nationalgrid

Thomas J. Campbell
Project Manager

November 7, 2008

Mr. Douglas MacNeal, P.E.
Environmental Engineer 2
Remedial Action Bureau C
Division of Environmental Remediation
625 Broadway
Albany, New York 112233-7014

Re: Rockaway Park Former MGP Site
Site No. 2-41-029
Final (100%) Remedial Design Report Submission

Dear Mr. MacNeal:

The Department's letter dated October 24, 2008 indicates the 95% Remedial Design Report for the Rockaway Park former MGP site is approved. Accordingly, we are providing one (1) hard copy and (1) electronic a copy on compact disc (CD) of the 100% Final Remedial Design Report to the Department which has been signed and sealed by a professional engineer licensed in the State of New York.

If you have questions please contact me at (516) 545-2555.

Sincerely,

James M. Szemer FOR
Thomas J. Campbell
Project Manager

cc:

S. Mattei – NYSDEC Region 2 (w/o copy)
A. Garcia-Costas – NYSDEC Region 2 (w/o copy)
V. Brevdo - NYSDEC Region 2 (1 copy)
S. Selmer - NYSDOH (1 copy)
C. Willard - National Grid (1 CD)
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100% SUBMISSION

REMEDIAL DESIGN REPORT

VOLUME I OF II

For the:

Rockaway Park Former Manufactured Gas Plant Site
Rockaway Park, Queens County, New York
Site Number 2-41-029

Submitted by:

NATIONAL GRID US
Hicksville, New York 11801

NOVEMBER 2008

Prepared by:

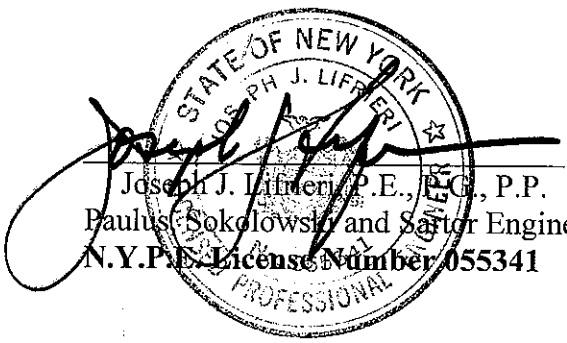
Paulus, Sokolowski and Sartor Engineering, PC
67A Mountain Boulevard Extension
Warren, Somerset County, New Jersey

PROFESSIONAL ENGINEER'S CERTIFICATION

The undersigned on behalf of National Grid US and Paulus, Sokolowski, and Sartor Engineering, PC certifies: that I am and at all pertinent times hereinafter mentioned was a Professional Engineer licensed or otherwise authorized under article 145 of the Education Law of the State of New York to practice engineering; that I am the individual who had primary direct responsibility for the implementation of the subject remedial program; and that all substantive requirements of the said remedial program have been complied with; the data demonstrates that remediation requirements have been or will be achieved in accordance with time frames contained in the approved remedial program and all activities described in this report have been performed in accordance with the said remedial program and any subsequent changes as agreed to and approved by the Department, including:

(a) Any use restrictions, institutional and/or engineering controls, and/or any site management plan requirements are contained in a duly recorded environmental easement and that every municipality in which the site is located has been notified of the environmental easement;
(b) A site management plan for any engineering controls employed at the site has been approved; and
(c) Any required financial assurance mechanisms have been executed.

November 7, 2008
Date



Joseph J. Lifferi, P.E., C.G., P.P.
Paulus, Sokolowski and Sartor Engineering, PC
N.Y.P.E. License Number 055341

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EXECUTIVE SUMMARY

Paulus, Sokolowski and Sartor Engineering, PC (PS&SPC) has been retained by National Grid US, formerly the KeySpan Corporation[1], to prepare this 100% Remedial Design Report (RDR) for the Rockaway Park Former Manufactured Gas Plant (MGP) Site (Site). This RDR presents the design activities and procedures to address known soil and groundwater impacts at the Site. The Site is located north and east of Rockaway Freeway, west of Beach 108th Street, and north and south of Beach Channel Drive in Rockaway Park, Queens County, New York. The Site encompasses an area of approximately 9.5 acres. The area of the Site known as the On-Site Area is located south of Beach Channel Drive and includes remnant facilities of a former National Grid US natural gas regulator station located in the southeastern portion of the Site. The portion of the Site located to the north of Beach Channel Drive is known as the Bulkhead Area and is owned by the City of New York.

In this RDR, the "On-Site Area" refers to the 8.9 acres located to the south of Beach Channel Drive which contained the former MGP. The "Bulkhead Area" refers to the 0.6 acre strip of land located to the north of Beach Channel Drive and to the south of Jamaica Bay.

The remedy to be implemented at the Site is detailed in a Record of Decision (ROD) entitled "Record of Decision, LILCO – Rockaway Park MGP Site, Rockaway Park, Queens County, New York, Site Number 2-41-029" prepared by the New York State Department of Environmental Conservation (NYSDEC) and dated October 2004. The ROD was based on the public's input to the "Proposed Remedial Action Plan" prepared and presented by NYSDEC and dated August 2004. Pre-design and design activities conducted to support this RDR are summarized in a document entitled "Remedial Design Work Plan, Rockaway Park Former Manufactured Gas Plant Site, Rockaway Park, Queens County, New York" (RDWP) prepared by PS&SPC and dated December 2005. The Final RDWP was approved by the NYSDEC on December 23, 2005.

The selected remedy includes the remedial construction components listed below.

- Shallow excavation in specified areas to the depth of eight feet below ground surface (bgs); which correlates with the approximate depth to groundwater and will be conducted to remove visually observed source material (i.e., soil containing visible tar, oils, and purifier wastes). The remedial excavation will proceed to a depth of eight feet bgs and possibly deeper in some localized areas to facilitate removal of encountered structures that potentially contain source material.

- Installation of a dense non-aqueous phase liquid (DNAPL) migration barrier, aligned in an east-west direction, along the northern boundary of the On-Site Area. This barrier, known as the On-Site DNAPL Barrier, will be approximately 695 feet long and will

[1] National Grid US acquired KeySpan Corporation in August 2007. For the purpose of this RDR, KeySpan Corporation activities conducted prior to August 2007 will be referenced as "National Grid US", the current property owner.

extend to a depth of 120 feet bgs in its central section and to 50 feet bgs on its eastern and western reaches. The technology to be utilized to install the DNAPL migration barrier will be the Waterloo Barrier® steel sheet pile system.

- Installation of a DNAPL migration barrier in the central portion of the Bulkhead Area (i.e., the Bulkhead Barrier), aligned in an east-west direction, which will be approximately 170 feet long and extend to a depth of 70 feet bgs. The technology to be utilized to install the DNAPL migration barrier in this area will also be the Waterloo Barrier® steel sheet pile system.

- Installation of 31 passive DNAPL collection wells in the On-Site Area and within the Bulkhead Area, in areas with heavy concentrations of mobile DNAPL.

- Installation of a Site-Wide Cap in the On-Site Area as well as the Bulkhead Area consisting of two feet of clean material underlain by a geotextile demarcation barrier.

- Restoration of excavation/filled areas by grading, placement of gravel (On-Site Area) and placement of topsoil (Bulkhead Area).

Other administrative components of the selected remedy (e.g., Site Management Plan, imposition of institutional controls, annual certifications, etc.) are outlined in the RDWP.

Several tasks were completed prior to initiation of the design of the remedy. These pre-remedial design tasks served to gather supplementary information in support of the design as well as to demonstrate the selected remedial technologies. The pre-remedial design activities included, but were not limited to, a geotechnical investigation to acquire data in support of the design of the DNAPL migration barriers and the excavation shoring system; a conceptual Site groundwater flow model; a supplemental environmental investigation to further delineate the extent of the source material; evaluation of remedial construction material transportation options; performance of a subsurface obstruction survey to identify potential subsurface obstructions; and a successful field demonstration of the Waterloo Barrier® sheet piling system with sealed interlocks for use as the DNAPL migration barriers. A summary of the completed pre-design activities is presented in Section 2.0.

Based on the results of the pre-design activities, the subsurface containment barriers will be constructed using the Waterloo Barrier® sheet pile system. The Waterloo Barrier® system consists of a series of interlocked steel sheets with a sealable cavity within each interlock. After installation, the interlock is flushed and a low permeability sealant is injected into the entire length of the interlock. A discussion of Waterloo Barrier® system design is presented in Section 3.4.

Two parallel subsurface DNAPL migration barriers will be installed at varying depths along the northern portion of the Site. The first barrier, known as the On-Site Area Barrier, will extend approximately 695 linear feet and will be installed at two different depths. The center section of the On-Site Barrier will extend to a depth of 120 feet bgs and two flanking barriers will be installed on either side of the center section to a depth of 50 feet bgs. The second barrier, known

as the Bulkhead Area Barrier, will be installed within the Bulkhead Area to a depth of 70 feet bgs and a linear distance of approximately 170 feet. The installation of the migration barriers will serve two purposes. First, both barriers will inhibit the migration of DNAPL to areas located downgradient of the Site, including Jamaica Bay. Second, the barriers will allow DNAPL to be passively recovered by recovery wells to be installed upgradient and downgradient of the On-Site Area Barrier and updgraident of the Bulkhead Area Barrier. Both the alignment of the DNAPL migration barriers and the locations of the DNAPL recovery wells are depicted on Design Drawing C-04.

The DNAPL migration barriers have been designed to minimize impacts to upgradient and side-gradient groundwater flows. Projected long-term effects on the groundwater underlying the Site from the installation of the DNAPL migration barriers have been investigated through the development of a conceptual site-specific groundwater model. The results of this conceptual model indicate minimal effects on groundwater mounding behind the planned DNAPL migration barriers. The results of the groundwater modeling effort are presented in Section 2.5.

Shallow soil excavation will occur to a depth of eight feet bgs, which is the approximate depth of the groundwater table. The remedial excavation will be deepened in some localized areas to facilitate removal of encountered structures potentially containing source material. Based on the results of the supplemental environmental investigation, the area of shallow soil excavation was expanded from that proposed in the RDWP. The estimated volume of soil to be excavated is approximately 88,000 cubic yards. The extent of excavation is shown on Design Drawing C-04.

Excavated material will be consolidated under a temporary fabric enclosure operated under negative air pressure to control the release of volatile emissions and odors and loaded onto transport vehicles for off-site disposal. The temporary fabric enclosure will be equipped with a vapor management system (VMS) designed to both capture and treat airborne contaminants prior to release from within the enclosure to meet NYSDEC requirements. A discussion of the temporary enclosure and VMS system is presented in Section 3.2.

A Community Air Monitoring Program (CAMP) will be implemented both during the installation of the DNAPL migration barriers and during soil excavation. After the completion of remedial construction activities, Site management including operational, maintenance and monitoring (OM&M) activities, as discussed in Section 9.0, will be implemented.

The design for the planned remedial construction activities to be implemented at the Site is being performed by National Grid US's Remedial Design Team which comprises PS&SPC, GEI Consultants, Inc. (GEI) and Posillico Environmental, Inc. (Posillico). GEI was responsible for the preparation of the CAMP. National Grid US has procured an Air Monitoring Contractor, ENSR, to implement the requirements of the CAMP. Posillico is the selected Remedial Contractor for the construction activities and has provided construction means and methods for incorporation into the RDR. PS&SPC is responsible for incorporating the Design Team's input and completing the remaining components of the remedial design. ARCADIS has been retained by National Grid US to function as the Construction Manager (CM) for the planned remedial activities at the Site.

The approach for the design of the Site remedy has been selected to promote a timely and efficient implementation. NYSDEC provided comments on the 50% to 75% RDR in a letter dated November 10, 2006. Further, NYSDEC approved the 95% RDR in a letter dated October 24, 2008. National Grid US's responses have been incorporated into a draft version of the 95% RDR which was utilized to procure Posillico. National Grid US's Remedial Design Team has worked in conjunction with Posillico to further develop the design of the remedy into this 100% RDR submittal. NYSDEC comments from their review of the 95% RDR has been incorporated into the final remedial design (100% RDR). The final remedial design, to be certified by a Professional Engineer licensed in the State of New York, will be issued to the NYSDEC in a Final Remedial Design Report (100% Design). Community officials and stakeholders have been contacted during the development of the remedial design for input on community related issues in order to determine the need for measures to mitigate potential disruptions and perceived adverse impacts to the community.

A project schedule outlining the major construction milestones as well as a remedial cost estimate is included in Section 4.0. The project schedule is an evolving document that will be periodically updated to reflect actual field conditions and to summarize the remedial action progress.

This 100% RDR is organized into nine sections. Section 1.0, Introduction, provides an overview of the Site and describes the structure of the RDR. Section 2.0, Pre-Remedial Design Activities, summarizes the pre-design activities undertaken to support the development of the remedial design. Section 3.0, Remedial Activities, describes the activities to be undertaken for each of the remedial design components. Section 4.0, Engineering Cost Estimate and Schedule, provides a cost estimate for the implementation of the remedial components and a schedule identifying the remedial milestones. Section 5.0, Identification of Property Access and Required Federal and State Permits Required for Remediation, summarizes the various property access agreements and permits anticipated to be required for the remedial action. Section 6.0, Project Implementation and Contractor Selection, outlines the approach to implement the remedial design in conjunction with the selected remedial contractor. Section 7.0, Construction Quality Assurance Project Plan, outlines the procedures and protocols for monitoring and ensuring quality control during remedial construction as presented in Appendix N. Section 8.0, Health and Safety Plan, references the Site-Specific Health and Safety Plan developed by Posillico for the Site as presented in Appendix G. Finally, Section 9.0, Site Management Plan, discusses the proposed Site Management Plan.

1.0 INTRODUCTION

Paulus, Sokolowski and Sartor Engineering, PC (PS&SPC) has been retained by National Grid US, formerly KeySpan Corporation[2] to prepare this Remedial Design Report (RDR) for the Rockaway Park Former Manufactured Gas Plant (MGP) Site (Site). This RDR presents the 100% design elements associated with the construction and implementation of the selected remedy for the Site. The selected remedy is detailed in the document entitled "Record of Decision, LILCO – Rockaway Park Former MGP Site, Rockaway Park, Queens County, New York, Site Number 2-41-029" (ROD) prepared by NYSDEC and dated October 2004. This RDR has been prepared in accordance with the Order on Consent, Index Number D1-0002-98-11 (the Order) signed by National Grid US and the New York State Department of Environmental Conservation (NYSDEC) on March 31, 1999.

The ROD was based on the public's input to the "Proposed Remedial Action Plan" prepared and presented by the NYSDEC and dated August 2004. Pre-design and design activities implemented in developing this RDR are summarized in a document entitled "Remedial Design Work Plan, Rockaway Park Former Manufactured Gas Plant Site, Rockaway Park, Queens County, New York" (RDWP) prepared by PS&SPC and dated December 2005. The Final RDWP was approved by the NYSDEC on December 23, 2005. The 95% RDR was approved by NYSDEC on October 24, 2008.

This 100% RDR also presents the results of the pre-remedial design activities that were performed to gather data in support of the design for the selected remedy at the Site. The proposed pre-remedial design activities are summarized in the RDWP. Supplemental pre-design activities completed that were not addressed in the approved RDWP, including an exploration of the subsurface tunnel located within the Site and a field demonstration of Waterloo Barrier® sheeting technology, are also presented in this RDR.

The 50% to 75% RDR was reviewed by the NYSDEC and comments were provided to National Grid US in a November 10, 2006 comment letter. These comments have been incorporated into this 100% RDR. National Grid US has procured Posillico Environmental, Inc. (Posillico) using a draft version of this 100% RDR, Design Drawings and the Technical Specifications. National Grid US's Remedial Design Team has worked in conjunction with Posillico to incorporate construction means and methods and further develop the design of the remedy into this 100% RDR submittal. NYSDEC comments from the review of the 95% RDR has been incorporated into this final remedial design (100% RDR design). This 100% RDR final design, has been certified by a Professional Engineer licensed in the State of New York.

[2] National Grid US acquired KeySpan Corporation in August 2007. For the purpose of this RDR, KeySpan Corporation activities conducted prior to August 2007 will be referenced as "National Grid US", the current property owner.

1.1 Background and Description

The Site is in an area of Rockaway Park, Queens County, New York located to the north and east of Rockaway Freeway, to the west of Beach 108th Street; and, to the south of north and Beach Channel Drive. The location of the former MGP Site is depicted on Design Drawing CV-00 included in Appendix A of this RDR.

Operations at the Site began in the late 1870s. The MGP plant was initially operated by Rockaway Electric Light Company, Town of Hempstead Gas and Electric Company and later by the Queensboro Gas and Electric Company from the late 1870s to 1926. In 1926, Queensboro Gas and Electric Company became a subsidiary of the Long Island Lighting Company (LILCO). LILCO operated the MGP plant from 1926 to approximately 1958 when most of the facilities were demolished. In 1998, National Grid US acquired the Site through a merger of LILCO and the Brooklyn Union Gas Company (BUGCO).

A more detailed summary of the operating history of the Site is included in the remedial investigation reports that have been prepared for the Site. These reports are entitled "Remedial Investigation Report" prepared by Dvirka and Bartilucci (D&B) dated October 2002 and "Final Remedial Investigation Report, Volumes 1 and 2" prepared by GEI and dated January 2004.

The Rockaway Park Former MGP encompasses approximately 9.5 acres and currently includes a former National Grid US natural gas regulator station located in the southeastern portion of the Site.

The overall layout of the Rockaway Park Former MGP Site is depicted on Design Drawing C-01.

Properties immediately abutting the Former MGP are identified below.

- ***North – Beach Channel Drive.*** North of Beach Channel Drive is a New York City owned strip of land encompassing approximately 0.6 acres (Bulkhead Area), considered part of the Former MGP Site. Further to the north is Jamaica Bay.
- ***East – Beach 108th Street.*** East of Beach 108th Street is a City of New York Department of Environmental Protection (NYCDEP) sewage treatment plant.
- ***South – Rockaway Freeway.*** South of Rockaway Freeway are Metropolitan Transit Authority (MTA) and New York City Transit (NYCT) railroad tracks and a rail yard. Further to the south is a residential area of Rockaway Park.
- ***West – Rockaway Freeway.*** West of Rockaway Freeway are properties occupied by auto service and retail businesses.

In this RDR, the "On-Site Area" refers to the 8.9 acre portion of the Site located to the south of Beach Channel Drive. The "Bulkhead Area" refers to the 0.6 acre strip of land located to the north of Beach Channel Drive and to the south of Jamaica Bay.

1.2 Summary of Remedial Design Work Plan

A work plan was developed and presented to the NYSDEC to detail the activities and procedures proposed to be involved in the development of the remedial design for the Site in accordance with the ROD. The document entitled "Draft Remedial Design Work Plan for the Rockaway Park Former Manufactured Gas Plant Site, Rockaway Park, Queens County, New York" (Draft RDWP) was prepared by PS&SPC and initially submitted to the NYSDEC in December 2004 by National Grid US.

