FINAL REMEDIAL DESIGN REPORT

For

Operable Units No. 2 and No. 3
Former Brooklyn Borough Gas Works Site
Brooklyn, New York

Prepared for:

KEYSPAN CORPORATION

One MetroTech Center
Brooklyn, New York 11210-3850

March 2006

Prepared By:

PAULUS, SOKOLOWSKI AND SARTOR ENGINEERING, PC
67A Mountain Boulevard Extension
Warren, New Jersey 07059

PROFESSIONAL ENGINEER'S CERTIFICATION

The undersigned on behalf of KeySpan Corporation 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.

_____ _____

Date

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

TABLE OF CONTENTS

LIST OF APPENDICES

EXECUTIVE SUMMARY

Paulus, Sokolowski and Sartor Engineering, PC (PS&SPC) has been retained by KeySpan Corporation (KeySpan) to prepare this Remedial Design Report (RD Report) to design the required remedial actions for the former Brooklyn Borough Gas Works Site located in Brooklyn, New York, Site No. 2-24-026 (Site). This RD Report addresses Operable Unit Nos. 2 (OU-2) and 3 (OU-3). The New York State Department of Environmental Conservation (NYSDEC) technical and administrative guidance document, *Draft DER-10, Technical Guidance for Site Investigation and Remediation [NYSDEC, 2002]* (DER-10) was used as a guideline for the basis of the remedial design.

This RD Report has been prepared to be consistent with the NYSDEC DER-10 guidance document.

The Site is located between Neptune Avenue and the Belt Parkway, within the Coney Island section of the Borough of Brooklyn, New York, as depicted in the Design Drawings included in Appendix A. It is bordered by the right-of-way (ROW) of the Belt Parkway, a New York City Transit (NYCT) rail yard to the north, three operating commuter rail lines of the NYCT to the west, and the beginning reach of the Coney Island Creek to the south and east. This property, currently owned by KeySpan, is approximately 16 acres in size. NYCT is an operating unit of the Metropolitan Transportation Authority (MTA), a state agency. The westerly portion of the Site, containing most of the former manufactured gas plant (MGP) facilities, is relatively flat at elevations ranging between 4 to 6 feet (NAVD88). The easterly portion of the Site is at higher elevations ranging between 12 and 15 feet (NAVD88), reflecting its previous filling with miscellaneous materials.

The Brooklyn Borough Gas Company began construction of the first generator at the Site in 1908. Over the next four years, additional parcels of land were added, the facility was enlarged, and its gas production capability increased. In the 1930s, two (2) large-capacity gas holders, a station metering house, two (2) underground gas oil tanks, tar conditioners, tar seal pumps, and a tar separator were located in the western portion of the Site. Various storage and work buildings were also located in the central area of the property, including a blacksmith shop in the south-central area. To the east were the gas oil pump house and five gas oil tanks. The physical facility and property changed little from the 1930s through 1960. Brooklyn Borough Gas transformed its gas delivery operations to a natural gas-based system, and production of manufactured gas at the Coney Island facility ceased in November 1951. According to Brooklyn Borough Gas documents, gas deliveries to customers in 1952 were natural gas. Between 1952 and 1959, the Site's MGP capability may have been maintained and operated for the purpose of peak shaving. The Brooklyn Union Gas Company (which ultimately became KeySpan) acquired the Brooklyn Borough Gas Company in 1959. KeySpan did not manufacture gas at this facility. From 1960 to 1966, the facility was almost completely decommissioned and demolished. In 1974, a few buildings associated with a gate station, which included an axial compressor, a small gasholder, and the largest gasholder, remained operational providing natural gas service. KeySpan believes the gate station and gasholders were taken off line at the end of the 1970s and were subsequently decommissioned and demolished in the early 1980s. In the early 1970s, the easternmost portion

of the property was topped with fill and two (2) baseball fields were constructed on top of the fill in the late 1980s. These fields were decommissioned in 1996 and are no longer in use.

In March 2001, NYSDEC issued a Record of Decision (ROD) for *Operable Unit 1: Plant Site, Former Brooklyn Borough Gas Works Site, Coney Island, Kings County, New York (Site Number 2-24-026)*. The ROD requires that KeySpan remediate the uplands portion of the Site in accordance with the selected remedy described in the ROD. In March 2002, the NYSDEC issued a ROD for *Operable Unit 2: Coney Island Creek, Former Brooklyn Borough Gas Works Site, Coney Island, Kings County, New York (Site Number 2-24-026)*. This ROD requires that KeySpan remediate contaminants in and along the reach of Coney Island Creek, adjacent to the Site.

Subsequent to the issuance of the two RODs, NYSDEC and KeySpan met to discus the responses and phasing of the required remedial design and construction. Based upon those discussions, it was determined that the construction of the subsurface sheet pile barrier wall, identified as Element No. 6 in the March 2001 ROD for Operable Unit 1 (OU-1), should proceed in advance of the other components. This approach was intended to mitigate the seepage of Non-Aqueous Phase Liquid (NAPL) from the Site into Coney Island Creek and eliminate exposure pathways. The remaining components and elements of the March 2001 ROD were re-designated as OU-3. It was also decided that the design and construction of OU-2 and OU-3 would be progressed together, as one project.

KeySpan prioritized the design and construction of the OU-1 sheet pile barrier wall. The construction of this remedial element was completed in April 2004. Pairs of piezometers were installed along with the sheet pile barrier wall and monthly monitoring of the water levels and product thicknesses are being conducted.

Simultaneously with the design and construction of OU-1, KeySpan has pursued the design of OU-2 and OU-3. In June 2004, KeySpan presented a preliminary design for the combined remedial construction of OU-2 and OU-3 to NYSDEC. This presentation included both a verbal presentation and the submittal of 40% Design Drawings. Subsequently, NYSDEC provided comments on the KeySpan presentation in September and October 2004. 80% Design Drawings were submitted to the NYSDEC in July 2005 and the NYSDEC provided comments on this submission to KeySpan on August 12, 2005. A draft Final Remedial Design Report was submitted to the NYSDEC in September 2005 and NYSDEC comments were received by KeySpan on November 7, 2005. These NYSDEC comments were either incorporated in this RD Report or addressed in the January 18, 2006 response letter submitted to the NYSDEC by KeySpan.

Building upon these design submittals and the subsequent NYSDEC comments, this RD Report provides the basis of the design elements and an understanding of the design concepts for the remediation of OU-2 and OU-3. It also discusses the findings of the groundwater modeling and investigations that were performed to support this design.

In accordance with the remaining elements of the March 2001 ROD and the March 2002 ROD, the proposed combined remedial design for OU-2 and OU-3 will include the following remedial tasks:

- Excavation of a minimum of three feet of contaminated sediments (approximately 58,000 cubic yards) across the entire length and width of the OU-2 reach of the Coney Island Creek and removal of remaining NAPL to the extent practical;
- Amendment of the excavated sediments to be used as backfill in the upland portions of the Site;
- Backfilling and capping of the excavated areas within Coney Island Creek with up to three feet of sediment-quality material and the placement of a geotextile fabric between any underlying residual contaminated sediment and the clean backfill material;
- The cleaning of existing rip-rap, retaining walls, and/or bulkheads determined to be impacted by MGP-related contaminants to the extent practical;
- Removal of contaminated materials along the northerly bank of Coney Island Creek down to three feet below ground surface (bgs) to restore the bank and to establish a 50 foot wide Ecological Buffer Zone, including appropriate plantings, that will act as a transition between the Creek and the upland portions of the Site;
- Removal of existing wooden bulkhead and impacted soils encountered along the north bank of the Creek in the western area of the Site;
- Excavation of Coal Tar Source Areas (approximately 55,000 cubic yards) down to the existing groundwater table (an average depth of approximately 6 feet bgs) in the upland portions of the Site for offsite disposal;
- Installation of a NAPL collection trench along the interior of the installed OU-1 sheet pile barrier wall to capture NAPL and associated groundwater;
- Construction of a Groundwater Treatment System that will treat collected NAPL and associated groundwater prior to discharging to the Coney Island Creek;
- Construction of a low permeability Environmental Soil cap that will have a minimum thickness of three feet throughout the upland portions of the Site to minimize exposure pathways to the public; and
- Passive venting of vapors accumulating under the soil cap.

This RD Report is organized into the six sections summarized below:

- Section 1.0, Introduction, provides a description of the administrative history of the Site, describes the remedial design objectives, and provides project background;
- Section 2.0, Field Investigation and Groundwater Modeling, provides a description of and the results for the geotechnical field investigation performed at the Site and discusses the groundwater modeling program conducted for the Site;
- Section 3.0, Remedial Design, provides the design basis and remedial objectives for the Site and describes the remedial systems that will be constructed during implementation of OU-2 and OU-3 remediation activities;
- Section 4.0, Engineering Cost Estimate and Project Schedule, provides an engineering cost estimate for the remedial construction and provides a project schedule;

- Section 5.0, Identification of Federal, Local, and State Permits, provides a description of the types of permits to be obtained prior to execution of the remedial construction activities; and
- Section 6.0, Construction, provides a description of the implementation of the remedial construction activities and the contractor selection method.

1.0 INTRODUCTION

1.1 Administrative History

Paulus, Sokolowski and Sartor Engineering, PC (PS&SPC) has been retained by KeySpan Corporation (KeySpan) to prepare this Final Remedial Design Report (RD Report) to present the design of the required remedial actions for the former Brooklyn Borough Gas Works Site Operable Unit Nos. 2 (OU-2) and 3 (OU-3) (Site) located in Brooklyn, New York (Site No. 2-24-026).

In March 2001, the New York State Department of Environmental Conservation (NYSDEC) issued a Record of Decision (ROD) for *Operable Unit 1: Plant Site, Former Brooklyn Borough Gas Works Site, Coney Island, Kings County, New York (Site Number 2-24-026)*. This ROD requires that KeySpan remediate the uplands portion of the Site in accordance with the selected remedy described in the ROD. In March 2002, the NYSDEC issued a ROD for *Operable Unit 2: Coney Island Creek, Former Brooklyn Borough Gas Works Site, Coney Island, Kings County, New York (Site Number 2-24-026)*. This ROD requires that KeySpan remediate contaminants in and along the reach of Coney Island Creek, adjacent to the Site.

Subsequent to the issuance of the two abovementioned RODs, NYSDEC and KeySpan met to discuss the responses and phasing of the required remedial design and construction. Based upon those discussions, it was determined that the construction of the subsurface sheet pile barrier wall, identified as Element No. 6 in the March 2001 ROD for Operable Unit 1 (OU-1), should proceed in advance of the other remedial components. The purpose of the barrier was intended to mitigate the seepage of Non-Aqueous Phase Liquid (NAPL) from the Site into Coney Island Creek and eliminate exposure pathways. The remaining components and elements of the March 2001 ROD were re-designated as OU-3. It was also decided that the design and construction of OU-2 and OU-3 would be progressed together, as one project.

KeySpan prioritized the design and construction of the OU-1 sheet pile barrier wall. The construction of this remedial element was completed in April 2004. Pairs of piezometers were installed along with the sheet pile barrier wall and monthly monitoring of the water levels and product thicknesses are being conducted.

Simultaneously with the design and construction of OU-1, KeySpan has pursued the remedial design of OU-2 and OU-3. In June 2004, KeySpan presented a preliminary design for the combined remedial construction of OU-2 and OU-3 to NYSDEC. This presentation included both a verbal presentation and the submittal of 40% Design Drawings. Subsequently, NYSDEC provided comments on the KeySpan presentation in September and October 2004.

Building upon the June 2004 submittal and the subsequent NYSDEC comments, this RD Report provides the basis of the design elements and an understanding of the design

concepts for the remediation of OU-2 and OU-3. It also discusses the findings of the groundwater modeling and investigations that were performed to support this design.

The remainder of Section 1.0 discusses the remedial design objectives, provides relevant background information, and provides the organization of this RD Report.

1.2 Remedial Design Objectives

1.2.1 OU-3

As described in the March 2001 ROD, the overall remedial goal for OU-3 is to restore the Site to pre-disposal conditions, to the extent feasible and authorized by law, with the minimum remedial objective being to eliminate or mitigate, through the proper application of scientific and engineering principles, all significant threats to the public health and to the environment presented by the hazardous waste disposed at the Site.

The objectives selected for the remediation of this Site include the following:

- Eliminate, to the extent practicable, off-site migration of contaminants of potential concern within the Site groundwater;
- Eliminate, to the extent practicable, human exposures to contaminants;
- Eliminate, to the extent practicable, the migration of contamination into Coney Island Creek; and
- Eliminate, to the extent practicable, the exposure of fish and wildlife to levels of contaminants above standards/guidance values.

