



**SUPPLEMENTAL SITE INVESTIGATION
WORK PLAN (SSIWP) ADDENDUM
FORMER TIDEWATER FACILITY
TIDEWATER AND MERRY STREETS**

PREPARED FOR:

RIDEM
Providence, Rhode Island

PREPARED BY:

GZA GeoEnvironmental, Inc.
Providence, Rhode Island

October 2010
File No. 43654.00

Copyright© 2010 GZA GeoEnvironmental, Inc.

**GZA
GeoEnvironmental, Inc.**

*Engineers and
Scientists*

October 15, 2010
File No. 05.0043654.00



530 Broadway
Providence
Rhode Island
02909
401-421-4140
Fax: 401-751-8613
<http://www.gza.com>

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

Re: *Supplemental Site Investigation Work Plan (SWIPP) Addendum*
Former Tidewater Facility
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 *Supplemental Site Investigation Work Plan (SSIWP) Addendum* for the Former Tidewater Facility located in Pawtucket, Rhode Island (Site).

We intend on starting the exploration program in mid to late October 2010. Should you have any questions or comments, please feel free to contact us at (401) 421-4140, or via e-mail at margaret.kilpatrick@gza.com.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

A handwritten signature in blue ink, appearing to read 'Margaret S. Kilpatrick'.

Margaret S. Kilpatrick, P.E.
Senior Project Manager

A handwritten signature in blue ink, appearing to read 'John P. Hartley'.

John P. Hartley
Consultant/Reviewer

A handwritten signature in blue ink, appearing to read 'James J. Clark'.

for
James J. Clark, P.E.
Principal

MSK/JJC:tja

Attached: Report

Cc: Michele Leone, National Grid

TABLE OF CONTENTS

Page

1.00	INTRODUCTION	1
2.00	DATA GAP ANALYSIS	2
3.00	PROPOSED SCOPE OF WORK	3

FIGURES

FIGURE NO. 1	LOCUS PLAN
FIGURE NO. 2A	PROPOSED EXPLORATION LOCATION PLAN NORTH FILL AREA AND FORMER GAS PLANT AREA
FIGURE NO. 2B	PROPOSED EXPLORATION LOCATION PLAN FORMER POWER PLANT AREA AND SOUTH FILL AREA

APPENDIX

APPENDIX A	SOIL/WASTE CHARACTERIZATION PROTOCOL FOR FORMER MANUFACTURED GAS PLANTS
------------	--



1.00 INTRODUCTION



On behalf of The Narragansett Electric Company, d/b/a National Grid (National Grid), GZA GeoEnvironmental Inc. (GZA) has prepared this *Supplemental Site Investigation Work Plan (SSIWP) Addendum* describing additional investigation activities to be performed at the former Tidewater facility located at the terminus of Tidewater and Merry Streets in Pawtucket, Rhode Island (refer to Figure 1 for the Site *Locus Plan*). This property is herein referred to as the Site. The Site is located on the west side of the Seekonk River and is bound to the west by residential properties, to the south and southwest by the Francis J. Varieur School and Max Read Athletic Field, and to the north by undeveloped property owned by the City of Pawtucket. It encompasses approximately 27 acres and was the location of the former Tidewater Manufactured Gas Plant (MGP) and the former Pawtucket No. 1 Power Station. The Site is currently largely vacant with the exception of an active natural gas regulating station, an active switching station and electric substation and two transmission towers owned and operated by National Grid.

The investigation tasks described herein were developed to fill certain data gaps identified following completion of recent Site investigation activities at the Site (May-July 2010). These investigations were performed consistent with the November 2009 SSIWP submitted to the Department. The results of the May-July 2010 explorations and these additional proposed explorations, combined with previous studies will be used to develop a *Site Investigation Report (SIR)* for this Site. This SIR will be prepared consistent with applicable sections of Rule 7.00 of the Rhode Island Department of Environmental Management's (RIDEM) Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (Remediation Regulations–DEM-DSR-01-93, as amended and will include an assessment of remedial action alternatives.

For the purpose of the discussions herein and consistent with the November 2009 SSIWP, the Site has been previously subdivided into four areas based on their geographic location, past use and/or past occupants. Figures 2A and 2B, *Proposed Exploration Locations (SSIWP Addendum)*, present the location and configuration of the following areas:

- North Fill Area (NFA);
- Former Gas Plant Area (FGPA);
- Former Power Plant Area (FPPA); and
- South Fill Area (SFA).

This *SSIWP Addendum* is organized as follows:

- Section 1.00 contains this introduction;
- Section 2.00 describes existing data gaps based on an evaluation of the recent May-July 2010 data set;
- Section 3.00 presents the proposed scope of this study.

For details regarding the existing and historic Site conditions, including Site plans, previous Site investigations, hydrogeologic setting and observed impacts, please refer to the November 2009 SSIWP.



2.00 DATA GAP ANALYSIS

The following data gaps were identified based on a review of the preliminary findings of the May-July 2010 field investigations completed consistent with the November 2009 SSIWP. The scope of work presented in Section 3.00 has been designed to specifically address these data gaps.