The Draft RDWP was subsequently revised to include a phased approach to the remediation of the Site and the Final RDWP was approved in December 2005. The phased remedial approach detailed in the Final RDWP was warranted due to the following:

- The proposed Shallow Excavation Area encompassed the then existing gas regulator station located in the southeastern corner of the Site and this area could have only been remediated within a limited time of the year due to existing active gas facilities; and,

- The installation of the DNAPL migration barriers requires procuring a specialty remedial contractor utilizing specialty equipment. Since a specialty contractor had already been procured to install a migration barrier at another National Grid US former MGP site, National Grid US proposed to procure this same specialty contractor for the implementation of the Phase I remedial activities for this Site.

As such, the phased remedial approach for the Site, as detailed in the approved Final RDWP, included the following:

- Phase 1A – Remediation of the gas regulator station area located in the southeast corner of the Site;

- Phase 1 – Installation of the DNAPL migration barriers as depicted in the RDWP; and,

- Phase 2 – Performing shallow excavations for select areas of the Site as depicted in the RDWP.

Subsequent to the NYSDEC approval of the Final RDWP, National Grid US evaluated the option of re-locating the existing gas regulator station permanently off-site in order to not impede the implementation of the remedial activities at the Site. After completion of

that evaluation, National Grid US has elected to proceed with the relocation of the existing gas regulator station off-site. That relocation is now complete. Consequently, the need for a Phase 1A is no longer required and the remediation of this area will be conducted as part of the Site-wide remedial activities (i.e., Phase 2 remedial activities). Therefore, Phase 1A was eliminated from the remedial design for the Site.

Finally, due to the effective field demonstration of the installation of the Waterloo Barrier® sheeting as the selected DNAPL migration barrier technology and in order to compress the project schedule, the various remedial design and construction phases (i.e., Phases 1 and 2) have been consolidated into a single phase as presented in this RDR.

1.3 Remedial Design Work Plan Objectives

The objectives for the remedial design, as presented in the December 2005 RDWP, include the following:

- Summarize the results of the pre-design activities performed in support of the remedial design;
- Present the draft remedial design for the implementation of the proposed remedial construction activities;
- Conceptually describe the proposed methods and procedures that will be used to implement the proposed remedial construction activities;
- Incorporate all of the design aspects into a set of biddable quality plans and Technical Specifications necessary to procure a remedial contractor who will implement the proposed remedial construction activities and assist in the development of the remedial design;
- Identify the project plans (Construction Quality Assurance Project Plan, Health and Safety Plan) that will be used during the remedial construction activities; and,
- Provide a cost estimate and schedule for the implementation of the activities associated with the proposed remedial construction.

1.4 Remedial Design Report Organization

This RDR is organized in the following manner:

- Section 1.0 – INTRODUCTION: This section provides a brief description of the location of the Site, the historical operations performed on the Site, a summary of the approved RDWP, and the remedial action/design objectives for the proposed remedial construction activities.

- Section 2.0 – PRE-REMEDIAL DESIGN ACTIVITIES: This section of the RDR summarizes the activities implemented to gather information in support of the design of the remedial construction activities.

- Section 3.0 – REMEDIAL ACTIVITIES: This section details the current design for the remedial construction activities.

- Section 4.0 – ENGINEERING COST ESTIMATE AND SCHEDULE: This section presents an engineering cost estimate for the implementation of the remedial construction activities as well as a project milestone schedule.

- Section 5.0 – IDENTIFICATION OF PROPERTY ACCESS AND FEDERAL AND STATE PERMITS REQUIRED FOR REMEDIATION: This section of the RDR summarizes the permits that will be necessary to implement the proposed remedial construction activities.

- Section 6.0 – PROJECT IMPLEMENTATION AND CONTRACTOR SELECTION: This section of the RDR details the procedures utilized to select the remedial contractor to assist in the development of the remedial design and to implement the proposed remedial construction activities.

- Section 7.0 – CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN: This section references the Construction Quality Assurance Project Plan to be utilized during the implementation of the proposed remedial construction activities.

- Section 8.0 – HEALTH AND SAFETY PLAN: This section references the health and safety measures to be taken in order to ensure worker and public safety during the implementation of the remedial construction activities.

- Section 9.0 – SITE MANAGEMENT PLAN: This section presents a description of the Site Management Plan that will be developed to operate and maintain the various remedial components, engineering controls and institutional controls to be installed at the Site and to monitor the Site after completion of the proposed remedial construction activities.

2.0 PRE-REMEDIAL DESIGN ACTIVITIES

Several pre-remedial design tasks were performed to gather supplementary information in support of the remedial design for the construction of the selected remedy. As detailed in the RDWP, these pre-remedial design activities included the following:

- Preparation of a NAPL Contingency Plan to remove NAPL materials encountered during remedial excavation activities;
- Performing a supplemental geotechnical investigation to obtain geotechnical data that will be used for the design of the shoring systems to support the excavations and for the design of the DNAPL migration barriers. This investigation was also expanded to include a supplemental environmental investigation to further delineate the extent of the source material (i.e., soil containing visible tar, oils and purifier wastes);
- Conducting a baseline site survey to verify the existing topography of the Site and any physical features;
- Performing a subsurface obstruction survey to identify potential utilities and other potential impediments to the implementation of the remedial construction activities;
- Completing a conceptual groundwater flow model; and,
- Preparing a Community Air Monitoring Plan (CAMP) to be utilized during the implementation of the remedial activities at the Site.

Subsequent to NYSDEC approval of the Final RDWP, additional pre-remedial design activities were performed by National Grid US in order to gather supplementary information for the design of the selected remedy as well as to investigate remedial technologies. These activities included:

- Performing a material transportation analysis to evaluate alternatives for the transportation of materials to and from the Site in anticipation of planned remedial construction at the Site;
- Conducting a field investigation of the subsurface tunnel located along the northern portion of the Site;
- A field demonstration of the effectiveness of Waterloo Barrier® sheeting technology;
- Realignment of the DNAPL migration barrier located south of Beach Channel Drive due to existing Site constraints; and,
- Elimination of the excavation cell within the northeast corner due to further evaluation of Site investigation data.

The results of these additional activities are included with this RDR.

The following sections of the RDR detail the purpose, objectives, field implementation and results of each of the pre-remedial design activities implemented to support the design of the remedial construction activities.

2.1 NAPL Contingency Plan

The following describes the NAPL Contingency Plan to be implemented during the remedial construction activities.

2.1.1 Purpose of NAPL Contingency Plan

During the implementation of the planned remedial construction activities, soil removal will be limited to unsaturated zone soils. However, in limited circumstances, groundwater may be encountered (i.e., at the excavation bottom, during the removal of encountered structures containing source material, or during the flushing of the Waterloo Barrier® sheeting interlocks). Visible NAPL may be present either floating on the prevailing water table surface, at the unsaturated/saturated soil zone interface within the excavation, or encountered during the flushing of the Waterloo Barrier® sheeting interlocks. The NAPL Contingency Plan is designed to address the containment and removal of visible NAPL during the remedial construction activities.

2.1.2 Summary of NAPL Contingency Plan

Visible NAPL may be encountered at depth within the excavation areas. Indications of visible NAPL include the presence of an oil-like sheen or actual floating product. Visible NAPL may occur at the bottom of the excavation either floating on the water table or be present at the unsaturated/saturated zone interface. In addition, during significant rain events, NAPL may accumulate on storm water that may collect within an excavation. Elevated organic vapor concentrations will likely accompany the presence of visible NAPL.

In instances where visible NAPL is noted to be floating on the water table surface or on storm water within the excavation, absorbent pads/booms will be used to remove the NAPL. This approach is best suited for NAPL that appears as an oil-like sheen. Where the visible NAPL exists as floating product, the absorbent pads/booms will be used to collect and segregate the NAPL within the excavation. Once segregated, the NAPL will be recovered using a portable oil skimmer or similar device. The purpose of the skimmer is to remove the visible NAPL while minimizing the collection of water requiring disposal. In instances where visible NAPL occurs at the unsaturated/saturated zone interface, absorbent pads/booms will be used to entrain the NAPL and additional limited soil excavation will occur to remove the entrained NAPL. After completion of the

limited excavation, any residual floating NAPL will be addressed as discussed above. All collected NAPL will be containerized for subsequent off-site disposal.

In instances where visible NAPL is noted to be floating on the bottom of the trench during the flushing of the Waterloo Barrier® sheeting interlocks, absorbent pads/booms will be used to remove the NAPL. Similar to the NAPL recovery methods implemented during the remedial excavation activities, a portable oil skimmer or similar device will be utilized to recover NAPL. All collected NAPL will be containerized for subsequent off-site disposal.

In the case that a former MGP structure (e.g., tar tank, tar well, etc.) is encountered that contains a significant volume of NAPL where the use of an oil skimmer is impractical to remove the NAPL, the Remediation Contractor will mobilize suitable equipment to remove the material prior to decommissioning of the structure. Depending on the logistics (i.e., volume of NAPL, depth of the structure, etc.) a system of pumps and frac tanks or vacuum trucks equipped with an onboard vapor management system, as appropriate, may be utilized to remove the NAPL material from the structure. The NAPL will be containerized as removed, characterized and disposed of at an off-site facility properly licensed and permitted to accept this type of waste.

2.2 Supplemental Geotechnical and Environmental Investigations

The following subsections of this RDR discuss the implementation of the geotechnical investigation conducted to aid in the design of the excavation support shoring systems and for the design of the DNAPL migration barriers. In addition, the following subsections discuss the expansion of the investigation to include a supplemental environmental investigation to further delineate the extent of the source material (i.e., soil containing visible tar, oils and purifier wastes) in Site soils.

2.2.1 Purpose of Geotechnical Investigation

The objective of the supplemental geotechnical investigation was to acquire geotechnical data through the installation of soil borings, the collection of soil samples and the performance of various field and laboratory testing to provide geotechnical data to be used in the design of the shoring systems supporting the excavations. This supplemental geotechnical investigation was also performed to support the design of the installation of the DNAPL migration barriers.

2.2.2 Geotechnical Investigation Field Activities

The geotechnical investigation consisted of the installation of 31 soil borings (RPGSB-01 through RPGSB-31) across the Site. The geotechnical soil borings were performed by a licensed drilling subcontractor, Aquifer Drilling and Testing, Inc. (ADT), retained by National Grid US for this investigation. ADT provided truck mounted drilling equipment to perform the borings and utilized mud rotary

drilling techniques to advance the borings to the desired soil strata. In a majority of the boring locations, casing was installed in the upper portion of the borings to prevent the collapse of the borehole.

Representative samples of the subsurface soils were obtained by the Standard Penetration Test (SPT) procedures in accordance with American Society of Testing and Materials (ASTM) designation D 1586.

The drilling operations were performed under the full-time observation of a geologist from PS&SPC. The PS&SPC geologist maintained continuous logs of the materials encountered, classified the recovered soil samples and directed the sampling operations in order to obtain the desired subsurface information. Observations regarding soil staining, odors, and visible evidence/extent of product within the recovered samples were also noted on the individual soil boring logs along with the field classification.

Excess soil cuttings and bentonite drilling mud were containerized through the use of a drilling spoils washtub placed over the borehole throughout the drilling operation. As conditions warranted, the soil cuttings and drilling mud were periodically emptied from the washtub into 55-gallon drums for off-site disposal. Drilling operations then resumed with the addition of new drilling mud. Upon completion of each boring, all remaining spoils and drilling mud were placed in 55-gallon drums. The drums were appropriately labeled and staged within the Site limits. Each boring was subsequently cement grouted to the ground surface upon completion. At the conclusion of the field investigation, all recovered soil samples were delivered to PS&SPC's soil mechanics laboratory where they were texturally and visually examined and reclassified for geotechnical purposes where necessary. Detailed descriptions of the encountered soils are presented on the individual boring logs included in Appendix C.

2.2.3 Summary of Geotechnical Investigation Results

A general discussion of the Site geotechnical subsurface investigations is presented in the following subsections.

2.2.3.1 Subsurface Soil Conditions

The subsurface conditions evidenced by the borings can be generally described as a surficial layer of loose granular fill material intermixed with varying amounts of debris that are directly underlain by medium dense to dense sands with minor amounts of silt, except at boring RPGSB-30, where a stratum of organic soils, approximately ten feet thick, was encountered directly below the fill. Generalized descriptions of the strata are discussed below, in order of increasing depth.

Fill

Obvious fill was encountered in 26 of the 31 soil borings. Although the surficial sand in the remainder of the borings did not contain debris, the looseness of the sand is indicative of fill but this is not apparent from the sand's color and texture. At most locations, the thickness of the surficial fill, where present, ranged from about seven to 15 feet. The fill thickness is included with borings B-28 through B-31, which were located within or near the Bulkhead Area and ranged from 18 to 43 feet. Typically, the fill consists of loose fine and medium to find sands with less than 10 percent silt that contain varying amounts of debris, predominantly cinders and slag.

Organic Soils

Organic deposits were only encountered in boring B-30, which is located in the northwestern portion of the Site. The organic soils, which directly underlie the surficial fill, were present from depths of approximately 18 feet to 28 feet bgs. The soils comprising this stratum include soft/loose mixture of fine sand and organic clayey silt, and clayey silt containing numerous lenses of decomposed peat.

Sand

This stratum, which directly underlies Stratum O in boring B-30 and Stratum F in all other borings, typically consists of medium dense to dense fine and medium to predominantly fine sand with a trace amount of silt. Occasional loose zones and very dense zones were encountered at several locations. The thickness of these zones was generally less than 10 feet. All borings were terminated in Stratum S at depths varying from 35 feet to 131 feet bgs.

Groundwater Conditions

The depth to groundwater was not monitored during the supplemental geotechnical investigation due to the fact the bentonite drilling mud used to advance the mud rotary borings tends to impede groundwater inflow to the borehole. However, groundwater levels observed during the supplemental environmental investigation indicate the groundwater levels, at that time, ranged from approximately four and one half feet to eight feet bgs. Groundwater levels will fluctuate due to seasonal variations in precipitation and tidal influences.

2.2.4 Purpose of Supplemental Environmental Investigation

The purpose of the supplemental environmental investigation was to further delineate the extent of identifiable source material (i.e. soil containing visible tar, oils and purifier wastes) in Site soils.

2.2.5 Supplemental Environmental Investigation Field Activities

As part of the supplemental environmental investigation, 20 shallow soil sampling locations were located in the field as depicted on Design Drawing C-03. The purpose of this supplemental program was to confirm the extent of the Shallow Excavation Areas. Continuous soil samples were collected to a depth of 10 feet bgs. Three soil samples were collected at each sampling location. The sampler was driven to the required sample depth using a Geoprobe™ drilling rig that used direct push sampling technology. On retrieval, the samples were opened, screened with a photoionization detector (PID) and logged as to the soil type, fill material present, noticeable odors and visual contamination. A boring log with soil types, PID readings and the presence of any contaminants by visual or olfactory observations was prepared for each soil boring location.

2.2.6 Summary of Supplemental Environmental Investigation Results

It has already been reported that approximately two-thirds of the Site is composed of fill material that was brought in to fill Jamaica Bay in order to allow for construction of Beach Channel Drive. The expansion of the Site to a strip of land north of the existing plant occurred in the mid 1920s. The fill material, approximately 10 to 15 feet thick in most areas of the Site, is composed of sand with varying amounts of coarse and fine material. Mixed in with the sand fill are varying amounts of material consisting of ash, coal, coal clinkers, wood chips (purifier material), tar-like material, concrete, and shell fragments. These fill materials are remnants from the Former MGP that once occupied the Site. This is consistent with field observations noted during the supplemental geotechnical investigation. Also observed at general depths of between six feet and 10 feet bgs were sands saturated with a viscous brown oil with a moderate to strong naphthalene-like odor.

The investigation probes installed in the northwestern portion of the Site (RPIGP3, RPIGP4, RPIGP5 and RPIGP6), in the southeastern portion of the Site (RPIGP8 and RPIGP10) and along the southern portion of the Site (RPIGP12, RPIGP18, and RPIGP20) exhibited these oil saturated sands. A tar-like material was observed at depths generally between one, one and one-half and three feet bgs at RPIGP4, RPIGP17, RPIGP18, RPIGP19 and RPIGP20. The boring logs for the investigational probes RPIGP01 through RPIGP20 are contained in Appendix C of this RDR.

Groundwater was encountered at depths of four and one half feet to eight feet bgs. The zone that typically exhibited the highest PID readings was observed at between seven feet and 10 feet bgs (the probe termination depth).

Based on field observations gathered from the supplemental environmental investigation, additional shallow soil excavation is proposed to be completed as outlined on Design Drawing C-04.

2.3 Baseline Survey

For the purposes of the 50% to 75% RDR, the base map utilized for the preparation of the Design Drawings was a composite of a survey entitled "Topographical Survey Rockaway Park Gas Plant" prepared by National Grid US and dated September 18, 1995 and the figure entitled, "Figure 7-3A, Remedial Action Plan Alternative 3A" prepared by GEI.

A topographic survey was subsequently conducted on the Site by Nelson and Pope Engineers & Surveyors (Nelson & Pope) in October 2006 for both the On-Site Area and the Bulkhead Area. The survey activities included the identification and visual depiction of Site topography, surface features, relevant spot elevations, existing utilities, environmental wells, and property lines. In addition, the survey activities within the Bulkhead Area included surveying the extent of the plateau area, the top and bottom slopes, and the existing bulkhead. The October 2006 topographic survey has been incorporated into the Design Drawings included as Appendix A of this 100% RDR.

2.4 Subsurface Obstruction Survey

The following subsections of this RDR discuss the subsurface survey conducted to assess the presence of obstructions that may impede the implementation of the remedial activities.

2.4.1 Purpose of Subsurface Obstruction Survey

The purpose of the subsurface obstruction survey was to identify potential utilities and other impediments (i.e., former structures, foundations, etc.) along the proposed alignments of the DNAPL migration barrier and the proposed excavation areas.

The identification of utilities/impediments was determined to be necessary for the preparation of contingencies to remove, relocate or incorporate the potential obstructions during remedial construction activities. Further, the performance of the subsurface obstruction survey confirmed the locations of potential subsurface structures, piping and utilities identified on existing Design Drawings (Appendix A). All survey activities were conducted by Utility Survey Corporation (USC) of New Windsor, New York.

2.4.2 Subsurface Obstruction Survey Activities

2.4.2.1 Pre-Mobilization Survey Activities

Prior to mobilization to the field to conduct the subsurface obstructions survey, the New York Facilities Underground Protective Organization (NYFPO) as well as individual utility companies believed to have underground facilities within or adjacent to the Site were contacted to request a field mark out of their facilities. As a result of these contacts, several of the utility companies provided copies of drawings noting the locations of their facilities in the area of the Site.

