estimated value, below quantitation limit.
E: Estimated value, exceeds the upper limit of calibration.
NA: Not Applicable
D: Secondary Dilution Performed
D1: Tertiary Dilution Performed
a: Value outside of QC Limits.
§: Surrogate value outside of acceptable range.
X: It is not possible to calculate RPD, one result is below the detection limit, the other is above reporting l
G: Matrix Interference.
P: Greater than 40% RPD between the two columns, the higher value is reported according to the metho
I: Due to interference, the lower value is reported.
N: Spike recovery outside control limits.
E: Estimated due to Interference. (Metals)
¤: Duplicate outside control limits.
P: Spike compound. (Metals)
J: Below CRDL, Project DL, or RL but greater than or equal to MDL
C: Sample concentration is > 4 times the spike level, recovery limits do not apply. (Metals)
S: Spike Compound. (Organics)
§: RPD criteria not applicable to results less than 5 times the reporting limit. (Metals)
T: Tentatively identified corexit compound.
C: Co-elution.

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	Method Blank
Lab ID	TO051611B07
Matrix	NAPL
Reference Method	SHC
Batch ID	TO051611B07
Date Collected	N/A
Date Received	N/A
Date Prepped	05/16/2011
Date Analyzed	05/20/2011
Sample Size (wet)	0.1
% Solid	100
File ID	A1602251.D
Units	mg/Kg
Final Volume	1
Dilution	1
Reporting Limit	10.0

Class	Abbrev	Analytes	Result		SSRL
SHC	C9	n-Nonane (C9)	0.120	J	10.0
SHC	C10	n-Decane (C10)		U	10.0
SHC	C11	n-Undecane (C11)		U	10.0
SHC	C12	n-Dodecane (C12)		U	10.0
SHC	C13	n-Tridecane (C13)		U	10.0
SHC	1380	2,6,10 Trimethyldodecane (1380)		U	10.0
SHC	C14	n-Tetradecane (C14)		U	10.0
SHC	1470	2,6,10 Trimethyltridecane (1470)		U	10.0
SHC	C15	n-Pentadecane (C15)		U	10.0
SHC	C16	n-Hexadecane (C16)		U	10.0
SHC	1650	Norpristane (1650)		U	10.0
SHC	C17	n-Heptadecane (C17)		U	10.0
SHC	Pr	Pristane		U	10.0
SHC	C18	n-Octadecane (C18)		U	10.0
SHC	Ph	Phytane		U	10.0
SHC	C19	n-Nonadecane (C19)		U	10.0
SHC	C20	n-Eicosane (C20)		U	10.0
SHC	C21	n-Heneicosane (C21)		U	10.0
SHC	C22	n-Docosane (C22)		U	10.0
SHC	C23	n-Tricosane (C23)		U	10.0
SHC	C24	n-Tetracosane (C24)		U	10.0
SHC	C25	n-Pentacosane (C25)		U	10.0
SHC	C26	n-Hexacosane (C26)		U	10.0
SHC	C27	n-Heptacosane (C27)		U	10.0
SHC	C28	n-Octacosane (C28)		U	10.0
SHC	C29	n-Nonacosane (C29)		U	10.0
SHC	C30	n-Triacontane (C30)		U	10.0
SHC	C31	n-Hentriacontane (C31)		U	10.0
SHC	C32	n-Dotriacontane (C32)		U	10.0
SHC	C33	n-Tritriacontane (C33)		U	10.0
SHC	C34	n-Tetratriacontane (C34)		U	10.0
SHC	C35	n-Pentatriacontane (C35)		U	10.0
SHC	C36	n-Hexatriacontane (C36)		U	10.0
SHC	C37	n-Heptatriacontane (C37)		U	10.0
SHC	C38	n-Octatriacontane (C38)		U	10.0
SHC	C39	n-Nonatriacontane (C39)		U	10.0
SHC	C40	n-Tetracontane (C40)		U	10.0
SHC	TSH	Total Saturated Hydrocarbons	0.120	J	10.0
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	26.4	J	330

