AECOM

Prepared on Behalf of:
The Brooklyn Union Gas Company
d/b/a National Grid NY
Brooklyn, New York

Submitted by:

AECOM
Chelmsford, MA
60287690
June 2017

Feasibility Study

Former Equity Works MGP Site
222-254 Maspeth Avenue
Brooklyn, Kings County, New York

NYSDEC Site No.: 224050
Order on Consent Index #: A2-0552-0606

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Professional Certification

I, Michael J. Gardner, certify that I am currently a NYS Professional Engineer and that this Feasibility Study was prepared in accordance with all applicable statues and regulations and in substantial conformance with the Department of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in accordance with the DER-approved work plan and any DER-approved modifications.

Signature Michael Gardner Date 6/16/17

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List of Acronyms

AWQSGVs	Ambient Water Quality Standards or Guidance Values
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
COI	Constituent of Interest
cy	Cubic Yards
DER-10	NYSDEC Technical Guidance for Site Investigation and Remediation
DER-4	NYSDEC Technical Guidance for Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment
DO	Dissolved Oxygen
FedEx	Federal Express
ft	Feet
FWRIA	Fish and Wildlife Resources Impact Assessment
gpm	Gallons Per Minute
GRAs	General Response Actions
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
ISCO	*In situ* Chemical Oxidation
ISMP	Interim Site Management Plan
ISS	*In situ* Solidification
MGP	Manufactured Gas Plant
NAPL	Non-Aqueous Phase Liquid
NYCRR	New York Codes Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Administration
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyl Compounds
POTW	Publically-Owned Treatment Works
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RIR	Remedial Investigation Report
ROW	Right of Way
SCADA	Supervisory Control and Data Acquisition
SCGs	Standards, Criteria and Guidance Values
SCO	Soil Cleanup Objectives

SIR	Site Investigation and Remediation
SMP	Site Management Plan
sq ft	Square Feet
SVOCs	Semi Volatile Organic Compounds
TEA	Terminal Electron Acceptor
TMV	Toxicity, Mobility and Volume
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

Executive Summary

The former Equity Works Manufactured Gas Plant (MGP) site was located on three parcels of land at 222, 252 and 254 Maspeth Avenue, Brooklyn, Kings County, New York, 11211, northwest of the English Kills tributary of Newtown Creek and between Grand Street and the Brooklyn Queens Expressway (Highway 278). The site is currently occupied by Cooper Tank Recycling Company and is zoned for heavy manufacturing use. Current operations at the site include recycling and sorting of building materials. The site is currently bounded to the north by Maspeth Avenue and a liquefied natural gas facility, to the south by commercial storage and shipping, to the east by Federal Express (FedEx) and to the west by Vandervoort Avenue and commercial businesses. This Feasibility Study (FS) presents the results of the remedial alternative selection process for MGP impacts at the site.

Investigation Results

The Brooklyn Union Gas Company d/b/a National Grid NY ("National Grid") has conducted a series of investigations at the site since 2009, to characterize the potential MGP impacts within the site area. The site area consists of the following:

- The Site—three property parcels (222, 252 and 254 Maspeth Avenue), all occupied and used for the sorting and recycling of building materials.
- Off-Site Commercial Properties—a truck terminal currently occupied by FedEx (east of the site), warehouse facilities used for the storage and shipping of electronics equipment and paper products (southwest of the site) and the National Grid Greenpoint Energy Facility (north of the site).
- Off-Site Municipal Right of Ways—Maspeth Avenue and Vandervoort Avenue to the north and west of the Site, respectively.

Concentrations of constituents of interest (COI) in surface soil and subsurface soil exceed the New York State Department of Environmental Conservation (NYSDEC) Cleanup Objectives at various locations, but the most significant impacts are saturated non-aqueous phase liquid (NAPL) on the site at depths of 20 to 45 feet (ft) below ground surface (bgs). Since NAPL presence was observed to be aligned with the topography of the various lower permeability units, its potential to migrate from the Site to adjacent locations within the Site Area was largely limited.

Exceedances of the NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs) are generally associated with benzene, toluene, ethylbenzene and xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs). Dissolved-phase impacts are largely isolated to the site, with significantly lower levels (typically low to non-detect) at adjacent locations in the site area. NAPL and soil impacts in the Site Area may originate from a number of sources with similar characteristics; as a result, the dissolved-phase impacts may be associated with commingled sources. The potential for commingled impacts is supported by the presence of constituents, such as chlorinated solvents, which were not in use during the period of operation of the MGP.

The findings from the investigations demonstrate that there is no risk associated with the current uses of the site or adjacent properties. Soil impacts are capped by building foundations, concrete or

asphalt, and therefore there is no current exposure pathway for direct contact. Groundwater is not used within the site area.

Evaluation of Remedial Alternatives

This FS has been prepared in accordance with the NYSDEC Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC, 2010a) to define remedial action goals/objectives, and identify an appropriate approach to address the environmental conditions encountered in the site area. Summaries of activities and conclusions, associated with the sequential steps in the remedial alternative analysis process, are provided in the following sections.

Defining Remedial Goals/Objectives

The goal for remedial activities at the Equity Works site will be to eliminate or mitigate the potential risk posed by MGP related impacts, and to remove source material, i.e. the source of groundwater impacts to the extent practicable. Achieving the remedial goals for the site will require the management of the potential exposure pathways identified in the Qualitative Human Health Exposure Assessment (QHHEA) for media that exceed the applicable standards, criteria, and guidance (SCGs) and the removal of sources of MGP impacts to the extent practicable. The following generic remedial action objectives (RAOs) developed by NYSDEC were used for the accessible areas of the site:

- Prevent ingestion/direct contact with contaminated soil.
- Prevent ingestion of groundwater with contaminant levels above drinking water standards.
- Prevent migration of contaminants that would result in groundwater contamination, to the extent practicable.
- Remove the source of groundwater contamination, to the extent practicable.

These RAOs were used in the subsequent phases of this alternative analysis to facilitate the evaluation of general response actions (GRAs) and associated remedial technologies.

Screening of General Response Actions

The results from the site investigation activities identified MGP impacts in soil and groundwater. The initial step in the process of selecting an appropriate remedial alternative was the identification of a set of GRAs and associated technologies that could meet the RAOs. The physical limitations imposed by the site setting were considered when evaluating the ability of a response action, or technology, to achieve the remedial goals for the site. The following were determined to be the most appropriate technologies/approaches to reduce levels of impact and eliminate potential risk:

- Removal
  - Excavation will provide an effective means of reducing levels of shallow soil impacts, i.e., at depths less than 20 ft bgs.
  - Product Recovery will provide an effective means for removing any concentrated impacts in areas that are below the practical depth of excavation, i.e. below 20 ft bgs.

- Treatment
  - Solidification will provide an effective means to access the entire range of impact depths, to ensure complete contact/treatment with subsurface media, and to reduce the potential for off-site migration of residuals.
  - Natural Attenuation will provide the most effective means to improve groundwater quality in both the on-site and off-site areas, following the removal/treatment of source material. Biologically-enhanced treatment could be used at a future date in the event that an increased rate of biological degradation is desired.
- Elimination of exposure
  - Institutional controls would provide the best means of eliminating exposure pathways and controlling potential risk.

Alternatives Evaluation

The preferred technologies/approaches were assembled into a set of five remedial alternatives for the site. The alternatives were evaluated using a set of prescribed criteria that included: overall protection of human health and the environment, compliance with SCGs, long-term effectiveness/permanence, reduction in toxicity, mobility, and volume (TMV), short-term effectiveness, implementability, cost effectiveness and land use. The final criterion, community acceptance, will be evaluated later as part of the public meetings (part of the Citizen Participation Plan). Descriptions of the alternatives and summaries of their evaluations are provided below.

Alternative 1 – NO ACTION

NO ACTION would not require any intrusive work; however, it would not mitigate potential future exposure pathway risks and would not meet the remedial goals for the project.