In addition, historical facility drawings noting the overall layout of the Former MGP were provided to USC by National Grid US and PS&SPC. USC studied the drawings for information that may prove useful during the performance of the field survey.

2.4.2.2 Field Activities

The subsurface obstructions survey was conducted utilizing ground penetrating radar (GPR) supplemented with electro-magnetic pipe, cable and box locators (EM) and manual probings.

The survey was performed by USC in a manner that sought to maximize the retrieval of information and minimize the potential for error.

2.4.3 Subsurface Obstruction Survey Summary

The subsurface obstruction survey noted the presence of a number of subsurface features across the Site. A summary of the subsurface obstruction survey is depicted on Design Drawing C-02 of this RDR.

2.5 DNAPL Recovery Assessment

A DNAPL Recovery Assessment was completed between June 2003 and March 2004 and again between July 2005 and November 2005 to support the preparation of the Feasibility Study and the remedial design, respectively. In accordance with the NYSDEC-approved June 23, 2003 Tar Removal scope of work, measurable DNAPL that had accumulated within monitoring wells at the Site was removed to assess the recovery rate of DNAPL. Initial measurements were made at 23 monitoring wells at the Site to assess the presence of DNAPL in each well. Twenty-three monitoring wells were included in the initial assessment based on the following criteria:

- Wells containing measurable DNAPL during any previous sampling round;

- Monitoring wells screened across intervals that are either tar saturated or contain significant lenses of tar or tar coated material and where measurable quantities of DNAPL had not been observed to date; and,
- Monitoring wells that did not exhibit DNAPL impacts, but where another well in the same cluster exhibited DNAPL or is screened across an impacted zone as described above.

In 2003, measurements were made over a nine month period and the recovery rates, where applicable, were calculated. Recovery rates at monitoring wells RPMW-07I, RPMW-09I RPMW-09D were calculated at 0.08 feet per day (ft/d), 0.4 ft/d and 0.04 ft/d, respectively. The area around the RPMW-09 cluster, which is within the former location of the main operations and tar-handling area of the former MGP plant, appears to be the only location where any significant amount of DNAPL accumulates in wells.

In 2005, a single round of tar gauging and removal was conducted at six monitoring wells for the purposes of confirming the 2003 data. The six monitoring wells were those identified during the 2003 gauging rounds that exhibited measurable levels of DNAPL. Measurable DNAPL tar was identified in five of the six wells. Based on the data collected, the recovery rates appeared consistent with the 2003 data with one exception. The DNAPL recovery rate in monitoring well RPMW-09I (8×10^{-4} ft/d) was three orders of magnitude lower than in 2003. The limited amount of DNAPL recovered suggests that an automated recovery system is not warranted.

2.6 Conceptual Groundwater Flow Model

A groundwater flow model was developed of the Site using the United States Geological Survey's (USGS) MODFLOW program. The model was developed using data collected during the remedial investigations conducted at the Site. The model area was designed to replicate site geology, hydrogeology, tidal conditions, and subsurface anthropomorphic structures. The model was then verified using the 2000 tidal study and subsequent groundwater monitoring rounds as baseline conditions. The verified model provided an accurate depiction of the existing Site groundwater conditions.

The calibrated model was used to evaluate the DNAPL migration barrier conditions from Remedial Alternatives 4, 5, and 4A as presented in the ROD. The effects of each condition were evaluated with respect to groundwater overall flow direction and magnitude, and fluctuations in groundwater surface levels behind the proposed barriers. In addition, the flow direction and rate of individual particles from the behind the barrier conditions for Alternative 4A were evaluated as a means of estimating potential DNAPL migration pathways through or around the barrier as a function of groundwater flow.

For each alternative the groundwater flux through the proposed barriers was reduced significantly under both high and low tide conditions (88% to 84% under Alternatives 4 and 5 and 98% to 99% under Alternative 4A). Under all alternatives, a portion of the groundwater flow would bypass two edges (ends) of the migration barrier into and out of

the Site at high and low tide. The decreased flow through the barrier and the flow around the edges of the barrier(s) create a stagnation zone behind the barrier where the tidal influence is dampened. Groundwater levels in wells located behind the barrier and the center of the Site maintain similar average groundwater elevations as the existing conditions (within +/-0.2 feet); however, the amplitude of the tidal fluctuations is reduced. There was little to no observed effect on the tidal fluctuations or groundwater levels in the wells located at the southern Site boundary along the Rockaway Freeway.

In addition to the model simulation for groundwater flux and levels, two particle tracking simulations were conducted for each model layer which depict the location of individual groundwater particles at one month intervals after release behind the On-Site Barrier and between the two barriers.

For the model simulation of the particles released behind the On-Site Barrier, the particles released near the edges of the barriers bypass the 50-foot barrier horizontally and migrate to the model north boundary (ocean). Particles released from the center positions in the shallow layers bypass the 50-foot barrier vertically and migrate to the ocean. The model predicts that the groundwater travel time from the center positions behind the On-Site Barrier to the ocean under Alternative 4A will increase by a order of magnitude relative to existing conditions (17.5 years verses 1.5 years, respectively).

For the model simulation of the particles released between the two barriers, the particles bypass the Bulkhead Barrier and migrate to the model north boundary (ocean) either horizontally or vertically under the Alternative 4A condition. As with the On-Site Barrier, it takes much longer for particles to bypass the barrier and migrate to the ocean under the Alternative 4A condition. For example, the model predicts that a particle starting between the barriers near the western edge of the Bulkhead Barrier takes about five years and eight months to migrate to the ocean under the Alternative 4A condition compared to about one year under the existing condition.

Using the groundwater particle flow migration represents a worst case scenario for migration of particles through or around the barriers. Allowing for the differences in fate and transport between dissolved phase particles and DNAPL, this simulation shows that particle flow through or around the barriers will be severely retarded for groundwater and consequently much more retarded for the flow of a more viscous material like DNAPL that relies on preferential pathways and gravity as a means of transport. Given the very slow travel times and the low DNAPL recover rates measured at the Site as detailed in Section 2.5 of this RDR, a passive DNAPL observation/recovery well network is appropriate.

2.7 Community Air Monitoring Plan

A CAMP has been developed and is included in Appendix D of this RDR. The CAMP has been developed to provide specific procedures for measuring, documenting, and responding to potential airborne contaminants during the remedial construction activities.

The CAMP will be implemented to reduce risk of potential exposure of neighboring residents to MGP-related contaminants.

The CAMP is designed to:

- Provide monitoring, Alert/Action Limits, and contingency procedures for site work to prevent exposure of nearby residents to potential volatile contaminants; and,
- Provide a contingency plan that prevents significant airborne contaminant release from the Site.

During the implementation of remedial construction activities, fence line perimeter air monitoring will be conducted using a combination of real-time continuous air monitoring stations at fixed locations and, as necessary, hand-held, portable equipment at various perimeter and work zone monitoring locations.

A Contingency Plan with defined, specific response actions will be implemented if Alert Limits or Action Limits for any contaminant are exceeded. The response actions, potentially including work stoppage, will prevent or significantly reduce the migration of airborne contaminants from the Site.

The CAMP is being implemented in addition to the work zone monitoring that will be conducted by Posillico in accordance with the Site-Specific Health and Safety Plan.

2.8 Material Transportation Analyses

2.8.1 Preliminary Material Transportation Analysis

The 50% to 75% RDR submission included an evaluation of options associated with transporting material to and from the Site utilizing barges. The evaluation included the possibility of utilizing the existing subsurface tunnel that connects the On-Site Area and the Bulkhead Area in order to convey materials between the two areas. Both the transport of impacted material and clean backfill were evaluated.

Impacted Material

As detailed in the 50% to 75% RDR submission, the evaluation concluded that it was more cost-effective to transport impacted material off-site by trucks as compared to barges. In addition, concerns associated with transporting impacted material by transport barges (i.e., potential odor generation, material spillage/releases and multiple points of material handling [barge to rail to truck]) presented significant obstacles to the successful transport of impacted materials by barge.

Clean Backfill

For clean backfill, the evaluation concluded that it was not cost-competitive to deliver clean backfill material to the Site by barges as compared to truck transportation. Barge transportation was incrementally higher in cost than truck transportation. Although the material cost for clean fill delivered to the Site by barge was lower than that for truck delivery, the net cost for barge delivery was higher due to the greater ancillary costs (i.e., labor, equipment, etc.) associated with the on-site handling and conveyance system infrastructure.

Based on this evaluation, National Grid US has concluded that the transport of materials to and from the Site utilizing barges was not viable due to cost, concerns for potential odor generation, material spillage, and the uncertainty of the structural integrity of the existing subsurface tunnel.

2.8.2 Revised Material Transportation Analysis

Subsequent to the issuance of the 50% to 75% RDR as well as the 95% RDR to the NYSDEC, National Grid US has facilitated meetings with community representatives informing them of the planned remedial construction activities. Based on feedback received during these meetings, commercial truck traffic resulting from the planned remedial construction activities was identified as an issue of concern. As such, National Grid US retained the services of PS&SPC and Shaw Environmental & Infrastructure of New York, PC (Shaw) to conduct a revised material transportation analysis, the results of which are detailed in the Material Transportation Analysis Report (Transportation Report) included in Appendix E.

2.8.2.1 Purpose of the Revised Analysis

As detailed in the Transportation Report, the purpose of the analysis was to identify and evaluate the full range of viable alternatives required for the off-site disposal of excavated impacted materials and the on-site delivery of clean backfill associated with the planned remedial activities. The analysis identified transportation alternatives that met a set of specific criteria that had been established for the Site. The criteria included: (1) constructability (alternatives must be constructed using accepted engineering methods); (2) schedule impacts (alternatives should not negatively impact the existing remedial construction schedule); (3) regulatory compliance (alternatives must be acceptable to the regulatory agencies); and, (4) community impacts (alternatives should minimize potential adverse impacts to the surrounding community).

2.8.2.2 Alternatives Evaluated

The evaluated alternatives were advanced from an initial screening process. The initial screening matrix for both impacted soil and clean fill is included in the Transportation Report. The alternatives that were not advanced from the initial screening process were eliminated due to constructability issues, potential generation of odors, or physical Site limitations (existing overhead electric transmission lines).

Alternatives that were evaluated in the Transportation Report are highlighted below.

Impacted Soil

- Alternative 1A1 – Alternate Truck Routes
- Alternative 1A2 – Time Restrictions for Transport Vehicles
- Alternative 1B1 – Truck to Adjacent Facility
- Alternative 2A3 – Use Containers Through Existing Tunnel
- Alternative 2B1 – Trucking Impacted Soil to the Bulkhead Area
- Alternative 3A1 – Use of On-Site Mobile Thermal Desorption Unit

Clean Backfill

- Alternative 1A1 – Alternate Truck Routes
- Alternative 1A2 – Time Restrictions for Transport Vehicles
- Alternative 1B1 – Trucking From Adjacent Facility
- Alternative 2A1 – Convey Backfill Through Existing Tunnel
- Alternative 2A2 – Pneumatically Convey Backfill Through Existing Tunnel
- Alternative 2A4 – Convey Backfill Through Existing Tunnel Using Containers
- Alternative 2B1 – Truck Backfill to Site Area Using Roll Offs or Containers
- Alternative 2B2 – Truck Backfill to Site Area in Bulk
- Alternative 3A1 – Use of On-Site Mobile Thermal Desorption Unit

2.8.3 Conclusion

The selected alternative for the transportation of impacted materials from the Site to approved disposal facilities is "Alternative 1A2 – Time Restrictions for Transport Vehicles". Based on the results of the analysis, this alternative was considered to be constructible, will not present significant adverse impacts to the project schedule, is regulatory compliant and will reduce the potential adverse

impacts to the surrounding residential communities. Under this alternative, transport vehicles would only travel through the surrounding communities during limited daytime hours. These hours would be limited to off-peak hours for existing traffic and during time periods in which residents would most likely be away from their homes. The time period proposed is between the hours of 9:00 am until 2:00 pm.

The selected alternative for the transportation of clean backfill is "Alternative 1A2 – Time Restrictions for Transport Vehicles". Based on the results of the analysis, this alternative was considered to be constructible, would not present significant adverse impacts to the project schedule, is regulatory compliant and reduces the potential adverse impacts to the surrounding residential communities. Under this alternative, transport vehicles would only travel through the surrounding communities during limited daytime hours. These hours would be limited to off-peak hours for existing traffic and during time periods in which residents are most likely to be away from their homes. The time period proposed is between the hours of 9:00 am and 2:00 pm.

2.9 Subsurface Tunnel Exploration

The following subsections of this RDR discuss the subsurface tunnel exploration activities completed in order to evaluate the possibility of conveying materials between the On-Site Area and the Bulkhead Area.

2.9.1 Subsurface Tunnel Exploration

As detailed in the October 28, 2005 Letter Work Plan to the NYSDEC, the purpose of the tunnel exploration effort was to expose the ends of the tunnel and evaluate the possibility of utilizing the tunnel to support material management activities during remedial construction activities at the Site.

2.9.2 Field Activities Summary

On December 12, 2005, Coastal Environmental mobilized to the Site and began exploration activities by exposing the tunnel terminus in the On-Site Area (area south of Beach Channel Drive). The tunnel was measured to be approximately 12.5 feet in width with a height of approximately six feet. National Water Main Cleaning Company conducted a closed circuit television (CCTV) inspection of the interior of the tunnel. The CCTV inspection consisted of use of a small inspection vehicle equipped with a pan and tilt camera. Remotely controlled, the inspection vehicle entered the tunnel opening in the On-Site Area and provided a real-time inspection of the tunnel interior. The inspection revealed that the tunnel is backfilled with soil throughout its entirety. The backfilled soil mounds to within one foot of the tunnel roof apparently throughout the full length of the tunnel. The CCTV inspection remote controlled unit could not advance more

than approximately 35 feet into the tunnel due to the mounded backfill and due to an existing pipe rack on the tunnel sidewall. During the inspection, the CCTV unit would slide down the mounded backfill against the pipe rack and become inundated and incapable of advancing. The backfilled soil appeared to be free of debris and based on visual observations and PID readings, the soil appeared to be unimpacted by Site activities.

In the Bulkhead Area, the tunnel sidewalls were exposed by excavating the overburden soil. The overburden soil consisted of fill material with concrete and asphalt debris. The roof of the tunnel in the Bulkhead Area was not located. It is believed that the roof of the tunnel in the Bulkhead Area commences under the existing sidewalk or Beach Channel Drive. As such, the tunnel terminus was not exposed by Coastal within the Bulkhead Area due to concerns that excavation would undermine the existing sidewalk or Beach Channel Drive.

Upon completion of the field activities, the tunnel terminus in the On-Site Area was enclosed with a steel road plate and the terminus on the Bulkhead Area was backfilled with the excavated soil.

Based on these findings, and as reflected in the Material Transportation Analyses previously referenced, use of the tunnel for the conveyance of excavated materials and/or clean backfill is not considered to be feasible due to issues associated with constructability.

2.10 Steel Sheet Piling with Sealed Interlocks Field Demonstration Program

2.10.1 Purpose of the Field Demonstration Program

A field program was implemented at the Site in order to determine the feasibility of using steel sheeting with sealed interlocks as the preferred methodology for installation of the DNAPL migration barriers. The system of sheet piling with sealed interlocks that was demonstrated was the Waterloo Barrier® system. The following is a description of the system summarized from a technical paper presented at the 1997 International Technology Containment Conference.

The Waterloo Barrier® system consists of conventional sheet piling with a modified interlock. A sealable cavity is incorporated into the interlock between adjacent sheet piles as the sheeting is manufactured. The barrier is installed utilizing conventional pile driving technologies. A foot-plate at the base of the cavity reduces the build-up of compacted soil and the entry of obstructions during pile installation. After driving the entire length of the sheet, each cavity is jetted clean using pressurized water and air. Following the cleaning and inspection of the cavities, a low permeability sealant is emplaced from the bottom to the top of

each cavity[3]. Overall wall hydraulic conductivities of 10^{-8} to 10^{-10} centimeters per second (cm/s) have been demonstrated during field installations of this technology.

2.10.2 Field Demonstration Program

In accordance with the NYSDEC-approved January 19, 2006 Letter Work Plan, a total of four Waterloo Barrier® sheet piles were installed at the Site. The sheet piles were driven to a terminal depth of approximately 120 bgs utilizing a vibratory hammer. This depth corresponded to the planned depth of the center portion of the On-Site DNAPL migration barrier as described in the December 2005 RDWP.

Each of the sheet piles was installed in two sections to facilitate their installation. The first section (i.e., bottom section) consisted of a 65 foot length of steel sheeting reinforced along the top and bottom five feet. The second section (i.e., top section) consisted of a 60 foot length of steel sheeting. The bottom sections were driven consecutively leaving approximately six feet of sheeting above the ground surface. Once the bottom sections were installed to a depth of 60 feet bgs, the top five feet of each sheet pile were torch cut and removed. The top sections were then threaded onto and welded in place to each installed sheet. To provide additional support to the weld, reinforcement plates were added to each side of the sheet. Once welding/reinforcements were completed, each sheet was driven to approximately the final design depth. The results of the sheeting demonstration were as follows:

- Sheet No. 1: driven to a depth of 119+/- feet bgs using a vibratory hammer;
- Sheet No. 2: driven to a depth of 119+/- feet bgs using a vibratory hammer;
- Sheet No. 3: driven to a depth of 119+/- feet bgs using a vibratory hammer; and
- Sheet No. 4: driven to a depth of 119+/- feet bgs using a vibratory hammer.

Approximately one foot of sheeting was left above the ground surface to minimize the potential for damage to the vibratory hammer resulting from contact with surface soils and to provide a sufficient length of sheeting to allow for complete extraction.

[3] David Smyth, Robin Jowett and Murray Gamble, "Sealable Joint Steel Sheet Piling for Groundwater Control and Remediation: Case Histories", Paper Presented at the International Containment Technology Conference, St. Petersburgh, Florida, February 9 to 12, 1997.

The flushing of the interlocks was also demonstrated. Specifically, the three interlocks were flushed over the entire 120-foot length including the one foot stick-up. The results of the flushing were as follows:

- Interlock between Sheet Nos. 1 and 2: flushed to its entire length of 120 feet;
- Interlock between Sheet Nos. 2 and 3: flushed to its entire length of 120 feet; and
- Interlock between Sheet Nos. 3 and 4: flushed to its entire length of 120 feet.

The flushing of each interlock was completed with relative ease to a length of approximately 105 feet. Between approximately 105 feet and the terminal depth of 120 feet, the sheet piles had to be vibrated in order to clear obstructions within the interlocks and flush the final 15 feet.