Surrogates (% Recovery)	
ortho-Terphenyl	101
d50-Tetracosane	97

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	Laboratory Control Sample
Lab ID	TO051611LCS07
Matrix	NAPL
Reference Method	SHC
Batch ID	TO051611B07
Date Collected	N/A
Date Received	N/A
Date Prepped	05/16/2011
Date Analyzed	05/20/2011
Sample Size (wet)	0.1
% Solid	100
File ID	A1602253.D
Units	mg/Kg
Final Volume	1
Dilution	1
Reporting Limit	10.0

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit
SHC	C9	n-Nonane (C9)	172	S	10.0	86	200	50	130
SHC	C10	n-Decane (C10)	174	S	10.0	87	200	50	130
SHC	C11	n-Undecane (C11)		U	10.0				
SHC	C12	n-Dodecane (C12)	179	S	10.0	89	200	50	130
SHC	C13	n-Tridecane (C13)		U	10.0				
SHC	1380	2,6,10 Trimethyldodecane (1380)		U	10.0				
SHC	C14	n-Tetradecane (C14)	192	S	10.0	96	200	50	130
SHC	1470	2,6,10 Trimethyltridecane (1470)		U	10.0				
SHC	C15	n-Pentadecane (C15)		U	10.0				
SHC	C16	n-Hexadecane (C16)	192	S	10.0	96	200	50	130
SHC	1650	Norpristane (1650)		U	10.0				
SHC	C17	n-Heptadecane (C17)		U	10.0				
SHC	Pr	Pristane		U	10.0				
SHC	C18	n-Octadecane (C18)	211	S	10.0	106	200	50	130
SHC	Ph	Phytane		U	10.0				
SHC	C19	n-Nonadecane (C19)	196	S	10.0	98	200	50	130
SHC	C20	n-Eicosane (C20)	201	S	10.0	100	200	50	130
SHC	C21	n-Heneicosane (C21)		U	10.0				
SHC	C22	n-Docosane (C22)	205	S	10.0	103	200	50	130
SHC	C23	n-Tricosane (C23)		U	10.0				
SHC	C24	n-Tetracosane (C24)	202	S	10.0	101	200	50	130
SHC	C25	n-Pentacosane (C25)		U	10.0				
SHC	C26	n-Hexacosane (C26)	202	S	10.0	101	200	50	130
SHC	C27	n-Heptacosane (C27)		U	10.0				
SHC	C28	n-Octacosane (C28)	202	S	10.0	101	200	50	130
SHC	C29	n-Nonacosane (C29)		U	10.0				
SHC	C30	n-Triacontane (C30)	197	S	10.0	98	200	50	130
SHC	C31	n-Hentriacontane (C31)		U	10.0				
SHC	C32	n-Dotriacontane (C32)		U	10.0				
SHC	C33	n-Tritriacontane (C33)		U	10.0				
SHC	C34	n-Tetratriacontane (C34)		U	10.0				
SHC	C35	n-Pentatriacontane (C35)		U	10.0				
SHC	C36	n-Hexatriacontane (C36)	125	S	10.0	62	200	50	130
SHC	C37	n-Heptatriacontane (C37)		U	10.0				
SHC	C38	n-Octatriacontane (C38)		U	10.0				
SHC	C39	n-Nonatriacontane (C39)		U	10.0				
SHC	C40	n-Tetracontane (C40)		U	10.0				
SHC	TSH	Total Saturated Hydrocarbons	2650		10.0				
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	2850		330				

Surrogates (% Recovery)	
ortho-Terphenyl	102
d50-Tetracosane	99

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	Laboratory Control Sample Dup
Lab ID	TO051611LCSD07
Matrix	NAPL
Reference Method	SHC
Batch ID	TO051611B07
Date Collected	N/A
Date Received	N/A
Date Prepped	05/16/2011
Date Analyzed	05/20/2011
Sample Size (wet)	0.1
% Solid	100
File ID	A1602255.D
Units	mg/Kg
Final Volume	1
Dilution	1
Reporting Limit	10.0