Alternative 2 – NAPL Recovery, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls

This alternative includes the following:

- Continued NAPL recovery within the site using the system that was previously installed as an Interim Remedial Measure (IRM).
- Natural attenuation of dissolved-phase impacts throughout the site area.
- Revision of the existing Interim Site Management Plan (ISMP) for the site and implementation of institutional controls on adjacent properties, to address potential human health risk associated with exposure to residual impacts in soil and groundwater.

The alternative would retain the current use of the property and would be completed within approximately 10 years at an estimated cost of $1,713,000.

Alternative 3 – Excavation of Soil, NAPL Recovery, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls

This alternative includes the following:

- Installation of approximately 2,600 linear ft of sheet pile to a depth of 50 ft bgs to support excavation to a practical depth of 20 ft bgs, and to control the intrusion of water.
- Excavation of approximately 53,500 cubic yards (cy) of on-site soil.
- Management of groundwater collecting within the open excavation.
- Continued NAPL recovery within the site using the system that was installed as an IRM.
- Natural attenuation of dissolved-phase impacts throughout the site area.
- Revision of the existing ISMP for the site and implementation of institutional controls on adjacent properties/areas, to address potential human health risk associated with exposure to residual impacts in soil and groundwater.

The alternative would retain the current use of the property, but would disrupt daily operations until excavation and backfilling procedures were complete. It would be completed within 10 years at an estimated cost of $33,583,000.

Alternative 4 – Solidification of Impacted Media, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls

This alternative includes the following:

- Removal of 12,500 cy of vadose zone soils to provide access to impacted media in the saturated zone.
- *In situ* solidification of 141,200 cy of impacted soil on-site to a depth of approximately 50 ft bgs .
- Natural attenuation of dissolved-phase impacts throughout the site area.
- Revision of the existing ISMP for the site and implementation of institutional controls on adjacent properties/areas, to address potential human health risk associated with exposure to residual impacts in soil and groundwater.

The alternative would retain the current use of the property, but would disrupt daily operations until solidification procedures were complete. It would be completed within approximately 14 months of field work and 5 years of monitoring at an estimated cost of $30,085,000.

Alternative 5 – Restoration of On-Site and Off-Site Properties to Pre-Release Conditions

This alternative includes the following:

1) Installation of 2,900 linear ft of a secant pile wall to a depth of 70 ft bgs to support excavation of the accessible impacts on-site.

2) Excavation and disposal of 148,800 cy of soil from the on-site area, and 153,000 cy of soil from the off-site area.

The alternative would elevate the use so that it is consistent above the zoning of its surroundings, but it would require demolishing buildings and an approved redevelopment plan requiring unrestricted use of the site and surrounding areas. It would be completed within approximately 2.5 years at an estimated cost of $153,810,000.

Recommended Alternative

As part of an IRM, National Grid installed a system of 23 NAPL recovery wells within the areas of the 222, 252 and 254 Maspeth Avenue parcels (July 2014), where lenses of impact have been observed. Five wells were installed at appropriate locations within the central areas of the site to reduce the quantity of NAPL from likely source areas. An additional 18 wells were installed along the perimeter of the site to remove mobile NAPL, and to control the potential for off-site migration (AECOM, 2016a). Based on the evaluation of GRAs and associated technologies presented in this document, the continued operation of the NAPL recovery system provides the most effective means to reduce the level of impact at the site. Alternative 2 reduces the level of impact through the reduction in the quantity of source material, and the associated dissolved-phase impacts through natural attenuation.

During the first two years of operation the system has operated with an on-line factor of 93% without incidents or unplanned releases from the system. Approximately 11,470 gallons of mixed fluids were collected from the system, and managed as an alternative fuel at the Tradebe Facility in Cohoes, New York. An estimate of the organic/water ratios over the current monitoring period indicates that the collected material likely contains over 6,800 gallons of NAPL assuming a NAPL to water ratio of 60:40.

A brief discussion of why the other alternatives were not recommended is provided below:

- Alternative 1—NO ACTION—The alternative did not address potential risks and did not meet the remedial goals for the project.
- Alternative 3—Excavation of Soil, NAPL Recovery, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls—The additional excavation of soil to a practical depth of 20 ft bgs did not provide additional risk-reduction benefit, given the depth of the most significant impacts, and was not readily implementable given the on-going commercial activity at the site.
- Alternative 4—Solidification of Impacted Media, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls—The alternative was not readily implementable given the on-going commercial activity at the site.
- Alternative 5—Restoration of On-Site and Off-Site Properties to Pre-Release Conditions—The alternative was not implementable given the on-going commercial activity in the site area.

When coupled with institutional controls to address the potential exposure pathways, the continued operation of the NAPL recovery system provides the most effective and implementable means to achieve the remedial goals for the site area, given the on-going level of commercial activity.

1.0 Introduction

The Feasibility Study (FS) has been prepared in accordance with the most recent and applicable guidelines of the New York State Department of Environmental Conservation (NYSDEC) Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC, 2010a), to define site-specific remedial action goals/objectives, and to identify an appropriate approach to address the environmental conditions encountered at the former Equity Works Manufactured Gas Plant (MGP) site. This document is formatted in the following manner:

- Summaries of the site history and results from investigations are presented in Section 2.
- Site-specific remedial goals and associated remedial action objectives (RAOs) to achieve those goals are established in Section 3.
- The applicability of general response actions (GRAs), e.g. treatment, to address MGP related impacts is evaluated in Section 4.
- The site-specific appropriateness of technologies associated with applicable response actions, e.g. non-aqueous phase liquid (NAPL) recovery, is determined in Section 5.
- Appropriate/effective technologies are assembled into alternatives and evaluated against established criteria in Section 6.
- An appropriate site remedy is proposed in Section 7.
- References are provided in Section 8.

The appendices provide summary tables for pertinent investigation data and cost information to support the evaluation of the remedial alternatives. Note that the estimates do not include potential costs associated with the interruption of business for the commercial activities on the site or adjacent properties.

2.0 Site History and Investigation Summary

The following discussion provides a description of the former Equity Works MGP site, including a summary of its history, summaries of the findings from the remedial investigation (RI), and a risk assessment. Sections of the discussion have been excerpted from the Remedial Investigation Report (RIR) prepared on March 31, 2016 by AECOM (AECOM, 2016b). Throughout this report, the area comprising the footprint of the historic MGP is defined as the "Site." The Site and other off-site areas investigated as part of the RI are referred to collectively in this document as the "Site Area."

2.1 Site Description and History

2.1.1 Site Location and Description

The former MGP facility was located on three parcels of land at 222, 252 and 254 Maspeth Avenue, Brooklyn, Kings County, New York, 11211, northwest of the English Kills tributary of Newtown Creek and between Grand Street and the Brooklyn Queens Expressway (Highway 278). See Figure 2-1 for the location of the Site.

The Site is currently occupied by Cooper Tank Recycling Company and is zoned for heavy manufacturing use. Current operations at the Site include recycling and sorting of building materials. The Site is currently bounded by the following industrial or commercial facilities/areas:

- To the north – Maspeth Avenue and National Grid's Greenpoint Energy Center Site, which includes a liquefied natural gas facility. A separate MGP operated on the property from 1927 to approximately 1952.
- To the southwest – Electronics storage/shipping and paper products storage/shipping. The adjacent property was initially a marsh with drainage running to the south to the English Kills tributary of Newtown Creek. The property was filled in the early 1900s and subsequent operations on the property included coal transfer and storage, storage for building materials, fuel oil storage and truck filling, carpet handling, material recycling, and industrial manufacturing and shipping.
- To the east – FedEx. The 300 Maspeth Avenue property initially consisted of marsh and drainage canals, which were progressively filled over time. The southern portion of the property was filled in the early 1900s, while the northern portion of the property was not developed until the early 1960s. Operations following the filling included coal yards, lumber yards, oil handling, oil and putty manufacturing, fuel oil storage and truck-filling and motor freight with truck servicing. Facilities have included multiple above ground petroleum storage tanks as well as six 10,000 gallon underground storage tanks (USTs) for gasoline. The latter were likely removed when the property was developed as a truck terminal and parking lot in the mid-1960's.
- To the west – Vandervoort Avenue and adjacent properties with operations including a truck wash facility, metal and glass fabrication, and retail businesses. Previously there were other operations such as a shipping warehouse.