Following the flushing of the interlocks, each of the sheets was extracted and decontaminated as per the NYSDEC-approved Letter Work Plan. Upon completion of decontamination, the sheets were staged on the Site for potential future re-use.

2.10.3 Summary of Field Demonstration Program Results

A letter report discussing the results of the field demonstration program was submitted to the NYSDEC on March 24, 2006. A copy of the detailed Summary Report prepared by C3 Environmental is included as Appendix F.

Based upon the results of the demonstration program, National Grid US and its Remedial Design Team developed the following conclusions regarding the use of Waterloo Barrier® sheeting:

1. Waterloo Barrier® steel sheeting can be successfully driven to a depth of 120 feet bgs by splicing two 60 foot sections of steel sheeting and adding reinforcement plates welded to each side of the spliced sheets; and

2. Interlocks between each sheet can be successfully flushed and grouted to a depth of 120 feet bgs.

Approval for use of Waterloo Barrier® sheeting as the selected technology for installation of the DNAPL migration barriers was received from the NYSDEC on March 28, 2006.

2.11 DNAPL Migration Barrier Realignment

As currently configured, an active 33 kV overhead electrical transmission/distribution line extends along the southern side of Beach Channel Drive parallel to the proposed alignment of the On-Site DNAPL migration barrier. This transmission line is one of two that services the electrical requirements of the Rockaways. Disruption to this transmission line would leave the Rockaways vulnerable to potential electric power reductions or losses. To ensure protection of the overhead transmission line, the Long Island Power Authority (LIPA) has requested that a 15 foot lateral distance be maintained between the barrier wall/construction equipment and the overhead transmission lines. To ensure that the 15 foot lateral distance is maintained, the On-Site Migration Barrier was relocated 20 feet to the south of its original proposed location. This set back distance accommodates both the mandatory 15 foot lateral clearance from the overhead lines and a five foot allowance for the width of the vibratory hammer. In addition, the eastern and western terminus of the On-Site Barrier were each be reduced laterally by 15 feet in order to accommodate the overhead transmission lines along Beach Channel Drive (western terminus) and the intersection of Beach Channel Drive and Beach 108th Street (eastern terminus). Based on this requirement, National Grid US relocated the On-Site Migration Barrier as depicted on Design Drawing C-04. The Barrier Wall Plan and Profile is depicted on Design Drawings C-10 and C-11.

There will be no change to the modeled groundwater conditions after re-alignment of the barrier that will have adverse effects on the selected remedial alternative. The new On-Site Barrier alignment will not cause any groundwater mounding effects behind the On-Site Barrier and the barrier will have similar reductions in groundwater flow through the On-Site Barrier in its new alignment.

As a result of the movement of the On-Site Migration Barrier, excavation of shallow soils will occur on the north side of the barrier utilizing trench boxes or similar measures. The northern extent of the excavation will be limited by an existing underground 33 kV electrical distribution line that runs parallel to Beach Channel Drive at a depth of approximately three and one half feet bgs on the Beach Channel Drive side of the northern Site fence line. At the request of LIPA, this underground line will be protected from potential disturbance by a three foot horizontal buffer. As such, soils within this three foot buffer will remain in place. Note, however, that the top two feet of soil will be removed using "soft-dig" methods in order to install the Site-Wide Cap.

From a source material management perspective, movement of the migration barrier will increase the amount of source material located between the On-Site and the Bulkhead Barriers. Based on the lateral extent of tar-saturated soil as depicted on the Remedial Investigation Report Plates 9, 10, and 11, there appears to be additional limited areas of tar saturation that will be on the north side of the On-Site Barrier as described below.

- In the 12 to 24 foot bgs depth interval, there will be additional materials remaining on the north side of the On-Site Barrier to the east of the existing storage garage. Although the tar saturated zone to the north of the On-Site Barrier will double in width parallel to the barrier, the total potential volume that will be north of the On-Site Barrier is minimal when compared to the volume that will remain behind the On-Site Barrier.

- In the 24 to 45 foot bgs depth interval, there will be additional materials remaining on the north side of the On-Site Barrier to the east of the existing storage garage and in the former substation area. As with the 12 to 24 foot interval, these materials are minimal when compared to the volume that will remain behind the On-Site Barrier. In addition, the materials located in the former substation area do not appear to have migrated beyond the Site boundary.

- In the 45 to 90 foot bgs depth interval, there will be additional materials remaining on the north side of the On-Site Barrier to the east of the existing storage garage. As with the other intervals, these materials are minimal when compared to the volume that will remain behind the On-Site Barrier.

These areas represent a limited extent of material that will remain north of the On-Site Barrier.

The movement of the On-Site Barrier will affect the installation of passive DNAPL recovery wells at the Site boundary. DNAPL has been observed in the former substation area within 20 feet of the Site boundary. This location may not be accessible after the installation of the barrier. In addition, the extent of the DNAPL in this area will extend to the north of the On-Site Barrier. Therefore, recovery/observation wells will need to be installed on each side of the On-Site Barrier in this area, where accessible, to ensure that efforts are made to assess and recover DNAPL, where feasible.

2.12 Elimination of Northeast Excavation Cell

The Feasibility Study and RDWP included a limited shallow excavation cell in the northeast corner of the Site. After additional review of Final Remedial Investigation data, there was no evidence of source material within the proposed excavation depth at this location. As a result, shallow soil excavation is not proposed in that portion of the Site.

3.0 REMEDIAL ACTIVITIES

The following sections detail the remedial design activities (i.e., 100% design level) to be performed at the Site in accordance with the requirements of the ROD. In general, the work will be implemented in the sequence of events summarized below.

1) Mobilization/Site Preparation Activities
   - Mobilization of Temporary Facilities
   - Construction of Staging Areas
   - Location of Underground 33 kV line
   - Removal of Interior Fencing
   - Installation of Soil Erosion and Sediment Control Measures
   - Construction of Decontamination Pad

2) Pre-Remedial Activities
   - Implementation of the Perimeter Utility Cut and Cap
   - Erection of Temporary Tent Enclosure
   - Protection/Abandonment of Existing Monitoring Wells
   - Pre-Trenching for DNAPL Barriers

3) Remedial Activities
   - Excavation/Backfilling in Shallow Excavation Area
   - Installation of Temporary Shoring Along Perimeter of Site (where necessary)
   - Installation of Bulkhead Area Migration Barrier
   - Installation of Soil Cap in Bulkhead Area
   - Installation of On-Site Migration Barrier
   - Installation of DNAPL Recovery Wells
   - Construction of Site-Wide Cap
   - Completion of Excavation/Backfill in Shallow Excavation Area
   - Completion of Site Wide Cap

4) Demobilization
   - Complete Punch List Items
   - Demobilization

Although listed in the general sequential order, several of the activities listed above will be performed concurrently. For example, site preparation activities consisting of the location of the underground 33 kV line may be performed while interior fencing is being removed and temporary facilities and staging areas are being constructed. Excavation activities in the Shallow Excavation Area will be performed while DNAPL migration barriers and temporary shoring are being installed. Further, construction of the Site Wide Cap may occur in areas of the Site while excavation activities in the Shallow Excavation

Area are occurring in other portions of the Site. The actual sequencing of events will depend on the logistics of the various work activities as implemented in the field.

3.1 Site Preparation

The Site will be prepared, as necessary, to facilitate the implementation of the planned remedial construction activities. Site preparation activities will include, but will not be limited to, the following activities:

- Recording existing conditions by photo documentation or surveying;
- Establishing construction entrances;
- Establishing a secure Site perimeter;
- Managing, protecting and supporting existing utilities;
- Removal of vegetation and on-site debris, as required;
- Establishing/upgrading Site haul roads;
- Establishing vibration and noise monitoring locations; and
- Conducting selective demolition, including removal of internal fences and abandoned utility poles.

Other site preparation activities will include the following activities:

- Establishing and maintaining soil erosion and sediment controls (SESC);
- Locating and isolating perimeter utilities;
- Providing temporary site facilities; and,
- Decommissioning selected groundwater monitoring wells.

These activities are further described in the following subsections of the RDR.

As detailed in a NYSDEC-approved Demolition Work Plan (September 2006), the former three-story office and one-story welding shop buildings located in the northwest and north-central portions of the Site, respectively, were demolished in March 2007. These buildings were demolished in order to facilitate the planned installation of the On-Site DNAPL Migration Barrier. The demolition activities were performed by Gramercy Group, Inc. in accordance with the requirements of the New York City Department of Environmental Protection (NYCDEP) and New York City Department of Buildings. After the demolition of the buildings was completed, the Site was restored by placing compacted fill materials to the level of adjacent grades.

A brief summary of the demolition activities performed is provided below:

- A pre-engineered sidewalk bridge was installed in front of the three-story office building to provide overhead protection for pedestrians;
- Full height scaffolding was provided on the western side of the three-story office building;

- Electric and gas service pipes and conduits were cut and sealed at-grade;
- A "drop zone" in the rear of the building on the north side was established and was cordoned off and barricaded for health and safety purposes;
- Slab and wall demolition proceeded systematically using a combination of hand and mechanical means from the top of the structure to the bottom;
- Floor beams and columns were torch cut;
- Above grade floor slabs were removed in small pieces utilizing a mini-excavator equipped with a hydraulic hammer;
- Water hoses were utilized to control dust; and
- Construction debris was characterized, segregated by type and loaded into transport trucks for off-site disposal at an approved disposal/recycle facility.

3.1.1 Soil Erosion and Sediment Control

Prior to commencement of land disturbance and demolition activities, temporary SESC measures will be installed and maintained by Posillico. The elements of the proposed SESC measures will be designed and installed in accordance with the New York State Standards and Specifications for Erosion and Sediment Control (previously titled New York Guidelines for urban Erosion and Sediment Control manual).

Posillico will utilize Best Management Practices (BMPs) including silt fencing, hay bale dikes, storm drain inlet protection, stabilized construction entrances/exits and dust control measures. The SESC measures will be installed as shown on Drawing No. C-06 and in strategic locations based on visual observation of flow patterns and the topography of work areas to control sediment entrained stormwater from existing and entering work areas. Stone access roads will be constructed throughout the Site to ensure truck traffic remains on clean materials. During remedial construction, SESC measures will be inspected and maintained on a daily basis and following precipitation events. Accumulated sediment will be removed from the SESC measures, as needed. Sediment that originates from the excavated area will be added to the stockpile for off-site disposal. Sediment will be removed from behind the silt fence and hay bales when sediment accumulates to a depth greater than 0.5 feet deep behind the barrier. Construction phase SESC measures will be inspected and maintained after every rain event.

Temporary Stabilized Construction Entrance(s)/Exit(s)

As shown on Drawing No. C-06, the construction entrances will be constructed with a non-woven geotextile overlain with coarse aggregate. Two entrances will be constructed at the Site. The main construction entrance will be located on the northeastern side of the Site (Beach 108th Street). The second temporary (short-term) entrance will be located along the northern side of the Site and accessed from Beach Channel Drive. The Beach 108th Street entrance will serve as the

main entrance. Tires of transport trucks exiting the Site will travel across these stabilized entrances and can be further inspected at these points. Routes on-site and off-site will be routinely monitored for build-up of excessive site soils and dust.

Silt Fence/Hay Bale Dikes

Silt fence/hay bale dikes will be installed around the eastern, southern and western perimeters of the Site as shown on Drawing No. C-06. Additional silt fence/hay bale dikes will be installed to delineate the limit of the work areas (installed on the down slope side), around the perimeter of any stockpile areas as well as in strategic locations based on visual observation of flow patterns and topography of work areas to control sediment entrained storm water from entering and exiting work areas.

Decontamination Pad

A decontamination pad will be constructed at the entrance of each temporary tent enclosure set up to clean trucks and equipment by mechanical means as well as with the use of high pressure, low volume, and hot water, as needed.

The decontamination pad will consist of a smoothly graded area large enough to accommodate the largest anticipated piece of construction equipment. Large rocks, stones and other obstructions will be removed from the prepared subgrade to prevent damage to the overlying decontamination pad containment system. Berms will be installed along both sides of the decontamination pad. The floor and berms will be covered with a thin layer of sand or stone dust overlain with a double layer of 40 mil high-density polyethylene (HDPE) geomembrane and a non-woven geotextile cushion layer. The 40 mil HDPE geomembrane layers will be installed in one continuous piece and the geotextile layers will be overlapped a minimum of 12 inches. An eight inch layer of three-quarter inch clean stone will be placed on top of the two geosynthetic layers. Wood planks or mats may be placed on top of the eight-inch stone layer to provide a stable traveling surface for vehicle wheels and tracks.

The entrance and exit of the decontamination pad will be ramped. Side shields or screens will be installed on both sides of the decontamination pad to prevent overspray outside the limits of the pad. The decontamination pad will be well marked to aid truck drivers that are directed to the decontamination pad prior to exiting the tent.

The decontamination pad will be graded to a sump to allow decontamination rinse water to be captured and transferred to a 55-gallon drum or a frac tank. Collected rinse water will be sampled for waste characterization analysis and disposed of

accordingly. Residual soil or waste materials generated during decontamination will be collected and managed with the excavated impacted soils.

After completion of the remedial activities, the components of the decontamination pads (i.e., sand or stone dust, HDPE geomembrane layers, the non-woven geotextile and the clean stone will be managed as contaminated materials. These materials will be characterized and disposed of at an off-site facility permitted to accept the various types of waste.

Dust and Odor Control Measures

Dust and odor control measures will include the use of a temporary fabric enclosure, water spraying, covering stockpiles and open excavations with sheeting and/or tarps and odor suppressant foams. As part of the removal of former MGP features, dust control measures will include the spraying of water or misting the work areas to ensure the concrete and brick is moist.

As designed, the use of the temporary fabric enclosure and the vapor management system are to serve as the primary odor and dust control measure being employed at the Site. The majority of earthwork remedial activities known to represent the greatest odor-generating potential will be performed under the enclosure.

Dust control measures will be implemented to minimize the potential for dust generation during soil excavation and handling, stockpiling and placement of fill. With the exception of the temporary enclosure, the primary method of dust control will be the application of water spray using water trucks and/or flat hose(s) connected to a water supply. Heavily traveled truck routes will be wet down by the water truck to minimize dust emissions. Truck routes on-site will be continuously monitored for excessive build-up of Site soils or dust. Durin g freezing temperatures, NYSDEC approved dust suppression measures will be spread in lieu of water to minimize the potential for ice at the Site. Additional dust control measures will include covering open excavations and stockpiles of soil, as required, to prevent erosion and dust generation.

Proper cleaning of trucks exiting the Site will aid in minimizing/eliminating potential off-site impacts from dust. Stabilized construction entrances/exits consisting of smoothly graded areas large enough to accommodate equipment and truck traffic will be constructed at exit points to clean tires of transport trucks exiting the Site. The base will be covered with non-woven geotextile and coarse aggregate and will be maintained and redressed while in use.

Truck routes on-site and off-site will be inspected continuously during high truck traffic periods for accumulation of excessive soil or dust. Proper cleaning of trucks exiting the Site will eliminate dusty conditions on adjacent roadways. Transport trucks exiting the Site will pass through an inspection area and will be

inspected to ensure tires and undercarriages are clean and that tarps are secured. Excessive mud and loose soil observed on the trucks will be manually removed with brooms and brushes, as necessary.

The majority of the excavation and soil handling activities will be performed within the temporary fabric enclosure to minimize potential impacts from odors. Some of the excavation activities (i.e., perimeter utility cut and cap, pre-trenching for the migration barriers and temporary excavation support system, etc.) will be performed outside of the enclosure. Odor will be monitored during excavation and handling of impacted soils from the Site. In the event that odor emissions are detected, controls will be implemented. Odor controls will include the use of odor suppressing foam and foaming devices or tarps to cover open excavations or stockpiles.

Odors will also be controlled by sequencing excavation in a manner that will result in manageable areas of open excavation. Odors will be mitigated, if necessary, by placing a layer of non-odorous soils or polyethylene sheeting over the excavation area or stockpile (overnight and off-hours). In addition, foam application equipment and an adequate supply of odor reducing foaming agent will be available for application to the excavation area or stockpiles, as needed.

3.1.2 Site Survey

A professional land surveyor licensed in the State of New York will be utilized to perform necessary surveying activities. Survey activities will include a pre-remedial Site survey (pre-condition assessment (PCA)), establishing work areas, establishing locations of utilities, verifying field quantities for pay items, and preparation of record of construction ("as-built") drawings.

3.1.3 Clearing and Grubbing

Vegetation and debris will be removed from the work zones and other areas where remedial activities will occur. Debris, stumps, roots and other vegetation that is generated during clearing operations will be stockpiled, characterized and disposed of off-site at an appropriate disposal facility.

3.1.4 Temporary Site Facilities

The temporary facilities required to facilitate the remedial activities will include providing office trailers, establishing required utilities, equipment staging areas, material staging areas, a decontamination area and pads, and ingress/egress to the Site. The proposed locations of these features are shown on Drawing C-06.

Posillico will provide temporary utilities as there are no existing utilities at the Site. These utilities will consist of electricity, telephone service, water supply, and sanitary facilities.

3.1.4.1 Office Trailers

Posillico will mobilize office trailers to the Site to be utilized during the implementation of the proposed remedial construction activities. The locations of the office trailer for National Grid US, the NYSDEC, PS&SPC, the Air Monitoring Contractor (ENSR) and Site Security are depicted on Drawing No. C-06. The office trailers and their contents will comply with requirements of the Technical Specifications (Section 01500) included in Appendix B of this RDR.

3.1.4.2 Equipment Staging Areas

Equipment staging areas will be established by Posillico at locations indicated on Drawing No. C-06. The staging areas will be located so as to facilitate equipment ingress and egress and allow for proper sequencing of the excavation work. Construction equipment will be mobilized on an as-needed basis. Table 3-1 outlines a general equipment list of the proposed type and quantity of major equipment to be utilized throughout the project. This equipment list and quantities may be subject to change based on actual field conditions.