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit	RPD	RPD Limit
SHC	C9	n-Nonane (C9)	175	S	10.0	87	200	50	130	2	30
SHC	C10	n-Decane (C10)	171	S	10.0	85	200	50	130	2	30
SHC	C11	n-Undecane (C11)		U	10.0						
SHC	C12	n-Dodecane (C12)	177	S	10.0	88	200	50	130	1	30
SHC	C13	n-Tridecane (C13)		U	10.0						
SHC	1380	2,6,10 Trimethyldodecane (1380)		U	10.0						
SHC	C14	n-Tetradecane (C14)	189	S	10.0	95	200	50	130	1	30
SHC	1470	2,6,10 Trimethyltridecane (1470)		U	10.0						
SHC	C15	n-Pentadecane (C15)		U	10.0						
SHC	C16	n-Hexadecane (C16)	191	S	10.0	95	200	50	130	1	30
SHC	1650	Norpristane (1650)		U	10.0						
SHC	C17	n-Heptadecane (C17)		U	10.0						
SHC	Pr	Pristane		U	10.0						
SHC	C18	n-Octadecane (C18)	210	S	10.0	105	200	50	130	1	30
SHC	Ph	Phytane		U	10.0						
SHC	C19	n-Nonadecane (C19)	194	S	10.0	97	200	50	130	1	30
SHC	C20	n-Eicosane (C20)	200	S	10.0	100	200	50	130	0	30
SHC	C21	n-Heneicosane (C21)		U	10.0						
SHC	C22	n-Docosane (C22)	205	S	10.0	102	200	50	130	0	30
SHC	C23	n-Tricosane (C23)		U	10.0						
SHC	C24	n-Tetracosane (C24)	201	S	10.0	100	200	50	130	1	30
SHC	C25	n-Pentacosane (C25)		U	10.0						
SHC	C26	n-Hexacosane (C26)	202	S	10.0	101	200	50	130	0	30
SHC	C27	n-Heptacosane (C27)		U	10.0						
SHC	C28	n-Octacosane (C28)	202	S	10.0	101	200	50	130	0	30
SHC	C29	n-Nonacosane (C29)		U	10.0						
SHC	C30	n-Triacontane (C30)	196	S	10.0	98	200	50	130	0	30
SHC	C31	n-Hentriacontane (C31)		U	10.0						
SHC	C32	n-Dotriacontane (C32)		U	10.0						
SHC	C33	n-Tritriacontane (C33)		U	10.0						
SHC	C34	n-Tetratriacontane (C34)		U	10.0						
SHC	C35	n-Pentatriacontane (C35)		U	10.0						
SHC	C36	n-Hexatriacontane (C36)	126	S	10.0	63	200	50	130	1	30
SHC	C37	n-Heptatriacontane (C37)		U	10.0						
SHC	C38	n-Octatriacontane (C38)		U	10.0						
SHC	C39	n-Nonatriacontane (C39)		U	10.0						
SHC	C40	n-Tetracontane (C40)		U	10.0						
SHC	TSH	Total Saturated Hydrocarbons	2640		10.0						
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	2780		330						

Surrogates (% Recovery)	
ortho-Terphenyl	102
d50-Tetracosane	99

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	ME MW-5P	ME MW-5P
Lab ID	1105069-01	1105069-01D
Matrix	NAPL	NAPL
Reference Method	SHC	SHC
Batch ID	TO051611B07	TO051611B07
Date Collected	05/05/2011	05/05/2011
Date Received	05/10/2011	05/10/2011
Date Prepped	05/16/2011	05/16/2011
Date Analyzed	05/22/2011	05/22/2011
Sample Size (wet)	0.097	0.1062
% Solid	100	100
File ID	A1602259.D	A1602261.D
Units	mg/Kg	mg/Kg
Final Volume	20	20
Dilution	1	1
Reporting Limit	206	188