The March 2001 ROD includes a selected remedy to achieve these objectives. Element No. 6 of the selected remedy, the sheet pile barrier wall, was completed in April 2004. The remaining elements of this selected remedy are as follows:

1. *A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS will be resolved.*

2. *Excavation of coal tar source areas down to the groundwater table. Excavated material will be consolidated under temporary enclosures, as appropriate, and as described in more detail in Sections 3.8 and 4.2 of the Feasibility Study Report to control, among other things, the releases of volatile emissions and odors. If coal tar source is visually observed beyond the excavation boundaries, the source will be removed to the extent feasible without water handling difficulties.*

3. *Off-Site transport and recycling and/or disposal of source area materials.*

4. *Installation of a protective cofferdam along the Coney Island Creek perimeter to minimize potential releases from the Site during creek bank excavation and restoration efforts.*

5. *Use of a temporary construction enclosure along the creek bank when trenching or excavation activities may release significant volatile emissions or odors into the atmosphere.*

6. *Removal of the existing wooden bulkhead and contaminated materials between the barrier wall and the cofferdam with subsequent construction of a stabilized creek bank.*

7. *Installation of a NAPL collection trench along the interior of the creek barrier wall section to capture migrating NAPL.*

8. *Treatment of approximately 72,000 gallons daily of non-aqueous waste and groundwater in a system designed to reduce contaminant concentrations such that the treated effluent may be discharged to the Coney Island Creek. Contaminants in the water will be reduced to non-detectable levels.*

9. *Installation of a multi-component cover system to act as a low permeability barrier to minimize both infiltration and the potential for direct contact of workers with residual contaminants. At least two feet of cover material is necessary for the protection of human health and the environment. The Site will be graded to a common elevation prior to installation of the cover system.*

10. *Passive venting and control of vapors which may form under the cover system. Performance evaluation of the passive system will be used to assess the need, if any, for an active system.*

11. *Restoration of the Coney Island Creek bank to provide a 50-feet wide ecological buffer zone. Monitoring wells will be installed immediately outside of the barrier within the buffer zone to assess the long-term performance of the barrier wall.*

12. *Use of institutional controls including deed restrictions, fencing, a health and safety plan, a contingency plan and long-term monitoring after the implementation of remedial actions to ensure continued adherence to the Site's health and safety plan; continued treatment of collected groundwater, maintenance of the multi-component cover system, and to prohibit the use of the Site for other than commercial and industrial purposes without permission from NYSDEC.*

13. *Since the selected remedy will result in untreated hazardous waste remaining at the Site, a long-term monitoring plan will be instituted. Monitoring wells will be installed across the Site to monitor the effectiveness of the multi-layer cover system and overall remedial plan and will be a component of the operation and maintenance plan for the Site. The effectiveness of the selected remedy will be evaluated at the end of a five-year monitoring period.*

14. *Any conceptual design for redevelopment, although not part of the remedy, must be evaluated by the NYSDEC for potential impacts to the remedy. However accomplished, redevelopment cannot adversely affect, compromise the integrity of, or disturb the Site remedy.*

1.2.2 OU-2

The objectives for the remediation of OU-2 (Coney Island Creek) are described in the March 2002 ROD. These objectives include:

- Eliminate, to the extent practicable, human exposures to MGP-related contaminants present in the Coney Island Creek surface water and sediment;
- Prevent or eliminate, to the extent practicable, exposure of fish and wildlife to levels of MGP-related contaminants in the Coney Island Creek surface water and sediments; and
- Prevent or eliminate, to the extent practicable, human exposure of MGP-related contaminants through the consumption of contaminated fish.

The March 2002 ROD includes a selected remedy to achieve these objectives. The components of the selected remedy are as follows:

1. *The top three feet of contaminated sediments across the entire length and width of the OU-2 reach of the Creek adjacent to the site will be excavated and dewatered for off-site treatment/disposal or placement under the cap system, as provided for by the March 2001 ROD.*

2. *An estimated 34,000 cubic yards of impacted sediment will be removed. The areas excavated will be capped with up to three feet of sediment-quality material, such as sand and/or silty-sand material. The cap will include a filter fabric or geotextile between any residual contaminated sediment and clean materials placed.*

3. *Restoration of the Coney Island Creek bank along the OU-1 site to remove contaminated materials and to provide a 50-foot wide ecological buffer zone, consistent with the requirements already established in the March 2001 ROD.*

4. *A long term monitoring program will be implemented to assure the effectiveness of the proposed remedy including the three foot cap system. As part of the monitoring, KeySpan will collect both sediment and surface water samples for laboratory analysis, perform a bathymetric survey and conduct modeling.*

1.3 Project Background

The Site is located between Neptune Avenue and the Belt Parkway, within the Coney Island section of the Borough of Brooklyn, New York, as depicted in the Design Drawings included in Appendix A. It is bordered by the right-of-way (ROW) of the Belt Parkway, a New York City Transit (NYCT) rail yard to the north, three operating commuter rail lines of the NYCT to the west, and the beginning reach of the Coney Island Creek to the south and east. This property, currently owned by KeySpan, is approximately 16 acres in size. NYCT is an operating unit of the Metropolitan Transportation Authority (MTA), a state agency. The westerly portion of the Site, containing most of the former manufactured gas plant (MGP) facilities, is relatively flat at elevations ranging between 4 to 6 feet (NAVD88). The easterly portion of the Site is at higher elevations ranging between 12 and 15 feet (NAVD88), reflecting its previous filling with miscellaneous materials.

The area immediately surrounding the Site is relatively flat and contains commercial and industrial uses. Residential zones near the Site are located northerly of Belt Parkway and southerly of Neptune Avenue.

The Site is covered by vegetation, installed as part of the OU-1 remedial construction, except for several exposed concrete foundations of former gasholders, process vessels, tanks and buildings and construction debris. Soil erosion controls and a turbidity barrier placed during the construction for OU-1 remain in place at the Site. A Site Location Map for the Former Brooklyn Borough Gas Works Site is provided in the Design Drawings included in Appendix A. Existing Site conditions are shown in Design Drawing, C-02.

The Brooklyn Borough Gas Company began construction of the first generator at the Site in 1908. Over the next four years, additional parcels of land were added, the facility was enlarged, and its gas production capability increased.

In the 1930s, two (2) large-capacity gas holders, a station metering house, two (2) underground gas oil tanks, tar conditioners, tar seal pumps, and a tar separator were located in the western portion of the Site. The main gas manufacturing operations were located in the central portion of the Site and contained:

- Four (4) generators
- A coal storage yard and coal off-loading equipment
- Pump rooms
- Booster and exhauster rooms
- Two (2) condensers

- Eight (8) purifier boxes
- Two (2) relief holders
- An electric tar precipitator
- A tar dehydrator system
- Two (2) tar separators
- Tar storage tanks
- Water tanks
- Oil pumps
- Drip oil tanks

Various storage and work buildings were also located in the central area of the property, including a blacksmith shop in the south-central area. To the east was the gas oil pump house and five gas oil tanks.

The physical facility and property changed little from the 1930s through 1960. Brooklyn Borough Gas transformed its gas delivery operations to a natural gas-based system, and production of manufactured gas at the Coney Island facility ceased in November 1951. According to Brooklyn Borough Gas documents, gas deliveries to customers in 1952 were natural gas. Between 1952 and 1959, the Site's manufactured gas plant (MGP) capability may have been maintained and operated for the purpose of peak shaving. The Brooklyn Union Gas Company (which ultimately became KeySpan) acquired the Brooklyn Borough Gas Company in 1959. KeySpan did not manufacture gas at this facility.

From 1960 to 1966, the facility was almost completely decommissioned and demolished. In 1974, a few buildings associated with a gate station, which included an axial compressor, a small gasholder, and the largest gasholder, remained operational providing natural gas service. KeySpan believes the gate station and gasholders were taken off line at the end of the 1970s and were subsequently decommissioned and demolished in the early 1980s.

In the early 1970s, the easternmost portion of the property was topped with fill and two (2) baseball fields were constructed on top of the fill in the late 1980s. These fields were decommissioned in 1996 and are no longer in use.

In July 1993, a seep releasing light non-aqueous phase liquid (LNAPL) from the Site into Coney Island Creek was reported by KeySpan to the appropriate regulatory agencies. Following an investigation, KeySpan conducted an interim remedial measure (IRM) to mitigate the release of LNAPL into Coney Island Creek. The IRM was constructed from July to November 1994 and included:

- Installation of inland recovery wells;
- Installation of hard boom and end connections in Coney Island Creek; and,
- Installation of a LNAPL skimmer and oil collection system.

The system was tested and demonstrated to be operational in late 1994. It was also observed and verbally accepted by the United States Coast Guard in May 1995.

In May 1995, KeySpan and the NYSDEC negotiated an Order on Consent (Index No. D2-001-94-12) to investigate and clean up the Site. The Order on Consent required KeySpan to perform a Remedial Investigation (RI), a baseline Risk Assessment (RA) and a Focused Feasibility Study (FFS). The RI was completed in 1997, the baseline RA was completed in 1998, and the FFS was completed in 2000.

In October 1997, KeySpan conducted a second IRM at the Site. The purpose of this IRM was to mitigate high concentrations of lead in surface soils that were not simultaneously contaminated with high levels of coal tar. This IRM involved the removal and proper disposal of the top one-foot of soil from approximately four acres on the western portion of the Site. As a result of this IRM, approximately 250 tons of non-RCRA hazardous soil and approximately 1,500 tons of RCRA hazardous soil were removed from the Site and disposed of at approved facilities.

In March 2001, the NYSDEC issued the ROD for the remediation of the uplands portion of the Site. In March 2002, the NYSDEC issued the ROD for the remediation of Coney Island Creek adjacent to the Site.

1.4 RD Report Organization

The text below describes the organization of this RD Report.

Section 1.0 – Introduction

The introduction describes the administrative history of the Site, describes the remedial design objectives, and provides project background.

Section 2.0 – Field Investigation and Groundwater Modeling

This Section provides a description of and the results for the geotechnical field investigation performed at the Site, sediment investigation done in the Coney Island Creek, and discusses the groundwater modeling program conducted for the Site.

Section 3.0 – Remedial Design

This Section provides the design basis and remedial objectives for the Site and describes the remedial systems that will be constructed during implementation of OU-2 and OU-3 remediation activities.

Section 4.0 – Engineering Cost Estimate and Project Schedule

This Section provides an engineering cost estimate for the remedial construction and provides a project schedule.

Section 5.0 – Identification of Federal, Local, and State Permits

This Section describes the types of permits to be obtained prior to execution of the remedial construction activities.

Section 6.0 – Construction

This Section describes the implementation of the remedial construction activities and the contractor selection method.

2.0 FIELD INVESTIGATION AND GROUNDWATER MODELING

2.1 Geotechnical Field Investigation

In December 2002, PS&SPC was contracted by KeySpan to complete a geotechnical investigation and exploration of the uplands portion of the Site (OU-3). The field investigation was performed from July 10 through August 11, 2003. A final report documenting the results of the investigation and laboratory testing was issued to KeySpan on December 10, 2003 and a copy of this report is included in Appendix B of this RD Report. The intended purpose of this work was to support a proposal by the New York City Department of Sanitation (DSNY) to construct a new district garage and its related facilities for DSNY's Brooklyn operations on the Site. The results of this investigation were used as a component in the remedial design of OU-2 and OU-3.

The investigation primarily encompassed the westerly portion of the Site (where the former MGP facilities existed) and included the collection of the field data and samples and the performance of geotechnical laboratory analyses. The investigation also necessitated the preparation of a work plan and a health and safety plan for approval by NYSDEC; a survey of the boring and piezocone locations; the installation of soil borings, and the performance of piezocones for soil properties evaluation and geotechnical laboratory testing of collected soil samples.

PS&SPC retained the services of CMI Subsurface Investigations, Inc. (CMI) of Old Tappan, New York to perform the borings. ConeTec, Inc. of Marlton, New Jersey was retained to perform the piezocone profiles.

CMI contacted the New York One Call System to mark out the underground utilities outside the Site. This utility markout was completed before the start of the mobilization. KeySpan personnel, familiar with the Site, provided technical assistance to ensure that no on-site underground utilities were located near the soil boring and piezocone locations.

A total of 44 soil borings and 50 piezocone profiles were completed. Twenty-two of the borings were drilled to a depth of 65 feet below ground surface (bgs) and the remaining twenty-two borings were drilled to a depth of 125 feet bgs. The borings were installed using both truck-mounted and all-terrain vehicle (ATV) mounted drilling rigs. All 50 piezocones were advanced to a depth of 125 feet bgs. Similarly, truck-mounted and ATV mounted drilling rigs were used to perform the piezocone profiles.

The field investigation was completed pursuant to the approved work plan and health and safety plan approved by NYSDEC. A community air monitoring plan (CAMP) was implemented during the work. A decontamination station was provided for the drill rigs pursuant to the work plan and health and safety plan. KeySpan managed all investigation-derived waste materials, including soil cuttings, drilling fluids and personal protective equipment for proper off-site disposal.

PS&SPC completed the survey of the elevations and locations of the borings and piezocones locations using a boundary survey furnished by KeySpan. North American Vertical Datum 1988 (NAVD 88) was used as the vertical datum and North American Datum 1983 (NAD 83) was used to specify the locations on the Site.

Samples were recovered from the soil borings for geotechnical laboratory analyses. The PS&SPC Geotechnical Laboratory located in Warren, New Jersey completed the geotechnical analyses. These analyses included a total of 50 grain size analyses, 23 Atterberg limits, 33 moisture content analyses, eight consolidation tests, ten direct shear tests and nine corrosivity tests.

2.2 Results of the Geotechnical Field Investigation

The results of the geotechnical field investigation for the DSNY proposal confirmed and complemented the geotechnical investigation performed for the OU-1 remedial design. Similar soil and geologic conditions were found in the geotechnical field investigation as in the OU-1 design borings. The depth to groundwater, a parameter needed for the design of the Coal Tar Source Areas excavations, was confirmed to be approximately six feet bgs. Additionally, borings and piezocones, adjacent to the Coal Tar Source Areas shown in the March 2001 ROD, identified the presence of coal tar residue at depths of approximately six feet bgs and provided support for the expansion of the Coal Tar Source Areas beyond the limits shown in the March 2001 ROD.

2.3 Supplemental Site Investigation

In February 2005, a supplemental site investigation program was implemented at the Site in accordance with the June 2004 Supplemental Investigation Work Plan (SIWP). The June 2004 SIWP was approved by the NYSDEC on September 3, 2004 via electronic mail. The investigation field activities included the collection of groundwater samples to support the design of the proposed groundwater treatment system to be constructed at the Site as well as to supplement the existing groundwater database of historical groundwater samples. Prior to this work being performed, groundwater samples were last obtained at the Site in 1997.