TABLE 3-1: GENERAL REMEDIATION EQUIPMENT LIST

Equipment Type	Equipment Make and Model	Equipment Use
Excavator	Komatsu PC-308-USLC-3	Excavation
Excavator with Hammer	Caterpillar 345B	Processing of remnant structures
Mobilram	ABI TM-18/22B	Sheet Pile Installation
Payloader	Caterpillar 980G	Loading of remediation derived wastes
Dozer	Caterpillar D6	Stockpiling, grading
Grader	Caterpillar 12H	Grading
Rubber Tire Backhoe	Caterpillar 446-B	Excavating, stockpiling, grading
Roller	Caterpillar CS-563C	Compaction
Excavator	Caterpillar 322C	Excavation
Cherry Picker	Grove RT635C	Sheet pile installation
Water Truck	To Be Determined	Dust control

TABLE 3-1: GENERAL REMEDIATION EQUIPMENT LIST		
Equipment Type	**Equipment Make and Model**	**Equipment Use**
Rusmar Foam Dispensing Machine	1600/40 and 400/25	Odor Control
Welding Machine	Lincoln Commander 300	Sheet pile installation
Welding Machine	MultiQuip 400A	Sheet pile installation
Crushing Plant	To Be Determined	Processing of remnant structures
Manlifts	To Be Determined	Temporary structure erection, sheet pile installation
High Pressure Water Jet	NLB Corp. 10275D	Decontamination

3.1.4.3 Material Staging Areas

The proposed material staging areas are shown on Drawing No. C-06. The staging areas will be established for excavated material, debris, liquid wastes and clean backfill. The staging areas will be physically segregated to prevent cross-contamination or commingling of materials. To the extent feasible, materials intended for off-site transportation and disposal will be staged in areas of the Site that are not proximate to existing off-site roadways in order to minimize the potential for off-site impacts. Staging areas for excavated soils and impacted debris will be principally located within the temporary enclosure on areas to be subject to excavation. Where it is not feasible to locate the soils/debris within the temporary enclosure, excavated soils and impacted debris may be staged outside of the enclosure on areas of the Site anticipated for the planned shallow excavation. All staging of excavated soil and impacted debris that may occur outside of the temporary enclosure will be performed on staging areas that are underlain by plastic sheeting with perimeter berms to contain run-on and run-off. Excavated soils and impacted debris staged outside of the temporary enclosure will be covered with plastic to minimize impacts from odors as well as the effects of weather. Odor suppressing foam will be applied to stockpiles, as necessary, to minimize the potential for impacts from odors generated by the impacted soils.

3.1.4.4 Ingress/Egress

Two ingress/egress points are proposed for the remediation activities. The primary ingress and egress to the Site will be from Beach 108th Street. The secondary ingress and egress point is located along Beach Channel Drive. The proposed ingress/egress locations are indicated on Drawing No. C-06. The necessary municipal permits to maintain a construction entrance/exit will be

obtained for the duration of the project. These permits will be obtained by Posillico prior to mobilization to the Site.

The proposed ingress and egress points will be constructed as detailed on Drawing No. C-06. The temporary construction ingress/egress points will be constructed as described in Section 3.1.1.

3.1.4.5 Decontamination Area

During the implementation of the remedial construction activities, the Site will be divided into three primary zones: the exclusion zone (EZ), the contamination reduction zone (CRZ), and the support zone (CSZ). These locations will be identified in the field during the implementation of the remedial activities based on the current work area(s). The decontamination area will be within the CRZ and will include the personnel decontamination area and the equipment decontamination pads.

3.1.4.6 Grout Plant

The grout plant to be used to mix the grout to seal the sheeting interlocks will consist of a small trailer-mounted colloidal mixer powered by a diesel engine. The mixing apparatus consists of water storage tanks, pressure gauges and reducers, hosing, an air motor driven slow speed agitator, and the colloidal mixer. Pre-determined amounts of water and grout are added to the colloidal mixer where the mixture is blended. This arrangement ensures consistent volumetric measurement for all batches. The mixer will be equipped with pneumatic grout discharge lines that will be used to inject grout into the DNAPL migration barrier sheet piling interlocks.

3.1.5 Site Security

Site security will be provided at the Site 24-hours per day and seven days per week. During Site working hours, a Posillico employee will be assigned to the main entrance gate to control access to the Site. The employee will be equipped with a two-way radio with phone service to ensure constant contact with Site personnel.

All Site workers, subcontractors and Site visitors will be required to sign a daily log. A list of persons authorized for Site entry will be maintained at the site entrance.

Posillico will utilize a subcontracted Site security company to provide manned Site security during non-working or inactive Site periods. Posillico will provide a separate enclosure (trailer) for security operations. The proposed location of the Security Trailer is depicted on Figure C-06. At a minimum, the Security Trailer

will contain a designated phone line and two way radios if more than one guard or attendant is utilized.

Posillico will maintain a stock of temporary fencing and spare locks on the site in the case that it is needed as additional security fencing for localized security measures. Personnel assigned to performing site security will not be required to adhere to the training, certification and medical monitoring program defined in the Site-Specific Health and Safety Plan (HASP). A copy of the HASP is included in Appendix G. However, site security personnel will be briefed on the site hazards. Security personnel will not be allowed into or instructed to enter any on-site EZs. All EZs will be delineated as such. Security personnel will be limited to patrolling the perimeter of the delineated EZ. All security personnel will be routinely briefed on those areas deemed inaccessible. The perimeter of the Site will be secured and locked during non-working hours. Perimeter security checks will be performed hourly and conditions will be logged.

3.1.6 Perimeter Utility Cut and Cap

Posillico will perform a utility cut and cap excavation along the perimeter of the Site to identify and manage utilities entering the Site. The following describes the approach to be implemented by Posillico when locating and managing the utilities around the perimeter of the Site.

Utility Location

A variety of methods will be used to initially locate and identify underground utilities. The methods will consist of reviewing historical facility drawings provided by National Grid US as well as the results of a subsurface obstruction survey performed as a pre-design activity (refer to Drawing No. C-02). In addition, Posillico will contact the New York City – One Call Center to field locate and mark-out all off-site underground utilities along the site perimeter. Finally, Posillico will retain the services of a utility contracting service to investigate the Site perimeter for potential utilities. National Grid US will also coordinate with LIPA and National Grid US's internal representatives to field locate its utilities along the Site perimeter, to the extent feasible.

Trenching

Posillico plans to excavate a two-foot to three-foot wide trench along the perimeter of the Site with the exception of the northern perimeter (adjacent to Beach Channel Drive). Along the northern perimeter, the perimeter cut/cap trench will be expanded to a width of approximately 10 feet to 12 feet. The extension of the width of the trench in this area is due to the presence of the overhead utility lines and logistical issues with the use of the temporary enclosure and the proposed trench support system (trench box).

The trench will be installed inboard of the Site perimeter so as not to undermine the perimeter silt fencing. An alternating sequence of hand excavation followed by mechanical excavation will be employed at all times. Posillico will manually excavate and probe the surface of the excavation prior to any soil being removed from the trench by mechanical means. The utility clearance activities will proceed at all times under the assumption that there will be an unmarked and active utility underground. Manual excavation activities will begin at a distance of two feet from the utility markout.

In the area of known utilities, excavation activities will commence perpendicular to the mark-out and will be enlarged according to the accuracy of the mark-out and the depth of the utility, if known. If a utility is not found ten inches bgs, the overburden material will be removed using a backhoe. This procedure will be repeated until the utility is located. If the utility is discovered at a depth greater than five feet bgs, Posillico will utilize shoring (typically a trench box), and/or an open cut and bench excavation methods that comply with the requirements of OSHA as listed in 29 CFR 1926.650, Subpart P.

In the case of areas where the presence of utilities is questionable, excavation of overburden material from the trench will involve hand digging and heavy equipment, as necessary. Posillico will manually excavate and probe the surface of the excavation prior to soils being removed by a backhoe. The depth of the manual probe will average six inches to ten inches. The amount of soil removed from the trench by the backhoe will not exceed the depth of the previous manual probe in order to minimize the chance of a premature line break. After completion of the probe, the next cut would be removed by the backhoe. Alternatively, soft dig techniques (i.e., use of Vactor or Guzzler-type equipment) can be used to excavate the trench and expose subsurface utilities. The excavation will be observed, at all times, for any indications of movement of the soils, soil consistency and foreign objects which may identify the presence of underground utilities.

After discovery of subsurface features, hand excavation methods or soft dig techniques will be employed to identify the feature. The final depth of the trench will be limited to the deepest utility/piping or to a maximum depth of the groundwater table (estimated to be eight feet bgs) or as directed by National Grid US.

The Perimeter Utility Cut and Cap activities will not be performed under the temporary enclosure. In order to mitigate potential impacts from odors and dust, odor controlling foam will be applied to the trenches, as necessary. In addition, trenches will be backfilled to grade daily to mitigate potential odors and/or dust emissions.

Trench Stabilization/Shoring

The final depth of the trench will be limited to the deepest utility or the depth of the groundwater table. This final depth will be determined in the field by National Grid US, PS&SPC and ARCADIS. If the resulting trenches are greater than five feet in depth, Posillico will either utilize a trench box(es) to support the sidewalls of the trench or bench the sidewalls of the trench in accordance with the requirements of 29 CFR 1926.650, Subpart P.

Material Stockpiling

Soils excavated from the trench and planned for off-site disposal will be temporarily staged adjacent to the trench, within the Site boundary, in lined and tarped roll-off containers. The soil will be staged a minimum of two feet from the edge of the trench as to conform to the minimum OSHA set-back requirements for trenches/excavations. Stockpiled soils and debris will be visually evaluated by PS&SPC, in conjunction with NYSDEC, for the presence of source material. Soil and debris judged to contain source material (based on visual observation) will be moved to a temporary stockpile area, staged in lined and covered roll-off containers for management as waste material for off-site disposal. Materials that are deemed to not contain source materials will be returned to the trench. Any additional soils required to backfill the trench will consist of certified clean fill.

Utility Breaking/Plugging

When a utility line or piping is located, Posillico (in consultation with National Grid US, PS&SPC and ARCADIS), will attempt to identify the utility/line. Utilities encountered during trenching activities, whether marked or unmarked, will be assumed active unless otherwise determined. Identification of the status of a utility line will be made using the procedures identified below.

- Consultation with National Grid US, PS&SPC and ARCADIS.
- Review of historical drawings of the former MGP Site.
- If the utility cannot be identified as an inactive line, Posillico will contact the New York City One Call Center and request that a notice be transmitted to all utility owners in the area.
- If the utility owners cannot identify the utility, Posillico will attempt to determine the orientation, origin and/or terminus of the utility by investigating nearby surface features (i.e., pull boxes, manhole covers, etc.), utilizing manual or soft dig methods or by procuring the services of a private utility mark-out service employing ground penetrating radar (GPR) and other electromagnetic methods.
- The horizontal and vertical location of the identified utilities will be surveyed in the field and recorded on a "Record of Construction" Plan. In

addition, the location of the perimeter utility cut and cap will be recorded on the record of construction plan.

If a utility appears to be active, a representative of the utility company will be contacted to evaluate the line, determine the utility's disposition and terminate the service, as required.

For utilities/lines that are determined to be inactive, initial penetration of the utility/pipe will involve use of spark-proof drilling tools to create a small, approximately one-inch diameter hole in the utility/pipe. Access to the interior of the line will allow initial screening of the internal atmosphere with a combustible gas indicator (CGI) as well as a photo- or flame ionization detector (PID/FID) to determine the potential for an explosive atmosphere. Action levels presented in the Site-Specific HASP (refer to Appendix G) will be used to determine if an explosive atmosphere is present within the line. If screening indicates that a potentially explosive atmosphere exists within the utility, one or both of the following activities will be taken to mitigate the hazard:

- Purge or ventilate the line; and/or,
- Inert the line with a non-reactive gas (i.e., carbon dioxide or nitrogen).

Prior to and during purging or inerting activities, all potential sources of ignition will be removed from the immediate work area.

Once screening has identified acceptable conditions within the line, a non-sparking saw, such as a "Nibbler", or similar, will be utilized to cut and remove a section of pipe within the existing property line, or as close as is practical. Utility/piping sections that will be cut and removed for purposes of line breaking and capping will be visually examined for presence of asbestos or asbestos containing material (ACM).

Subsurface piping that contains product, product residue or exhibits elevated PID/FID readings will be drained to the extent practical. In connection with piping that extends beyond the perimeter of the Site, residual product will be evacuated through the use of either vacuum extraction, high pressure water, steam or an equivalent method. The final method of product evacuation will be determined in the field based on the size and condition of the encountered utility. Any residual material that drains or is evacuated from the line will be collected and segregated for characterization and off-site transportation and disposal.

Piping will then be cut, capped/plugged and abandoned in-place. Plugging of the line will require the mixing and placing of grout (hydraulic cement) into the open end of the cut line. Bentonite will be mixed with the soils being placed as backfill adjacent to the plugged lines.

If ACM is suspected to be present, Posillico will temporarily halt work in the area and notify PS&SPC and ARCADIS. A properly certified and NYCDEP licensed professional, Iron Eagle Environmental Services, Inc. of Wantagh, New York (Iron Eagle), will evaluate the conditions and, based on observations in the field, will recommend one of the following actions, as appropriate:

- Resumption of the work if it is determined that suspect ACM is not present in the work area;
- Alternate methods in the work area to eliminate any potential disturbance of the suspect ACM; or,
- Arrangement for additional screening of the observed conditions and discontinuance of the work in the immediate area of the suspect ACM until further notice. In this instance, Posillico will isolate the suspect area by the installation of a temporary barrier (i.e., caution tape, construction safety fencing, etc.).

After assessment of the conditions as described above, when necessary, Posillico will arrange for appropriate actions such as sampling of the suspect ACM. If determined to be necessary, Iron Eagle will perform an asbestos inspection and condition assessment of the material and area, collect appropriate bulk samples and send the samples to a laboratory certified under the NYSDOH ELAP for analysis.

Iron Eagle will determine when work may proceed in the area based on the results of the inspection and laboratory analysis of the samples. If asbestos is determined to be present at a regulatory level (greater than 1% asbestos), Posillico will utilize Iron Eagle to remove the materials.

The ACM removal approach is summarized below.

1. Proper notifications will be made to the NYCDEP, New York State Department of Labor (NYSDOL) and the USEPA per applicable requirements.
2. All work will be performed by Iron Eagle (License Number 99-0057), a licensed Asbestos Removal Contractor employing Certified Asbestos Handlers wearing appropriate personal protective equipment (PPE).
3. Work procedures will follow applicable Federal (USEPA and OSHA), State (NYSDOL) and City (NYCDEP) asbestos regulatory requirements including, but not limited to:

    - Demarcation of the work area and posting of warning signs;
    - Adequately wetting the asbestos material during removal;
    - After wetting and removal, properly packaging ACM wastes in leak-tight containers while wet (i.e., double bagging or wrapped);

- Labeling the container or wrapped waste with OSHA warning labels;
- Marking the container/wrapped waste with the name of the waste generator (National Grid US) and Site address;
- Loading the containers/wrapped waste into transport vehicle with appropriate warning labels;
- Preparation of Waste Shipment Records for each shipment of ACM that is transported from the Site; and,
- Transportation and disposal of ACM waste at Tri-State Transfer Associates Inc. (Bronx, NY) a properly licensed and permitted off-site disposal facility.

Dewatering

Utility lines/piping are anticipated to be located above the groundwater table elevation. However, it is possible that some lines may extend below the groundwater table. If required, Posillico will temporarily dewater the trench (localized dewatering) to access and cut /cap the line. Localized dewatering will be performed using a positive displacement pump at a low point in the trench. Generated fluids will be handled as summarized below.

An inspection of the area subject to the localized dewatering activities will be conducted. The inspection will be performed to verify the presence/absence of NAPL, odors, sheens or other indications of impacts to the groundwater. If indications of impacts to the groundwater are noted by PS&SPC/NYSDEC, Posillico will containerize all effluent from the dewatering system. Once characterized, the impacted groundwater will be disposed of at an off-site facility that is properly licensed and permitted to accept the waste fluids.

If no indications of impacts to the groundwater are noted by PS&SPC/NYSDEC, all effluent from the dewatering system will be pumped to an area of the Site designed to allow the estimated volume of water to be dewatered from the area to recharge into the subsurface. The "recharge" area(s) may be located in a different portion of the Site, as necessary, depending on the logistics of the work area to be subject to the dewatering activities. All dewatering activities will be subject to the following conditions:

- The water must percolate into the ground within 24 hours. No ponding of water for an extended period of time will be allowed;
- The area where the water is to be discharged (i.e., the "recharge" area) must be downgradient of clean areas and a reasonable distance from a clean area;
- No water will be allowed to be subject to overland flow. All water dewatered from an area must be transferred to the "recharge" area by piping and contained within the acceptance area; and,

- Dewatering activities will only be allowed to occur during working hours.

The side slopes of the recharge area will be covered, as necessary, with an impermeable liner (Claymax 200R as manufactured by CETCO Lining Technologies of Arlington Heights, Illinois) and gravel to prevent erosion and penetration of the dewatering discharge into adjoining areas. The need for the impermeable liner will be determined in the field by the NYSDEC, National Grid US, and PS&SPC. The base of the recharge area will be covered with a six-inch layer of gravel to prevent silt build up and facilitate the percolation process. A construction detail of the proposed recharge area is presented on Drawing No. C-09.

Once all dewatering is completed, the impermeable liner and gravel materials will be removed from the recharge area and disposed of off-site. The recharge area will be restored to grade by backfilling the area with certified clean fill.

Underground 33 kV Electrical Transmission/Distribution Line Location

In addition to the active overhead 33 kV electrical transmission/distribution line that extends along the southern side of Beach Channel Drive, there is an active underground 33 kV electrical transmission/distribution line that is located along the northern boundary of the Site. During the perimeter utility cut and cap work, Posillico will identify the exact location and depth of this utility in order to eliminate potential electric power reductions or losses.

To verify the location of the 33 kV line, Posillico will coordinate with National Grid US to arrange for a representative of the Long Island Power Authority (LIPA, the Owner of the 33 kV line) to confirm the mark-out and be present on-site during activities associated with exposing, locating and restoring the area around the 33 kV line.

If the 33 kV line is noted to be present below the existing sidewalk or asphalt roadway surface, a hydraulic backhoe will be utilized to remove the surfacing material (i.e., concrete and/or asphalt). After removal of the surfacing materials, Posillico will utilize soft-dig techniques to uncover the 33 kV line. All excavation will be performed by hand, beginning at a distance of two feet from the utility mark-out utilizing non-conductive (fiberglass) tools or, if requested by LIPA, a vactor-type guzzler truck. Test pits will be performed at ten foot intervals to locate the alignment of the utility. The test pits will be enlarged according to the accuracy of the mark-out and the depth of the utility. No machinery or tools will be allowed to contact the surface of the 33 kV line. If the depth of the line is found to be greater than four feet bgs, the use of the Vactor may be utilized to supplement the soft dig techniques.

Once the 33 kV line is exposed, the utility location and elevation will be surveyed by a Professional Surveyor licensed in the State of New York. The surveying will be performed adjacent to the 33 kV line so as no instruments will come in contact with the line.

After the survey is completed, all test pits will be marked with a survey stake as per LIPA's instructions. Once the mark-out is approved by LIPA, Posillico will commence backfill operations in accordance with LIPA's requirements. Following restoration, Posillico will place additional survey stakes with warning signs at an offset distance of 15 feet away from the line to maintain awareness of the location of the 33 kV line.