2.1.2 Site History

2.1.2.1 Manufactured Gas Plant

The former MGP facility was constructed in 1892 by the Equity Gas Works Construction Company. The MGP facility was acquired by The Brooklyn Union Gas Company in approximately 1903. The plant was developed to its maximum extent in 1921. The relief holder was partially decommissioned by 1931 and the gas manufacturing equipment removed by 1933.

2.1.2.2 Post-Manufactured Gas Plant

The entire Site is now owned by third parties. The manufacturing and industrial operations in the Site Area prior to and during this period included companies that processed/stored oil, manufactured rope/twine, and dyed fabric. These operations are believed to have resulted in a complex nature of environmental impacts to soil and groundwater that included petroleum/tar, solvents and dyes.

Many of the industrial operations that operated in the Site Area used petroleum feedstocks or managed products that are similar to those generally associated with the MGP process. As a result, these non-MGP operations may be associated with environmental residuals that are similar in nature and composition to by-products from the MGP process and can complicate the process of identifying specific sources of impact.

2.2 Investigation Summary

AECOM has conducted a RI at the Site, on behalf of National Grid. The results have been documented in the RIR (AECOM, 2016b). Summaries of the findings are provided below.

2.2.1 Site Geology

The stratigraphy in the Site Area includes urban fill to a depth of 15 to 25 feet (ft) below ground surface (bgs) that is generally underlain by the following low permeability units:

- meadow mat (the former ground surface prior to development), encountered from 8 to 26 ft bgs, that was laterally continuous beneath the Site Area.
- intermediate clay unit, encountered from 36 to 52 ft bgs, that was laterally continuous under the majority of the Site Area with the exception of the western portion of the Site.
- lower clay unit, encountered from 78 to 86 ft bgs, comprised of a discontinuous clay unit observed in a subset of borings beneath the 222, 252, and western portion of the 254 Maspeth Avenue parcels, and extending to the north onto the Greenpoint property and to the south beneath 1 Rewe Street and the western portion of 7/9 Rewe Street.
- regional Gardiners Clay unit, that was laterally continuous beneath the Site Area and located from 80 to 100 ft bgs.

Interbedded sands and silts are present beneath the meadow mat and between the various low permeability units. As noted above, the intermediate clay and lower clay units were observed to pinch out towards the western edge of the Site near the former relief holder.

2.2.2 Site Hydrogeology

2.2.2.1 Groundwater

The water table was observed at 6 to 10 ft bgs. Groundwater flow in the shallow, intermediate and deep overburden aquifer zones is generally to the east and southeast. Since the Upper Glacial Aquifer beneath the Site Area is over 100 ft thick and the English Kills represents the upper reach of an estuarine system of Newtown Creek, it is likely that some portion of deep groundwater flow beneath the Site underflows the English Kills/Newtown Creek system and discharges more directly to the regional East River discharge boundary. Although there are measurable vertical head potential differences between the aquifer zones from shallow to intermediate and from deep to intermediate portions of the aquifer, the presence of the low conductivity meadow mat and intermediate clay units likely impedes actual groundwater flow between the shallow to intermediate and deep to intermediate zones. The data collected during the project indicates that portions of the deep aquifer beneath the Site Area can be affected by tidal cycles.

2.2.3 Investigation Data Summary

This section presents a summary of the findings of the investigation and includes field observations and analytical results by media including soil and groundwater.

2.2.3.1 Soil

Impacts with observed NAPL do not extend beyond the Site Area, and are largely confined to the Site. The evaluation of soil quality was complicated by the fact that impacts, including staining, sheen and the presence of NAPL, can be evidence of environmental impacts from the MGP, as well as from a number of the other non-MGP industrial sources that have been identified in the Site Area. Based on the Site history and RI findings, tar handling structures on the 222 Maspeth Avenue parcel and the western edge of the 254 Maspeth Avenue parcel were identified as the likely sources of both NAPL and dissolved-phase chemicals in the groundwater at the Site. Non-MGP related constituents such as polychlorinated biphenyl compounds (PCBs) were also identified in soils beneath the Site Area.

NAPL is believed to have migrated vertically downward through the fill under density driven flow until it reached the former natural ground surface (meadow mat), where a portion of the NAPL spread laterally to the north and east within, or on top of, the meadow mat surface. NAPL also migrated vertically through the underlying, more permeable glacial outwash sands, where it collected on the intermediate clay layer at typical depths of 45 to 50 ft bgs. The intermediate clay unit pinches out under the 222 Maspeth Avenue parcel, roughly mid-way beneath the former No. 1 Relief Holder, and is absent in borings advanced west of this area.

The absence of the confining intermediate clay at the western edge of the Site allowed portions of the released NAPL to migrate vertically downward to the next confining, or semi-confining, layer which is identified in the RI as the lower clay lens. The lower clay lens is a discontinuous clay unit observed in a subset of borings beneath the 222, 252, and western portion of the 254 Maspeth Avenue parcels, and extending to the north onto the Greenpoint property, to the south beneath 1 Rewe Street, and to the western portion of 7/9 Rewe Street. The lower clay lens is absent in the western portion of the 222 Maspeth Avenue parcel.

The absence of the lower clay lens beneath a portion of the 222 Maspeth Avenue parcel may have allowed some of the released NAPL to migrate vertically downward to the top of the Gardiners Clay. As the NAPL continued to migrate further from its source, the volume of the NAPL and the driving

head of the NAPL decreased. As a result, the least amount of NAPL was observed at the top of the Gardiners Clay surface. Where present, NAPL aligned with the topography of the top of the Gardiners Clay surface.

Since NAPL presence was observed to be aligned with the topography of the various lower permeability units, its potential to migrate from the Site to adjacent locations within the Site Area was largely limited. Data from the RI demonstrated that although NAPL impacts were observed in one boring on the eastern edge of the Site Area, on the FedEx property, the limited impacts were in a residual rather than saturated state, demonstrating no potential for future migration. NAPL impacts were observed under the properties immediately south, adjacent to the Site.

The laboratory analysis of soil samples demonstrated that exceedances of the applicable NYSDEC Soil Cleanup Objectives (SCOs) were largely limited to volatile organic compounds such as benzene, toluene, ethylbenzene and xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs). Both classes of compounds are associated with petroleum and MGP related residuals. There were limited detections of PCBs, and none of the detections were associated with the MGP operations. Twelve of the 15 samples with detections of PCBs above the Unrestricted Use SCOs were from the top 6.5 ft bgs of the surface material of the Site in fill that was placed following cessation of MGP operations. The remaining samples with detections of PCBs above Unrestricted Use SCOs were collected at an off-site location (300 Maspeth Avenue) where MGP operations did not occur.

The horizontal extent of BTEX and PAH impacts in soil was delineated by borings to the west along Vandervoort Avenue, to the south on adjacent commercial properties, to the east (with the exception of an area on the FedEx property where USTs were formerly located), and to the north onto National Grid's Greenpoint Energy Center, which is currently being investigated under a separate RI with NYSDEC oversight.

BTEX and PAH impacts in soil within the Site Area are largely delineated vertically. Only 19 of 55 samples taken from depths below 40 ft bgs or greater had constituent concentrations above the Unrestricted Use SCOs. It's important to note that the nature and extent of environmental impacts is affected by a number of factors including historic land use and the contribution from surrounding sources.