- A wooden subsurface raceway was encountered during test pit work extending in an approximate north/south orientation between the FGPA and FPPA. Further investigation is proposed to evaluate the extent of the raceway.
- Intermittent oil/coal tar-like breakout areas were encountered along the access roadway to the FPPA transmission tower area. Further investigation is proposed to evaluate the extent of these impacts.
- Buried oil sludge areas near former Fuel Oil tanks #1 and #3 on the FPPA. The test pits in these areas did not fully assess the limits of the buried oil sludge; further investigation is proposed to evaluate the extent of these impacts.
- Buried oil sludge/former Fuel Oil tank #1 area on the FPPA. Given the visual observations and analytical Upper Concentration Limit (UCL) exceedances in this area, installation of a groundwater monitoring well to assess potential presence of non-aqueous phase liquid (NAPL) is warranted.
- TB-103/MW-103 area on the FPPA. Test pits completed in this area encountered visual observations of impacts (oil/coal tar), but did not fully define the extent. Additional investigations are proposed to further evaluate limits of impacts.
- Blue staining in soils to the west of TP-346 on the FPPA. Test pits completed in this area encountered visual observations of impacts, but did not fully define the extent of impact to the west. Additional investigations are proposed to further evaluate limits of impacts.
- Hillside to the west of TP-376/TP-372/TP-352 on the FPPA. Visual observations of blue staining and buried oil sludge were not fully assessed in this area of the Site due to topography issues. Additional investigation via surface soil sampling/observations is proposed to further evaluate limits of impacts.
- Additional investigations to assess analytical exceedances of the soil UCLs at the following locations:
 - a. TP-336 (7-8') on the FPPA: TPH and PAHs
 - b. TP-353/TP-354 on the FGPA: TPH (to the east and south)
 - c. TP-335 (1-2') on the FPPA: TPH
 - d. TP-338 (9-10') on the FPPA: TPH



- Surface soils at locations TP-349, TP-335 (both on the FPPA) and SS-121 (on the FGPA). Surface soil samples collected from these locations exhibited elevated total cyanide concentrations (4,200, 12,000 and 3,800 mg/kg, respectively). Additional shallow soil investigations are proposed to further evaluate the limits of impacts.
- Installation of groundwater monitoring well clusters between MW-4 and MW-313S/D (FGPA) and upgradient of MW-1 (SFA) to evaluate the extent/presence of NAPL.
- Installation of additional groundwater monitoring well clusters to further evaluate groundwater quality (*i.e.*, elevated benzene concentrations) along the shoreline on the FGPA. Specifically, additional well installations are proposed for the area upgradient of MW-313 and in the area between MW-312 and MW-203.

3.00 PROPOSED SCOPE OF WORK

GZA proposes to perform a supplemental subsurface investigation program consisting of the completion of test pits, soil borings/monitoring wells and shallow surface soil samples designed to address the data gaps identified in Section 3.00. Proposed exploration locations are shown on the attached Figures 2A and 2B. Please note that based on field conditions and the results of utility clearance, the exact locations of the proposed explorations are subject to modification. Consistent with the November 2009 SSIWP, in areas where significant visual impacts have been identified or are observed, analytical testing will be limited. Visual and olfactory observations will be used as the primary investigation tool in these areas. Exceptions to this approach will include impacted groundwater, certain surface soils, and areas where further evaluation of UCL soil exceedances and specific contaminant impacts (*i.e.*, isolated cyanide impacts) are identified. Fieldwork associated with the subsurface exploration program will be completed in accordance with a *Health and Safety Plan* (HASP) prepared for the project. The data generated during this program will be combined with the recent May-July 2010 investigation and previous historic investigation data to prepare a comprehensive SIR for this Site.

The following paragraphs summarize the work scope included in this SSIWP Addendum.

CRMC Permitting

A portion of the proposed investigation included in this SSIWP Addendum falls within 200-feet of the coastal feature, and as such, is subject to the jurisdiction of the Coastal Resource Management Council (CRMC). As part of the recent investigation work performed at the Site, a CRMC permit was obtained (F2009-12-034), which is effective until December 11, 2012. Under this task, GZA will prepare an application package requesting a modification to the existing CRMC permit to cover completion of the additional proposed exploration program which falls within the CRMC jurisdiction limits.

Test Pit Explorations



GZA proposes to complete approximately 10 additional test pit locations (to be identified as TP-379 to TP-386) at the locations shown on Figures 2A and 2B. At each of the proposed test pit locations, multiple test pits (identified as “A”, “B”, *etc.*...) may be advanced to further assess subsurface environmental conditions, as determined in the field. Prior to completing the test pits, GZA will perform Site reconnaissance to coordinate DigSafe® clearance, and to visually evaluate access restrictions. Certain of the locations may be altered due to the presence of underground utilities or other Site features. Table 1 summarizes the proposed test pit locations according to Site area, as well as the general location and rationale for the exploration locations.

The test pits have been positioned to supplement the existing data and available information regarding former Site features. To evaluate subsurface conditions, the test pits will be completed using a rubber-tired backhoe to a depth of approximately up to 10 feet below grade, or as subsurface conditions allow. For those locations where extensive underground utilities may be present, the test pits will be initially advanced using a vactor truck. In areas where the proposed test pits are located in close proximity to one another, trenches may be advanced as opposed to individual test pits to better assess subsurface soil conditions. All test pit spoils will be used as backfill when each exploration is complete and no test pits will be left open overnight.

GZA personnel will document the test pit explorations, visually evaluating and classifying soil conditions in the field. Based on the observed subsurface conditions, soil samples will be collected at those locations and depths indicative of impacts for visual and olfactory evaluation. All soil samples will be field screened for total volatile organic compounds (TVOCs) using a handheld photoionization detector (PID). (Refer to *Soil/Waste Characterization Protocol For Former Manufactured Gas Plants* provided in Appendix A). Observations and field screening results will be documented in test pit logs.

As previously noted, the primary purpose of the test pit work is to further assess the nature and extent of visual evidence of impacts. As presented in Table 1, soil samples will be collected at select test pit locations and submitted for analysis testing to further assess specific elevated concentrations (primarily total cyanide) and exceedances of the Method 1 UCL criteria. It is anticipated that at least one soil sample from each test pit location will be selected for laboratory analysis. The soil samples may be analyzed for VOCs using EPA Method 8260, TPH using EPA Method 8100M, PAHs using EPA Method 8270, total cyanide and EPA 13 Priority Pollutant Metals.

The soil samples will be collected in glass jars and will be kept cool during shipment under chain-of-custody documentation to GZA’s Environmental Chemistry Laboratory.