Class	Abbrev	Analytes	Result		SSRL	Result		SSRL	RPD	RPD Limit	
SHC	C9	n-Nonane (C9)	101	J	206	87.6	J	188	14	30	
SHC	C10	n-Decane (C10)		U	206		U	188		30	N/A
SHC	C11	n-Undecane (C11)	270		206	265		188	2	30	
SHC	C12	n-Dodecane (C12)	478		206	544		188	13	30	
SHC	C13	n-Tridecane (C13)		U	206		U	188		30	N/A
SHC	1380	2,6,10 Trimethyldodecane (1380)	2560		206	2620		188	2	30	
SHC	C14	n-Tetradecane (C14)	793		206	824		188	4	30	
SHC	1470	2,6,10 Trimethyltridecane (1470)	2920		206	2980		188	2	30	
SHC	C15	n-Pentadecane (C15)		U	206		U	188		30	N/A
SHC	C16	n-Hexadecane (C16)	911		206	977		188	7	30	
SHC	1650	Norpristane (1650)	2260		206	2300		188	2	30	
SHC	C17	n-Heptadecane (C17)	442		206	417		188	6	30	
SHC	Pr	Pristane	3010		206	2990		188	0	30	
SHC	C18	n-Octadecane (C18)		U	206		U	188		30	N/A
SHC	Ph	Phytane	1870		206	1950		188	5	30	
SHC	C19	n-Nonadecane (C19)		U	206		U	188		30	N/A
SHC	C20	n-Eicosane (C20)		U	206		U	188		30	N/A
SHC	C21	n-Heneicosane (C21)		U	206	86.2	J	188		30	X
SHC	C22	n-Docosane (C22)		U	206		U	188		30	N/A
SHC	C23	n-Tricosane (C23)		U	206		U	188		30	N/A
SHC	C24	n-Tetracosane (C24)		U	206		U	188		30	N/A
SHC	C25	n-Pentacosane (C25)		U	206		U	188		30	N/A
SHC	C26	n-Hexacosane (C26)		U	206		U	188		30	N/A
SHC	C27	n-Heptacosane (C27)		U	206		U	188		30	N/A
SHC	C28	n-Octacosane (C28)		U	206		U	188		30	N/A
SHC	C29	n-Nonacosane (C29)		U	206		U	188		30	N/A
SHC	C30	n-Triacontane (C30)		U	206		U	188		30	N/A
SHC	C31	n-Hentriacontane (C31)	66.2	J	206	62.7	J	188	5	30	
SHC	C32	n-Dotriacontane (C32)		U	206		U	188		30	N/A
SHC	C33	n-Tritriacontane (C33)		U	206		U	188		30	N/A
SHC	C34	n-Tetratriacontane (C34)		U	206		U	188		30	N/A
SHC	C35	n-Pentatriacontane (C35)		U	206		U	188		30	N/A
SHC	C36	n-Hexatriacontane (C36)		U	206		U	188		30	N/A
SHC	C37	n-Heptatriacontane (C37)		U	206		U	188		30	N/A
SHC	C38	n-Octatriacontane (C38)		U	206		U	188		30	N/A
SHC	C39	n-Nonatriacontane (C39)		U	206		U	188		30	N/A
SHC	C40	n-Tetracontane (C40)		U	206		U	188		30	N/A
SHC	TSH	Total Saturated Hydrocarbons	15700		206	16100		188	3	30	
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	861000		6800	872000		6220	1	30	

Surrogates (% Recovery)		
ortho-Terphenyl	84	81
d50-Tetracosane	91	93

NEWFIELDS

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	ME MW-5P
Lab ID	1105069-01
Matrix	NAPL
Reference Method	SHC
Batch ID	TO051611B07
Date Collected	05/05/2011
Date Received	05/10/2011
Date Prepped	05/16/2011
Date Analyzed	05/22/2011
Sample Size (wet)	0.097
% Solid	100
File ID	A1602259.D
Units	mg/Kg
Final Volume	20
Dilution	1
Reporting Limit	206