2.2.3.2 Groundwater

Dissolved-phase impacts in shallow zone (water table) wells are largely isolated to the Site, with significantly lower levels (typically low to non-detect) at adjacent locations in the Site Area.

Constituent concentrations in the intermediate portion of the overburden aquifer are generally the highest observed in the Site Area, consistent with this zone containing the most widespread presence of NAPL. Dissolved BTEX and PAHs were highest at wells in the Site and decreasing in the direction of groundwater flow at adjacent locations in the Site Area. No PCBs were detected in groundwater from any of the wells sampled. Given the trends observed in the data, dissolved-phase concentrations of these constituents will decrease further at locations outside of the Site Area due to biodegradation, attenuation, and dilution. Non-MGP related constituents, such as chlorinated solvents, are also present in groundwater beneath the Site Area.

Dissolved-phase impacts in the deepest portion of the overburden aquifer above the Gardiners Clay are lower in concentration and generally consistent laterally with the overlying intermediate zone. Source material in the Site Area may originate from a number of sources with similar characteristics;

as a result, the dissolved-phase impacts may be associated with commingled sources. The potential for commingled impacts is supported by the presence of constituents, such as chlorinated solvents, which were not in use during the period of operation of the MGP.

2.3 Qualitative Human Health Exposure Assessment

The results from the RI are appropriate to assess the potential for exposure to constituents present in impacted soils, groundwater, soil vapor, and indoor air. Under current conditions, complete exposure pathways for potential receptors in the Site Area do not exist because of the current use and activities of the properties. A potential for indoor air pathway locations in the Site was addressed by an interim action to control a preferential pathway at a utility access structure, and constituents detected at other locations within the Site Area were determined to either be consistent with ambient background or not attributed to vapor intrusion. Shallow soils containing visible source material were also removed from the Site under an Interim Remedial Measure (IRM) completed in September 2012 (AECOM, 2016a).

Future construction workers who perform excavation work in areas on or adjacent to the Site may potentially be exposed to impacts in subsurface soil and groundwater. Note that New York City provides potable water to Brooklyn, and potential exposure related to the consumption of groundwater is not a concern. The potential construction worker pathway on-site is currently addressed by an Interim Site Management Plan (ISMP) that requires that subsurface work be conducted by Occupational Safety and Health Administration (OSHA) trained personnel using a site-specific health and safety plan (HASP), and coordination with National Grid's Site Investigation and Remediation (SIR) Department.

2.4 Fish and Wildlife Impact Analysis

An assessment of Site conditions against the Fish and Wildlife Resources Impact Analysis (FWRIA) Decision Key determined that an FWRIA was not required.

2.5 Site Conceptual Model and Risk Assessment Summary

The objectives of the RI have been fulfilled and the nature and extent of environmental impacts at the Site Area have been adequately defined. The extent of NAPL is defined vertically and horizontally within the Site Area. The RI demonstrated that there is no migration of NAPL beyond the Site Area. Where present at one boring on the eastern edge of the Site Area, the NAPL was documented in a residual state and was not mobile. NAPL is largely contained within the Site itself by the topography of the various subsurface low permeability confining layers. National Grid is currently conducting an IRM to recover NAPL from recovery wells screened at and above the intermediate clay layer beneath the Site. The NAPL above the intermediate clay layer and other depths was determined to be stable prior to implementation of the IRM as evidenced by the documented decrease in NAPL impacts away from source areas showing a progressive change from NAPL saturation to NAPL coating to staining and odors and at distal areas within the Site Area. The extent of subsurface soil impacts primarily associated with BTEX and PAHs are also generally delineated within these same areas (AECOM, 2016a).

Dissolved-phase groundwater impacts, including BTEX and a limited set of PAHs are characterized within the Site Area and concentrations are lower at downgradient wells as compared to the Site. The dissolved-phase impacts are the result of a number of factors including geologic conditions, groundwater flow patterns, and the presence of source material in soil. The source material in the Site Area may originate from a number of sources with similar characteristics. As a result, the dissolved-

phase impacts may be associated with commingled sources. Given the trends observed in the data, the dissolved-phase concentrations of these constituents will decrease further at locations outside of the Site Area due to biodegradation, attenuation, and dilution.

Complete exposure pathways have not been identified for potential receptors in the Site Area given the current use of the properties. Potable water in the Site Area is provided by the City of New York, and areas containing environmental impacts are covered by asphalt, or are developed property, and therefore do not pose an immediate risk to receptors. However, future construction workers who may perform excavation work in areas on or adjacent to the Site may potentially be exposed to impacts in subsurface soil and groundwater. The potential construction worker pathway on-site is addressed by an ISMP that requires that subsurface work be conducted by OSHA trained personnel using a site-specific HASP, and coordination with National Grid's SIR Department.

3.0 Remedial Action Goals and Objectives

The goal for remedial activities will be to eliminate or mitigate the potential risk posed by MGP impacts, and remove source material, i.e. the source of groundwater impacts, to the extent practicable. Achieving the remedial goals for the site will require that the remediation activities result in the management of the potential exposure pathways identified in the RIR (AECOM, 2016b), and the removal of sources of MGP impacts to the extent practicable given the physical limitations of the site. Therefore, the following generic RAOs that have been developed by NYSDEC will be used in the development and evaluation of remedial alternatives for the site:

- Prevent ingestion/direct contact with contaminated soil.
- Prevent ingestion of groundwater with contaminant levels above drinking water standards.
- Prevent migration of contaminants that would result in groundwater contamination, to the extent practicable.
- Remove the source of groundwater contamination, to the extent practicable.

The RAOs will be used in the subsequent phases of the remedial alternative analysis to facilitate the evaluation of GRAs and associated remedial technologies. When evaluating the ability of a response action or technology to achieve the RAOs, the physical limitations imposed by the site setting will be considered.

4.0 Identification and Screening of General Response Actions

The results from the investigation activities discussed in Section 2 of this document have identified MGP related impacts in soil and groundwater at the Site and in the Site Area. As discussed previously, the Site Area consists of the following:

- The Site—three property parcels (222, 252 and 254 Maspeth Avenue), all occupied and used for the sorting and recycling of building materials.
- Off-Site Commercial Properties—a truck terminal currently occupied by Federal Express (FedEx) (east of the Site), warehouse facilities used for the storage and shipping of electronics equipment and paper products (southwest of the Site) and the National Grid Greenpoint Energy Facility (north of the Site).
- Off-Site Municipal Right of Ways – Maspeth Avenue and Vandervoort Avenue to the north and west of the Site, respectively.

The following discussion provides a summary of those impacts and a review of the applicability of GRAs actions to address the associated potential risk to human health and the environment.

4.1 Summary of Media Impacts

4.1.1 Soil

The areal distribution of soil impacts are illustrated in Figures 4-1 (depths from 0 to 20 ft bgs) and 4-2 (depths below 20 ft bgs). The vertical distribution of impacts is illustrated in Figures 4-3, 4-3a and 4-b (cross-sections), with the calculated quantities of impacted media presented in Table 4-1. The area of impacted soil has been defined using the following criteria:

- Locations where concentrations in subsurface soils that are greater than the NYSDEC CP-51 criteria for PAHs or NYSDEC Part 375 commercial criteria for other constituents.
- Locations where observations from boring logs indicate the presence of “lenses” or saturated areas of more concentrated residuals such as NAPL. Note that for the purpose of this evaluation, NAPL has been considered a “soil” impact.
- Locations where observations from boring logs indicate the presence of lesser observations of impacts including blebs, stringers and coating.

The locations where exceedances of those criteria or impacts have been observed are summarized in Appendix A, with a summary of the impacts and associated quantities of soil provided below. Note that the MGP related impacts in soil are covered by asphalt or developed property where the potential exposure pathways are limited to future subsurface construction/utility workers.