Soil Boring and Monitoring Well Installations



GZA proposes to install 5 additional test borings to be completed as groundwater monitoring wells (to be identified as MW-332 to MW-336) at the locations shown on Figures 2A and 2B. Prior to installing the borings and/or wells, GZA will perform Site reconnaissance to coordinate DigSafe® clearance, and to visually evaluate access restrictions. Some of the locations may change due to the presence of underground utilities or other Site features. The rationale for the exploration locations are described in the attached Table 2. Depending on utility clearance, we may vacuum excavate the first few feet of some of the explorations.

The test borings will be installed a truck-mounted drill rig using hollow stem augers (HSA). Based on our understanding of subsurface conditions, soil boring depths are anticipated to be approximately 20 to 25 feet below ground surface, with the exception of the multi-level well monitoring wells. At these locations, we anticipate that the borings will extend to the depths of the till layer, or approximately 35 to 40 feet bgs. The drilling tools will be steam-cleaned between each monitoring well location, depending on the level of impacts noted at the exploration. A GZA geologist or engineer will be present during drilling to classify soil conditions, oversee well installations and prepare boring/well installation logs.

The monitoring wells will be constructed of 2-inch diameter PVC well screen and solid PVC riser pipe (for the wells installed with HSA). The 10-slot well screen will be set to span from the bottom of the boring to within approximately 1 foot of grade. Filter sand will be backfilled around the well screen and a 6-inch thick bentonite seal will be placed round the solid riser pipe. A concrete surficial seal with a steel protective casing will be installed to protect the wells.

Soil cuttings and wash water (*i.e.*, decontamination water) generated during drilling will be field-screened for total volatile VOCs with a photoionization detector (PID) and then placed in 55-gallon drums for subsequent characterization and off-Site disposal at an appropriate facility.

Soil samples will be obtained during the drilling of the monitoring wells and the test borings at approximately 2-foot intervals with a split-spoon sampler using Standard Penetration Test (SPT) techniques. Select soil samples will be collected in glass jars and will be kept cool during shipment under chain-of-custody documentation to GZA's Environmental Chemistry Laboratory.

Soil samples will be screened in the field for total VOCs using a PID. It is anticipated that up to 1 soil sample per boring will be selected for laboratory analysis. The soil samples may be analyzed for VOCs using EPA Method 8260, TPH using EPA Method 8100M, PAHs using EPA Method 8270, total cyanide and EPA 13 Priority Pollutant Metals. The soil samples will be collected in glass jars and will be kept cool during shipment under chain-of-custody documentation to GZA's Environmental Chemistry Laboratory.



Surface Soil Sampling and Testing

GZA proposes to collect 4 additional shallow surface soil samples at the locations presented on Figures 2A and 2B to supplement the existing soil analytical data and facilitate the evaluation of direct exposure criteria exceedances. The rationale for the surface soil locations is described in the attached Table 3. The surface soil samples will be collected using a hand-auger from the upper 2 foot of soil (0-2 feet). The hand-auger sampler will be decontaminated between each sampling location using a mixture of deionized (DI) water and Alconox®, followed by a rinsing with clean deionized water.

Samples may be submitted to GZA's Environmental Chemistry Laboratory for the following possible analytical testing: TPH via EPA Method 8100M, PAHs via EPA Method 8270C and select metals (arsenic, lead, cyanide [including total and PAC]). Using the historic and proposed sampling results, GZA will complete a site-specific human health risk assessment (Imminent Hazard Evaluation) for surface soils at the Site.

Groundwater Sampling and Analysis

Groundwater samples will be collected from the 5 newly installed monitoring wells to supplement the existing groundwater data set. GZA will sample the wells using the US EPA's January 2010 *Low Stress (low flow) Purging and Sampling Procedure*. As part of that sampling methodology, well stabilization will be determined through the measurement of specific water quality parameters recorded during the purging process. Prior to sampling, the wells will be inspected for the presence of NAPL using an electronic oil/water interface probe. After the wells are sampled, a bailer will be installed to confirm the oil/water interface probe readings in the wells in which the presence of LNAPL and DNAPL was indicated.

Special care will be taken to assure that NAPL is not introduced into the sample. Well purging will include the visual evaluation of the presence/absence of NAPL in the purge water. Purge water will be placed in labeled containers, and subsequently disposed of at an appropriate, National Grid-approved, off-Site facility.

The groundwater water samples will be collected in laboratory provided containers, placed in an ice-filled cooler and delivered under chain-of-custody documentation to GZA's Environmental Chemistry Laboratory.

Groundwater samples will be analyzed for volatile organic compounds (Method 8260b), total petroleum hydrocarbons (Method 8100M), polycyclic aromatic hydrocarbons (Method 8270), dissolved/free cyanide (EPA Method 9010) and total cyanide (EPA Method 9010).



Should NAPL be present in the monitoring wells, it will be removed and the recovery rate documented. Based on the results of the groundwater testing program, the return rate of the NAPL and/or thickness of NAPL, distinct NAPL samples may be selected for PAH (Method 8270), VOC (Method 8260B) and/or TPH Fingerprinting (Method 8100M or equivalent).

Report Preparation

GZA is in the process of preparing a SIR for the Tidewater Site. The format of the SIR will generally follow that prescribed in Section 7.03 of the RIDEM's Remediation Regulations. It is anticipated that the SIR will be submitted in two phases; a Site Data Report (SDR) followed by a Remedial Evaluation Report. Results of the proposed additional subsurface investigation work described herein will be incorporated into the final SIR for the Site.

As presented in the November 2009 SSIWP, the report will describe the information obtained during the course of the investigation and our professional opinion with respect to:

- the nature, extent and character of the observed conditions,
- the potential sources of the observed conditions,
- the potential environmental and public health impacts from those conditions, and
- recommendations for remedial action including the identification of applicable alternatives and evaluation of the No Action alternative.