Class	Abbrev	Analytes	Result		SSRL
SHC	C9	n-Nonane (C9)	101	J	206
SHC	C10	n-Decane (C10)		U	206
SHC	C11	n-Undecane (C11)	270		206
SHC	C12	n-Dodecane (C12)	478		206
SHC	C13	n-Tridecane (C13)		U	206
SHC	1380	2,6,10 Trimethyldodecane (1380)	2560		206
SHC	C14	n-Tetradecane (C14)	793		206
SHC	1470	2,6,10 Trimethyltridecane (1470)	2920		206
SHC	C15	n-Pentadecane (C15)		U	206
SHC	C16	n-Hexadecane (C16)	911		206
SHC	1650	Norpristane (1650)	2260		206
SHC	C17	n-Heptadecane (C17)	442		206
SHC	Pr	Pristane	3010		206
SHC	C18	n-Octadecane (C18)		U	206
SHC	Ph	Phytane	1870		206
SHC	C19	n-Nonadecane (C19)		U	206
SHC	C20	n-Eicosane (C20)		U	206
SHC	C21	n-Heneicosane (C21)		U	206
SHC	C22	n-Docosane (C22)		U	206
SHC	C23	n-Tricosane (C23)		U	206
SHC	C24	n-Tetracosane (C24)		U	206
SHC	C25	n-Pentacosane (C25)		U	206
SHC	C26	n-Hexacosane (C26)		U	206
SHC	C27	n-Heptacosane (C27)		U	206
SHC	C28	n-Octacosane (C28)		U	206
SHC	C29	n-Nonacosane (C29)		U	206
SHC	C30	n-Triacontane (C30)		U	206
SHC	C31	n-Hentriacontane (C31)	66.2	J	206
SHC	C32	n-Dotriacontane (C32)		U	206
SHC	C33	n-Tritriacontane (C33)		U	206
SHC	C34	n-Tetratriacontane (C34)		U	206
SHC	C35	n-Pentatriacontane (C35)		U	206
SHC	C36	n-Hexatriacontane (C36)		U	206
SHC	C37	n-Heptatriacontane (C37)		U	206
SHC	C38	n-Octatriacontane (C38)		U	206
SHC	C39	n-Nonatriacontane (C39)		U	206
SHC	C40	n-Tetracontane (C40)		U	206
SHC	TSH	Total Saturated Hydrocarbons	15700		206
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	861000		6800

Surrogates (% Recovery)	
ortho-Terphenyl	84
d50-Tetracosane	91

NewFields

Project Name: GZA Tidewater
Project Number: 43654 T25

Client ID	Alaska North Slope Crude
Lab ID	TS021811AWS03
Matrix	Oil
Reference Method	SHC
Batch ID	TS021811AWS03
Date Collected	N/A
Date Received	N/A
Date Prepped	N/A
Date Analyzed	02/16/2011
Sample Size (wet)	0.10042
% Solid	100
File ID	A1600126.D
Units	mg/Kg
Final Volume	10
Dilution	1
Reporting Limit	99.6

Class	Abbrev	Analytes	Result		SSRL	% Rec	Spike Conc.	Lower Limit	Upper Limit
SHC	C9	n-Nonane (C9)	5810		99.6	81	7199.78	65	135
SHC	C10	n-Decane (C10)	4710		99.6	81	5833.13	65	135
SHC	C11	n-Undecane (C11)	4380		99.6	83	5250.75	65	135
SHC	C12	n-Dodecane (C12)	4020		99.6	83	4836.53	65	135
SHC	C13	n-Tridecane (C13)	3700		99.6	84	4404.33	65	135
SHC	1380	2,6,10 Trimethyldodecane (1380)	833		99.6	84	986.28	65	135
SHC	C14	n-Tetradecane (C14)	3380		99.6	83	4073.29	65	135
SHC	1470	2,6,10 Trimethyltridecane (1470)	1310		99.6	83	1573.12	65	135
SHC	C15	n-Pentadecane (C15)	3490		99.6	87	4012.46	65	135
SHC	C16	n-Hexadecane (C16)	3010		99.6	84	3603.09	65	135
SHC	1650	Norpristane (1650)	948		99.6	73	1297.77	65	135
SHC	C17	n-Heptadecane (C17)	2650		99.6	79	3341.69	65	135
SHC	Pr	Pristane	2160		99.6	96	2245.61	65	135
SHC	C18	n-Octadecane (C18)	2540		99.6	88	2891.35	65	135
SHC	Ph	Phytane	1150		99.6	86	1337.78	65	135
SHC	C19	n-Nonadecane (C19)	2320		99.6	89	2615.78	65	135
SHC	C20	n-Eicosane (C20)	2220		99.6	89	2502.55	65	135
SHC	C21	n-Heneicosane (C21)	1980		99.6	89	2216.50	65	135
SHC	C22	n-Docosane (C22)	1860		99.6	85	2194.34	65	135
SHC	C23	n-Tricosane (C23)	1650		99.6	86	1928.46	65	135
SHC	C24	n-Tetracosane (C24)	1580		99.6	88	1788.80	65	135
SHC	C25	n-Pentacosane (C25)	1490		99.6	88	1700.43	65	135
SHC	C26	n-Hexacosane (C26)	1280		99.6	86	1493.83	65	135
SHC	C27	n-Heptacosane (C27)	1050		99.6	91	1153.73	65	135
SHC	C28	n-Octacosane (C28)	749		99.6	87	864.09	65	135
SHC	C29	n-Nonacosane (C29)	731		99.6	96	759.11	65	135
SHC	C30	n-Triacontane (C30)	569		99.6	88	648.96	65	135
SHC	C31	n-Hentriacontane (C31)	463		99.6	80	577.38	65	135
SHC	C32	n-Dotriacontane (C32)	513		99.6	111	461.32	65	135
SHC	C33	n-Tritriacontane (C33)	319		99.6	85	375.24	65	135
SHC	C34	n-Tetratriacontane (C34)	341		99.6	93	366.50	65	135
SHC	C35	n-Pentatriacontane (C35)	262		99.6	82	318.57	65	135
SHC	C36	n-Hexatriacontane (C36)	182		99.6	85	212.92	65	135
SHC	C37	n-Heptatriacontane (C37)	142		99.6	88	161.39	65	135
SHC	C38	n-Octatriacontane (C38)	141		99.6	92	152.45	65	135
SHC	C39	n-Nonatriacontane (C39)	81.1	J	99.6	87	92.99	65	135
SHC	C40	n-Tetracontane (C40)	85.9	J	99.6	95	90.11	65	135
SHC	TPH	Total Petroleum Hydrocarbons (C9-C44)	529000		19900	73	727695.00	65	135