Existing Utility Poles

Posillico will protect and support existing on-site utility poles that are actively in service and are within or immediately adjacent to the planned remedial work areas. Posillico will protect and support the existing on-site utility poles that are to remain in place in accordance with the requirements of the pertinent utility company and Design Drawing C-09.

3.1.7 Existing Environmental Wells

Due to the inherent difficulties imposed by the planned remedial construction activities, protection of the existing on-site monitoring wells within the Shallow Excavation Areas would be difficult and impractical. Monitoring wells located outside of the Shallow Excavation Areas will be protected during remedial construction activities. Monitoring wells to be protected as well as those to be abandoned are identified on Design Drawing C-04. Monitoring wells designated to be abandoned will be abandoned by a New York certified licensed well driller in accordance with the NYSDEC, Division of Environmental Remediation (DER), Groundwater Monitoring Well Decommissioning Procedures, dated April 2003. Monitoring wells that are to remain will be protected by wooden fences/barricades, orange construction fencing and applicable signage. All Site personnel will be made aware of these areas in the daily safety discussions.

Monitoring wells slated for abandonment will be decommissioned by Delta Well and Pump, Inc. of Ronkonkoma, New York prior to Site excavation activities. Where possible and practical, the well will be abandoned by removing the casing. When removal is not possible or practical, the entire casing, including the annular space between the riser and the casing (if applicable), will be filled with a grout mix consisting of a cement-bentonite slurry in the ratio of 7.8 gallons of water to 3.9 pounds of dry bentonite to 94 pounds of dry Portland cement. Grout will be placed in each well under pressure using a tremie pipe. The tremie pipe will be placed at the bottom of the well and be slowly raised as grout fills the well. The tremie pipe will be removed once grout is observed at the top of the casing.

Displaced groundwater generated during abandonment activities will be collected and containerized in 55-gallon drums for off-site disposal. Casings will be removed to an approximate depth of eight feet bgs during Site excavation activities.

3.2 Excavation Areas

As depicted on Design Drawing C-04, excavation activities within the Shallow Excavation Areas will consist of removing observed source material to a depth of eight feet bgs, which is the approximate depth to the groundwater table. As previously discussed, the results of the supplemental geotechnical and environmental investigations warranted the expansion of the Shallow Excavation Areas beyond the limits detailed in the ROD. Assuming an average excavation depth of eight feet bgs, the volume of material to be removed from the proposed Shallow Excavation Areas is estimated to be approximately 88,000 cubic yards (in-place).

In addition, excavations outside of the designated Shallow Excavation Area will occur to a depth of two feet bgs in order to accommodate installation of the Site-Wide environmental Cap. However, the excavation depth for the construction of the Cap may be less in those areas of the Site where the proposed grade is higher than the existing grade. All areas of the Site will contain a two foot thick cap consisting of imported clean materials (refer to Section 3.5).

3.2.1 Excavation Approach

All impacted soils will be removed and either temporarily stockpiled or loaded directly into transport vehicles for off-site disposal within the enclosure. Saturated soils that are encountered as excavation progresses will be staged adjacent to the excavation area and will be allowed to gravity drain back into the excavation. Drier soils may be used to mix with the wet soils until soils meet the disposal facility parameters for moisture content and are adequately dried for loading into transport vehicles.

Subsurface foundations and former industrial piping will be removed as discussed in Section 3.3 of this RDR.

If source material is visually observed to extend beyond the excavation boundaries, then excavation activities will extend horizontally beyond the boundaries to the extent feasible. The maximum horizontal expansion of the Shallow Excavation Area will be limited to the Site boundaries as shown on Design Drawing C-04. Excavation that has the potential to undermine existing public rights-of-way (i.e., sidewalks, roadways, infrastructure beyond the Site perimeter) will not be implemented. National Grid US and the NYSDEC representative will make the final determination as to whether or not encountered material is constituted to be source material. The determination for removal will

be based on a combination of visual observations and field screening techniques. The maximum horizontal extent of the remedial excavation areas will be limited to the Site boundaries as shown on Drawing No C-02.

3.2.2 Shallow Excavation Approach

With the exception of the excavation activities required to construct the Site-Wide Cap as well as at portions of the Site where overhead restrictions are present, all remedial excavation activities within the Shallow Excavation Areas will be conducted within a temporary fabric enclosure to control the release of volatile emissions and odors. The temporary fabric enclosure will be re-located, as necessary, as the remedial excavation activities progress.

Excavations will proceed once the temporary fabric enclosure and vapor management system (VMS) are positioned. Soil will be removed with a standard excavator and either stockpiled within the enclosure or placed directly into transport vehicles within the temporary enclosure. Excavations will continue to a depth of eight feet bgs, if necessary, based on the presence of source material or former MGP structures. Once the design depths are achieved, the area will be backfilled to roughly within two feet of the final cap surface grade to allow for installation of the Site-Wide Cap. Once this elevation is achieved, the area will be graded and the Site-Wide Cap installed to the finished elevations shown on Drawing No. C-07.

The assembled tent enclosure (the temporary fabric enclosure) will be moved by either pulling the tent enclosure with a dozer and/or payloader. The placement of the enclosure will be planned in a manner that minimizes the amount of relocations required. Configurations and relocations may change based on actual field conditions. The mode of movement will depend on where the enclosure is positioned and where it will be positioned next. Tent enclosure movements will be in an east-west and north-south direction and will be performed by pulling the enclosure on the tent enclosure skid-plate system with a dozer and payloader. Once in position, the tent enclosure will be ballasted in place with concrete blocks placed over steel plates at each structure tent enclosure rib.

3.2.3 Temporary Fabric Enclosure

In those portions of the Site where overhead restrictions are not present, the planned excavation areas will be performed within a temporary fabric enclosure. Posillico will utilize one fabric enclosure measuring approximately 118 feet by 197 feet equipped with a 45 degree peak roof.

The fabric enclosure is a stressed membrane enclosure consisting of aluminum framework of arched ribs, which will support a durable all-weather PVC fabric membrane. The fabric membrane will be designed to be resistant to the elements

of weather on the enclosure's exterior while also being resistant to environmental impacts on the enclosure's interior.

The fabric enclosure is designed for a standard wind load of 110 mph (based on an "Exposure Category C" factor and a 3 second gust) in accordance to Chapter 31 of the New York State Building Code.

The enclosure will be equipped with adequate lighting to allow for those limited instances when Site work must be conducted in low ambient light conditions. To facilitate the viewing of remedial construction activities within the enclosure, observation windows are placed at strategic locations to allow for viewing from multiple angles. Finally, one 14 foot by 16 foot cargo door and two personnel ingress/egress doors are included to facilitate both vehicle and Site worker movement within and outside of the enclosure.

The enclosure will be equipped with a VMS designed to provide a minimum of six air exchanges per hour and to process recovered air from within the enclosure. To achieve the required air exchanges, the VMS will be equipped with four (4) units consisting of a 20,000 cubic feet per minute (cfm) blower and damper, adsorber with 16,000 pounds (lbs) of reactivated vapor phase carbon, particulate filter and breakthrough indicator. For ease of movement, the VMS components will be stationed on flatbed trucks and connected to the enclosure components with flexible ducts. A 20 kilowatt generator will be used to power the VMS components. The 20 kilowatt generator will be a MQ Power Whisper Watt Generator (Model DCA-25SSI).

When the enclosure is ready to be moved, the VMS components and generator will be disconnected and moved by truck to the next location where the enclosure will be repositioned and the components reconnected. Placement of the VMS will be closely coordinated with excavation sequencing and enclosure movement to ensure there is sufficient room for the flatbed trucks and generator to be staged outside the enclosure. Emissions from the VMS will be continuously monitored (every 15 minutes) using a properly calibrated photo-ionization detector (PID) and detector tubes, if needed, to ensure compliance with emissions criteria for benzene, toluene, ethyl benzene and xylene (BTEX) is achieved.

The design package associated with the temporary fabric enclosure is included in Appendix H of this RDR.

3.2.3.1 Vapor Management System

The temporary fabric enclosure will be equipped with a VMS that will provide six air exchanges per hour for the interior of the enclosure and the depth of excavation while maintaining negative air pressure within the enclosure.

The temporary building is approximately 118 feet by 197 feet with a 45 foot high, 45 degree peak roof. The volume of the enclosure is approximately 697,000 cubic feet. Excavation within the enclosure will create an additional volume of up to 101,570 cubic feet of air space for a total volume of approximately 798,570 cubic feet. At six air changes per hour, the required flow rate is 79,860 cubic feet per minute (cfm). Each NB20 air handling/treatment system is rated for 20,000 cfm. Therefore, four air handling systems will be used to achieve the required air change for the remediation activities. The engineered design package for the VMS is included in Appendix I.

The VMS is designed to process (utilizing carbon adsorbers) the recovered air from within the enclosure to remove contaminants in order to meet NYSDEC air emission standards and the requirements of the Health and Safety Plan (HASP). Posillico will continuously monitor (every 15 minutes) the emissions from the VMS utilizing a properly calibrated PID. If the PID readings exceed 10 parts per million (ppm) or greater above background, detector tubes for BTEX will be utilized to sample the VMS exhaust to determine BTEX concentrations. The calculated discharge of BTEX will be compared to the NYSDEC Guidelines for Control of Toxic Air Contaminants (Appendix J). Posillico will ensure that the type and quantity of carbon media used in the VMS will meet the emission limits for BTEX.

3.2.4 Excavation Shoring/Sheeting Plan

Posillico will shore the excavations, as necessary, within the proposed Shallow Excavation Areas. As depicted on Design Drawing C-05, the proposed shoring design includes a combination of benching and steel sheeting installation. In areas where the proposed excavations extend greater than two feet in depth and located adjacent to a roadway, sidewalk or the existing electric substation, temporary steel sheet piling will be installed to a depth of approximately 25 feet bgs. Posillico will install the steel sheet piling prior to excavating along the roadways, sidewalks, or the existing electric substation. The design of the temporary steel sheet pile earth support system, signed and stamped by a Professional Engineer licensed in the State of New York, is presented on the attached Drawing P-1. Further, engineering calculations associated with the design of the system are included in Appendix K.

In areas of the Site where the proposed excavations do not abut the roadways, sidewalks, or existing electric substation, the excavations will be benched back as required to provide a stable excavation side slope. The benching of excavations will meet the OSHA sloping requirements as specified in 29 CFR 1926.650, Subpart P.

Since the proposed Shallow Excavation Area extends beyond the proposed northern extent of the DNAPL migration barrier, Posillico will use trench boxes to safely and effectively excavate soil (down to the existing groundwater table) between the DNAPL migration barrier and to within three feet of the underground 33kV transmission line parallel to Beach Channel Drive.

During the installation of temporary steel sheet piling, noise and vibration monitoring will be conducted as detailed in subsequent sections of this RDR.

3.3 Removal of Former MGP Features Within the Shallow Excavation Areas

Former MGP features including foundations, piping, tanks and other industrial features encompass a substantial portion of the Site. The majority of these features are below grade but there are some that can be seen at grade. As depicted on Design Drawing No. C-01, the existence of these features is the result of the former MGP operations that have occurred at the Site.

All former MGP features encountered during the Shallow Excavation Activities will be removed under the temporary enclosure where they will be separated into visibly clean and visibly impacted material during the excavation process. All odor and dust control will be provided by the temporary enclosure during this activity. All contaminated excavated materials including liquids, soil and remnant material will be managed and clearly delineated within the temporary enclosure .

3.3.1 Former MGP Features Containing Source Material

Former MGP features within the planned remedial excavation areas (that potentially contain source material) will be removed to the extent practical. In order to facilitate the removal of encountered structures that potentially contain source material, the excavation may be deepened, as necessary.

Encountered foundations and similar structures will be demolished utilizing a hoe ram, hydraulic hammer or equivalent attachment mounted on an excavator, backhoe or other conventional excavation equipment. After demolition, the debris will be prepared and decontaminated, as necessary, to meet the acceptance criteria of the selected disposal or recycling facility. Preparation will consist of demolishing the surface slabs into pieces that are manageable and meet facility acceptance criteria. Decontamination of concrete debris will consist of pressure washing using a high pressure, low volume power washer. In addition,

physical/mechanical agitation (scraping with hand tools) of soil may be utilized to minimize wastewater generation. Generated decontamination fluids will be containerized on-site where fluids will be characterized for off-site disposal.

Subsurface piping that contains product or product residue or exhibits elevated PID readings will be removed to the extent practical. Piping that extends beyond the perimeter of the Site, including into the existing electrical substation, will have any residual product evacuated through the use of vacuum extraction, high pressure water/steam or equivalent method to the extent practical. The final method of product evacuation will be determined in the field and will be based on the size and condition of the encountered piping. The piping will then be cut, capped and abandoned in place as discussed in Section 3.1.6.

3.3.2 Former MGP Features Not Containing Source Material

Former MGP features within the planned remedial excavation areas (that do not potentially contain source material) will be removed only to the planned excavation depth (i.e., eight feet bgs). These features will be removed from the excavation, crushed on-site in a mobile processing plant and either re-used on-site as backfill material or disposed off-site as construction debris at a facility(ies) approved by National Grid US.

3.4 DNAPL Migration Barriers

Two parallel subsurface DNAPL migration barriers are planned to be installed at varying depths along the northern portion of the Site. The locations and alignments of the migration barriers are depicted on Design Drawing C-04. The first barrier, located immediately south of Beach Channel Drive, extends to within 15 feet of the eastern edge of the existing Electric Substation in the northwest corner of the Site and to within 15 feet of the eastern corner of the Site at the intersection of Beach 108th Street and Beach Channel Drive for a total linear distance of approximately 695 feet. This migration barrier, known as the On-Site Barrier, will be installed at two different depths. The center section of the On-Site Barrier will extend to a depth of 120 feet bgs for a linear distance of approximately 250 feet. Two flanking 50 foot bgs barriers will be installed on either side of the center section of the On-Site Barrier for a combined linear distance of approximately 440 feet.

The second migration barrier, known as the Bulkhead Area Barrier, will be installed within the Bulkhead Area to a depth of 70 feet bgs and a linear distance of approximately 170 feet. The installation of the migration barriers will serve two purposes. First, both barriers will inhibit the migration of DNAPL to areas located downgradient of the Site, including Jamaica Bay. Second, the On-Site Barrier will allow DNAPL to be passively recovered by recovery wells to be installed upgradient and immediately downgradient of the On-Site Barrier. The proposed locations of the recovery wells are depicted on Design Drawing No. C-04.

The DNAPL migration barrier locations and configurations were selected based on the results of the conceptual groundwater flow modeling conducted as part of the pre-design activities as well as limitations imposed by the existing LIPA overhead and underground electric transmission lines as discussed in Section 2.10. As presently configured, the DNAPL migration barriers are expected to have little to no effect on groundwater elevations outside the immediate area of concern. Given the geology, Site access constraints, and desire to minimize short-term impacts on the surrounding community, the DNAPL migration barriers are currently proposed to be constructed utilizing steel sheeting with sealed interlocks. Based on the results of the completed field demonstration program, the steel sheeting with sealed interlock system will consist of the Waterloo Barrier® system (refer to Appendix F).

3.4.1 Pre-Trenching Activities

In order to manage subsurface obstructions and utilities, a trench will be excavated along the proposed alignment of the DNAPL migration barriers. The trench will be excavated to a depth of eight feet bgs (or immediately above the groundwater table, whichever is encountered first). The width of the trench will allow for the top of the sheeting to be driven to a terminal depth of two feet below the final proposed ground surface. Any obstructions such as former foundations and construction debris encountered during the pre-trenching activities that have the potential of hindering the installation of the migration barriers will be removed and temporarily staged on-site for off-site disposal. The approximate locations of the staging areas are depicted on Design Drawing C-06.

Excavation support for the pre-trenching along the alignment of the DNAPL migration barriers will be performed using trench boxes or will be benched as appropriate. Trench boxes will be installed in excavations using a zero-swing excavator and an appropriately rated four-way cable. The trench boxes will be installed once the excavation reaches a depth of four feet bgs. Once the trench box is installed, the excavation will continue to the required depth of eight feet bgs (or immediately above the groundwater table, whichever is encountered first).

In the event that soil containing source material is encountered during the pre-trenching activities, the soil will be removed. The soil will be staged on-site where National Grid US and the NYSDEC representatives will make the determination as to whether or not the soil contains source material. This determination will be based on visual observation and field screening techniques (i.e. PID readings).

After completion of the excavation, backfilling will take place within the trench box. Fill will be placed in lifts and compacted accordingly. The trench box will be lifted in intervals as not to exceed the previously placed lift. Once the

excavation has been backfilled to four feet bgs, the trench box will be removed and backfilling will continue.

Posillico plans to backfill the trench with either excavated soil (non-source material containing soil) or clean off-site material to within three feet of the ground surface. The DNAPL migration barrier will then be driven to two feet below the final proposed ground surface as described below. Final backfilling of the remaining three feet of the trench will occur during installation of the Site-Wide Cap. In the Bulkhead Area, the final three feet of the trench will be backfilled during the subsequent installation of the cap.

3.4.2 Installation of the DNAPL Migration Barriers

The subsurface DNAPL migration barriers, consisting of a Waterloo Barrier® sheet pile system, will be installed along the proposed alignment as depicted on Design Drawing C-04. The barriers will consist of Waterloo Barrier® WEZ95 steel sheeting. Both the top and bottom five feet of each steel sheet will be reinforced with two 3/8-inch stiffener plates to improve driving mechanics. The stiffener plates will be attached at the Site by a New York State Certified Welder.

All sheeting will be installed using an ABI Mobilram TM18/22B to provide high stability and precision as well to minimize noise and vibration impacts to off-site structures. Due to constraints pertaining to work in the vicinity of the 33kV overhead power lines between June 1 and September 1, the Bulkhead Area Migration Barrier will be installed first. The on-site DNAPL migration barrier consisting of the 120 foot depth center section and the two 50 foot depth sections will be installed after September 1, when work is permitted in the vicinity of the 33kV overhead power lines.

The installation of the DNAPL migration barrier near the overhead power lines will adhere to the required 15 feet setback in the vicinity of the 33kV overhead line, the 10 feet setback in the vicinity of the 13kV overhead line and the 5.5 feet setback in the vicinity of the insulated 33kV overhead line. In addition, the following precautions will be taken when working in the vicinity of overhead power lines:

- All sheet piles will be staged on the south side of the proposed barrier alignment;
- The tracks of the ABI Mobilram will be parallel to the barrier alignment;
- The position of the ABI Mobilram's boom will at no time be perpendicular to the barrier;
- Each sheet pile will remain attached to the ABI Mobilram until installed; and,

- A racking system will be used during the driving to ensure proper alignment and verticality.