4.1.1.1 Site

Impacts are present across the 222, 252 and 254 Maspeth parcels, generally at depths below 5 ft bgs. There are limited exceedances of the part 375 Cleanup Objectives and CP-51 criteria. The most significant impacts, saturated NAPL, are primarily observed at depths of 20 to 45 ft bgs. There were only limited observations of saturated NAPL observed from 15 to 20 ft bgs and below 50 ft bgs. Approximately 118,000 cubic yards (cy) of impacted soil, i.e. soil exhibiting exceedances of the NYSDEC non-residential soil cleanup objectives, the presence of NAPL (saturated, lenses, blebs or coating), have been identified on the Site.

4.1.1.2 Other Site Areas

Adjacent properties include the FedEx property to the east at 300 Maspeth Avenue and the warehouses at 1 and 7/9 Rewe Street to the south. As stated previously, source material in the Site Area may originate from a number of non-MGP sources with similar characteristics and may not be associated with the operation of the Former Equity Works. As a result, the delineation of MGP related impacts is complicated by the historical use of the properties for unrelated coal and fuel storage activities and the confounding nature of those residuals.

- Impacts are present in the southern portion of the 300 Maspeth Avenue property generally at depths of 15 to 20 ft bgs. Impacts are largely associated with exceedances of constituent criteria or the presence of NAPL coating. Observations of saturated NAPL were limited to an isolated, thin (0.5 ft) lens of material at a single location. Approximately 3,800 cy of impacted material have been identified on the property.
- Samples collected from two locations on the 1 Rewe Street property indicate the potential for constituent impacts at depths of 6-10 and 20 to 25 ft bgs and NAPL at varying thickness between depths of 15 to 37 ft bgs. Observations of saturated NAPL were limited to a depth of 20 to 23.5 ft Up to 13,000 cy of impacted soil have been identified on the property.
- Constituent and NAPL impacts on the 7/9 Rewe Street property have been observed at varying thickness between depths of 15 to 48 ft bgs. Saturated NAPL was observed at a single location at depths of 43 to 48 ft bgs. Up to 6,000 cy of impacted soil have been identified on the property.

Adjacent Municipal Right of Ways (ROWs) include Vandervoort Avenue to the west of the Site and Maspeth Avenue, an intersecting street, to the north.

- Impacts at Vandervoort Avenue were observed in two separate intervals: 14 to 19 ft bgs (NAPL coating) and NAPL at 77 to 90 ft bgs. Up to 3,000 cy of impacted media have been identified in the ROW.
- No samples were collected from Maspeth Avenue; however, a review of data from locations on the Site and the Greenpoint Facility suggest the potential for impacts at varying thickness from 17 to 35 ft bgs. Up to 13,000 cy of impacts may be present within the ROW.

4.1.2 Groundwater

Exceedances of the NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs) are generally associated with BTEX and PAHs. Dissolved-phase impacts in shallow zone (water table) wells are largely isolated to the Site, with significantly lower levels (typically low to non-detect) at adjacent locations in the Site Area.

Constituent concentrations in the intermediate portion of the overburden aquifer are generally the highest observed in the Site Area, consistent with this zone containing the most widespread presence of NAPL. Locations with exceedances of AWQSGVs are illustrated in Figure 4-4. Dissolved-phase impacts were highest within the Site wells and decreasing in the direction of groundwater flow at adjacent locations. Given the trends observed in the data, dissolved-phase concentrations of these constituents will decrease further at locations outside of the Site Area due to biodegradation, attenuation, and dilution. Constituents in the deepest portion of the overburden aquifer are lower in concentration and generally consistent laterally with the overlying intermediate zone.

Source material in the Site Area may originate from a number of sources with similar characteristics. As a result, the dissolved-phase impacts may be associated with commingled sources. The potential for commingled impacts is supported by the presence of constituents, such as chlorinated solvents, which were not in use during the period of operation of the MGP.

4.2 General Response Actions

The following section provides an evaluation to identify a set of GRAs available to address site media and determine if they are generally applicable for use in the Site and within the Site Area. The response actions have been grouped by the media (soil and groundwater) that they are designed to treat, as well as by the preferred order of response identified in DER-10 (NYSDEC, 2010a), i.e., removal/treatment, containment and elimination of exposure. Note that the remaining GRA, treatment at the point of exposure, has not been included in the evaluation since it is generally not applicable to MGP related impacts in soil and groundwater. The GRAs are evaluated based on appropriateness to address MGP related impacts and site-specific applicability. The findings from the evaluation are summarized in Table 4-2. A subsequent evaluation of specific technologies for those response actions determined to be applicable for use at the site will be conducted in Section 5 of the document.

4.2.1 Soil

4.2.1.1 Removal/Treatment

Removal activities at MGP sites can generally take the form of excavation of impacted soil or recovery of mobile NAPL. Each approach provides a means to permanently eliminate environmental impacts, with impacted media managed at a permitted off-site facility.

Treatment generally involves *in situ* management of MGP residuals to either decrease the concentration of constituents, physically change the media to decrease the potential mobility of impacts, or limit their ability to affect groundwater quality.

Appropriateness

Excavation and off-site disposal is routinely used at MGP sites in areas with open access and where impacts are either located above the water table or at relatively shallow depths within the saturated zone. Product recovery or *in situ* treatment can be used to address impacts at greater depths or in areas with limited access.

Site Applicability

Excavation could be performed to a practical depth of 20 ft bgs using excavation support given the shallow depth of the water table. NAPL recovery could be used to address the most significant

impacts, i.e., intervals of saturated NAPL, at greater depths. Note that the current NAPL recovery system has proven to be an effective means of reducing source strength and providing containment.

4.2.1.2 Containment

Containment can be used to isolate subsurface impacts to control risk.

Appropriateness

Soil caps are routinely used to eliminate direct contact pathways to subsurface impacts at MGP sites and barrier walls are frequently used to control the migration of mobile residuals in subsurface areas.

Site Applicability

Containment remedies would not provide significant benefit at the site. The majority of soil impacts are located at significant depths below the ground surface, and the preferred response actions of removal/treatment (above) are expected to provide a permanent means to address mobile residuals.

4.2.1.3 Elimination of Exposure

Methods for controlling potential exposure pathways generally involve the implementation of physical (engineering) or administrative (institutional) controls.

Engineering Controls

Engineering controls would likely be limited to the containment approaches discussed above. A general discussion of that approach, as well as a review of the associated appropriateness and applicability, has been provided previously in Section 4.2.1.2.

Institutional Controls

Institutional controls, such as a Site Management Plan (SMP), would provide a legally enforceable mechanism for limiting site activities to control potential exposure pathways.

Appropriateness

Institutional controls are routinely used to control potential risk at MGP sites.

Site Applicability

Institutional controls will require negotiations/agreement with the property owners, but should be implementable.

4.2.1.4 Summary of General Response Actions for Soil

The evaluation of GRAs indicates that removal/treatment and elimination of exposure should be retained for the further screening of specific technologies/approaches.

4.2.2 Groundwater

Groundwater concentrations that exceed NYSDEC standards, can be addressed through two means: the treatment/removal of source material or specific treatment of the dissolved-phase to reduce constituent levels. The most significant improvement in groundwater quality would come from the removal or treatment of MGP related impacts in soil, as discussed previously in Section 4.2.1.1.

Therefore, the following GRAs are intended to specifically address dissolved-phase impacts and would likely be used in conjunction with the soil remedies described in the previous section.

4.2.2.1 Removal/Treatment

Removal

Extraction and treatment of impacted groundwater (pump and treat) is a source reduction process that uses well points/pumps to remove groundwater for treatment on the surface, with subsequent management at a publicly owned treatment works (POTW).

Appropriateness

Groundwater extraction is used infrequently at MGP sites due to the fact that source material is often left in place as a result of accessibility issues. Even though some quantity of impacted groundwater could be removed and treated, it is likely that residual soil impacts would provide a continuing source to affect groundwater quality.