2.3.1 Groundwater Sampling

As part of the investigation field activities, eleven existing monitoring wells (MW-IW-01 through MW-IW-04, MW-4, MW-9, MW-10, MW-14 through MW-16 and MW-21) were sampled and the groundwater samples were sent to H2M Laboratories and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals including cyanide. The analytical results have been tabulated and are included in Appendix C of this RD Report. A summary of these analytical results is as follows:

- VOCs were detected in all the monitoring wells with the exception to monitoring well, MW-15. The VOCs detected were benzene, toluene,

ethylbenzene, xylenes (BTEX) and styrene. Benzene was detected in all the monitoring wells at levels above regulatory criteria. Groundwater samples collected from monitoring wells, MW-14 and MW-IW-03, were also reported to have toluene, ethylbenzene and xylenes at concentrations above regulatory criteria (i.e. TAGM 4046);

- SVOCs, naphthalene and 2-methylnaphthalene, were detected in monitoring wells, MW-14 and MW-IW-03, above the regulatory criteria. Monitoring well, MW-15, was the only well where no SVOCs were detected in the collected groundwater sample;

- Cyanide was detected in all monitoring wells but the groundwater samples only exceeded regulatory criteria in three monitoring wells (MW-IW-01, MW-IW-02 and MW-IW-03). Sodium, manganese and iron were also detected in all the monitoring wells at concentrations exceeding regulatory criteria. Selenium was the only metal not detected in any of the monitoring wells. Aluminum, antimony, magnesium and thallium were the only other metals to be detected above regulatory criteria in the monitoring wells. Groundwater samples collected from monitoring wells, MW-10, MW-IW-01 and MW-IW-03, had the greatest number of analytes detected above regulatory criteria while the groundwater sample collected from monitoring well, MW-15, had the least; and

- DNAPL was observed in monitoring well, MW-04 and was therefore not sampled during this sampling event.

In order to more accurately predict the influent water characteristics to the proposed groundwater treatment system, an additional groundwater sampling event is proposed to be conducted at the Site in September 2005. Monitoring wells, MW-1 through MW-15, MW-17, MW-20, and IW-1 through IW-4 are proposed to be sampled during this event.

2.3.2 MTA Soil Pile Sampling

The February 2005 investigation program also included collecting soil samples from an existing soil/debris pile, generated by MTA operations, and currently located on an MTA-owned property located in the northern portion of the Site. The pile was reportedly generated by the MTA during excavation activities performed on a site located immediately west of the Site. The soil pile encompasses an area of approximately one-quarter of an acre and the estimated volume of material in the pile is approximately 1,900 cubic yards (3,100 tons). Visual inspection of the pile indicates it consists of medium to fine sands with some silts, concrete rubble ranging from six-inches to five-feet, asphalt pavement debris, rubber hosing, rubber tires, sheet metal, bulky wastes (water tanks, car parts and machinery parts), timber railroad ties and municipal solid waste (plastic, bottles, bedding, clothing, etc.).

KeySpan collected soil samples from the pile to characterize the pile for waste disposal purposes and to determine the presence of any impacts. Eight (8) soil samples were collected and sent to H2M Laboratories and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) volatile organic compounds (VOCs), TCLP semi-volatile organic compounds (SVOCs), TCLP pesticides/herbicides, BTEX, polychlorinated biphenols (PCBs), TCLP Metals, total petroleum hydrocarbons (TPH) and (polyaromatic hydrocarbons (PAHs). A summary of these analytical results is as follows:

- There were no TCLP organic or BTEX analytes detected in any of the eight composite soil samples collected;

- Two PCBs (Aroclor 1254 and Aroclor 1260) were detected in all eight soil samples and ranged from 0.13 mg/kg to 1.6 mg/kg; none of which exceeded the appropriate regulatory criteria;

- Five TCLP metals were detected in the collected soil samples. Zinc was detected below the regulatory criteria in all eight soil samples. Cadmium was detected below regulatory criteria in one soil sample. Mercury was detected above the regulatory criteria in four of the collected soil samples ranging from 890 ug/l to 1,370 ug/l. Copper was detected in five soil samples, but they were below the regulatory criteria. Lead was detected in one soil sample;

- TPH was detected in all eight of the composite soil samples and ranged from 550 mg/kg to 1,410 mg/kg. There are no specific regulatory criteria for TPH in soil. Seventeen different PAH compounds were detected in the eight composite soil samples. Twelve of the analytes (Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Indeno[1,2,3-cd]pyrene, Phenanthrene and Pyrene) were detected in all eight soil samples. Benzo[b]fluoranthene, Benzo[k]fluoranthene and Chrysene exceeded the regulatory criteria in all eight soil samples. Benzo[a]anthracene was detected above the regulatory criteria in four of the eight soil samples while Indeno[1,2,3-cd]pyrene was detected above criteria in only one sample location, BGWWC-B, which also had the greatest number of analytes detected and in exceedance of the regulatory criteria. No individual location exceeded the 500 mg/kg criteria for total detected SVOCs; and

- Nineteen individual soil samples were collected and analyzed for VOC and SVOC analytes. There were no VOCs detected in any of the nineteen soil samples analyzed. More than twenty SVOC analytes were detected in the nineteen soil sample locations. Eight of the analytes;

Benzo[a]anthracene Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Carbazole, Chrysene, Indeno[1,2,3-cd]pyrene and Phenol were detected at levels that exceeded the regulatory criteria. Only Chrysene was detected above the regulatory criteria in all nineteen soil samples.

2.3.3 Coney Island Creek Sediment Investigation

KeySpan has retained Alpine Ocean Seismic Survey, Inc. (Alpine) to conduct a sediment investigation in the Coney Island Creek to obtain information regarding the chemical and biological quality of the sediments in the Creek as well as obtaining geotechnical properties of the soil strata below the Creek. This investigation has culminated into a report prepared by Alpine and titled, "Final Report Coney Island Creek Sediment Investigation" as is included as Appendix L of this RD Report. In addition, Alpine partnered with GZA Consultants to assist with health and safety monitoring and sample observation and classification. A representative from PS&SPC was also on-site to represent KeySpan during the investigation activities. All sediment samples targeted for chemical and biological analysis were sent to ChemTech Consulting Group, Inc. of Edison, New Jersey (ChemTech), a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certified laboratory, under proper chain-of-custody procedures.

Eight (8) four foot Vibracore samples (S01 through S08) were collected on November 3 and 4, 2005 by Alpine. Alpine's "Mini-Barge" was used as the Vibracore sampling platform. A 14 foot skiff with an outboard motor was utilized to maneuver the barge to the proposed core locations as depicted in Alpine's report (Appendix L). The positioning system utilized by Alpine consisted of a Trimble 4000 Differential GPS Navigation System that utilized a 12-channel satellite receiver and a dual-channel radio beacon receiver. In addition, the positioning system used a laptop computer, color video monitor and Hypack Max software. A pneumatic Vibracore unit was used that consisted of: an air-driven hammer assembly; an aluminum H-beam which acts as a vertical guide for the vibrator; a set of four steel support pads and legs which hold the beam upright on the creek bottom; an aluminum coring pipe; a cutting edge; a core retainer; a Lexan core liner: and a penetrometer. Sediment samples were collected from the Vibracores and analyzed at a certified laboratory for a variety of chemical analyses utilizing MEP, SPLP, and Elutriate analyses. The results of these analyses are included in Appendix L of this RD Report.

A geotechnical exploration program was conducted at 10 boring locations (GT-1 through GT-10) along the section of Coney Island Creek adjacent to the project site. The borings were performed immediately adjacent to the southern shoreline of the Creek for the purpose of collecting representative samples of the subsurface sediments and underlying soils for evaluation of their geotechnical strength characteristics and engineering properties. The geotechnical data and strength characteristics derived from this exploration will be used in the design of the

shoring system that is to be installed along the southern shoreline of the Creek by the selected remedial contractor prior to commencement of the sediment dredging operations.

The geotechnical borings were performed using a Sprague and Henwood portable drilling rig mounted on a steel barge that was moved to each boring location using a small power boat. The drilling operations were performed by CMI Subsurface Investigations, Inc. of Tappan, New York. Alpine provided personnel and Differential Global Positioning Satellite Navigation System (DGPS) equipment to guide and locate the barge at each geotechnical location. Representatives of PS&SPC maintained continuous logs of the explorations and monitored the sampling operations in order to obtain the desired subsurface information. Environmental conditions on the work barge were monitored by representatives of GZA who also collected samples of the recovered sediments/soils for analytical testing.

The borings were advanced through the Creek sediments and underlying soils using mud-rotary drilling techniques. A temporary steel casing was installed to the bottom of the Creek sediments to maintain an open borehole throughout the drilling and sampling operations. Representative soil samples were obtained at two-foot intervals using the Standard Penetration Test (SPT), in accordance with the American Society of Testing and Materials (ASTM) procedure D 1586. Samples were recovered continuously from the top of the Creek sediments to a depth of twelve feet and then at five-foot intervals thereafter to termination depths of 20 to 27 feet. At the conclusion of the borings, all geotechnical samples were brought to PS&SPC's soil mechanics laboratory in Warren, New Jersey for analysis. In addition to the geotechnical borings included with Alpine's report, these geotechnical soil borings are also included in Appendix L.

In response to NYSDEC comments regarding the requirement to demonstrate a 90 percent reduction in leachate contaminants, sediment samples of un-amended and amended sediments were analyzed utilizing Synthetic Precipitation Leaching Procedure (SPLP) and Multiple Extraction Procedure (MEP) leachability testing procedures. These results are included in Appendix L of this RD Report.

2.4 Groundwater Modeling

2.4.1 Overview of Model

Additional groundwater flow modeling was performed for the Site by HydroQual, Inc. (HydroQual), under contract to PS&SPC. The Modular Three-dimensional Finite-Difference Groundwater Flow Model (MODFLOW) was selected for the simulation of the Site groundwater flow. MODFLOW was originally developed by the US Geological Survey in 1984 and has undergone numerous revisions. The current version of this model, MODFLOW-2000 (Harbaugh, et. al, 2000) has been incorporated into the pre- and post-processing software used for this project

(Visual MODFLOW-Pro), developed by Waterloo Hydrogeologic. This model and software are well proven and accepted in the industry for application to porous media flow systems such as that in the Coney Island area. The tracking of particles within the simulated flow system is conducted using the MODPATH code. MODPATH was originally developed by the USGS in 1989 and was revised in 1994 (Pollock, 1994). The current version (Version 3.2) was released in 2000 and has been incorporated into Visual MODFLOW-Pro. A copy of HydroQual's May 2005 Groundwater Modeling Report, data and flow maps are included in Appendix D.

The objective of the groundwater model simulations was to aid in the final design of the proposed NAPL collection trench and to confirm the estimated flow rate of 72,000 gallons per day as included in the March 2001 ROD. Design criteria that were evaluated included the vertical position of the horizontal collection pipe relative to the projected post-remedial groundwater table elevation and the projected post-remedial flow rate that the NAPL collection trench would need to manage. The groundwater flow model was used to simulate the post-remedial conditions at the Site including the low permeability environmental cover and the operation of the NAPL collection trench. Simulations were conducted for the following two infiltration scenarios:

- Existing Site conditions including the existing perimeter sheet pile containment barrier with the existing soil cover and post-remedial Site conditions including a low permeability environmental soil cover; and
- Operation of the NAPL collection trench.

The groundwater flow modeling consisted of the following key tasks:

- Development of a conceptual model of groundwater flow;
- Development of a numerical model;
- Calibration of the model; and
- Simulation of the two infiltration scenarios.

2.4.2 Development of a Conceptual Model

The conceptual model of the hydrogeologic conditions in the vicinity of the Site was developed through the application of basic hydrogeologic principles to data obtained from previous investigations and field observations made during a site visit on October 7, 2004. In addition, temporary piezometers, TP-1 through TP-16, were installed on the eastern portion of the Site on March 31 and April 1, 2005 using a GeoProbe® drilling rig. Three rounds of groundwater levels were obtained from the available on-site monitoring wells and the temporary piezometers. Previously collected data included soil boring logs, monitoring well specifications, monthly results of groundwater elevations from on-site piezometers, slug test results, and geotechnical laboratory data. Data collected during the site visit included depth to groundwater in available monitoring wells

and the elevation of the top of well casing for selected monitoring wells relative to the perimeter piezometers. Data derived from the as-built plans of the existing sheet pile barrier was also used as input, including the locations and depths of placement.

A summary of the conceptual model of hydrogeologic conditions in the vicinity of Coney Island Creek is provided as follows:

Feature	Basis
Geology consists of unconsolidated Quaternary glacial and marine deposits that form part of the barrier island off the southern shore of Long Island. These deposits are predominantly sand and extend to the Gardiner's Clay at a depth of approx. 180 feet.	Literature review (Flint and Skinner, 1977).
A discontinuous layer of clay, peat, and silt ("peat") occurs at an elevation just above mean sea level. A "lower clay" layer occurs at an elevation of approximately –20 feet (msl). This layer is limited to the northwestern portion of the Site.	Soil boring logs from previous investigation including the Remedial Investigation Report (E&E, 1997), and more recent geotechnical borings.
The horizontal hydraulic conductivity of the sand ranges from approximately 5 to 50 ft/d. The vertical anisotropy of the sand is on the order of 10 to 1. The vertical hydraulic conductivity of the "peat" layer is on the order of 1 x 10-6 to 1 x 10-7 cm/s.	Results of slug tests in monitoring wells and laboratory permeability tests.
Coney Island Creek is tidally influenced with a tidal range of approximately 5 feet. The tidal influence on groundwater levels is generally less than one foot.	Historic groundwater elevation data.
Shallow groundwater flows towards and discharges into Coney Island Creek. Deeper	Measured water levels in monitoring wells, surface water elevations from topographic maps, and basic principles of groundwater

Feature	Basis
groundwater flow paths discharge to the ocean.	hydrogeology.
The head in the sand/fill above the "peat" (where present) is several feet greater than that in the underlying sand. This creates a strong vertically downward gradient in portions of the Site.	Comparison of groundwater elevations in monitoring well couplets.
The perimeter sheet pile wall penetrates through the "peat" layer and keys into the "lower clay" layer (where present).	As-built information regarding the construction of the sheet pile wall.
Recharge to the groundwater from precipitation on open, vegetated ground is approximately 15 to 18 inches per year.	Regional estimates from the literature.