In order to achieve the required depth of 120 feet bgs for the center section of the on-site migration barrier, splicing will be required. Two 60 foot sections will be spliced together by driving the first sheet to a depth of 56 feet bgs (approximately 4 feet remaining above grade). The second sheet will be welded to the first sheet using a 24"x 6" x 3/8" splice plate on both sides of the sheet. The 120 foot sheet will then be driven to a depth of approximately 115 feet bgs (approximately 5 feet remaining above grade) in order to allow the interlock to assist in keeping the next sheet in position for welding. Once the entire 120 foot deep section is installed, all sheets will be driven to their final depths. The top of the DNAPL migration barriers will be driven to an elevation that corresponds to a minimum of two feet below the proposed final grade in order to allow for the installation of the Site-Wide Cap.

Following installation of the sheets, the interlocks will be flushed to remove soils/debris. The full length of the interlock channels between each of the installed sheets will be flushed with clean water to remove soil/debris. If necessary, in instances where interlock obstructions can not be cleared by standard flushing, a high-pressure water jetting system and/or additional vibrating of the sheets will be employed to clear obstructions within the interlocks. Flush water will be allowed to percolate onto the ground surface immediately adjacent to the installed sheets. In the event that NAPL is observed, flush water will be collected and containerized for subsequent characterization and off-site disposal.

Finally, the seams in the sheet piles will be sealed with WBS-301 joint sealants as defined in the Technical Specifications. In accordance with information provided by C3 Environmental Limited (the licensed installer of the Waterloo Barrier® sheet pile system), WBS-301 grout is a silica fume modified, cementitious based grout. The grout composition consists of superplasticizers, silica fume, fly ash, expansion agents and Portland cement. Approximately 85% to 100% of the composition consists of Portland cement. Therefore, the WBS-301 grout has chemical reactions similar to concrete. As such, the primary chemical constituents of concern (COCs) at the Site were compared to the Portland Cement Association's Concrete Information Bulletin IS001, entitled, "Effects of Substances on Concrete and Guide to Protective Treatments." Since the document indicates that the COCs have minimal effects on concrete, the National Grid Us Remedial Design Team can conclude that the COCs will also have minimal effects on the WBS-301 grout.

A QA/QC program consisting of visual inspection, joint inspection (prior to driving), driving tolerances, flushing/joint inspection and driving records will be implemented to ensure the proper installation of the migration barrier. Any deficiencies in the sheet piles will be photographed, documented and visibly

marked with an "X" to ensure that the sheet is not installed. If repairs will be conducted on the deficient sheet, a proposal will be submitted to National Grid US and PS&SPC for review and approval.

In addition, a New York State certified land surveyor will layout the horizontal locations and establish control points for the DNAPL migration barrier wall prior to the installation of any sheets. Vertical alignment of the sheets will be measured using a digital inclinometer.

3.5 Construction of Site-Wide Cap

The Site-Wide Cap will be installed across the entire Site to limit potential future exposure pathways. The cap will consist of an 18-inch layer of well-graded sandy soil material overlain with six inches of NYSDOT Type 2 aggregate meeting the specifications stated in Section 3.10. The Site-Wide Cap will be underlain with a fabric barrier to demarcate the cap from the subgrade materials as depicted on the details included on Design Drawing No. C-09.

Areas within the Shallow Excavation Area will be backfilled concurrent with excavation activities to within two feet of the final Site-Wide Cap grade to accommodate construction of the Site-Wide Cap. Soils from areas outside of the Shallow Excavation Areas will be removed to a depth of two feet to allow construction of the Site-Wide Cap. Excavation depths may be less in areas of the Site where the proposed grade is higher than the existing grade.

Prior to placing the Site-Wide Cap, the Site will be graded to promote drainage towards the center of the Site as shown on Design Drawing No. C-07. Once grading is achieved, as documented by a confirmatory record of construction survey, installation of the Site-Wide Cap will commence. In general, Site-Wide Cap installation will begin on the south side of Site and proceed in a northerly direction.

A demarcation barrier will be installed over the subgrade. The demarcation barrier will consist of Mirafi 135N geotextile. The geotextile will be rolled out with edges overlapped a minimum of 12 inches to 18 inches. The leading edges of the barrier will be anchored to hold the material in-place while awaiting backfill.

The 18-inch sandy fill material layer will be placed in two, nine to 12-inch loose lifts in a manner that will not damage the underlying demarcation barrier. Fill material will be placed along the edge of the barrier material and graded in-place with a low ground pressure (LGP) dozer. The LGP dozer will remain on the placed fill material and will not be in direct contact with the underlying geotextile. The nine-inch to 12-inch thick lifts will be compacted to a minimum 90% of Modified Proctor density per ASTM D1577. In-place quality control compaction testing will be performed by either Universal Testing of Babylon, New York, American Standard Testing and Consulting Laboratories of Bayside, New York or Soil Mechanics Drilling Corporation of Babylon, New York to

ensure specified compaction has been achieved. Each lift will be tested at a frequency of one test per 2,500 square feet. In the event specified compaction is not achieved, the non-conforming area will be re-compacted by passing over the area with a roller. If specified compaction is not achieved after re-compaction, the moisture content may be adjusted (moistened or aerated), as needed, before re-compacting the area.

Once geotechnical testing of the second lift of sandy soil is complete in an area, placement of the six-inch aggregate layer will begin. The imported aggregate will be placed in one lift and spread with conventional earthwork equipment.

3.5.1 Proposed On-Site Grading

As depicted on Design Drawing No. C-07, the proposed grading plan for the on-site area includes a gradual slope from the perimeter of the On-Site Area toward the center of the Site. The intent of the grading plan is to contain the majority of rainwater runoff on-site and to minimize the amount of rainwater runoff leaving the On-Site Area. Currently, there are no provisions in the remedial design for the construction of on-site drainage systems (i.e., catch basins, drains, etc.) that would connect to the existing off-site storm water drainage system. In the event that conditions change in the field, the remedial design may be amended to address Site drainage alternatives. The grading plan has been designed to promote rainwater runoff toward the center of the Site where it would be allowed to percolate into the subsurface soils. In order to enhance the percolation rate for on-site storm water runoff, the top layer of the Site-Wide Cap will consist of gravel.

3.5.2 Proposed Bulkhead Area Grading

As depicted in on Design Drawing Nos. C-06A and C-07, the proposed grading plan in the Bulkhead Area will include a gradual slope from the southern extent of the Bulkhead Area near Beach Channel Drive toward the north to the existing steel sheet pile bulkhead. National Grid US is currently coordinating with the City of New York Parks and Recreation Department regarding the Request to Perform Work on Park Property Application, where the City of New York requires the installation of a tie-back system for the existing steel sheet pile bulkhead. The existing steel sheet pile bulkhead is in disrepair and National Grid US in cooperation with the City of New York is studying alternatives to address the existing steel sheet pile bulkhead and support the installation and long-term sustainability of the necessary Bulkhead Area engineering controls. Once the Bulkhead Area is graded to the finished elevations, the area will be vegetated, by the City of New York Parks and Recreation Department, to minimize the potential for erosion.

3.6 Construction Phase Non-Aqueous Phase Liquid (NAPL) Recovery

Refer to Section 2.1 of the RDR for a description of the proposed NAPL Contingency Plan to be implemented during the construction phase of the remedial activities.

As part of the implementation of the selected remedy, passive DNAPL recovery wells will be installed on each side of the On-Site Barrier and the upgradient side of the Bulkhead Area Barrier. The wells are proposed to be installed in locations indicated on Drawing C-04. The wells will be installed as per the construction detail on Drawing C-11 and the requirements of the Technical Specifications. Methods to be utilized to recover DNAPL from the wells, the management of the recovered DNAPL and a schedule for the recovery efforts will be included in the Site Management Plan. The Site Management Plan is discussed in Section 9.0 of this RDR.

3.7 Monitoring

3.7.1 Air Monitoring

A CAMP has been established for the identified pre-remedial design and design activities. A copy of the CAMP is provided in Appendix D. The CAMP, in conjunction with the air monitoring requirements of the Health and Safety Plan (HASP), will:

- Establish background levels of target compounds in ambient air prior to initiation of remedy;
- Monitor and document perimeter ambient air levels of target compounds during the implementation of the remedy;
- Provide an early warning system to prevent elevated off-site exposures by responding aggressively to exceedances of short-term action levels, to ensure that longer-term exposures at the perimeter are below acceptable risk levels;
- Evaluate ongoing effectiveness of, and need for additional vapor and/or dust suppression controls and/or alteration of work activities, to reduce airborne compounds to below acceptable risk levels; and,
- Use real-time perimeter monitoring results in conjunction with confirmatory air sampling.

3.7.2 Vibration Monitoring

Remedial construction activities will be performed so as to limit the potential for adverse impacts due to vibration. During both the installation of the shoring system for the planned Shallow Excavation Areas and the on-site and Bulkhead Migration Barriers, the driving of sheet piles has the potential to create ground vibrations. Vibration monitoring will be conducted during all sheet pile driving activities being implemented as part of the remedial construction activities. Vibration will be monitored at locations to be determined along the perimeter of the installation area. Additional vibration monitoring will be conducted at several distances from the sheet pile driving activities and/or near sensitive structures/receptors in close proximity to the sheet pile driving activity. Potential sensitive receptors include, but are not limited to, the existing electrical substation, the sewer treatment plant, the elevated MTA New York City Transit (NYCT) railroad tracks and adjacent business and residential structures.

On-site vibration monitoring will be performed using GeoSonics SSU 2000DK Seismograph and Acoustic Monitor or equivalent equipment.

A vibration criterion of 0.4 inches per second (in/sec) peak particle velocity (PPV) is proposed as the applicable trigger threshold criteria for ground-borne vibration measurement during remedial construction activities. This criterion has become the recognized industry standard for the control of vibration impacts to residential structures. Additionally, this 0.4 in/sec operations criterion was the criterion approved by NYCT on September 24, 2008.

MTA/NYCT has approved an operational criterion of one in/sec to trigger an alarm and the maximum criterion is two in/sec.

All monitoring and surveillance equipment will be operated, maintained and calibrated in accordance with the manufacturer's instructions and the established quality assurance procedures. All equipment will be checked daily for proper operation. Field validation logs will be maintained on-site. Vibration monitoring records will be maintained on-site throughout the duration of the project.

3.7.3 Noise Monitoring

Remedial construction activities will be performed so as to limit the potential for adverse impacts due to noise. During the installation of the DNAPL migration barriers and the shoring system for the Shallow Excavation Areas, the driving of sheet piles will likely create noise levels in excess of background conditions. Noise monitoring will be conducted during all sheet pile driving activities being implemented as part of remedial construction activities. Noise will be monitored at locations to be determined along the perimeter of the installation area.

On-site noise monitoring will be performed using a Bruel and Kjaer Modular Precision Sound Level Meter or equivalent equipment. These sound meters are capable of collecting a wide range of measurements, take several measurements simultaneously and automatically store data at the end of a pre-set time period. Monitoring will be conducted continuously during periods of active sheet pile driving. Results of the monitoring will be collected and reviewed throughout the monitoring period. Noise monitoring records will be maintained on-site throughout the duration of the project.

All monitoring and surveillance equipment will be operated, maintained and calibrated in accordance with the manufacturer's instructions and the established quality assurance procedures. All equipment will be checked daily for proper operation. Field validation logs will be maintained on-site.

The Noise and Vibration Monitoring Plan is included as Appendix L to this RDR.

3.8 Odor Control/Vapor Management

Odor control and vapor management technologies and processes have been evaluated to mitigate or eliminate potential odors during the remedial construction activities. A contingency plan is included as part of the CAMP that is attached as Appendix D. The purpose of the contingency plan is to identify potential Site control measures that may be implemented in response to elevated levels of target compounds or odor. In general, a tiered warning Action Limit and response action will be implemented during the air monitoring program. Tiered warning Action Limits are defined as follows:

- Action Limit 1: Normal or ambient air conditions where all target concentrations are less than 75% of the Action Limit;
- Action Limit 2: Concentration of at least one target is equal to or greater than 75% of the Action Limit, but less than the Action Limit; and,
- Action Limit 3: Concentration of at least one target is greater than the Action Limit.

The contingency plan will rely on real-time data generated from the fixed station monitoring and meteorological monitoring. These data sources will be evaluated together in order to make appropriate decisions concerning Site conditions and potential control measures.

Details on the real time monitoring action and contingency plans are included with the CAMP (refer to Appendix D).

3.9 Decontamination

Equipment and personnel decontamination will take place inside the temporary enclosure utilized in each excavation area. All heavy machinery, trucks, equipment and personnel entering the temporary enclosure will be subject to the decontamination procedures summarized in the following subsections.

3.9.1 Equipment Decontamination

Equipment decontamination will occur under controlled conditions in the temporary enclosure constructed around each excavation area. Decontamination activities will include the removal of contaminated soil, debris and other miscellaneous materials from all construction equipment and tools utilized within the temporary enclosure using a combination of high-pressure water sprays, low pressure hoses and detergent washing. In addition, physical/mechanical agitation (brushing/scraping with hand tools) of soil may be utilized to minimize wastewater generation.

The decontamination pad(s) will be constructed to adequately facilitate decontamination of the largest mobile construction equipment and to withstand the anticipated traffic loads throughout the duration of the project. The decontamination pad(s) will be an area with a bermed perimeter and lined with crushed stone and underlain by a geotextile layer and two plastic liners. The decontamination pad(s) will be constructed to meet the following requirements:

- The area facilitating the decontamination pad(s) will be modified as needed to accommodate the pad(s);
- The pad area will be lined with two layers of 40 mil HDPE sheeting (thick enough to withstand daily use) and woven geotextile and covered with crushed stone in a manner that allows rinsate water to freely drain and collect in a sump for removal and disposal;
- The pad area(s) will be graded for easy entrance and exit to vehicles and equipment;
- The pad(s) will be able to hold a minimum of four inches of standing water at the shallowest point within the containment. It will be sized sufficiently to prevent splashing and spraying from decontamination activities from contacting the surrounding unprotected surfaces;
- In the event that the size of the pad is limited by site constraints, a curtain of 10-mil sheeting will be constructed around the pad to eliminate the

possibility of wash water and/or sediment leaving the decontamination area; and

- The pad(s) must be kept empty and protected from rainwater when not in use.

Material that does not infiltrate into the spaces between the crushed stone will be manually consolidated and transferred to a disposal vehicle.

A new decontamination pad will be constructed at each excavation location as the temporary enclosure is relocated. The crushed stone will be reused in each subsequent decontamination pad, if feasible. If not feasible, the crushed stone and liners will be excavated and transported to the disposal facility and new crushed stone and liners will be used. Any other materials utilized in constructing the pad will be packed into 55-gallon drums, stored on wooden pallets and covered with a tarp until their off-site removal (anticipated weekly) and disposal.

3.9.2 Personnel Decontamination

Prior to entering the work-site, all personnel will use a dedicated portion of the on-site employee trailer to change from street clothes into work apparel. All personnel will leave the employee trailer through an appointed exit and proceed to the work-site. When leaving the Site, employees will reverse the traffic flow and depart the work-site through the door they entered. Boot brushes and a catch tray will be provided at the entrance of the employee trailer to minimize the transfer of sediment into the trailer. The floor of the personnel changing room will be swept clean at the end of each shift. All collected material will be transferred to 55-gallon drums for off-site disposal.

Personnel field decontamination/cleanup will take place in the temporary enclosure prior to the individual leaving the work area. Disposable protective coverings will be removed and placed in 55-gallon drums for disposal. Individuals will also be required to brush sediment from their boots prior to leaving the temporary enclosure to eliminate the potential for accidental spread of contamination.

Additional details for personnel decontamination are presented in the Health and Safety Plan contained in Appendix G.

Two personnel decontamination areas will be constructed at the Site. These areas correspond with the locations of the staging areas identified on Drawing C-06. The first location, located in the northwestern corner of the Site adjacent to the on-site substation, will be used during the initial site preparation phases of the work until the main area can be constructed adjacent to the Beach 108th Street Site entrance.

3.10 Materials Management

3.10.1 Backfill Materials

3.10.1.1 Backfill Acceptance Criteria

All off-site backfill materials utilized as part of remedial construction activities will be obtained from either clean sources approved by the NYSDOT or other National Grid US-approved sources, as approved by the NYSDEC, identified during the design process. A representative confirmatory sample will be collected from each off-site source of sandy soil and topsoil backfill materials at a rate of one per every 5,000 yds^3. The sample will be analyzed at a NYSDOH-certified ELAP-approved laboratory for total volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), organic pesticides/herbicides, polychlorinated biphenyls (PCBs) and Target Analyte List (TAL) parameters. Alternatively, when sources of backfill are greater than 10,000 yds^3, the sampling frequency can be reduced to one per 10,000 yds^3. The analytical results of these samples will be submitted to NYSDEC to obtain written authorization to use the backfill materials. As discussed with NYSDEC, stone and gravel backfill materials will not be subject to these analytical requirements.

3.10.1.2 Types of Backfill

The types of backfill that will be brought on-site by Posillico will consist of clean backfill material for the Shallow Excavation Areas and backfill for the Site-Wide Cap. The cap will consist of 18 inches of a well-graded sandy soil overlain by six inches of gravel (in the On-Site Area) or topsoil (in the Bulkhead Area). The cap will be underlain by a geotextile fabric (Mirafi 135N) to serve as a demarcation barrier. A well-graded sandy soil material will be used to backfill the Shallow Excavation Areas as well to supplement the soil component of the Site-Wide Cap.

Well-Graded Sandy Soil

The backfill material (well-graded sandy soil) will be provided by Tilcon New York, Inc. located in West Nyack, New York. The quarry is approved by the NYSDOT as Source Number 8-8R. The clean backfill certification information is included in Appendix M of this RDR. Analytical data from confirmatory samples of the materials to support the integrity of the fill material will be forwarded to the NYSDEC, for review and approval, prior to the use of the well-graded sandy soil at the Site. These samples will be obtained and analyzed to meet the requirements of the Technical Specification (refer to Section 02300).

The sieve analysis results and the Technical Specification requirements are summarized in Table 3-2.

TABLE 3-2: WELL-GRADED SANDY SOIL MATERIAL SPECIFICATIONS		
Sieve Size	**Tilcon New York Sieve Analysis (Percent Passing)**	**Technical Specification Requirements (Percent Passing)**
2"	100%	100%
¾"	100%	70% - 100%
No. 4	58%	30% - 80%
No. 50	20%	10% - 35%
No. 200	10%	5% - 12%

Gravel Layer

The gravel material will be a crushed gravel or crushed stone conforming with the NYSDOT Standard Specifications for Coarse Aggregate size designation Type 2. The NYSDOT Type 2 stone will be provided by Tilcon New York, Inc. located in West Nyack, New York. The quarry is approved by the NYSDOT as Source Number 8-8R. The clean backfill certification information for the gravel material is included in Appendix M of this RDR.

The sieve analysis results and the Technical Specification requirements are summarized in Table 3-3.