Site Applicability

Pump and treat, will not be retained since the removal/treatment of source material will likely reduce source strength to facilitate the effectiveness of natural attenuation processes. Note that additional *in situ* treatment could be considered in the future if significant exposure pathways become evident.

In Situ Treatment

In situ treatment of groundwater would reduce dissolved-phase constituent levels using relatively passive means. Methods could include natural attenuation and biological enhancement.

Appropriateness

MGP impacts are readily amenable to *in situ* treatment to enhance biological degradation.

Site Applicability

Treatment is most effective after the removal/treatment of significant soil impacts, and when applied at the downgradient limit of the source material.

4.2.2.2 Containment

Containment would involve extraction of groundwater to provide hydraulic control. A general discussion of the approach, as well as a review of the associated applicability and protectiveness has been provided previously as removal/treatment (Section 4.2.2.1).

4.2.2.3 Elimination of Exposure

Engineering Controls

Engineering controls would be limited to hydraulic containment. A general discussion of the approach, as well as a review of the associated applicability and protectiveness has been provided previously as removal/treatment (Section 4.2.2.1).

Institutional Controls

Institutional controls, such as a SMP, would provide an enforceable mechanism for limiting site activities to control potential exposure pathways.

Appropriateness

Institutional controls are routinely used at MGP sites to control potential exposure pathways.

Site Applicability

Institutional controls will require negotiations/agreement with the property owners, but should be implementable.

4.2.2.4 Summary of General Response Actions for Groundwater

The evaluation of GRAs indicates that treatment (*in situ*) and elimination of exposure (institutional controls) should be retained for the further screening of technologies/approaches.

5.0 Technology/Approach Screening

The following discussion provides a review of specific technologies/approaches associated with those GRAs that have the potential to provide remedial benefit at the site. They are grouped according to the media that they are designed to treat, and area, i.e., on-site/off-site. The approaches are reviewed based on their ability to achieve the general remedial goals that have been developed for the site, i.e., ability to eliminate the potential risk from exposure and reduce levels of impact. Based on the results from the evaluation, preferred technologies/approaches are identified for each grouping and will be used in the subsequent development of remedial alternatives in Section 6. The results from the technology/approach evaluation for soil and groundwater are summarized in Tables 5-1 and 5-2, respectively.

5.1 Soil

The review of GRAs conducted in Section 4 demonstrates that removal/treatment and elimination of exposure (institutional controls) have been retained as applicable approaches to reduce impacts and address potential risk, respectively. Containment measures have not been carried through for evaluation since Containment remedies would not provide significant benefit at the site. The majority of soil impacts are located deep below the ground surface, and the preferred response actions of removal/treatment are expected to provide a permanent means to address mobile residuals. Elimination of exposure using institutional controls has been carried through since they are routinely used to control potential risk at MGP sites and they are likely implementable. Discussions of the specific technologies/approaches that have been retained for evaluation are provided below.

5.1.1 On-Site

Impacts are present across the 222, 252 and 254 Maspeth parcels, generally at depths below 5 ft bgs. There are limited exceedances of the Part 375 Cleanup Objectives and CP-51 criteria, but the majority of impacts are associated with the observed presence of NAPL. The most significant impacts, saturated NAPL, are primarily observed at depths of 20 to 45 ft bgs. There were only limited observations of saturated NAPL observed from 15 to 20 ft bgs and below 50 ft bgs.

5.1.1.1 Removal

Excavation

Excavation and disposal/treatment of impacted soils is a physical process that removes the impacted soil for *ex situ* management. Excavation and off-site disposal would consist of the following basic elements: site preparation, excavation shoring, dewatering, removal of impacted soils, treatment prior to shipment (if required), loading, transport, disposal, backfilling, and site restoration. Given the urban setting, and saturated conditions, it is assumed that excavation would proceed to a practical depth, e.g., 20 ft bgs.

Risk Elimination

Excavation and disposal would likely eliminate the potential direct contact risk to the potential receptors, i.e., construction personnel.

Reduction in the Level of Impact

Excavation would be appropriate to eliminate impacts in on-site areas to a practical depth of approximately 20 ft bgs, but would not address the larger quantity and most concentrated impacts located at greater depth.

NAPL Recovery

NAPL recovery is a process to remove mobile residuals from the subsurface to reduce the level of impacts to their residual saturation point. Collected NAPL would be removed periodically to an end point that would be negotiated with the NYSDEC. The collected NAPL would be managed off-site at a permitted facility.

Risk Elimination

NAPL recovery would not eliminate the potential human health risk to construction personnel working in the saturated zone, but would reduce the potential for source material to migrate from the site.

Reduction in the Level of Impact

The approach would continue to reduce levels of impacts to the residual saturation point of site media and enhance the ability of biological processes to improve groundwater quality.

5.1.1.2 Treatment

In situ treatment would provide the ability to access impacted soil to a greater depth than excavation. The following discussion provides a review of treatment approaches that are typically evaluated for application at former MGP sites: chemical oxidation and solidification.

Chemical Oxidation

In situ chemical oxidation (ISCO) is a source reduction process that injects a chemical oxidant into the pore space of the impacted soils. An appropriate reagent would be selected to react with the constituents of interest (COI) and oxidize them into non-toxic reaction products. Conventional ISCO treatment requires the installation of multiple vertical injection wells in the treatment area. Liquid chemical mixtures would be prepared and injected using pumps, hoses, and tanks. The effectiveness of ISCO is highly dependent on subsurface soil conditions and nature of the contaminants present. Several injection events are typically required to overcome both the effect of naturally occurring organic carbon, metals, and minerals present in the subsurface and the potential for uneven distribution of reagents. Additionally, although research is ongoing with several commercial companies, ISCO has not been demonstrated to be effective on heavily impacted media, i.e., soil containing NAPL, at MGP sites.

Risk Elimination

Chemical oxidation would reduce levels of impact, but would not eliminate the potential risk from direct contact with soil by construction personnel, or eliminate the source of dissolved-phase impacts.

Reduction in the Level of Impact

Chemical oxidation would likely reduce impacts; however, chemical oxidation has only been used with varying success at MGP sites due to the practical limitations of delivery/distribution and inability to effectively treat saturated intervals of NAPL.

Solidification

In situ solidification (ISS) is a source containment process that uses cement slurry to immobilize the COI in the soil by decreasing the relative permeability of the impacted media. Auger/jet grout rigs or excavators are typically used to introduce cement slurry producing a monolithic, solidified mass to eliminate NAPL and isolate the areas of impact from groundwater flow.

ISS would occur in three phases. In the preparation phase, utilities would be identified/addressed and major subsurface obstructions such as concrete debris and foundations would be removed by conventional excavation. In the second phase, impacted soils in the accessible areas would be mixed with the cement slurry and allowed to cure to a solidified mass. The solidification process results in an increase in soil volume, typically ranging from 10 to 30%, with the excess material (spoils) typically transported off-site for disposal at a permitted landfill. The third phase would be site restoration including final grading, addition of clean surface soil, and seeding or other appropriate surfacing.

Risk Elimination

Solidification would not affect the potential direct contact risk to construction personnel, but would eliminate the potential for impacts to migrate from the site.

Reduction in the Level of Impact

ISS treatment would not result in a decrease in constituent concentration in soil, but would reduce the level of dissolved-phase impacts.

5.1.1.3 Elimination of Exposure

A SMP could be used to place restrictions on activities where there was a reasonable potential for direct contact with impacted media. The controls would limit access to impacted soil and require the use of established practices to ensure the safe handling and proper on-site management/off-site disposal of impacted soil.

Risk Elimination

The implementation of the practices detailed in a SMP would eliminate potential risk by controlling exposure pathways.

Contaminant Reduction

The use of a SMP would not decrease levels of impact.