The horizontal model domain encompasses an area approximately 8,000 feet by 9,300 feet. The model domain was chosen to be significantly larger than the Site for several reasons. First, a larger domain allows model boundaries to be placed along natural boundaries such as the Atlantic Ocean. Second, by incorporating groundwater flow from adjacent areas, a better simulation of the discharge to the collection system is conducted within the regional flow system. Confidence is increased since the input values for recharge and hydraulic conductivity are appropriate regionally as well as locally. Lastly, this approach assures that boundary conditions do not artificially influence the amount of water available from adjacent areas during pumping simulations.

Vertically, the model domain extends from ground surface to an elevation of minus 180 feet bgs. Thus, the bottom of the domain is at the general elevation of the Gardiner's Clay, which can be considered a no-flow boundary.

2.4.3 Numerical Model

A horizontal finite-difference grid was superimposed over the area to be simulated. A grid with 140 rows and 167 columns was used. A variable grid spacing was chosen with a closer spacing over the Site and a coarser spacing in off-site areas with less data for comparison. The grid spacing is 15 ft x 15 ft in the center and gradually increases to 225 ft x 225 ft at the grid boundaries.

The model was divided into six layers to simulate the various hydrogeologic units and to provide vertical resolution of heads in the deeper, uniform sand. The layers and the corresponding hydrogeologic units in the base case model are listed below:

MODEL LAYER	HYDROGEOLOGIC UNIT
Layer –1	Fill and sand above the "peat" layer
Layer – 2	"peat" layer
Layer – 3	Quaternary sand deposits
Layer – 4	Lower clay / Quaternary sand
Layer – 5	Quaternary sand
Layer – 6	Quaternary sand

Constant head cells were used to simulate the Atlantic Ocean along the southern beach and along the northwestern shoreline parallel to Shore Parkway. An elevation of 0.0 feet, msl was used for these boundaries. River cells were used to simulate Coney Island Creek within the model domain. An average tide elevation of +1.5 feet was used for the specified water surface elevation. Tidal fluctuations were not simulated due to the relative lack of tidal influence reported in monitoring wells. The wooden bulkhead along Coney Island Creek was simulated with "wall" cells in layers 1 and 2 during calibration of the model to pre-sheet pile (1986) conditions. An effective thickness of 1 foot and a hydraulic conductivity of 1 x 10-6 cm/s were assumed. Wall cells were also used to simulate the perimeter sheet pile wall during calibration of the model to current conditions (2005). These cells were included in model layers 1 through 3. An effective thickness of one foot and a hydraulic conductivity of 1.0 x 10-7 cm/s were assumed.

2.4.4 Calibration of Numerical Model

The base case model was first calibrated to current (April 2005) conditions using standard trial and error calibration methods. The model was run to steady-state conditions and compared to the predicted groundwater elevations to a set of field-measured target water levels. Input parameters were varied within reasonable ranges relative to field-measured values. The calibrated model was then checked by simulating pre-sheet pile barrier wall conditions and comparing the results to water levels collected in November 1996.

The results of the calibration process indicate that the model provides a reasonable simulation of the groundwater flow conditions in the vicinity of the Site and is capable of predicting changes in groundwater elevations and flow rates due to the installation of the NAPL trench and low permeability soil cover. The calibration has also confirmed the various components of the conceptual model, such as hydraulic conductivity, recharge, and the selection of regional and local boundaries.

2.4.5 Simulation of NAPL Collection Trench and Cover

The calibrated groundwater flow model was used to simulate groundwater extraction from a downgradient NAPL collection trench that is proposed to be located upgradient of the Ecological Buffer Zone and the existing sheet pile containment barrier. The objective of the NAPL collection trench system is to collect NAPL inboard of the barrier. A one-foot depression in the groundwater table was established as the goal for model simulations. This level of depression will allow NAPL to locally migrate to the trench and enter the horizontal perforated pipe.

The environmental soil cover is to consist of low permeability soil (1×10^{-5} cm/s or greater) over the entire Site. An average annual recharge rate of 15.5 inches per year was used in the calibrated model and 0.5 inches per year was used in the proposed Ecological Buffer Zone since this area will be underlined with an HDPE liner.

2.4.6 Conclusions

A groundwater flow model has been constructed for the Site and immediate surrounding areas. The model was successfully calibrated to measured groundwater elevations both prior to, and after the installation of the perimeter sheet pile containment barrier. Input values for hydraulic conductivity and recharge were within ranges supported by the field data and the regional literature. The results of the calibration process indicated that the model is a reasonable simulation of the groundwater flow conditions and is capable of predicting changes in groundwater elevations and capture zones due to the installation of low permeability soil covers and the NAPL collection trench. Predictive model simulations indicate that the NAPL collection trench would collect groundwater at an annual average flow rate of approximately 20 to 30 gallons per minute (gpm) or 28,800 to 43,200 gallons per day. This flow rate would be greater during the initial dewatering of the fill and may vary throughout the year with precipitation events. The optimum vertical placement of the horizontal perforated pipe within the NAPL collection trench is at a uniform elevation of +1 on the western leg and +3 (NAVD88) on the eastern leg.

3.0 REMEDIAL DESIGN

3.1 Remedial Objectives

In accordance with the remaining elements of the March 2001and the March 2002 RODs, the proposed combined remedial design for OU-2 and OU-3 will include the following remedial tasks:

- Excavation of the top three feet (minimum) of contaminated sediments across the entire length and width of the OU-2 reach of the Coney Island Creek and removal of remaining NAPL to the extent practical;
- Amendment of the excavated sediments to be used as backfill in the upland portions of the Site;
- Backfilling and capping of the excavated areas within Coney Island Creek with up to three feet of sediment-quality material and the placement of a geotextile fabric between any underlying residual contaminated sediment and the clean backfill material;
- The cleaning of existing rip-rap, retaining walls, and/or bulkheads determined to be impacted by MGP-related contaminants to the extent practical;
- Removal of contaminated materials along the northerly bank of Coney Island Creek down to three feet below ground surface (bgs) to restore the bank and to establish a 50 foot wide Ecological Buffer Zone, including appropriate plantings, that will act as a transition between the Creek and the upland portions of the Site;
- Removal of existing wooden bulkhead and impacted soils encountered along the north bank of the Creek in the western area of the Site;
- Excavation of Coal Tar Source Areas down to the existing groundwater table (an average depth of approximately 6 feet bgs) in the upland portions of the Site for offsite disposal;
- Installation of a NAPL collection trench along the interior of the installed OU-1 sheet pile barrier wall to capture NAPL and associated groundwater;
- Construction of a groundwater treatment system that will treat collected NAPL and associated groundwater prior to discharging to the Creek;
- Construction of a low permeability environmental soil cap that will have a minimum thickness of three feet throughout the upland portions of the Site to minimize exposure pathways to the public; and
- Passive venting of vapors accumulating under the soil cap.

3.2 Pre-Mobilization and Submittals

Each of the remedial tasks is discussed in detail below. The remedial design is supported by Design Drawings, contained in Appendix A and Technical Specifications, contained in Appendix E. The Design Drawings and the Technical Specifications provide for a performance-based remedial construction and the selected remedial contractor is responsible for providing the means and methods to achieve the performance criteria of these documents. The selected remedial contractor will be required to prepare a Site Management Plan (SMP) that will detail the proposed means and methods for achieving

the remediation goals in accordance with the Design Drawings and Technical Specifications. This SMP will be required to be submitted to KeySpan for review and acceptance prior to the implementation of the Site remediation.

In addition to the Design Drawings and Technical Specifications, a generic Health and Safety Plan (generic HASP) is also enclosed in Appendix F. The selected remedial contractor will be required to provide a site-specific Health and Safety Plan (site-specific HASP) to coordinate with contractor's means and methods of construction and this plan will be submitted for the review and acceptance by KeySpan and the NYSDEC. The Contractor shall prepare a site-specific HASP based on the requirements contained in the attached generic HASP. The Contractor site specific HASP may be more stringent than the generic HASP. A community air monitoring plan (CAMP) will be implemented as part of the approved site-specific HASP. This CAMP will consist of an appropriate number of monitoring stations, modeled after the requirements provided in NYSDEC Manual DER-10.

As there will be numerous construction materials to be used during the remedial construction, the quality and suitability of these materials will need to be checked on a continuous basis. For this purpose, a generic construction quality control project plan (generic CQCPP) has been prepared and is contained in Appendix G. The selected remedial contractor will review this generic CQCPP and develop a site specific CQCPP for review and acceptance by KeySpan. The Contractor shall prepare a site-specific CQCPP based on the requirements contained in the attached generic CQCPP and the Technical Specifications. The Contractor site specific CQCPP may be more stringent than the generic CQCPP and the requirements of the Technical Specifications.

Following KeySpan review and acceptance of the remedial contractor's SMP, site-specific HASP, and site-specific CQCPP, KeySpan will distribute copies of these documents to NYSDEC and the New York State Department of Health (NYSDOH) for review and concurrence. The approved documents and drawings will serve as the Contract Documents in which the selected remedial contractor must conform to during the remedial activities for the Site.

3.3 Mobilization

Site mobilization activities will be performed to initiate remedial on-site activities. All on-site personnel will have the requisite 1910.120 Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) Training as well as site-specific training prior to any intrusive activity. Staging areas for materials, construction equipment and excavated material, decontamination areas, and support areas will be identified and approved by KeySpan prior to performing work. These areas will be selected based on ease of access, location of site constraints, proximity to the major work areas and Site traffic patterns. Equipment and materials for the remedial activities will be brought to the Site as required. All equipment will be inspected prior to utilization for the remedial activities and checked periodically for performance and corrective repair. All equipment will be clean prior to

arrival on the Site. The selected remedial contractor will coordinate with KeySpan regarding equipment and material staging.

3.4 Site Preparation

The Site shall be prepared, as needed, to facilitate the implementation of the proposed remedial activities. Site preparation activities shall include removal of vegetation as required and any on-site debris within the limits of the proposed remedial work as detailed in the Contract Documents.

Other site preparation activities shall include but not be limited to: establishing/upgrading Site haul roads, establishing existing conditions by photo documentation or surveying, decommissioning or relocation of existing utilities, mobilizing and erecting fabric enclosure(s) including vapor management system(s), mobilizing process equipment and temporary facilities for dredging activities, conducting selective demolition, and furnishing all temporary facilities required to facilitate the implementation of the remedial activities.

3.4.1 Soil Erosion and Sediment Control Measures

Prior to commencement of land disturbance and demolition activities, temporary soil erosion and sediment control measures shall be installed and maintained for the remedial activities as specified in the Contract Documents.

Remedial activities shall be carried out so as to minimize erosion and silting in accordance with the New York Guidelines for Urban Soil and Sediment Control. Remedial activities will be performed so as to limit the potential for fugitive odor and dust emissions. Dust control measures will consist of water spraying or approved equivalent. The type of dust control (e.g. water spray) and odor suppression measures (e.g. Biosolve^{TM}) shall be proposed by the selected remedial contractor in the approved SMP. In addition, a temporary fabric enclosure(s) will be utilized during the excavation activities in the Coal Tar Excavation Area.

Heavyweight turbidity barriers and dispersion curtains shall be utilized, both upstream and downstream of operations, during the Creek dredging to contain the dispersion of silt/sediment and to prevent suspended solids from migrating downstream in the Coney Island Creek during remedial activities. In addition, the turbidity barriers shall be equipped with a containment boom to contain LNAPL. The Contractor's SMP will detail the type and the locations of the turbidity barriers.

In addition, real time turbidity monitors will be positioned in key locations around the perimeter of the dredged area as detailed in the approved SMP and will be equipped for data transmission to an on-shore display and data recording

monitoring device. A detailed discussion of the turbidity monitoring is included in Section 3.12 of this RD Report.

During remedial construction, erosion and sediment control measures will be inspected and maintained on a daily basis. Accumulated sediment will be removed from the erosion and sediment controls as needed. Sediment that originates from the excavated area will be added to the stockpile for off-site disposal.

3.4.2 Decontamination Pads and Activities

The decontamination pads shall consist of an area of suitable size for the decontamination purposes underlain by crushed stone or sand and lined with an impermeable liner conforming with the requirements of the Contract Documents at locations agreed to by KeySpan. The remedial contractor may utilize pre-fabricated decontamination pads as approved by KeySpan.

Decontamination activities shall include the removal of contaminated soil, debris and other miscellaneous materials from all construction equipment and tools utilized within the Exclusion Zone using a high-pressure low volume steam cleaner. Physical/mechanical agitation (scraping with hand tools) of soil can be utilized to minimize wastewater generation.

3.5 Excavation of Coal Tar Source Areas

As depicted on Design Drawing, C-03, excavation activities within the Coal Tar Source Areas will consist of removing observed coal tar source material to the depth of the groundwater table, estimated at six feet below ground surface (bgs) based on the March 2001 ROD. As previously discussed, the results of the 2003 geotechnical investigation warranted the expansion of the Coal Tar Source Areas beyond the limits detailed in the March 2001 ROD. Assuming an average excavation depth of 6 feet bgs, the estimated volume of material to be removed from the proposed Coal Tar Source Areas is approximately, 55,000 cubic yards. Excavated material will be consolidated under a temporary enclosure(s) to control the release of volatile emissions and odors and loaded onto transport vehicles for off-site disposal (as detailed in the approved SMP). If coal tar source material is visually observed to extend beyond the excavation boundaries, then excavation activities will extend beyond the boundaries to the extent feasible without water handling difficulties. KeySpan and the NYSDEC representative will make the final determination as to whether or not encountered material is constituted to be coal tar source material that requires removal. This determination for removal will be based upon visual observation and field screening techniques. In addition, any subsurface former industrial features (i.e. piping, tanks, etc.) encountered during the excavation of the Coal Tar Source Areas (above the existing groundwater table) and constituted to be coal tar source materials will be removed to the extent practical. Due to inherent problems with constructability, the existing former gasholder pads are not proposed to be removed

during the Coal Tar Source Area excavation activities. The former gasholder pads are proposed to be left in place to supplement the proposed cap system.