Surrogates (% Recovery)	
ortho-Terphenyl	n/a
d50-Tetracosane	n/a

NEWFIELDS

U: The analyte was analyzed for but not detected at the sample specific level reported.
B: Found in associated blank as well as sample.
J: Estimated value, below quantitation limit.
E: Estimated value, exceeds the upper limit of calibration.
NA: Not Applicable
D: Secondary Dilution Performed
D1: Tertiary Dilution Performed
ª: Value outside of QC Limits.
§: Surrogate value outside of acceptable range.
X: It is not possible to calculate RPD, one result is below the detection limit, the other is above reporting limit.
G: Matrix Interference.
P: Greater than 40% RPD between the two columns, the higher value is reported according to the method.
I: Due to interference, the lower value is reported.
N: Spike recovery outside control limits.
E: Estimated due to Interference. (Metals)
¤: Duplicate outside control limits.
P: Spike compound. (Metals)
J: Below CRDL, Project DL, or RL but greater than or equal to MDL
C: Sample concentration is > 4 times the spike level, recovery limits do not apply. (Metals)
S: Spike Compound. (Organics)
§: RPD criteria not applicable to results less than 5 times the reporting limit. (Metals)
T: Tentatively identified corexit compound.
C: Co-elution.

NEWFIELDS

Environmental Forensics Practice LLC

Chain of Custody

Proj. No 43654 | Proj. Name Tidewater

SAMPLERS: Signature [signature]

ANALYSIS REQUESTED →
"NUMBER OF CONTAINERS"

LAB ID	CLIENT ID	DATE	TIME	TOTAL # OF CONTAINERS	PRESERVED	SAMPLE DESCRIPTION	MATRIX (Oil/Soil/Water)	GC-FID-TPH (C_8+)	GCMS-Alkyl PAH	GCMS-Biomarkers	PIANO-VOA	Organic Lead	METALS	PCB	Pesticides
009123-01	Sheen-1-083010	8-3010	1740	1	—	*Hold Analyses 1	Oil Sheen								
-02	Sheen-2-083010	8-30-10	1850	1	—	2 Oil Sheen	Oil Sheen								
-03	FB-083010	8-30-10	1900	1	—	2 Field Blank									

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	8.31.10	1000	[signature]	8/31/10	1330
[signature]	8/31/10	1815	Tulan Fey	8/31/10	1815
Tulan Fey	9/1/10	0955	[signature]	9/1/10	0955