5.1.2 Off-Site

Soil impacts are present in the southern portion of the 300 Maspeth Avenue property generally at depths of 15 to 30 ft bgs. Observations of saturated NAPL were limited to an isolated, thin (0.5 ft) lens of material at a single location.

Samples collected from Rewe Street property locations indicate the potential for constituent soil impacts at depths of 6 to10 ft bgs and 20 to 25 ft bgs (1 Rewe Street) and NAPL at depths of 15 to 45 ft bgs. Observations of saturated NAPL were limited to depths of 20 to 23.5 ft bgs (1 Rewe Street) and 43 to 48 ft bgs (7/9 Rewe Street).

Soil impacts were observed in the Vandervoort Avenue ROW. No samples were collected from Maspeth Avenue ROW; however, a review of data from locations on the Site and the Greenpoint Facility suggest the potential for shallow impacts from 5 to 10 ft bgs and deeper impacts from 20 to 40 ft bgs.

As discussed previously in Section 4.2.1, removal/treatment and elimination of exposure using institutional controls have been retained for further evaluation. A review of their applicability for off-site areas is provided below.

5.1.2.1 Removal

Excavation

A description of excavation was provided previously in Section 5.1.1.1. Excavation will not be practical at the FedEx property or the municipal ROWs due to the current, extensive levels of traffic and activity. The approach will not be effective on the Rewe Street properties since the current data indicates that impacts are located at depths below the practical depth of excavation, i.e., 20 ft bgs.

NAPL Recovery

A description of NAPL recovery was provided previously in Section 5.1.1.1. Recovery wells could be installed within the source area and screened within the depth interval where the impacts have been observed. However, NAPL that is located in off-site areas, and at an increasing distance from the original on-site sources, will either be approaching or at residual conditions. As a result, the effectiveness of recovery activities will likely be limited.

5.1.2.2 Treatment

In situ treatment would provide the ability to access impacted soil to a greater depth than excavation. Off-site residuals on the Rewe Street properties are generally present at depths that are not likely to be encountered during routine construction activities and do not appear to present an incremental effect on groundwater quality relative to the on-site source material. As a result, the limited benefits of treatment are not likely to warrant the required disruption to the businesses and traffic patterns in the area.

5.1.2.3 Elimination of Exposure

A description of the use of institutional controls using a SMP to eliminate the potential exposure from impacted soil was provided previously in Section 5.1.1.3. A SMP could be used to control future site activities and control potential risks on adjacent properties. Since a traditional SMP will not be practical for use in the municipal ROWs, an alternative administrative control mechanism will be used. National Grid has an in-place program to address the potential exposure pathways for construction workers in areas proximate to their former MGP sites. The areas are tied into the NY 811 system for utility mark out and identified as environmental sites. The National Grid environmental staff is notified by NY 811 of proposed intrusive activities and coordinates with municipalities and/or contractors that request utility marking/clearance to ensure that impacted soil is managed in accordance with health and safety and disposal requirements.

Risk Elimination

The implementation of the practices detailed in the institutional controls (SMP and administrative controls) would eliminate potential risk by controlling exposure pathways.

Reduction in the Level of Impact

The use of the institutional controls would not decrease levels of impact.

5.2 Groundwater

The evaluation of GRAs for dissolved-phase impacts demonstrated that treatment and elimination of exposure using a SMP should be carried through for further evaluation. Extraction, containment and elimination of exposure (engineering controls) of dissolved-phase impacts were not carried through since they would not provide significant benefit given the potential for residual soil impacts to provide a continuing source of impact.

Exceedances of the NYSDEC AWQSGVs are generally associated with BTEX and PAHs. Dissolved-phase impacts in shallow zone (water table) are largely contained to the Site. Constituent concentrations in the intermediate portion of the overburden aquifer are generally the highest observed in the Site Area, consistent with this zone containing the most widespread presence of NAPL.

Site levels of BTEX and PAHs decreased in the direction of groundwater flow at adjacent locations in the Site Area. It is believed that dissolved-phase concentrations of these constituents will decrease further at locations outside of the Site Area due to biodegradation, attenuation, and dilution. As indicated previously, source material in the Site Area may originate from a number of sources with similar characteristics. As a result, the dissolved-phase impacts may be associated with commingled sources. The potential for commingled impacts is supported by the presence of constituents, such as chlorinated solvents, which were not in use during the period of operation of the MGP.

5.2.1 Treatment

5.2.1.1 Natural Attenuation

Naturally occurring bacteria in soil and groundwater have been demonstrated to reduce the dissolved-phase concentrations of MGP COI through biological processes. The processes can be either aerobic or anaerobic in nature, with aerobic activity providing the most efficient means of degradation. Natural attenuation is generally improved with the removal/treatment of source material and can frequently achieve a stable dissolved-phase plume.

Risk Elimination

Natural attenuation can provide a stable dissolved-phase plume, but is not likely to eliminate the potential risk from the remaining levels of constituents.

Reduction in the Level of Impact

Natural attenuation can reduce constituent concentrations to a steady-state condition.

5.2.1.2 Biologically-Enhanced Treatment

Biologically-enhanced treatment is a process where nutrients, or other additives, are injected into the subsurface environment in order to encourage natural biodegradation of dissolved-phase constituents through aerobic mechanisms. The effectiveness of treatment is uncertain due to the potential for non-uniform distribution of nutrients due to variations in the permeability of subsurface media.

Risk Elimination

Biologically-enhanced natural attenuation processes can provide a stable, i.e., contained, dissolved-phase plume, but is not likely to eliminate the potential risk.

Reduction in the Level of Impact

Biologically-enhanced natural attenuation processes can reduce constituent concentrations to a steady-state condition.

5.2.2 Elimination of Exposure

Institutional controls could be used to place restrictions on site activities and the use of groundwater.

5.2.2.1 Risk Elimination

The implementation of the practices required by institutional controls would eliminate potential risk by controlling exposure pathways.

5.2.2.2 Reduction in the Level of Impact

The use of institutional controls would not decrease levels of impact.

5.3 Preferred Approaches for Impacted Media

The review of options for managing impacted soil and groundwater has identified the most appropriate approaches for achieving the remedial goals given the physical limitations of the Site Area. The evaluation demonstrated that institutional controls would provide the best means of eliminating exposure pathways and controlling potential risk. The following technologies will also be retained as a means to reduce levels of impact, and used to develop alternatives for detailed evaluation in Section 6 of this document.

5.3.1 Soil

5.3.1.1 On-Site Area

Excavation would provide an effective means of reducing the quantity of impacts for on-site soil since it provides the potential to remove “shallow”, i.e., depths less than 20 ft bgs, impacts. Product Recovery is appropriate for removing concentrated impacts at depths greater than 20 ft bgs. Solidification would provide the potential to control the migration of source material and reduce the level of dissolved-phase impacts.

5.3.1.2 Off-Site Area

MGP related impacts within the practical depth of excavation (0 to 20 ft bgs) are located in areas with significant vehicle traffic/activity limiting accessibility. Additionally, the impacts located at greater depths do not appear to present an incremental effect on groundwater quality relative to the on-site source material. Since there would be limited benefits of removal or treatment, institutional controls would be used to address potentially complete exposure pathways.

5.3.2 Groundwater

Natural attenuation will provide an appropriate means to improve groundwater quality throughout the Site Area following the removal/treatment of source material located on the Site. Biologically-enhanced treatment could be used at a future date in the event that an improved rate of biological degradation is required.