3.6 Backfilling Coal Tar Source Areas

As detailed in subsequent sections of this RD Report, the excavations within the Coal Tar Source Areas will be mostly backfilled with the processed dredge material (PDM) generated during the Coney Island Creek dredging operations. Based on the proposed dredging approach for the Creek, it is estimated that approximately 58,000 cubic yards of dredge material will be removed from the Creek. As such, it is anticipated that supplemental backfill material will not be required to backfill the excavations within the Coal Tar Source Areas. However, in the event that supplemental backfill material will be required, this backfill material will consist of the following gradation (or approved alternative):

Sieve Size	Percent Passing
2”	100%
3/4 inch	70% - 100%
No. 4	30% - 80%
No. 50	10% - 35%
No. 200	5% - 12%

After placement, the cured PDM will be tested for compressive strength in accordance with ASTM D698 and ASTM D1557 to demonstrate a compressive strength of 3,000 pounds per square foot at a maximum strain of 5% on the sample core. Core samples of in-place backfilled PDM for laboratory testing will be acquired at a rate of not less than one sample for every 40,000 square feet of backfilled PDM. A protocol for the compressive strength testing of PDM will be included with the selected remedial contractor’s SMP for review and approval by KeySpan.

Analytical testing will be required for any soil backfill brought to the Site. For soil backfill, the selected remedial contractor will be required to collect representative confirmatory samples from each off-site source of soil backfill material at a rate of one per every 5,000 cubic yards. The samples will be analyzed at a New York State Department of Health (NYSDOH)-certified Environmental Laboratory Accreditation Program (ELAP)-approved laboratory for total PAHs and total volatile organic compounds (VOCs) and shall meet the requirements of TAGM 4046. All analytical data will require the approval from the NYSDEC and KeySpan prior to delivery of backfill to the Site.

3.7 Environmental Soil Cover

Upon completion of the excavation activities for the Coal Tar Source Areas and the dredging of Coney Island Creek, a soil cover system will be constructed to function as a low permeability barrier to minimize both rain water infiltration and the potential for direct contact of the public with residual contaminants. The construction of the NAPL

collection trench and the Ecological Buffer Zone may occur simultaneously with the environmental soil cover construction as detailed in the approved SMP.

As detailed in the March 2001 ROD, at least two-feet of low permeability soil will be necessary for the protection of human health and the environment. The Environmental Soil Cover system will include at least two (2) feet of low permeability soil overlaid with a 6-inch (minimum) topsoil cover to facilitate vegetative growth and underlined by a 1 foot (minimum) layer of gravel to facilitate passive venting of vapors that may collect under the cover system.

3.7.1 Low Permeability Soil Layer

A minimum two (2) foot layer of low permeability soil shall be included with the Environmental Soil Cover. The low permeability soil shall have a compacted in-place hydraulic conductivity of not greater than 1 x 10^{-5} cm/sec when compacted to at least 95 percent of the modified proctor density (as determined by ASTM D1557) at the required moisture content. The selected remedial contractor shall submit a proposed gradation for this material along with information on the permeability acceptance window with the SMP for review and approval by KeySpan and the NYSDEC.

3.7.2 Vapor Gravel Layer (Passive Venting)

A one (1) foot layer of gravel shall be included with the Environmental Soil Cover to passively manage potential accumulated vapors. The vapor gravel material will be a clean coarse aggregate conforming to the NYSDOT Specifications for Coarse Aggregate size designation 4A that has the following gradation (or an approved alternative):

Sieve Size	Percent Passing
3”	100%
2.5”	90% - 100%
1.5”	0% - 20%

A woven geotextile fabric will be installed between two non-woven geotextile fabrics and the geotextile system will be placed between the gravel and the surrounding soils to minimize siltation of the gravel. The woven geotextile fabric will be installed to minimize siltation from surrounding soils and the nonwoven geotextile fabric will be installed to protect the woven geotextile fabric from potential punctures and tears from the gravel or the surrounding soils.

The purpose of the vapor gravel layer is to control potential vapors that may accumulate under the Environmental Soil Cover system. The controlled vapors will then be passively vented to the atmosphere via Polyvinyl Chloride (PVC) stickups (as detailed in the Contract Documents) that will be installed every 200 feet center to center.

3.7.3 Topsoil Layer

A six (6) inch topsoil cover shall be included with the Environmental Soil Cover, which will facilitate the growth of vegetation. Topsoil will generally conform to the following parameters (or as approved):

- Topsoil shall have at least 2 percent by weight of fine textured stable organic material and no greater than 6 percent. Muck soil shall not be considered topsoil.
- Topsoil shall have not less than 20 percent fine textured material (passing the No. 200 sieve) and not more than 15 percent clay.
- The pH of the topsoil shall be between 5.5 and 6.5.
- Topsoil treated with soil sterilants or herbicides shall be so identified.
- Topsoil shall be relatively free of stones and other materials over 1½ inches in diameter, trash, noxious weeds such as nutsedge and quackgrass, and will have less than 10 percent gravel by volume.
- Topsoil containing soluble salts greater than 500 ppm shall not be used.

3.8 NAPL Collection Trench

A NAPL collection trench will be constructed immediately upgradient of the 50-foot Ecological Buffer Zone as specified in the Contract Documents. The NAPL collection trench will be constructed by excavating a trench that is approximately 5 feet wide with a varying depth of approximately 5 to 15 feet below the proposed finished grade and backfilled with 1 to 3 inch diameter stone. The NAPL collection trench will extend along the length of the Ecological Buffer Zone, which is approximately 1,900 feet long. The NAPL collection trench gravel material will be a clean coarse aggregate conforming to the NYSDOT Specifications for Coarse Aggregate size designation 4A that has the following gradation (or an approved alternative):

Sieve Size	Percent Passing
3”	100%
2.5”	90% - 100%
1.5”	0% - 20%

The purpose of the NAPL collection trench is to capture migrating NAPL and to prevent it from migrating into the Ecological Buffer Zone and the Coney Island Creek. The NAPL collection trench has been designed to capture both light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL). The LNAPL will be captured by an 18-inch diameter perforated HDPE horizontal pipe that will be set at an optimum vertical placement within the NAPL collection trench as specified by the results of the groundwater modeling report contained in Appendix D. As discussed in Section 2.4 of this RD Report, the optimum vertical placement of the horizontal perforated pipe within the NAPL collection trench is at a uniform elevation of +1 on the western leg and +3 (NAVD88) on the eastern leg. The 18-inch diameter horizontal pipe will extend

throughout the NAPL collection trench and will tie into two (2) six (6) foot diameter concrete NAPL Extraction/Pumping Stations. The two (2) NAPL Extraction/Pumping Stations will be equipped with submersible pumps that will convey LNAPL and associated groundwater to the Groundwater Treatment System via force mains.

As per comments received from the NYSDEC, the design for the NAPL collection trench has been modified to capture migrating DNAPL. The original design of the NAPL collection trench as included with the June 2004 40% Design Drawings has been modified to include a 40 millimeter, impermeable, HDPE liner not only draped across the downgradient side of the trench but along the bottom of the trench as well. The bottom of the trench will slope towards the NAPL Extraction/Pumping Stations. Any DNAPL that migrates into the NAPL collection trench will trek along the bottom of the trench and eventually culminate into a sump like configuration on the exterior of the pumping station. Any DNAPL that collects into this sump like configuration will be extracted via six-inch diameter recovery wells as detailed in Design Drawings, C-06 and C-13. The HDPE liner will commence along the bottom of the NAPL collection trench, extend up the downgradient wall of the trench and terminate at the existing sheet pile barrier wall as detailed in Design Drawings, C-08 and C-09. In addition, the proposed bottom elevation of the trench has been deepened to an elevation of approximately 0.0 feet and sloping down (at an average slope of 0.5%) to an elevation of –2.0 feet (NAVD88) at the NAPL Extraction/Pumping Stations. By deepening the trench, the trench bottom profile elevation approximates the top elevation of the observed discontinuous shallow peat layers.

To better ensure that DNAPL collection is achieved along the full length of the trench, four (4) additional DNAPL recovery wells will be installed along the full length of the trench as depicted on Design Drawing, C-06. DNAPL will be extracted via the recovery wells utilizing vacuum removal or pumping and will be transferred to the on-site groundwater treatment system.

In addition, as per comments received from the NYSDEC, deep DNAPL recovery wells (6 inch diameter) will be installed as depicted on Design Drawings, C-05 and C-06, within the western portion of the trench to ensure the capture of DNAPL below the bottom of the trench.

3.9 Groundwater Treatment System

The March 2001 ROD included the design and construction of a groundwater treatment system having the capacity to treat 72,000 GPD of impacted groundwater. As mentioned in Section 2.4 of this RD Report, groundwater modeling was performed to confirm this flow rate using modeling simulations. As such, predictive model simulations indicate that the NAPL collection trench would collect groundwater at an annual average flow rate of approximately 28,800 to 43,200 GPD. Since the predicted flow rate may vary throughout the year with precipitation events, the peak capacity of the groundwater treatment system will be designed for a flow rate of 30,000 GPD with a peak flow rate capacity of 40,000 GPD.

The groundwater treatment system will specifically target and treat non-aqueous phased liquid (NAPL). The NAPL and associated groundwater will be conveyed to the groundwater treatment system from the NAPL collection trench's pumping stations via force mains. Treated effluent will be discharged to the Coney Island Creek. As a minimum, treated effluent will not exceed discharge concentration limits as established by the NYSDEC and as published in the New York State Ambient Water Quality Standards and Guidance Values, June 1998.

HydroQual has also been contracted by KeySpan to design the groundwater treatment system. A conceptual design of the system is included in Appendix K of this RD Report as a document titled, "Preliminary Process Design (Phase I) for the Groundwater Treatment System" and dated August 2005. As part of this design, bench-scale testing will be conducted to determine specific operational and performance criteria particularly with respect to NAPL removal, removal of metals, and chemical oxidation. The bench-scale testing will assist in defining certain operating variables such as chemical and other consumables requirements, reaction times and residual production rates. The purpose of the bench-scale testing is to conduct laboratory-scale simulations of the treatment processes to be tested. In addition, pilot-scale testing will be conducted to include equipment specifications, assembly details, operating protocols, and a sampling and analytical schedule. The purpose of the pilot-scale testing will be to demonstrate the effectiveness of the selected process scheme, identify optimum operating conditions, estimate chemical and other consumables requirements and to also estimate the production of residuals. Once the bench-scale and pilot-scale testing are complete and the results have been evaluated, KeySpan will conduct the design of the groundwater treatment system and will prepare the necessary contract documents for construction.

The groundwater treatment system will most likely be housed within a pre-engineered building or enclosure including individual treatment units, sludge handling equipment, and a control center. The likely process sequence of the groundwater treatment system will involve equalization/storage of impacted groundwater, an oil/water separation system for NAPL removal followed by physical chemical treatment for metals removal, dissolved organics removal by air stripping or chemical oxidation (Fenton process), and final filtration and granular activated carbon absorption prior to a discharge. Sludge handling will most likely include a storage tank, dewatering operation (i.e. belt press or plate and frame press) and onsite storage of dewatered sludge for off-site disposal.

It is anticipated that the construction of the groundwater treatment system will be conducted by a contractor other than the remedial contractor selected to perform the remaining components of the OU-2 and OU-3 remediation. However, since the operating capacity of the system will most likely be substantially less than what was originally anticipated, KeySpan may elect the option of allowing the selected remedial contractor to construct the groundwater treatment system during the OU-2 and OU-3 remediation. It is anticipated that the groundwater treatment system will be operational during the implementation of the OU-2 and OU-3 remediation for possible utilization.

3.10 Ecological Buffer Zone

A 50-foot wide Ecological Buffer Zone will be constructed along the northern bank of Coney Island Creek. As dictated by the March 2002 ROD, MGP impacted materials will be removed to restore the Creek bank and establish this transition between the Creek and the upland portions of the Site. Clean fill will be backfilled to create the Ecological Buffer Zone and the bank will be contoured as depicted in the Contract Documents. The certified clean fill will consist of a minimum of three (3) feet of Sandy Loam planting medium with the addition of 20 percent by volume of composted organic material. The Clean Fill shall conform to the following textural analysis specified for a "Sandy Loam" as per the United States Department of Agriculture (USDA) textural classification chart:

- 45 to 85 percent sand;
- 15 to 55 percent silt plus clay (fines content); and
- 5 percent (minimum) clay.

The fines content should have a low plasticity with a plasticity index of seven (7) or less. The Sandy Loam may contain up to 15 percent gravel that is one inch or less in diameter. The composted organic matter can be either mixed in thoroughly with the Clean fill prior to placement or tilled into the upper 12 to 18 inches after placement. The composted organic material must pass a ¾ inch sieve (i.e., 100 percent passing), be fully cured, and not contain any foreign matter such as metal, plastics, construction rubble/debris or asphalt. The pH of the Sandy Loam will be between 5.5 and 6.5. The Sandy Loam material will be verified by a NYSDOT approved laboratory prior to delivery to the Site.

The Ecological Buffer Zone will be planted with appropriate plant species, as detailed on Design Drawing, C-15 to balance goals of restoring aquatic and terrestrial habitat with aesthetic considerations and will support plant life, create habitat for selected bird species and promote additional beneficial uses. Excavated MGP impacted soil will either be disposed of off-site or amended and placed on-site, under the Environmental Soil Cover.