TABLE 3-3: GRAVEL LAYER MATERIAL SPECIFICATIONS		
Sieve Size	**Tilcon New York Sieve Analysis (Percent Passing)**	**Technical Specification Requirements (Percent Passing)**
1 ½"	100%	100%
1"	90%	90% - 100%
¾"	39%	
½"	7%	0% - 15%
3/8"	3%	
¼"	2%	
No. 4	1%	

Topsoil Layer

Within the Bulkhead Area, the soil cap will consist of a six inch topsoil layer. This layer is intended to facilitate the growth of vegetation. In general, the topsoil layer will consist of at least 2%, and no more than 6%, by weight of fine textured stable organic material with a pH of between 5.5 and 6.5. To promote proper drainage, the topsoil will consist of at least 20% fine textured material and have no more than 15% clay content. Finally, in addition to the acceptance criteria

discussed below, the topsoil will be relatively free of stones and other materials over 1½ inches in diameter, trash, noxious weeds such as nutsedge and quackgrass, have less than 10% gravel by volume and not contain greater than 500 parts per million (ppm) of soluble salts.

The source of the topsoil material as well as the clean backfill certification information and associated analytical results of confirmatory samples will be provided to the NYSDEC, for review and approval, once the source is procured. Clean backfill certifications for initial activities are included in Appendix M. No topsoil will be imported to the Site prior to the submission of the clean backfill certification information and approval by the NYSDEC.

3.10.1.3 Compaction

Clean well-graded sandy soil fill material will be placed in approximately 12-inch lifts within the excavations associated with the perimeter utility cut and cap, DNAPL migration barrier pre-trenching and the Shallow Excavation Area to within two feet of the final grade and compacted to a minimum 90% of modified proctor density per ASTM D1577. Within the On-Site Area, the Site-Wide Cap, consisting of 18 inches of well-graded sandy material and six inches of gravel, will be placed in two lifts and mechanically compacted to a minimum of 90 percent of the modified proctor density (as determined by ASTM D1557). The crushed stone or gravel will be placed in one lift and mechanically compacted.

Within the Bulkhead Area, the soil cap will consist of 18 inches of well-graded sandy material and six inches of topsoil to be used as a growing medium. The well-graded sandy material will be placed in two lifts and mechanically compacted to a minimum of 90 percent of the modified proctor density (as determined by ASTM D1557).

In-place quality control compaction testing will be performed by either Universal Testing of Babylon, New York, American Standard Testing and Consulting Laboratories of Bayside, New York or Soil Mechanics Drilling Corporation of Babylon, New York to ensure specified compaction has been achieved. Each lift will be tested at a frequency of one test per 2,500 square feet. In the event the specified compaction is not achieved, the non-conforming area will be re-compacted by passing over the area with a roller. If specified compaction is not achieved after re-compaction, the moisture content may be adjusted (moistened or aerated), as needed, before re-compacting the area.

3.10.1.4 Re-Use of On-Site Materials

During the implementation of remedial construction activities, no structures (that contain potential source material) or former industrial piping excavated from the Shallow Excavation Areas will be re-used on-site as backfill material. Excavated

soils that do not contain source material (i.e., soil containing visible tar, oils and purifier wastes) based on visual observations will be reused on-site as backfill underneath the Site-Wide Cap. The visual determination for reuse will be performed by PS&SPC in conjunction with NYSDEC.

As depicted on the Design Drawings, existing surface foundations and potential subsurface foundations will be encountered during the excavation activities within the Shallow Excavation Areas. Encountered foundations will be demolished utilizing a hoe ram attachment on an excavator, backhoe or equivalent.

After demolition, if the foundation material is determined to be impacted and/or contain source material, the debris will be prepared and decontaminated, as necessary, to meet the acceptance criteria of the selected disposal or recycling facility. Preparation will consist of demolishing the surface slabs to pieces that are manageable and meet facility acceptance criteria. Decontamination of concrete debris will consist of pressure washing using a power washer. Generated decontamination fluids will be containerized on-site where fluids will be waste characterized for off-site disposal.

Concrete removed from the excavation and determined not to contain source materials will be processed on-site and reused as backfill materials below the environmental Site-Wide Cap. The determination of whether or not the concrete can be reused on-site will be based on visual observations conducted by PS&SPC in conjunction with the NYSDEC. To avoid issues with compaction, the crushing of the concrete will be performed to a gradation similar to that of the well-graded sand backfill material.

3.10.1.5 Transportation

During the implementation of remedial construction activities, Posillico will coordinate and manage transportation and disposal of generated wastes to National Grid US approved disposal facilities. The anticipated wastes to be generated during the remedial construction work consist of soil, wastewater, construction debris, miscellaneous debris and PPE. All wastes designated for off-site disposal will be transported in vehicles that will be lined, foamed (as necessary), and covered with an impermeable tarp to prevent spills and/or releases to the environment. All transporters have been reviewed for permitting requirements and licensing by Posillico.

To the extent practical, wastes will be stockpiled, containerized and loaded for off-site transport within the temporary enclosure to minimize the potential for migration of contamination. In coordination with NYSDEC, National Grid US will restrict daily truck traffic to and from the Site to only 9:00 a.m. to 2:00 p.m., Monday through Friday. Trucks will be assigned specific times to arrive at the

Site to avoid traffic at the Site and surrounding areas. All trucks will be positioned by on-site personnel before and after wastes are loaded.

All wastes designated for off-site disposal will be transported to solid, liquid, and hazardous waste treatment/disposal facilities that have been approved by National Grid US. All disposal facilities have been reviewed for permitting and licensing requirements, licenses and regulatory enforcement status. National Grid US will be identified as the generator of all solid wastes transported from the Site. A Bill of Lading corresponding to each shipment of solid waste will be completed and a representative of National Grid US will sign the waste documents.

Soil

Removed source materials are not expected to be classified as hazardous waste for disposal during the implementation of remedial construction activities. In accordance with NYSDEC TAGM 4061, waste contaminated with coal tar, which exhibits the toxicity characteristic for benzene (D018), which does not contain significant quantities of purifier wastes, and is destined for thermal treatment may be conditionally excluded from the requirements of 6 NYCRR Parts 370-374 and 376.

Soils that have been determined to be impacted will be transported to the facilities identified below.

- Clean Earth of New Castle, Inc, New Castle, Delaware
- Clean Earth of Philadelphia, Philadelphia, Pennsylvania
- Clean Earth of Southeastern Pennsylvania, Morrisville, Pennsylvania
- Mid-Atlantic Recycling Technologies (MART) a.k.a. Cassie Protank, Vineland, New Jersey
- ESMI of New Jersey, Keasbey, New Jersey
- ESMI of New York, Fort Edward, New York

Soils that exceed RCRA TCLP criteria and, therefore, are considered hazardous materials, will be transported to Chemical Waste Management, Model City, New York.

Wastewater

Liquid wastes (e.g., subsurface piping/structure contents, decontamination waters) may be potentially contaminated with BTEX and PAHs and other chemical constituents from on-site sources. The presence of any hazardous constituents in the wastewater is expected to be dilute; therefore, the wastewaters are not expected to be classified as hazardous waste for disposal. Liquid wastes will be

stored on-site in 1,000 gallon (minimum) capacity holding tanks until they are removed for off-site disposal.

Wastewater that has been determined to be impacted will be transported to Clean Water of New York, Inc., Staten Island, New York.

PPE/Miscellaneous Debris

PPE and miscellaneous debris will be generated at the Site. These materials are not anticipated to be classified as hazardous wastes for disposal and, therefore, will be managed as solid wastes. These materials will be placed in 55-gallon drums or similar containers during the work and, at the direction of National Grid US, will be removed from the Site as soon as it is practicable. Construction debris such as industrial piping and structural materials will be segregated, decontaminated and prepared as necessary, and placed within roll-off containers for off-site disposal.

Former Industrial Piping

Former industrial piping that is encountered and removed during remedial construction activities will be decontaminated and prepared, as necessary, to meet the selected disposal or recycling facility's acceptance criteria. These materials are not anticipated to be classified as hazardous wastes for disposal and therefore will be managed as solid wastes.

Former industrial piping will be transported to either G.R.O.W.S. Landfill (Morrisville, Pennsylvania) or Tullytown Resource Recovery Facility (Tullytown, Pennsylvania).

Concrete Structures

As previously stated, concrete debris will be prepared, as necessary, to meet the selected disposal or recycling facility's acceptance criteria. These materials are not anticipated to be classified as hazardous wastes for disposal and therefore will be managed as solid wastes.

Concrete structures will be transported to either G.R.O.W.S. Landfill (Morrisville, Pennsylvania) or Tullytown Resource Recovery Facility (Tullytown, Pennsylvania).

Former Timber (Wood) Material

Former timber support structures (i.e., horizontal cribbing, piles, etc.) that are encountered and removed during remedial construction activities will be decontaminated and prepared, as necessary, to meet the selected disposal facility's

acceptance criteria. These materials are not anticipated to be classified as hazardous wastes for disposal and therefore will be managed as solid wastes.

Former timber materials, if determined to be impacted, will be disposed of along with impacted soils at one of the thermal desorption facilities listed above. If determined to be un-impacted, the timber materials will be transported to either G.R.O.W.S. Landfill (Morrisville, Pennsylvania) or Tullytown Resource Recovery Facility (Tullytown, Pennsylvania).

3.11 Engineering and Institutional Controls

Engineering and Institutional Controls will be implemented as part of remedial construction activities at the Site to protect human health and the environment from MGP-related constituents that will remain in the subsurface. As described in Section 3.5 of this RDR, the proposed Site-Wide Cap (underlain by a geotextile) that will be constructed as part of the proposed remedial construction activities will serve as an Engineering Control to eliminate contact with residual MGP-related constituents. The underlying geotextile will serve as a demarcation barrier in the event that future excavations are performed at the Site.

Various institutional controls will be further evaluated during the development of the remedial design process to augment the Engineering Controls by non-physical means and may include administrative measures, such as restrictions on groundwater use and future construction on the Site. The Institutional Controls are intended to prevent exposure to constituents remaining on the Site, and prevent actions that would interfere with the effectiveness of the remedial program or with the effectiveness and/or integrity of operation, maintenance, or monitoring activities. As detailed in the ROD, one institutional control to be implemented at the Site consists of the development of a Site Management Plan.

3.11.1 Site-Wide Cap Construction

As described in Section 3.5 of this RDR, a Site-Wide Cap will be installed across the entire Site to limit potential future exposure pathways. The cap will consist of an 18-inch layer of well-graded sandy soil material overlain with six inches of NYSDOT Type II aggregate meeting the specifications stated in Section 3.10. The cap will be underlain with a fabric barrier (Mirafi 135N) to demarcate the cap from the backfill materials and existing subgrade materials.

Construction of the Site-Wide Cap is described in Section 3.5 of this RDR.

3.12 Site Restoration

Site restoration activities will consist of Site grading and capping the Site as depicted on the Design Drawings; installation of a vegetative cover within the Bulkhead Area; re-

establishing disturbed monitoring wells (may be performed by others); re-establishing chain link fencing; and removing soil erosion and sediment control measures.

As noted on Drawing No. C-07, the final Site grade will serve to direct on-site stormwater runoff to the central portion of the Site and allow for percolation into the subsurface.

4.0 ENGINEERING COST ESTIMATE AND SCHEDULE

4.1 Remedial Cost Estimate

Remedial construction costs for the Site are the sole responsibility of National Grid US. Based on the 95% design, the construction costs for the remedial activities are estimated to range between $35,000,000 and $40,000,000.

This remedial cost estimate is based on the cost projections provided by Posillico during the procurement process.

4.2 Remedial Construction Schedule – Remedial Design & Construction

The project schedule for the major remedial design and construction milestones is presented below. This schedule tracks the remedial design tasks from preparation of this RDR through implementation of the remedial construction activities. This construction schedule, enclosed as Appendix O, is identified as "DRAFT" due to the fact that the remedial action construction schedule will periodically be modified to address actual field conditions and the remedial construction progress.

TASK	MILESTONE DATE
Submit 50% to 75% RDR to the NYSDEC	May 2006
NYSDEC Approval of the 50% to 75% RDR	January 2007
Procurement of Remedial Contractor	January 2008
Submit 95% RDR to the NYSDEC	March 2008
NYSDEC approval of the 95% RDR	October 2008
Submit 100% RDR to the NYSDEC	November 2008
NYSDEC Approval of the 100% RDR	November 2008
Contractor Mobilization for Remedial Construction	November 2008
Remedial Construction is Completed By Remedial Contractor[4]	July 2010

[4] This construction milestone for remedial action completion is a placeholder, where the actual construction completion will be controlled by field conditions and the off-site disposal of the impacted soils.

5.0 IDENTIFICATION OF PROPERTY ACCESS AND FEDERAL AND STATE PERMITS REQUIRED FOR REMEDIATION

This section of the RDR describes the property access agreements as well as the federal, state and local permits required for the implementation of remedial construction activities. As part of the remedial design process, National Grid US has worked with local utilities, the local community and others to identify and protect their facilities.

5.1 Property Access Agreements

A majority of the remedial activities will be implemented within the On-Site Area. However, the Bulkhead Area will need to be utilized; therefore National Grid US is currently negotiating access agreements with the City of New York which will be in place prior to the mobilization of materials and equipment in this area.

5.2 Federal, State and Local Permits

Activities at the Site are being performed under an Order on Consent signed by National Grid US and the NYSDEC On March 31, 1999. In accordance with 6 NYCRR 375-1, NYSDEC-issued permits are not required for the pre-remedial design or remedy implementation. Rather, the remedial measures are evaluated and implemented based on the substantive elements of the applicable and relevant and appropriate state environmental laws and regulations. No federal or state permits are anticipated to be required for either the pre-design or design activities. Local permits are necessary for utility connections and roadway (lane) closure activities. National Grid US and Posillico will procure and maintain these local permits. As per 6 NYCRR 375-1.7c, no permits, consents, approvals or other authorizations are required under any local zoning, land use or other regulatory program. Consultation with local officials and other stakeholders has occurred as part of the final design completion phase.

6.0 PROJECT IMPLEMENTATION AND CONTRACTOR SELECTION

6.1 Construction Implementation

Remedial construction activities will be performed in accordance with the NYSDEC approved 100% RDR. The Design Drawings and Technical Specifications accompanying this 100% RDR will govern the implementation of the remedial activities. National Grid US has retained Posillico Environmental, Inc. (Posillico) who will be responsible for the various components of the remedial construction. Other subcontractors (i.e., electricians, well drillers, etc.) will be utilized by Posillico, as required.

6.2 Contractor Selection

National Grid US has procured Posillico in accordance with National Grid US procurement policies and procedures, using a draft version of the 95% RDR, Design Drawings and Technical Specifications. The selection process took place in two steps: a Request for Qualifications (RFQ) and a Request for Proposal (RFP).

The RFQ step, which is complete, included the identification of remedial contractors with the experience to perform the remedial construction activities. Statement of Qualifications (SOQs) from various contractors were received and evaluated by National Grid US and a list of qualified remedial contractors determined.

An RFP package that provided sufficient background, technical, and contractual information for the remedial contractors to submit appropriate technical and cost proposals was prepared and issued to the qualified contractors.

Following the evaluation of submitted bids and the selection of the remedial contractor, a Notice to Proceed was issued to Posillico.

6.3 Contractor Design Submittals

Posillico was responsible for the preparation of numerous submittals for the review of National Grid US during the development of this 100% RDR. Once approved, these submittals were incorporated into the remedial design. The development of this RDR incorporated the design submittals provided by Posillico and culminated in the 95% RDR and 100% RDR submittals.

During the development of the remedial design into the RDR submittals, the means and methods to complete the planned remedial construction activities were developed. Specific details incorporated into the RDR Contractor Submittals are summarized below.

- The planned Site preparation necessary to facilitate the remedial construction activities.

- The planned labor, materials and equipment necessary to implement the remedial construction activities.
- The planned sequencing for implementing the remedial construction activities.
- A material management plan or approach including the disposal of excavated contaminated material and liquids and the transportation of clean backfill material to be brought on-site.
- An operations approach including planned truck routes, equipment staging area, material staging areas, soil erosion and sediment control measures, decontamination pad(s) locations, exclusion zones and contamination reduction zones, etc.

In addition, Posillico was required to review generic versions of the HASP and the Construction Quality Assurance Project Plan (CQAPP) and either adopt the requirements of each of the documents or provide site-specific amendments. A discussion of the site-specific versions of the CQAPP and HASP are provided in Sections 7 and 8 of this RDR, respectively.

7.0 CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

A Construction Quality Assurance Project Plan (CQAPP) has been developed to address quality control/quality assurance (QA/QC) issues and to ensure the integrity of analytical data obtained during all remedial activities to be performed at the Site. The CQAPP is included in Appendix N of this RDR. The CQAPP sets forth general framework and specific details of the methods and procedures that will be implemented to demonstrate that the remedial construction activities will be performed pursuant to the 100% RDR.

8.0 HEALTH AND SAFETY PLAN

A Site Specific Health and Safety Plan has been prepared by Posillico to address worker health and safety during the implementation of the planned remedial construction activities described in this RDR.

A copy of the Site Specific Health and Safety Plan is included in Appendix G.

9.0 SITE MANAGEMENT PLAN

Following the completion of the remedial construction activities, a detailed post-remedial Site Management Plan (SMP) will be submitted to the NYSDEC for review and approval. This SMP will detail the proposed initial and continuing monitoring and maintenance activities for the Site. The SMP will be developed to include the actions summarized below.

- Address residual contaminated soils that may be excavated from the Site during future redevelopment. The plan would require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations.
- Evaluate the potential for vapor intrusion for any buildings developed on the Site, including a provision for mitigation of any identified impacts.
- Provide for the operation and maintenance of the components of the remedy.
- Identify any use restrictions to on-site development or groundwater use.

At a minimum, the SMP will include the proposed monitoring and maintenance activities to be performed on a periodic basis as summarized below.

- Initial monitoring and maintenance of the soil erosion and sediment control measures until the gravel layer is placed in the on-site area and until new vegetation has been established within the Bulkhead Area by the City of New York Parks and Recreation Department.
- Monitoring and maintenance of the Site-Wide Cap.
- Monitoring the overall effectiveness of the remediation.
- Monitoring and maintenance of the Site's security chain link fencing.
- Monitoring of the groundwater.
- Monitoring of groundwater table to determine depth to groundwater and the presence/absence of NAPL.
- Passive NAPL recovery.

National Grid US will implement a long term monitoring program for the Site following the completion of the remediation. National Grid US proposes that this monitoring program be followed for a period of five years after which the effectiveness of the selected remedy for the Site will be evaluated. After completion of this evaluation by National Grid US and the NYSDEC, the proposed monitoring program will either be modified or will continue as originally proposed.