J:\ENV\43654.msk\Reports\Work Plan\Addendum SSIWP\43654 SSIWP Addendum final.docx

TABLES

TABLE 1
PROPOSED TEST PIT LOCATIONS

FORMER TIDEWATER FACILITY
Pawtucket, Rhode Island

Proposed Exploration	Site Area	General Location and/or Purpose
TP-379	FPPA	Northern extent of wood raceway
TP-380	FPPA	Southern extent of wood raceway
TP-381	FPPA	Oil/coal tar-like breakout areas in access road
TP-382	FPPA	Buried oil sludge near former Fuel Oil Tank #1; TP-336 (7-8'): <i>TPH and PAHs</i>
TP-383	FPPA	Buried oil sludge near former Fuel Oil Tank #3
TP-384	FPPA	TB-103/MW-103; Assess UCL (oil/coal tar)
TP-385	FPPA	West of TP-346; Assess blue-stained soils
TP-386	FPPA	TP-353/TP-354; <i>TPH</i>
TP-387	FPPA	TP-335 (1-2'); <i>TPH</i>
TP-388	FPPA	TP-338 (-10'); <i>TPH</i>

Notes:

1. Soil samples will be collected at TP-382, -386, -387 and -388 and submitted for analytical testing for contaminant constituents noted in ***bold italics***.
2. At least one soil sample from each test pit location may be submitted for VOCs, TPH, PAHs, total cyanide and/or PP-13 metals.

TABLE 2
SUMMARY OF PROPOSED TEST BORING AND MONITORING WELL LOCATIONS

FORMER TIDEWATER FACILITY
Pawtucket, Rhode Island

Proposed Exploration	Site Area	General Location and/or Purpose
MW-332	FPPA	Former Fuel Oil Tank #1; Assess potential presence of NAPL
MW-333	FGPA	Between MW-4 and MW-313; Assess presence of NAPL
MW-334	SFA	Upgradient of MW-1; Assess presence of NAPL
MW-335	FGPA	Upgradient of MW-313; Assess groundwater quality (benzene concentration)
MW-336	FGPA	Between MW-312 and MW-203; Assess groundwater quality (benzene concentration)

Notes:

1. All proposed groundwater monitoring well locations will consist of shallow and deep cluster wells, unless otherwise noted.
2. At least one soil sample from each test boring may be submitted for VOCs, TPH, PAHs, total cyanide and/or PP-13 metals.

TABLE 3
PROPOSED SURFACE SOIL SAMPLE LOCATIONS

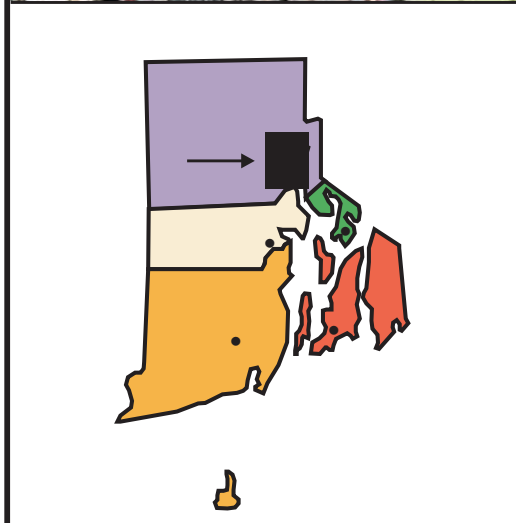
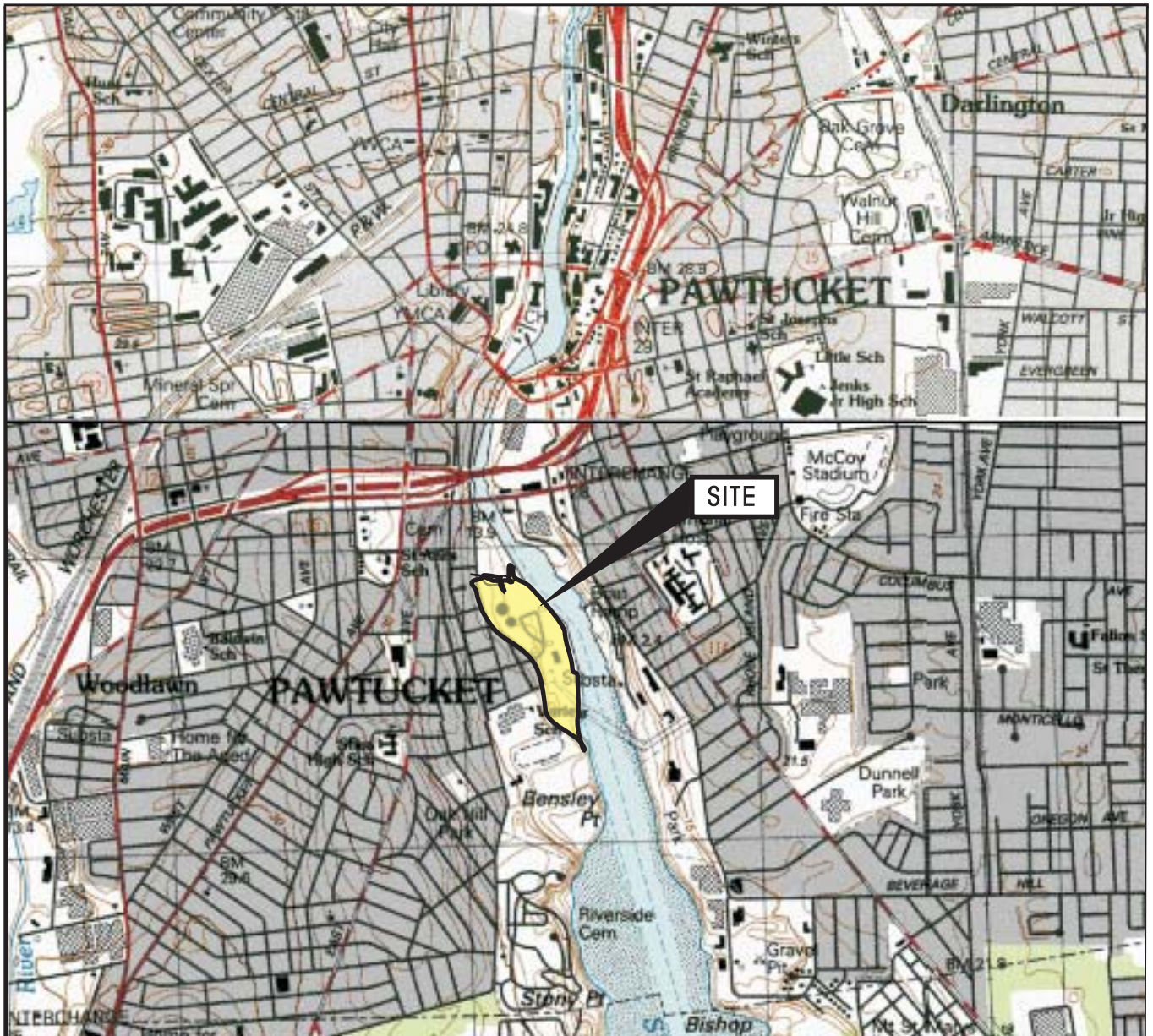
FORMER TIDEWATER FACILITY
Pawtucket, Rhode Island