The following plant species are currently proposed for the Ecological Buffer Zone starting at the intertidal area up towards the uplands:

- Smooth cordgrass (*spartina alterniflora*);
- Salt meadow cordgrass (*Spartina patens*);
- Salt marsh aster (*Aster tenuifolius*);
- Spike grass (*Distichlis spicata*);
- American beach grass (*Ammophila breviligulata*);
- Swamp rose mallow (*Hibiscus moscheutos*);
- Bitter panic grass (*Panicum amarum*);
- Blue flag iris (*Iris versicolor*);
- Seaside goldenrod (*Solidago sempervirens*);
- Groundsel bush (*Baccharis halimifolia*);
- High tide bush (*Iva frutescens*);
- Northern bayberry (*Myrica pensylvanica*);

- Beach plum (*Prunus maritime*);
- Redtop (*Agrostis alba*);
- New York aster (*Aster novi-belgii*);
- Switchgrass (*Panicum virgatum*);
- Red chokeberry (*Aronia arbutifolia*);
- Nigra inberry (*Ilex glabra nigra*);
- Arrowwood viburnum (*Viburnum dentatum*);
- Shadblow serviceberry (*Amelanchier Canadensis*);
- American holly (*Ilex opaca*);
- Eastern redcedar (*Juniperus virginiana*); and
- Black cherry (*Prunus serotina*).

As dictated by the March 2001 ROD, the existing wooden bulkhead located on the western portion of the Site and on the northern bank of the Coney Island Creek will be removed to the proposed excavation depth during the dredging of the Creek and/or during the establishment of the Ecological Buffer Zone. The existing wooden bulkhead, which is approximately 500 feet in length, will be removed down to the proposed excavation depth, to the extent practical. The void space between the remaining portion of the existing wooden bulkhead and the existing sheet pile barrier wall will be backfilled to the extent practical as directed by KeySpan. Based on field observations made during the OU-1 remedial activities, it is anticipated that heavily impacted soil will be encountered during the removal of the existing wooden bulkhead. In areas where heavily impacted soils are encountered and removed, a 6-inch thick layer of grout (or approved alternative) will be tremied along the bottom of the excavation and will extend laterally within the excavation as dictated by field conditions and by KeySpan and the NYSDEC to minimize the potential for uplifting of the underlying heavily MGP impacted soil.

As described in previous sections of this RD Report, a HDPE impermeable liner will be installed from the bottom of the NAPL collection trench and extend under the Ecological Buffer Zone before terminating at the existing sheet pile barrier wall. The liner will be coupled with the existing sheet pile barrier wall utilizing a tremie concrete seal as detailed in Design Drawings, C-07 and C-08 or approved alternative method. This liner system will minimize the potential for uplifting of underlying MGP impacted soil. In addition, the liner system will minimize the potential for rainwater to infiltrate the subsurface and come in contact with MGP impacted soils. Should the selected remedial contractor present an alternative to installing a HDPE liner system (i.e., utilizing tremie grout or bentonite impregnated liners), this proposed alternative would be included in the contractor's SMP that would require approval by both KeySpan and the NYSDEC. The remedial contractor may present an alternative due to the inherent difficulties with installing a liner system within the existing groundwater table without conducting dewatering operations.

In accordance with the March 2001 ROD, monitoring wells will be installed within the Ecological Buffer Zone as depicted on Design Drawing, C-05, to monitor the long term performance of the NAPL collection trench. Monitoring will consist of groundwater table measurements and determining the presence/absence of NAPL.

3.11 Existing Features Along Coney Island Creek

In accordance with the March 2002 ROD, existing features along Coney Island Creek (i.e. rip rap, retaining walls, or bulkheads) that will remain in place and are impacted by MGP materials will be cleaned to the extent practical. It is anticipated that the majority of the existing features along the northern extent of the Coney Island Creek will be removed during the remedial activities. The existing features to remain along the southern extent of the Creek that are determined to be impacted by MGP material will be cleaned with adsorbent pads (or equivalent) to the extent practical. The means and methods for cleaning the existing features along the southern extent of the Creek will be included with the contractor's approved SMP.

3.12 Coney Island Creek Dredging and Capping

In accordance with the March 2002 ROD, the top three feet (minimum) of contaminated sediments across the entire length and width of the OU-2 reach of the Coney Island Creek adjacent to the Site will be dredged. The existing bathymetry of the Creek is irregular and varies from a bottom elevation of approximately –8.0 feet on the western end and a bottom elevation of approximately –2.0 feet on the eastern end based on utilizing NAVD88 as a vertical datum.

3.12.1 Dredging Overview

A Dredging Plan (C-09) is included as part of the Design Drawings. Due to the irregularity of the Creek bathymetry, the Dredging Plan has divided the Creek into five reaches (Reach 1 through Reach 5) that correlate to the average bottom elevation of the Creek in that particular area. The average bottom elevation of the Creek within the Reach 1 area is approximately –8.0 feet, the average bottom elevation of the Creek within the Reach 2 area is approximately –6.0 feet and so on until Reach 5 which has an average bottom elevation of the Creek of approximately –2.0 feet. Within each Reach, the initial design included a proposed dredge depth of three feet below the assigned average bottom elevation of the particular Reach. However, as per comments received from the NYSDEC, the Design Drawings have been modified to include a minimum three (3) foot dredge depth throughout the extent of the Coney Island Creek. It is estimated that this modified dredging approach will result in approximately 58,000 cubic yards (in-place) of Creek sediment being removed during the dredging activities.

The proposed construction approach to the Creek dredging includes the mechanical removal of sediments using an environmental clamshell bucket, transporting the dredge materials to the upland portions of the Site, and processing/amending the dredged materials for on-site placement under the proposed environmental soil cover. Relatively large amounts of debris are anticipated to be encountered during this dredging process and this debris must be removed and segregated from the sediments. In such situations, a standard bucket may be used to remove debris.

3.12.2 Sediment Excavation

Dredging will commence at the westernmost end of the Creek (i.e., 10 feet from the MTA ROW) and proceed to the east (deeper to shallower water depths), providing flotation depths for the excavation and transport marine equipment and terminate in the western end of the Creek (10 feet from the property line). In addition, the lateral extent of the dredging will extend to the existing sheet pile barrier wall on the north side of the Creek and to the shoring system (to be installed by the selected remedial contractor) along the south side of the Creek immediately above the Mean High Water Line (2.0' NAVD88). Based on the proposed dredging approach, it is estimated that approximately 58,000 cubic yards of dredge material will be removed from the Creek. Prior to the dredging activities, a hydrographic survey of the Creek will be conducted to establish the pre-dredging conditions.

In order to facilitate the proposed dredging activities while maintaining a stabilized bank along the southern extent of the Coney Island Creek, the selected remedial contractor will install a shoring system consisting of sheet piling or approved alternative. In order to facilitate the dredging of sediments up to the Mean High Water Line (2.0' NAVD88), the proposed alignment of the shoring system will be immediately above this elevation. Upon completion of the dredging and backfilling activities within the Coney Island Creek, the shoring system (which will be of marine grade) is proposed to remain in place to provide ongoing stabilization of the southern Creek bank. Upon completion of the dredging and backfilling activities, the top of the permanent shoring system will be trimmed one (1) foot below the ground surface.

The existing sheet pile barrier wall in the western portion of the Site will require a reinforcement system such as tiebacks or some other approved supporting technique during the dredging activities should the grade differential between the upland elevation and the dredge depth be greater than 8 feet.

The general sediment excavation approach consists of sediment being excavated utilizing an environmental bucket (to minimize the addition of water) equipped with a GPS RTK positioning/recording system and placed into shallow draft barge with a covered hopper roll on/roll-off container for transport to a temporary mooring station established at the southernmost tip of land at the Site. Each loaded shallow draft barge will be allowed to dock at the temporary mooring station for a period of 24 hours to allow sediments to settle and free water to rise to the surface of the hopper bin. At the end of this period, free water will be containerized for on-site treatment or off-site disposal. After this 24-hour period, the dredge material will be mechanically re-handled and placed into a screening hopper bin located at the mooring station for deposition onto a conveyor system. During low tide, the barges will be positioned in the deeper areas of the Creek or placed on spuds (or approved equivalent) to prevent the barges from being mired

into the sediments. The mooring barge will extend into the Creek to provide some standoff distance for additional draft for loaded barges and will be used as a platform for an excavator to remove the sediments from the roll on/roll off bins for transfer to the screening hopper bin. The conveyor system will transport the decanted dredge material from the screening hopper bin to a wet storage area located in an upland area of the Site within a temporary enclosure for processing and amending the dredge material. A liner will be placed under the conveyor to prevent loss of material during transport between the screening hopper bin and the wet storage area so as to prevent the reintroduction of sediments to the Creek. The wet storage area will be also lined to prevent seepage into the subsurface.

The purpose of the wet storage area is to stage dredged materials to facilitate continuous operation of the amending equipment. The duration in which the dredged material will be staged within the wet storage area will be dependent on the handling capacity of the amending equipment.

3.12.3 Turbidity

During the dredging operations, turbidity barriers and deflection curtains will be deployed at both upstream and downstream ends of the work zone to provide, in effect, full containment of the dredged area. The turbidity barriers and deflection curtains will be employed throughout the duration of the remediation to contain re-suspended sediments associated with the dredging of the Creek and the subsequent re-establishment of the contours of the Creek. Turbidity barriers will be of heavy-duty quality and will confine sediments to the dredging area and will restrict the potential for off-site migration of any re-suspended sediments. Deflection curtains will also be of heavy-duty quality and will be capable of deflecting tidal flows from the turbidity barriers.

Turbidity will be continuously measured in the field by the selected remedial contractor utilizing real time turbidity monitors. These turbidity monitors shall consist of OBS-3 turbidity monitors which also measure total suspended solids (TSS) based on turbidity levels. Using polynomial equations, a correlation between turbidity and TSS is established by the OBS-3 monitors. In addition, KeySpan may request that a field demonstration be conducted to demonstrate the correlation between turbidity and TSS utilizing laboratory analysis.

In the event that a visible increase of turbidity attributable to dredging operations is observed outside the turbidity barrier, immediate action will be taken by the selected remedial contractor to reduce the amount of sediment being re-suspended by dredging operation. The Contractor's Site Management Plan shall detail the proposed corrective measures to be implemented.

The TSS concentrations within and outside the dredging areas will be continuously monitored utilizing the OBS-3 monitors. In the event that the TSS concentration within the dredging area (i.e. within the turbidity barrier) exceeds

background concentrations by 100 mg/l, an immediate action correcting the re-suspension of sediment will be implemented by the Contractor. In the event that TSS concentrations outside the dredging area exceed 25 mg/l TSS above background, dredging operations will be temporary suspended until the cause of the exceedance is determined and immediate corrective actions are implemented by the Contractor.

The selected remedial will collect one (1) water sample every day within the Coney Island Creek approximately 50 ft downstream of the dredging area. The collected water sample shall be analyzed for TSS in an approved laboratory with a 24 hour turnaround time. In the event that TSS concentration in this sample exceeds the established background level by more than 25 mg/l, the sample shall also be analyzed for PAHs and volatiles with expedited turn around times. The laboratory results will be submitted to the NYSDEC for review.

The selected remedial contractor shall collect one (1) water sample on a daily basis from the impacted area outside the barrier, along the perimeter boom, and the sample will be analyzed for volatiles and PAHs. If analytical results indicate significant exceedances of New York State Water Quality Standards attributable to dredging operations, additional control measures will be evaluated and implemented.

3.12.4 Debris

It is anticipated that debris removal will be required during the dredging process. It is envisioned that larger debris such as bridge pilings, large concrete blocks, old bulkheads, etc. will be excavated separately with a barge mounted excavator and will be segregated from the sediments and staged for off-site disposal. The smaller sized debris will be removed with the sediments and placed into the shallow draft hopper barges for handling in the sediment re-handling process. Debris will be screened and removed when the sediment is removed from the hopper barge and placed on the screening hopper bin prior to the placement onto the conveyor system to the wet storage area. Some smaller pieces of debris may be transported to the wet storage area for secondary screening prior to the processing and amending operations.

3.12.5 Utilities

Historically, several submerged gas pipelines crossed the Coney Island Creek in a north-south direction. Allegedly, these pipelines were abandoned with the closure of the former gas operations in 1966, however it is unknown whether all of the pipelines were cleaned, plugged, or removed.

The selected remedial contractor will identify the location of two 30-inch diameter former gas mains that are believed to cross the Coney Island Creek to the east of the southern most tip of the upland portions of the Site as depicted in

the Design Drawings. One of the former gas mains is inactive and the other is active and utilized as an electrical conduit for a power supply line that terminates on-site. It is believed that the eastern former gas main is used as an electrical conduit and the western former gas main is inactive.

Should the two former gas mains be located within the proposed dredging limits, the selected remedial contractor will protect and support the active gas main and cut, clean, and remove the in-active gas main for off-site disposal. The means and methods that the Contractor will utilize to protect and support the active former gas main and to remove the in-active former gas main will be included in the Contractor's SMP.

Should the two former gas mains be located below the proposed dredging limits, the selected remedial contractor will identify which former gas main is active and which former gas main is inactive. The contractor will abandon the inactive former gas main in place by tremie grout or concrete into the pipe from both ends or by an alternate means approved by KeySpan. The active former gas main will be protected and/or supported from the abandonment activities as needed. In reviewing historical drawings of the Site, it appears that there are tees for the gas pipelines that extend upward to the ground surface and cement can be tremied into the inactive gas pipeline from these tees. The means and methods for abandonment and protection/support of the former gas mains will be included in the contractor's approved SMP.

In addition, storm water outlets and sewer outfalls are anticipated to be encountered within the proposed dredge areas of the Creek. Other utilities may exist and will be identified prior to initiating any dredging activities by conducting site surveillance and by utilizing electromagnetic, magnetic, or acoustic emission techniques to locate the potentially submerged objects or obstructions that may impact the dredging activities. Once identified and located, the utility lines will be protected and/or supported during the dredging activities to minimize damage and/or interruption of service.