Comments: Samples to be shipped to: Alpha Analytical-Woods Hole Lab
320 Forbes Blvd.
Mansfield, MA 02048
Tel: (508) 822-9300
Attn: Liz Porta

1 * Hold analysis of sheen-1-083010 pending approval by Meg Kilpatrick.
2 Contact Ted Healey of NewFields for analysis

Rec'd: [signature] 9/1/10 1135

81 of 82

Sample Delivery Group Form

Laboratory Job No: 1009123 Client: NEWRE
Receipt Date/Time: 9/1/10 1135 SDG Reviewer: W

Samples Delivered By:
[X] Alpha Courier [ ] Client [ ] UPS [ ] FedEx [ ] Other ____
Bill of Laden: [ ]Yes [ ] Unavailable Tracking #: ____

Chain of Custody: [X] Present [ ] Absent: ____
Custody Seals: [X] Absent [ ] Present/Intact [ ] Present/Broken

Cooler/Sample Temperature:
Is Ice/Blue Ice present? [X] Yes [ ] No [ ] N/A ____

Temp taken from: Temp Blank:(a) 5° (b)____ (c)____ (d)____ (e)____
IR Gun: (a) 5° (b)____ (c)____ (d)____ (e)____
IR Gun SN: 9403C
Was Temp: [X] 2-6 Celsius
[ ] <2 Celsius ... were samples frozen upon receipt? [ ] Yes [ ] No
[ ] >6 Celsius ... were samples delivered direct from site? [ ] Yes [ ] No

Containers Received: [X] Intact
[ ] Broken/Leaking Sample IDs: ____
Sample IDs: ____

All Containers Accounted For? [X] Yes
[ ] No: ____
Extra Samples Received? [X] No
[ ] Yes: ____
Do Sample Labels and COC agree? [X] Yes
[ ] No: ____

Are Samples in Appropriate Containers? [X] Yes
[ ] No: ____
Are samples rec'd within holding time? [X] Yes
[ ] No: ____
* Please note: the analysis of pH will always be performed beyond the regulatory-required holding time of 15 min. from the time of collection.

pH of samples upon receipt: [X] N/A [ ] <2 [ ] >12 and/or [ ] ____
Are samples properly preserved? [ ] Yes [ ] No If No then........
Initial pH= ____ preserved In-House with [ ] HCL [ ] H_2SO_4 [ ] HNO_3 [ ] NAOH <<Final pH = ____>>
Other Issues: ____
Chlorine Check: [ ] N/A [ ] Present [ ] Absent

VOA/VPH vials: [ ] Yes [X] No Preserved? [ ] Yes [ ] No If yes: [ ] HCL, [ ] ____
Aqueous: vials contain head space? [ ] No [ ] Yes : ____
Soils: MeOH covering soil? [ ] Yes [ ] No : ____
Reagent H_2O Preserved vials Frozen @ date/time: ____
Frozen by Client? [ ] No [ ] Yes @ date/time: ____

Was Client notified of any discrepancies listed above? [ ] Yes [ ] No [ ] N/A

If Yes: Call Tracker # ____

Form No.: 01-02 08/11/2010

NEWFIELDS

Environmental Forensics Practice LLC

Chain of Custody

1102037

Proj. No 43654 T25

Proj. Name TIDEWATER

SAMPLERS: Signature Sophie Naklicki

ANALYSIS REQUESTED → "NUMBER OF CONTAINERS"

	LAB ID	CLIENT ID	DATE	TIME	TOTAL # OF CONTAINERS	PRESERVED	SAMPLE DESCRIPTION	MATRIX (Oil/Soil/Water)	GC-FID-TPH (C_8+)	GCMS-Alkyl PAH	GCMS-Biomarkers	PIANO-VOA	Organic Lead	METALS	PCB	Pesticides
-1	MW-3P	MW-3P			2	/	LNAPL	OIL	√							
-2	MW-313P	MW-313P			2	/	LNAPL	OIL	√							
-3	MW-341P	MW-341P			2	/	DNAPL	OIL	√							

Relinquished by:	Date	Time	Received by:	Date	Time
Sophie Naklicki	2/18	13:00	Fed Ex		
Fed Ex	2/19/11	10:45	[signature]	2/19/11	10:45