Proposed Exploration	Site Area	General Location and/or Purpose
SS-143	FPPA	West of TP-376/TP-372/TP-352; Assess visual impacts
SS-144	FPPA	TP-349; Assess <i>cyanide</i> impacts
SS-145	FPPA	TP-335; Assess <i>cyanide</i> impacts
SS-146	FGPA	SS-121; Assess <i>cyanide</i> impacts

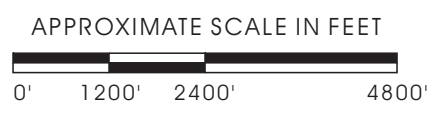
Notes:

1. Surface soil samples will be collected from the upper 2 foot of soil column at the locations identified.
2. Surface soil samples will be submitted for analytical testing for those contaminants noted in ***bold italics*** .

FIGURES



FROM USGS PROVIDENCE, RI QUADRANGLE MAP
 (DIGITAL TOPOGRAPHIC MAPS PROVIDED BY MAPTECH, INC.)
 (CONTOUR ELEVATIONS ARE IN METERS ABOVE NGVD, AT 3 METER INTERVALS)



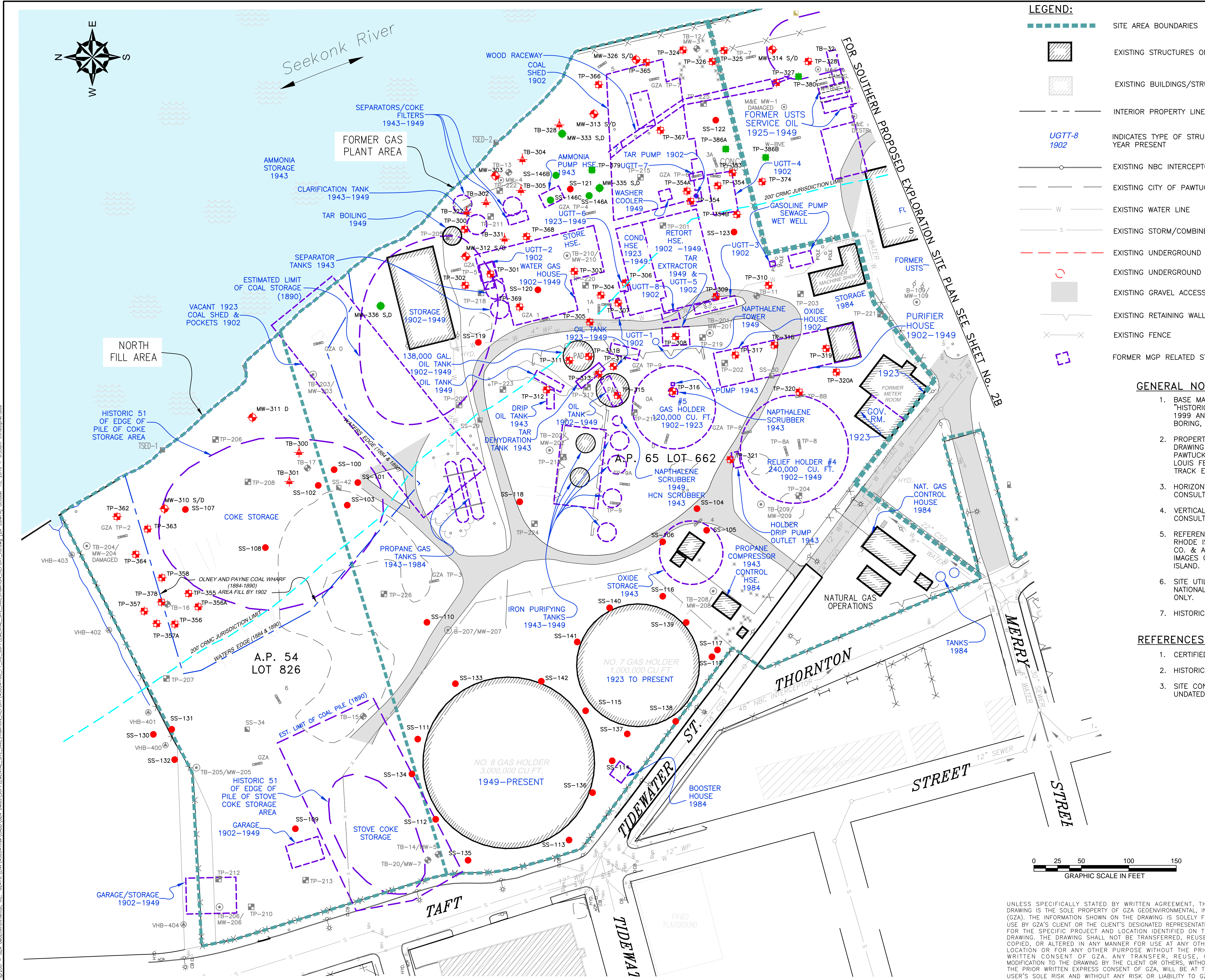
TIDEWATER FACILITY

PAWTUCKET
 RHODE ISLAND

LOCUS PLAN

JANUARY 2007

FIGURE NO. 1



LEGEND:

- SITE AREA BOUNDARIES
- EXISTING STRUCTURES ON-SITE
- EXISTING BUILDINGS/STRUCTURES OFF-SITE
- INTERIOR PROPERTY LINE
- UGTT-8 1902 INDICATES TYPE OF STRUCTURE AND YEAR PRESENT
- 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 GRAVEL ACCESS ROAD
- EXISTING RETAINING WALLS
- EXISTING FENCE
- FORMER MGP RELATED STRUCTURES

SAMPLE LEGEND

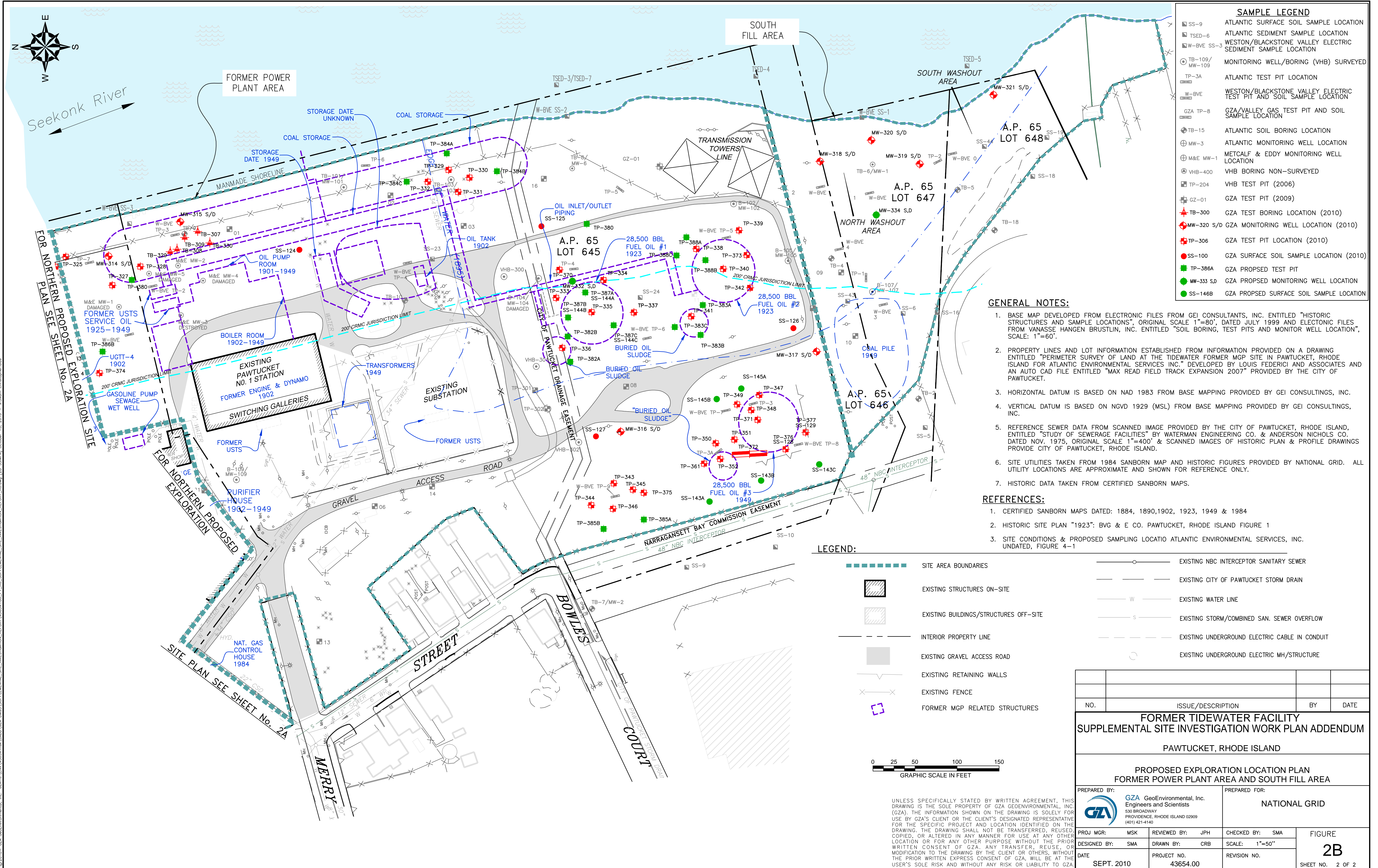
- SS-9 ATLANTIC SURFACE SOIL SAMPLE LOCATION
- TSSED-6 ATLANTIC SEDIMENT SAMPLE LOCATION
- W-BVE SS-3 WESTON/BLACKSTONE VALLEY ELECTRIC SEDIMENT SAMPLE LOCATION
- TP-109/MW-109 MONITORING WELL/BORING (VHB) SURVEYED
- TP-3A ATLANTIC TEST PIT LOCATION
- W-BVE WESTON/BLACKSTONE VALLEY ELECTRIC TEST PIT AND SOIL SAMPLE LOCATION
- GZA TP-8 GZA VALLEY GAS TEST PIT AND SOIL SAMPLE 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 BORING 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)
- TP-386A GZA PROPOSED TEST PIT
- MW-333 S/D GZA PROPOSED MONITORING WELL LOCATION
- SS-146B GZA PROPOSED SURFACE SOIL SAMPLE LOCATION