3.12.6 Dredged Sediment Amending

All dredged material processing and amending, including the wet storage area, will be performed within a temporary fabric enclosure to minimize the release of any odors and volatiles from the sediments into the surrounding environment. The temporary fabric enclosure will be equipped with a vapor management system (VMS) that will provide six air exchanges per hour. After a short storage period in the wet storage area (at a duration that facilitates continuous operation of the amending equipment), the dredged material will be screened to separate debris greater than 2 inches and this debris will be conveyed to a crusher to break the particulate matter to a size that the pug mill can handle (<2 inches). Debris that is not appropriate for crushing will be segregated and staged for off-site disposal.

The graded sediment will then be conveyed to the pug mill where the sediment will be blended with Portland cement at a proportion of 8% to 10% cement by wet weight. Once blended and solidified/stabilized, the PDM will be temporarily stored prior to final placement and utilization as on-site upland backfill material. It is anticipated that the PDM will have an unconfined compressive strength of 3,000 pounds per square foot (psf) with 5% strain once cured. No precautionary measures for handling the PDM will be needed once solidified, and no odor/volatilization problems are anticipated. Pug mill production rates will be sized to match the excavation production rate in the Coal Tar Source Areas. Once blended, the PDM can be temporarily stored for up to 2-3 days prior to placement into the excavations within the Coal Tar Source Areas. Since the existing upland circular concrete pads that had been used to support the former holders are in close proximity to the Coal Tar Source Areas, they are proposed to be used as temporary staging areas for the PDM prior to backfilling activities. These areas are envisioned for independent use and the volume of the PDM staged on each concrete pad will be dependent on the backfilling requirements during the excavation activities within the Coal Tar Source Areas. A temporary berm (asphalt or approved alternative) will be placed around the perimeter of the concrete pads to contain any leachate generating from the PDM. The staged PDM will be transported to the excavation areas utilizing a conveyor system(s). The conveyor system(s) will be adapted and adjusted to place the material in the excavation areas as necessary. Dust control measures will be implemented by the selected remedial contractor as discussed in Section 3.4.1 of this RD Report.

As per the NYSDEC comments on the September 2005 RDR submittal, the amended sediments must demonstrate 90 percent reduction of contaminants in the leachate before the amended sediments can be backfilled in the upland portions of the Site. This requirement is based on the United States Environmental Protection Agency (USEPA) Guidance on Demonstrating Compliance with the Land Disposal Restrictions (LDR) Alternative Soil Treatment Standards, Final Guidance (EPA 530-R-02-003), July 2002.

Under the LDR alternative soil treatment standards in 40 CFR 268.49, there are two approaches to achieving compliance:

- Hazardous constituents must be reduced by at least 90 percent through treatment so that no more that 10 percent of their original concentration remains or comparable reductions in mobility for metals, OR

- Hazardous constituents must not exceed 10 times the Universal Treatment Standards (10 x UTS) at 40 CFR 268.48

As discussed in the January 18, 2006 response letter to the NYSDEC, KeySpan proposed that the required 90 percent reduction be capped at 10 times UTS in accordance with the EPA guidance document.

As discussed in Section 2.3.3 of this RD Report, a sediment investigation of the Creek was conducted by KeySpan in the November 2005. In response to NYSDEC comments regarding the requirement to demonstrate a 90 percent reduction in leachate contaminants, sediment samples of un-amended and amended sediments were analyzed utilizing Synthetic Precipitation Leaching Procedure (SPLP) and Multiple Extraction Procedure (MEP) leachability testing procedures. Applicable portions of the un-amended SPLP and MEP sediment data from the sediment investigation study were compared to the UTS and the above referenced USEPA guidance document.

Many of the sediment data laboratory results included in the report contained in Appendix L of this RD Report are reported by the laboratory as "U" (non-detect) values both prior to and after amendment. Therefore, a demonstration of 90 percent hazardous constituent removal would not be applicable for many sample values. However, a comparison of the maximum laboratory result values (including U and J values) of the un-amended (raw) sediment samples to the UTS was performed and this comparison indicates that the analytical results were observed to be less than UTS. For constituents with UTS values based on extract (TCLP) values (such as metals), sediment SPLP and MEP extraction data were also compared successfully against the UTS requirement. Therefore, KeySpan believes that amending the PDM with 8 to10 percent cement will apparently meet the requirements of the above referenced USEPA guidance document.

However, as per the subsequent NYSDEC comments received, samples of the amended sediment (before and after amending) will be collected by the selected remedial contractor every 2,000 cubic yards to demonstrate the 90% reduction capped at 10 times the UTS. All collected samples will be analyzed utilizing Synthetic Leaching Procedure (SPLP), EPA SW 846, Method 1312. In addition, as per received NYSDEC comments, a biotoxicity test on the amended sediments may be required and conducted as a one time procedure.

3.12.7 Backfill and Capping of Dredged Creek Areas

In accordance with the March 2002 ROD and following the excavation of contaminated sediments, the remaining sediments in Coney Island Creek will be capped with up to three feet of sediment-quality material as detailed in the Contract Documents. This sediment-quality material will consist of a combination of stone/gravel, sand, and organic material. The cap will include a geotextile fabric between any residual contaminated sediment and the clean materials that are being placed as detailed in the Contract Documents. It is estimated that approximately 58,000 cubic yards of backfill material will be required to cap the dredged areas of Coney Island Creek as depicted in Design Drawing, C-09.

Upon completion of the excavation of the sediments, a hydrographic survey of the Creek will be conducted to confirm that the sediments have been removed to the design dredge elevations and to the defined lateral extents. Imported clean

material will be used to backfill the excavated Creek areas and this material will consist of the following composition:

- 10% stone/gravel (NYSDOT designation type 2 or equivalent);
- 10% stone/gravel (NYSDOT designation type 1A or equivalent);
- 70% sand (NYSDOT designation type 1B or equivalent); and
- 10% organic material (NYSDOT Item 713.15 or equivalent).

It is proposed that sand make up the majority of the proposed backfill in order to establish the sediment quality characteristics of the backfill. In addition, it is proposed that 20% of the backfill material consist of stone/gravel to minimize the potential for erosion or scouring from occurring. The remaining portion of the backfill is proposed to consist of 10% organic material that would provide nutrient enriched material that will promote and facilitate the re-establishment of the mud flats subsequent to the remedial work being completed. The backfill material will be well mixed prior to placement such that the surface layer is not armored.

The NYSDOT designation type 2 stone/gravel will consist of certified clean coarse aggregate conforming to the following gradation:

Sieve Size	Percent Passing
1 ½ inch	100%
1 inch	90% - 100%
½ inch	0% - 15%

The NYSDOT designation type 1A stone/gravel will consist of certified clean coarse aggregate conforming to the following gradation:

Sieve Size	Percent Passing
½ inch	100%
¼ inch	90% - 100%
⅛ inch	0% - 15%

The NYSDOT designation type 1B sand will consist of certified clean coarse aggregate conforming to the following gradation:

Sieve Size	Percent Passing
¼ inch	100%
⅛ inch	90% - 100%
180 µm	0% - 15%

The organic material (NYSDOT Item 713.15) will consist of humus or peat, peat moss, or source-separated compost. The following definitions for the different organic materials are specified by the NYSDOT.

Humus or Peat

Commercially produced natural humus or peat from freshwater sources and may contain sedge peat, sphagnum peat or reed peat. The material will be free from hard lumps, roots, stones and other objectionable materials. It will be in a shredded or granular form and able to pass through a 12.5 millimeter sieve. The acidity will not be less than 3.5 pH and the organic matter will not be less than 85% as determined by loss on ignition. The minimum water holding capacity will be 200% by weight on an oven-dry basis.

Peat Moss

Commercially produced peat moss composed of the partly decomposed stems and leaves of any or several species of sphagnum moss. The material will be free from wood, decomposed colloidal residue and other foreign matter. The acidity range of the material will be 3.5 pH to 5.5 pH and the minimum water holding capacity will be 1100% by weight on an oven-dry basis.

Source-Separated Compost

Commercially or municipally produced material that is organic in nature and produced by the biological and biochemical decomposition of source-separated compostable material that is separated at the point of waste generation. Source-separated compostable materials may include, but are not limited to, leaves and yard trimmings, manure and/or other agricultural residuals. The composted organic material must meet a 100% pass through at ¾ inch sieve size, be fully cured, and not contain foreign materials such as metals, plastics or asphalt.

The Creek will be backfilled to the proposed grades as depicted on Design Drawings, C-10 and C-11. Backfill material will be loaded on shallow-draft barges for deposition on the Creek bottom. Barges will need to access the upstream (eastern) area of the Creek first and will deposit the material from east to west, thereby always moving towards the deeper water areas and ensuring enough draft depth for the shallow draft barges and equipment. Deposition on the eastern end may be restricted to placement during high tide or it may be possible to reach from a deeper area to a shallower area during low tide to avoid delays in the project. Deposition progress will be continuous from east to west.

As depicted on the Dredging Cross Sections included with Design Drawings, C-10 and C-11 in Appendix A, the environmental cap will commence at the proposed dredge elevation for each Reach and extend vertically approximately three feet. The environmental soil cap will then extend laterally to the toe line

illustrated on the Dredging Cross Sections and rise at a 1V:5H slope upward before terminating at the existing sheet pile barrier or proposed grade elevation along the northern bank of the Creek and the proposed shoring system along the southern bank. In order to establish a gradual and consistent Creek bottom bathymetry, some backfilling above the existing Creek bottom grade will be required. However, this issue is negated due to the fact that at least the same volume of additional sediments will be removed above the proposed Creek bottom grade and will not be replaced thus, resulting in zero-net fill.

The remains of the former railroad bridge (i.e. pilings, timbers, etc.) are to be removed during the dredging activities. The bridge remains will be removed to at least the depth of dredging.

A turbidity barrier(s) will remain in place at both the downstream and the upstream end of the active deposition area to contain any re-suspended sediment or fines in the backfill material. The barge will be mechanically loaded and unloaded during the backfilling activities and uniform spreading will be required. Either a mechanical excavator bucket or drag bar will be used to level any humps and to locate depressions that may need re-filling. In the shallow water areas, an amphibious excavator may be used for spreading if the barge-mounted machine is unable to access the areas. During the backfilling operations, a geotextile fabric will be placed under the backfill material in accordance with the March 2002 ROD. The geotextile fabric will most likely be installed by towing a roll(s) of the fabric by barge during the backfill material deposition operations. The fabric will unravel as a uniform layer of backfill is deposited onto the fabric and into the Creek.

Once a reach or section has been backfilled, a hydrographic survey will be taken to confirm that the material has been backfilled to the proposed grade elevations and specified lateral limits. This survey will be presented as an "as-built" survey and will be used for final acceptance.

3.13 Sheet Pile Barrier Wall Modifications

The existing sheet pile barrier wall that was installed as part of the OU-1 remedial activities at the Site will be abridged as depicted in Design Drawings, C-17 and C-18. In general, it is proposed that the sheet pile barrier wall be abridged as follows:

- Along the Shore Parkway, the existing sheet pile barrier wall will be abridged approximately one (1) to two (2) feet below the proposed finished grade but not less than one (1) foot above the existing groundwater table;

- Along the Coney Island Creek, the existing sheet pile barrier wall will be abridged approximately zero to six (6) inches below the proposed finished grade but not less than one (1) foot above the existing groundwater table; and

- Along the MTA property, approximately one (1) foot below the proposed finished grade but not less than (1) foot above the existing groundwater table.

In areas where the existing groundwater table elevations (i.e. pre-remedial groundwater elevations) prohibit the selected remedial contractor from maintaining a one (1) foot freeboard (minimum), the remedial contractor will sequence the trimming operations in those areas to later in the project until the estimated post-remedial groundwater table elevation is achieved and thus allowing the minimum freeboard to be maintained.

In order to facilitate the construction of the storm water drainage swales as depicted in Design Drawing, C-05 the existing sheet pile barrier wall will be abridged approximately six (6) inches below the bottom of each proposed drainage swale. The bottom of the drainage swale will be equipped with an impermeable HDPE liner that will adjoin the existing sheet pile barrier wall as depicted in Design Drawings, C-07 and C-08, thus minimizing the potential for the groundwater table to cascade over the barrier wall.

During the dredging activities, the Contractor is required to protect the existing sheetpile barrier wall located along the northern bank of the Creek. The Contractor shall note the following criteria;

3.13.1 Sheet Pile Barrier Wall Support

The maximum allowable grade differential between the upland side of the existing sheet pile barrier wall and he dredge depth shall not be greater than eight (8) feet at any point in time during construction.

Should the Contractor need to exceed this 8 foot allowable grade differential, the Contractor will be required to:

- Use tie backs or approved equivalent to support the existing sheetpile barrier wall; and/or
- Lower the upland grade by excavating soil away from the sheetpile barrier wall in order to meet this maximum 8 foot grade differential.

The Contractor's SMP shall detail how this maximum allowable grade differential will be met and maintained during the remedial construction activities. A tieback design or other approved reinforcement system shall require the review and approval by KeySpan and/or PS&SPC prior to implementation.

3.14 Site Restoration Activities

Site restoration activities will consist of a minimum of the following: grading and capping the Site as depicted by Design Drawing, C-05; backfilling and capping the dredged areas of the Coney Island Creek; establishing a vegetative cover on the disturbed upland areas; re-establishing disturbed monitoring wells and piezometers; re-establishing security fencing; and removing soil erosion and sediment control measures.

3.14.1 Abandonment of Existing Environmental Wells

Due to the inherent difficulties imposed by the proposed remedial activities for OU-2 and OU-3, protection of the existing on-site monitoring wells would be difficult and impractical. As such, it is proposed that all the on-site monitoring wells (with the exception to the existing piezometers) be abandoned by a New York certified licensed well driller in accordance with in conformance with the New York State Department of Environmental Conservation (NYDEC) Part 360-2.11 Hydrogeologic Report, Item (a) (8) Monitoring Wells and Piezometers, (vi) Abandonment of Wells.