Comments: Samples to be shipped to: Alpha Analytical-Woods Hole Lab
320 Forbes Blvd.
Mansfield, MA 02048
Tel: (508) 822-9300
Attn: Liz Porta

In holding fridge

ALPHA ANALYTICAL

Sample Delivery Group Form

Laboratory Job No:______________ **Client:** GZA

Receipt Date/Time: 2/19/11 10:45 **SDG Reviewer:**__________

Samples Delivered By:
[ ] Alpha Courier [ ] Client [ ] UPS [X] FedEx [ ] Other ____________
Bill of Laden: [ ]Yes [ ] Unavailable Tracking #: Attached

Chain of Custody: [X] Present [ ] Absent:____________________
Custody Seals: [X] Absent [X] Present/Intact [ ] Present/Broken

Cooler/Sample Temperature:
Is Ice/Blue Ice present? [ ] Yes [X] No [ ] N/A____________________

Temp taken from: Temp Blank:(a)_____ (b)_____ (c)_____ (d)_____ (e)_____
IR Gun: (a) 20.2°C (b)_____ (c)_____ (d)_____ (e)_____
IR Gun SN: ____________________
Was Temp: [ ] 2-6 Celsius
[ ] <2 Celsius ... were samples frozen upon receipt? [ ] Yes [ ] No
[X] >6 Celsius ... were samples delivered direct from site? [ ] Yes [ ] No

Containers Received: [X] Intact
[ ] Broken/Leaking Sample IDs:____________________
Sample IDs:____________________

All Containers Accounted For? [ ] Yes
[ ] No: ____________________
Extra Samples Received? [ ] No
[ ] Yes: ____________________
Do Sample Labels and COC agree? [ ] Yes
[ ] No: ____________________

Are Samples in Appropriate Containers? [ ] Yes
[ ] No: ____________________
Are samples rec'd within holding time? [ ] Yes
[ ] No:____________________
* Please note: the analysis of pH will always be performed beyond the regulatory-required holding time of 15 min. from the time of collection.

pH of samples upon receipt: [ ] N/A [ ] <2 [ ] >12 and/or [ ] __________
Are samples properly preserved? [ ] Yes [ ] No If No then........
Initial pH= _____ preserved In-House with [ ] HCL [ ] H_2SO_4 [ ] HNO_3 [ ] NAOH <<Final pH = _____>>
Other Issues:____________________
Chlorine Check: [ ] N/A [ ] Present [ ] Absent

VOA/VPH vials: [ ] Yes [ ] No Preserved? [ ] Yes [ ] No If yes: [ ] HCL, [ ] ________
Aqueous: vials contain head space? [ ] No [ ] Yes :____________________
Soils: MeOH covering soil? [ ] Yes [ ] No :____________________
Reagent H_2O Preserved vials Frozen @ date/time: ____________________
Frozen by Client? [ ] No [ ] Yes @ date/time:____________________

Was Client notified of any discrepancies listed above? [ ] Yes [ ] No [ ] N/A

If Yes: Call Tracker #______________

Form No.: 01-02 08/11/2010

NEWFIELDS

Chain of Custody

1105069

Environmental Forensics Practice LLC

Proj. No 43054 T25 | Proj. Name TIDEWATER

SAMPLERS: Signature Sophie Narkiewicz

ANALYSIS REQUESTED → "NUMBER OF CONTAINERS"

LAB ID	CLIENT ID	DATE	TIME	TOTAL # OF CONTAINERS	PRESERVED	SAMPLE DESCRIPTION	MATRIX (Oil/Soil/Water)	GC-FID-TPH (C_8+)	GCMS-Alkyl PAH	GCMS-Biomarkers	PIANO-VOA	Organic Lead	METALS	PCB	Pesticides
-1 ~~[illegible]~~	ME MW-5P	5/5/11	1100	1	—	LNAPL	OIL	✓							

Relinquished by:	Date	Time	Received by:	Date	Time
Sophie Narkiewicz	5/9/11	1200	Nancy A Rose	5/10/11	1015

Comments: Samples to be shipped to: Alpha Analytical-Woods Hole Lab
320 Forbes Blvd.
Mansfield, MA 02048
Tel: (508) 822-9300
Attn: Liz Porta