- GENERAL NOTES:**
- BASE MAP DEVELOPED FROM ELECTRONIC FILES FROM GEI CONSULTANTS, INC. ENTITLED "HISTORIC STRUCTURES AND SAMPLE LOCATIONS", ORIGINAL SCALE 1"=80', DATED JULY 1999 AND ELECTRONIC FILES FROM VANASSE HANGEN BRUSTLIN, INC. ENTITLED "SOIL BORING, TEST PITS AND MONITOR WELL LOCATION", SCALE: 1"=60'.
 - 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.
 - HORIZONTAL DATUM IS BASED ON NAD 1983 FROM BASE MAPPING PROVIDED BY GEI CONSULTANTS, INC.
 - VERTICAL DATUM IS BASED ON NGVD 1929 (MSL) FROM BASE MAPPING PROVIDED BY GEI CONSULTANTS, INC.
 - 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 CITY OF PAWTUCKET, RHODE ISLAND.
 - SITE UTILITIES TAKEN FROM 1984 SANBORN MAP AND HISTORIC FIGURES PROVIDED BY NATIONAL GRID. ALL UTILITY LOCATIONS ARE APPROXIMATE AND SHOWN FOR REFERENCE ONLY.
 - HISTORIC DATA TAKEN FROM CERTIFIED SANBORN MAPS.

- REFERENCES:**
- CERTIFIED SANBORN MAPS DATED: 1884, 1890, 1902, 1923, 1949 & 1984
 - HISTORIC SITE PLAN "1923": BVG & E CO. PAWTUCKET, RHODE ISLAND FIGURE 1
 - SITE CONDITIONS & PROPOSED SAMPLING LOCATIONS: ATLANTIC ENVIRONMENTAL SERVICES, INC. UNDATED, FIGURE 4-1.

NO.	ISSUE/DESCRIPTION	BY	DATE
FORMER TIDEWATER FACILITY SUPPLEMENTAL SITE INVESTIGATION WORK PLAN ADDENDUM			
PAWTUCKET, RHODE ISLAND			
PROPOSED 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: JPH	CHECKED BY: SMA	FIGURE 2A
DESIGNED BY: SMA	DRAWN BY: CRB	SCALE: 1"=50"	
DATE: SEPT. 2010	PROJECT NO.: 43654.00	REVISION NO.:	SHEET NO. 1 OF 2

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.



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
TB-109/MW-109	MONITORING WELL/BORING (VHB) SURVEYED
TP-3A	ATLANTIC TEST PIT LOCATION
W-BVE	WESTON/BLACKSTONE VALLEY ELECTRIC TEST PIT AND SOIL SAMPLE LOCATION
GZA TP-8	GZA/VALLEY GAS TEST PIT AND SOIL SAMPLE 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 BORING 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)
TP-386A	GZA PROPOSED TEST PIT
MW-333 S/D	GZA PROPOSED MONITORING WELL LOCATION
SS-146B	GZA PROPOSED SURFACE SOIL SAMPLE LOCATION

- GENERAL NOTES:**
1. BASE MAP DEVELOPED FROM ELECTRONIC FILES FROM GEI CONSULTANTS, INC. ENTITLED "HISTORIC STRUCTURES AND SAMPLE LOCATIONS", ORIGINAL SCALE 1"=80', DATED JULY 1999 AND ELECTRONIC FILES FROM VANASSE HANGEN BRUSTLIN, INC. ENTITLED "SOIL BORING, TEST PITS AND MONITOR WELL LOCATION", SCALE: 1"=60'.
 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 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.
 7. HISTORIC DATA TAKEN FROM CERTIFIED SANBORN MAPS.

- REFERENCES:**
1. CERTIFIED SANBORN MAPS DATED: 1884, 1890, 1902, 1923, 1949 & 1984
 2. HISTORIC SITE PLAN "1923": BVG & E CO. PAWTUCKET, RHODE ISLAND FIGURE 1
 3. SITE CONDITIONS & PROPOSED SAMPLING LOCATIONS ATLANTIC ENVIRONMENTAL SERVICES, INC. UNDATED, FIGURE 4-1

LEGEND:

[Dashed Line]	SITE AREA BOUNDARIES	[Line with Circle]	EXISTING NBC INTERCEPTOR SANITARY SEWER
[Hatched Box]	EXISTING STRUCTURES ON-SITE	[Line with Square]	EXISTING CITY OF PAWTUCKET STORM DRAIN
[Dotted Box]	EXISTING BUILDINGS/STRUCTURES OFF-SITE	[Line with W]	EXISTING WATER LINE
[Dashed Line]	INTERIOR PROPERTY LINE	[Line with S]	EXISTING STORM/COMBINED SAN. SEWER OVERFLOW
[Grey Box]	EXISTING GRAVEL ACCESS ROAD	[Line with Dashed]	EXISTING UNDERGROUND ELECTRIC CABLE IN CONDUIT
[Line with V]	EXISTING RETAINING WALLS	[Line with Circle]	EXISTING UNDERGROUND ELECTRIC MH/STRUCTURE
[Line with X]	EXISTING FENCE		
[Dotted Box]	FORMER MGP RELATED STRUCTURES		



UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

NO.	ISSUE/DESCRIPTION	BY	DATE
FORMER TIDEWATER FACILITY SUPPLEMENTAL SITE INVESTIGATION WORK PLAN ADDENDUM			
PAWTUCKET, RHODE ISLAND			
PROPOSED 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) 421-4149	PREPARED FOR:	NATIONAL GRID
PROJ MGR:	MSK	REVIEWED BY:	JPH
DESIGNED BY:	SMA	DRAWN BY:	CRB
DATE	SEPT. 2010	CHECKED BY:	SMA
		SCALE:	1"=50"
		PROJECT NO.	43654.00
		REVISION NO.	
			FIGURE 2B
			SHEET NO. 2 OF 2

APPENDIX A

**SOIL/WASTE CHARACTERIZATION PROTOCOL FOR FORMER
MANUFACTURED GAS PLANTS**



SOIL/WASTE CHARACTERIZATION PROTOCOL FOR FORMER MANUFACTURED GAS PLANT (MGP) SITES NATIONAL GRID

GZA GeoEnvironmental, Inc. (GZA) has adopted this protocol to standardize the characterization of contaminated media and the stratigraphy at MGP sites. Consistent documentation of observed impacts and characterization data is a critical element in the development of remedial strategies. GZA's adherence to the protocols described herein will facilitate the development of consistent documentation and reporting associated with our investigation of National Grid MGP sites.

SOIL SAMPLE DESCRIPTIONS

It is important that descriptive qualifiers are consistently used to characterize the degree and nature of observed impacts. The following presents examples of descriptive qualifiers that will be used when logging soil borings.

SOIL LOGGING

- All soils are to be logged using the modified Burmister Soil Classification
- PID or FID used to screen all soil samples (consistent with the Jar Headspace Method) –all readings will be recorded and included on the logs, not just the highest.
- Moisture terms: Dry, Moist and Wet.
- Color terms - use geotechnical color charts - colors may be combined: e.g., red-brown.
- Log will include: Moisture, Color, grain sizes (lower case), DOMINANT GRAIN SIZE (CAPS), sorting, cohesive or non-cohesive, plasticity of cohesive soils, density description, blow counts ("N" values), water level, PID readings and environmental/depositional/geologic descriptions.
- Representativeness - Soil logs will include particular notes if the field representative believes that there is a possibility the soil sample being described is not representative of the interval sampled.

- Logs will include descriptive notes on observations of waste materials, separate phase product, etc., consistent with the nomenclature described below.
- All samples will be photographed which will be noted on the boring logs.
- Boring log formats will be consistent for all National Grid projects.

PHOTOGRAPHIC EVIDENCE

Field personnel will be prepared to record photographs of evidence of contamination during all investigation events. In addition, clean samples will also be photographed to document areas of no observed impact. The photographic evidence will serve to support the written descriptions of contamination as described herein. A log of the photograph will be maintained, which clearly identifies sample location, date of sample collection, exploration identification and sample identification. The recording of photographs will also be recorded on the boring logs.

DESCRIPTION OF CONTAMINANTS

The following describes the terms to be used when describing observations of impact at National Grid MGP sites. These terms will be used consistently on the boring logs, report text, tables and figures.

Sheen - iridescent petroleum-like sheen. Not to be used to describe a "bacterial sheen" that can be distinguished by its tendency to break up on the water surface at angles whereas petroleum sheen will be continuous and will not break up. A field test for sheen is to put a soil or pre-purge groundwater sample in a jar of water and shake the sample (jar shake test), then observe and record the presence/absence of sheen on the surface of the water in the jar.

Stained - used with color (i.e., black or brown stained) to indicate that the soil matrix is stained a color other than the natural (non-impacted) color.

Coated - soil grains are coated with tar/free product - there is not sufficient free phase material present to saturate the pore spaces.

Blebs - observed discrete sphericals of tar/free product - but for the most part the soil matrix was not visibly contaminated or saturated. Typically this is residual product.

Saturated - the entirety of the pore space of a sample is saturated with the tar/free product. Care should be taken to ensure that what is being observed is not water saturating the pore spaces if this term is used. Depending on viscosity, tar/free phase saturated materials may freely drain from a soil sample.

Oil - Used to characterize free and/or residual product that exhibits a distinct fuel oil or diesel fuel like odor; distinctly different from MGP-related odors/impacts.

Tar - Used to describe free and/or residual product that exhibits a distinct "coal tar" type odor (e.g., naphthalene-like odor). Weathered tars may not exhibit an odor and are identified on a visual basis. Colors of product can be brown, black, reddish-brown, or gold.

Solid Tar - Used to describe product that is solid or semi-solid phase. The magnitude of the observed solid tar should be described (e.g., discrete granules or a solid layer).

Purifier Wastes- Purifier wastes are commonly identified by their distinctive blue/green color. Other colors may be present including indigo (deep blue) or brown/rust. Typically purifier waste materials contain wood chips, oyster or clam shells or granular material. The waste material may have a distinctive sulfur-like odor when freshly exposed to air.

Coal Ash /Clinker - Odorless, grey or black in color. Clinker may exhibit glazing.

Olfactory Descriptors

Use terms such as "tar-like odor" or "naphthalene-like odor" (i.e., mothball-like) or "fuel oil-like odor" that provide a qualitative description (opinion) as to the possible source of the odor. Use modifiers such as "strong," "moderate," and "faint" to indicate the relative intensity of the odor.

DNAPL/LNAPL

A jar shake test may be performed to identify and determine whether observed tar/free-phase product is either denser or lighter than water. In addition, MGP residues can include both light and dense phases - this test can help determine if both light and dense phase materials are present at a particular location.

Viscosity of Free-Phase Product

If free-phase product/tar is present, a qualitative description of viscosity will be made, such as:

- Highly viscous (e.g., taffy-like)
- Viscous (e.g. No.6 fuel oil or bunker crude like)
- Low viscosity (e.g. No.2 fuel oil like)

GROUNDWATER SAMPLING OBSERVATIONS

Any observations of sheen, blebs, free-phase product/tar, staining or coating of the sampling equipment, odor, etc., that are made during sampling of groundwater are to be included in the groundwater sample collection log.