Monitoring wells, MW-1 through MW-10, MW-13 through MW-17, MW-20, IW-1 through IW-4, MW-IW-2, and DW-1 through DW-4 are proposed to be abandoned during the proposed remedial activities for OU-2 and OU-3 by a New York licensed driller. These monitoring wells will be re-constructed during the proposed restoration activities to simulate the pre-abandonment monitoring well construction. Currently, monitoring wells, MW-18, MW-19, and MW-21 and MW-22, can no longer be located at the Site and may have been covered. The selected remedial contractor will attempt to locate these monitoring wells during the proposed remedial activities for OU-2 and OU-3. Should they be identified, the location(s) will be established and the monitoring wells will be abandoned and re-constructed as described above.

Piezometers, 1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 5A, 5B, 6A, 7A, 8A, 9A, and 10A are proposed to be abandoned by a New York licensed driller in accordance with the New York State Department of Environmental Conservation (NYDEC) Part 360-2.11 Hydrogeologic Report, Item (a) (8) Monitoring Wells and Piezometers, (vi) Abandonment of Wells. The abandoned piezometers will be re-constructed during the proposed restoration activities as directed by KeySpan.

3.14.2 Backfill Documentation

All fill material delivered to the Site shall be accompanied by documentation stating the fill is certified “clean” from a virgin source or a blend of soils originating from virgin sources not subject to manufacturing operations and free of contaminants. In addition, the fill material is required to originate from a NYSDOT approved source. The selected remedial contractor will provide facility name, owner name and street address of the fill source to KeySpan prior to on-site delivery.

In addition to the above documentation, analytical testing will be required for any soil backfill brought to the Site. For soil backfill, the selected remedial contractor will be required to collect representative confirmatory samples from each off-site source of soil backfill material at a rate of one per every 5,000 cubic yards. The samples will be analyzed at a New York State Department of Health (NYSDOH)-

certified Environmental Laboratory Accreditation Program (ELAP)-approved laboratory for total PAHs and total volatile organic compounds (VOCs) and shall meet the requirements of TAGM 4046. All analytical data will require the approval from the NYSDEC and KeySpan prior to delivery of backfill to the Site.

3.15 Post Remediation Activities

The activities following the remedial action will meet the requirements of Technical Guidance DER 10. These proposed post-remediation activities will be detailed in subsequent documents to be prepared and submitted to the NYSDEC for review and approval.

3.16 Engineering and Institutional Controls

Engineering and Institutional Controls will be implemented as part of the selected remedy for OU-2 and OU-3 to protect human health and the environment from MGP-related constituents that will remain in the subsurface at the Site. Engineering Controls are intended to eliminate contact with MGP-related constituents and to mitigate potential migration of these constituents from the Site. The Engineering Controls will be constructed as detailed in this RD Report and include construction of a site-wide Environmental Soil Cover to limit disturbance of and prevent exposure to impacted soils and installation of a NAPL collection trench to mitigate (in conjunction with the existing sheet pile barrier wall) the potential migration of residual MGP-related constituents from the Site.

The Institutional Controls are intended to prevent exposure to constituents remaining on the Site and to 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. The institutional controls for the Site will consist of deed restrictions, fencing, a health and safety plan, a contingency plan, prohibiting the use of the Site for other than commercial or industrial purposes without permission from the NYSDEC, and long term monitoring after the completion of the remediation for the Site.

4.0 ENGINEERING COST ESTIMATE AND PROJECT SCHEDULE

An engineering cost estimate has been developed for OU-2 and OU-3 construction activities. This estimate is based on the following assumptions:

1. Preparation of a budget estimate which includes an appropriate contingency of 20%.
2. The use of union labor to complete the construction and the use of Craft Labor rates based on Davis Bacon wage rates for Kings Co. NY.
3. Work activities completed only five days/week.
4. No substantial dewatering will be conducted.
5. Existing concrete pads and foundations to be left on-site.
6. PPE not to exceed Modified Level D requirements.
7. Pricing based upon 2005 dollars – no escalation costs are included.

A cost estimate for the combined OU-2 and OU-3 remedial construction activities is provided in Appendix H.

Appendix I contains a project schedule for this project. This schedule provides the estimated duration of the construction activities, along with the estimated duration from issuing the pre-mobilization submittals through the anticipated completion of post construction activities.

These tasks will be implemented following the approval of the RD Report. A projected schedule of activities, from the approval of the Final RD Report, is provided below:

TASK	ESTIMATED COMPLETION
Approval of Final RD Report	0
Procurement of Contractor	30 Days after Approval
Mobilization	30 Days after Contractor Procurement
Limited Site Clearing and Grubbing	40 Days after Contractor Procurement
Erosion and Sediment Control Measures	45 Days after Contractor Procurement
Construction Activities	250 Days after Contractor Procurement
Restoration/Demobilization	300 Days after Contractor Procurement

5.0 IDENTIFICATION OF FEDERAL, LOCAL, AND STATE PERMITS

5.1 General

This section describes the local, state, and federal permits required for the OU-2 and OU-3 remedial construction activities. In addition, it discusses the property agreements and deed restrictions for the Site.

5.2 Property Agreements/Deed Restrictions

Parcels of land owned by the City of New York and the MTA are within the proposed remedial areas. Therefore, access agreements may be needed to complete the proposed remediation in these areas.

Easements and rights of way may be required for the OU-2 and OU-3 remedial action activities. The final use of the Site has not been determined; however, the ROD requires a deed restriction to limit the use of the Site to commercial or industrial purposes only. A deed restriction will be pursued after the final use of the Site is determined.

5.3 Local Permits

As per 6 NYCRR 375-1.7c, no permit, consent, approval, or other authorization under any local zoning, land use or other regulatory program is required for OU-2 and OU-3 remedial action activities. Therefore, a soil erosion/sediment control plan approval, prepared in accordance with local requirements, will not be required for the proposed remedial action activities. However, the remedial contractor performing the remedial activities for OU-2/OU-3 will meet the substantive aspects of the soil erosion/sediment control standards.

5.4 State Permits

As described in this RD Report, a portion of the Coney Island Creek will be dredged and an Ecological Buffer Zone will be constructed along the northern bank of the Creek. As such, the remedial contractor will follow substantive aspects of 6 NYCRR Parts 608 (Use and Protection Waters) and 661 (Tidal Wetlands).

Dredging portions of the Coney Island Creek as described in this RD Report must meet the standards promulgated in 6 NYCRR Part 661.9 for activities in tidal wetlands and adjacent areas. KeySpan believes that the proposed dredging activities will meet these standards due to the following:

- The proposed dredging activities are believed to be compatible with the policy of the Tidal Wetlands Act to preserve and protect tidal wetlands and to prevent their despoliation and destruction. The proposed dredging and backfilling activities will have a beneficial impact on the present and potential value of the affected tidal

wetland area and adjoining tidal wetland areas in the Coney Island Creek by removing MGP impacted sediment. Vegetated wetlands, as well as tidal mudflats, will be restored in Coney Island Creek upon completion of the remedial dredging activities. In addition, a 50-foot wide Ecological Buffer Zone will be established on the northern bank of the Coney Island Creek. These activities will result in enhanced wetland values as compared to existing conditions. The proposed activities are compatible with public health and welfare, as the backfill cap will prevent contact with underlying MGP impacted sediments, thereby, mitigating future threats to the public and/or the environment; and

- The proposed dredging activities are believed to be reasonable and necessary to remove MGP impacted sediments within the Coney Island Creek and to establish an Ecological Buffer Zone as required by the Order on Consent with the NYSDEC.

KeySpan believes that the proposed dredging activities also comply with the pertinent development restrictions promulgated in 6 NYCRR Part 661.9 due to the following:

- Pilings are exempt from minimum setback requirements;

- Existing and new structures and other impervious surfaces will cover less than 20 percent of the adjacent area; and

- Placement of the Ecological Buffer Zone supports the removal of suspended solids in the rainwater runoff from the uplands portions of the Site.

5.5 Federal Permits

Dredging and restoration activities within Coney Island Creek adjacent to the Site will require the issuance of a Nationwide Permit No. 38 from the United State Army Corps of Engineers, New York District (USACE). KeySpan has submitted an application to the USACE for this purpose and this permit has been issued to KeySpan. A copy of this permit is included in Appendix J of this RD Report. A NYSDEC Water Quality Certification and New York State Department of State Coastal Zone Management Consistency Determination are required by the USACE as part of the USACE NP No. 38 authorization.

6.0 CONSTRUCTION

6.1 Construction Implementation

The OU-2 and OU-3 construction activities will be performed in accordance with the USACE Nationwide Permit and the Contract Documents as described in this RD Report and the approval by NYSDEC. The Design Drawings and the Technical Specifications provide for a performance-based construction and the selected remedial contractor will provide the means and methods to achieve the performance criteria of the specifications. KeySpan plans to retain one remedial contractor who will be responsible for all of the required remedial construction, except for the groundwater treatment system, which may be constructed by a separately procured contractor. However, since the operating capacity of the system will most likely be substantially less than what was originally anticipated, KeySpan may elect the option of allowing the selected remedial contractor to construct the groundwater treatment system as well.

6.2 Method for Contractor Selection

KeySpan will select the remedial contractor, in accordance with corporate policies and procedures. It is anticipated that the selection process will have two steps: a Request for Qualifications (RFQ) and a Request for Proposal (RFP).

The RFQ step will include the identification of a sufficient number of contractors with the experience to perform the combined OU-2 and OU-3 remedial construction activities from contractor lists maintained by KeySpan and from other sources. An RFQ will be prepared and issued to these contractors requesting that they prepare a statement of qualifications (SOQ) to identify and support their qualifications to perform and complete the services for the OU-2/OU-3 remedial construction. SOQs will be evaluated by KeySpan and PS&SPC and a list of qualified contractors will be determined.

An RFP package that provides sufficient background, technical, and contractual information for the contractors to submit appropriate technical and cost proposals will be prepared and issued to the qualified contractors. The RFP will request the submittal of separate technical and cost proposals. Evaluation criteria will be prepared for the review of contractor technical and cost proposals and a scoring matrix will be developed to objectively rank the submitted proposals. During the RFP process, any questions from the contractor on the RFP will be addressed. KeySpan and PS&SPC may also seek to clarify contractor proposals through questions. The selection of a remedial contractor will be based on the evaluation criteria and the responses to any KeySpan and PS&SPC questions.

Following the selection of the remedial contractor, KeySpan will negotiate a contract. When the contract is signed by both KeySpan and the selected remedial contractor, KeySpan will notify all contractors which firm submitted the successful proposal. A notice to proceed will be issued to the selected remedial contractor and a pre-construction meeting will be scheduled. NYSDEC will be invited to the pre-construction meeting with the selected remedial contractor.

6.3 Contractor Submittals

The remedial contractor will be responsible for the preparation of numerous submittals for the review of KeySpan and PS&SPC. The major submittals will include a Site Management Plan, a Site-Specific Health and Safety Plan and a Site-Specific Construction Quality Control Project Plan. After submittals have been reviewed and accepted by KeySpan and PS&SPC, they will be submitted to NYSDEC for review and concurrence. KeySpan will provide sufficient copies of the accepted contractor submittals for NYSDEC's use and coordination with other agencies.

Within the Site Management Plan, the remedial contractor will be responsible for detailing the means and methods to complete the required remedial construction. The Site Management Plan will include a detailed description as well as the proposed sequencing for completing the major remedial activities such as Coal Tar Source Area excavation, Creek dredging and backfilling, construction of the Ecological Buffer Zone, construction of the NAPL collection trench, and construction of the Environmental Soil Cover. Stockpile and staging areas for clean materials and waste materials needed for the remedial construction will be required to be identified. The Site Management Plan will also include additional drawings that will supplement the Design Drawings provided with the Final Design Report and provide for the necessary surveying for the remediation. As-built drawings of the completed remediation and construction will also be required through the Site Management Plan. All engineering drawings will be required to be prepared and stamped by a Professional Engineer, retained by the remedial contactor, who is licensed in the State of New York. Similarly, survey documents will be signed and stamped by a Professional Surveyor, retained by the remedial contractor, who is licensed in the State of New York.

The site-specific HASP will detail any revisions and/or updates required by the remedial contractor to the approved generic HASP included with this RD Report. The remedial contractor's site specific HASP will be required to identify the personnel and their credentials, for the approval of KeySpan, that will provide health and safety services. All remedial contractor personnel working on the Site will also be required to provide health and safety credentials including OSHA training certificates and medical records. At this time, KeySpan plans to utilize a standard community air monitoring plan (CAMP) during the construction

activities, pursuant to NYSDEC DER-10, to monitor for dust and VOC emissions and the remedial contractor's HASP will be required to identify the locations and equipment proposed to implement this CAMP.

The remedial contractor's site-specific CQCPP will be required to set forth the general framework and specific details of the methods and procedures that will be implemented to demonstrate that construction activities have been performed pursuant to the Contract Documents. The site-specific CQCPP will describe the quality control organization of the remedial contractor and the allocation of responsibilities for performing quality control activities.

APPENDIX A

Design Drawings

APPENDIX B

Geotechnical Field Investigation Report

APPENDIX C

Supplemental Site Investigation Results

APPENDIX D

May 2005 Groundwater Modeling Report

APPENDIX E

Technical Specifications

APPENDIX F

Generic Health and Safety Plan

APPENDIX G

Generic Construction Quality Control Project Plan

APPENDIX H

Remedial Cost Estimate

APPENDIX I

Project Schedule

APPENDIX J

Nationwide Permit No. 38

APPENDIX K

Groundwater Treatment System Phase I Design

APPENDIX L

Coney Island Creek Sediment Investigation