6.0 Alternatives Evaluation

The preferred technologies/approaches from the previous section have been assembled into a set of five remedial alternatives that include the following:

- Alternative 1 – NO ACTION
- Alternative 2 – NAPL Recovery, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls
- Alternative 3 – Excavation of Soil, NAPL Recovery, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls
- Alternative 4 – Solidification of Impacted Media, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls
- Alternative 5 – Restoration of On-site and Off-Site Properties to Pre-Release Conditions

This section reviews these alternatives on their ability to meet the site-specific remedial goals and RAOs as well as the following criteria:

- Overall Protection of Human Health and the Environment—considers how the remedial alternative prevents or mitigates potential risks under current and likely future conditions. Alternatives that maintain the current condition of no significant risk, or that permanently reduce or eliminate exposure pathways under any reasonable future site use without causing significant risks during implementation, are rated HIGH. A MEDIUM rating is applied to alternatives that provide adequate protection of human health and the environment but have one or more potential drawbacks, such as reliance on long-term maintenance or institutional controls, and uncertainty regarding the final levels of impact. A LOW rating applies to alternatives that do not protect against reasonably foreseeable future exposures to site impacts or may increase the likelihood of certain exposure scenarios (e.g. increased mobility or toxicity). A rating of UNACCEPTABLE is given to alternatives that, on balance, pose more risks to human health and the environment than NO ACTION.
- Compliance with Standards, Criteria And Guidance Values (SCGs)—addresses whether the remedy will meet the remedial goals and SCGs presented in Section 3. For the purpose of this evaluation, the principal applicable standards/criteria have been assumed to be the NYSDEC Part 375 soil criteria for restricted commercial use and the Ambient Water Quality SCGs for groundwater. A HIGH rating is given to alternatives that are expected to achieve all the remedial goals and either achieves the SCGs or is expected to result in significant reductions (90% or more) in current concentrations. A MEDIUM rating is given if an alternative will achieve the remedial goals, but is not expected to achieve the SCGs. A LOW rating is given if an alternative is not expected to achieve most of the remedial goals and SCGs.
- Long-Term Effectiveness and Permanence—evaluates the magnitude of remaining risks and the adequacy and reliability of controls. Alternatives receive a HIGH rating if there is a reasonable expectation that the primary objectives can be met and maintained. If an alternative has been successfully implemented at another MGP site under similar conditions and demonstrated long-term effectiveness, the remedial action generally receive a rating of

MEDIUM. A LOW rating is given to alternatives that had a reasonable expectation of providing a permanent remedy. Alternatives with a MEDIUM rating may result in impacts remaining in place and may require long-term maintenance of controls. A LOW rating is given to alternatives that do not remove or treat impacts, do not provide adequate controls to prevent future exposure scenarios, or rely on on-going maintenance of controls that will be difficult to assure. A rating of UNACCEPTABLE is given to technologies that have been tested under similar conditions, and were found to be ineffective.

- Short-Term Effectiveness—evaluates potential risks to the public, remediation workers, and the environment during implementation of the remedy. The duration of remedial activities is also considered. Alternatives with minimal intrusive site work receive a HIGH rating for short-term effectiveness. Alternatives that pose short-term risks that can be effectively managed receive a rating of MEDIUM. Alternatives receive a rating of LOW if they present significant short-term risks and the ability to fully control these risks is uncertain. In general, alternatives that include bringing partially treated or untreated impacts to the surface receive a MEDIUM rating if potential exposures are short and easily controlled. If impacts are brought to the surface over a long period and exposures are difficult to control, a LOW rating is given to the alternative. A rating of UNACCEPTABLE is given to alternatives that, despite implementation of control technologies, would still present unacceptable risks to receptors.
- Reduction in Toxicity, Mobility, And Volume (TMV)—considers the quantity of impacts that are permanently destroyed, immobilized, or otherwise treated. The degree to which the treatment may be irreversible and the nature and amount of treatment residuals are considered. Alternatives that remove impacts from the site or that fully treat (i.e., mineralize) impacts receive a HIGH rating. A MEDIUM rating is provided to alternatives that immobilize impacts, reduce impacts to less toxic forms, or provide only partial treatment. Treatment alternatives that are reversible or provide no significant reduction in toxicity, mobility, or volume receive a LOW rating. A rating of UNACCEPTABLE is given to technologies, which under similar circumstances increased the toxicity, mobility, or volume of contaminants.
- Implementability—considers potential obstacles to construction of the remedy at the site. The availability of personnel and equipment to implement the remedy is considered as is the need for permits and the likelihood of obtaining regulatory approvals. Site owner acceptance of the alternative is also a key issue. The expected effectiveness and ability to monitor the effectiveness of the alternative are also considered. Alternatives that are known to have been successfully implemented at similar sites receive a HIGH rating. Alternatives that are likely to be implemented successfully but where uncertainty exists in terms of effectiveness, ability to confirm treatment, or require extensive permitting receives a MEDIUM rating. A LOW rating is given to alternatives that are expected to be difficult to implement. A rating of UNACCEPTABLE is given to alternatives that are not possible to implement.
- Cost Effectiveness—compares the effectiveness of the alternative to its cost. Alternatives receive a HIGH rating if they are determined to be effective (ratings of MEDIUM/HIGH for the criteria for permanence, reduction of TMV and short term effectiveness) and the cost is less than the average value for the alternatives evaluated (excluding NO ACTION). A MEDIUM rating is applied if the effectiveness ratings are MEDIUM/HIGH and the cost is greater than the average cost of the alternatives evaluated. A LOW rating will be used if the alternative has received a one of more LOW ratings for effectiveness or implementability, regardless of cost.
- Land Use—evaluates the ability of a remedy to allow the use of the site/surroundings for purposes that are consistent with its current, intended or reasonably anticipated uses. A HIGH rating will be applied to alternatives that maintain, or elevate the use of a site so that it is

consistent with area zoning, e.g. industrial, commercial, residential, and surroundings. A MEDIUM rating will be applied to alternatives that maintain the use of the site if not consistent with area zoning. A LOW rating will be used for alternatives that do not maintain the current use of the site.

The final criterion, community acceptance, will be evaluated at a later date during the public hearings which are part of the Citizen Participation Plan.

Each of the proposed alternatives is described below, and evaluated in terms of the above criteria and the site-specific remedial goals, i.e., eliminating potential exposure pathways, and removing source material to the extent feasible. As required in DER-10 (NYSDEC, 2010a), the description of each alternative includes a discussion of its size/configuration, schedule, disposal options, permit requirements and other factors required for evaluation. A summary of the findings from the evaluation is presented in Table 6-1.

6.1 Alternative 1 – NO ACTION

The evaluation of NO ACTION is included to provide a baseline for the comparison of the other alternatives.

6.1.1 Evaluation Related to Remedial Goals

6.1.1.1 Elimination/Mitigation of Potential Exposure Pathways

NO ACTION would not change current conditions at the site and therefore, would not eliminate or mitigate the potential exposure pathways for soil, groundwater or sediment.

6.1.1.2 Reduction in the Level of Impact

NO ACTION would have no effect on the levels of impact at the site. The only means of reduction in the level of impact would be via natural attenuation processes. The timeframe for remediation with this alternative is estimated to be more than 100 years for natural processes to degrade COI at subsurface locations due to the continued presence of source material. This option would not have any spatial, disposal or permit requirements. There are also no limitations or other factors necessary to evaluate this alternative.

6.1.2 Evaluation Related to Review Criteria

6.1.2.1 Overall Protection of Public Health and the Environment

NO ACTION for soil, groundwater and sediment is rated as LOW for overall protection of public health and the environment. NO ACTION would not reduce the potential human health risk posed during future subsurface construction activities, or changes in site use.

6.1.2.2 Compliance with Standards, Criteria and Guidance

NO ACTION is rated as LOW for this criterion. This alternative does not achieve the RAOs and does not result in site-wide compliance with the SCGs. This alternative would not result in the reduction of constituent concentrations in soil or groundwater, other than from the potential effect of natural processes.

6.1.2.3 Long-Term Effectiveness and Permanence

NO ACTION is rated LOW for this criterion. Since no activities would be conducted to remediate site impacts, they will remain in place with no means to control the potential exposure pathways.

6.1.2.4 Reduction in Toxicity, Mobility and Volume

NO ACTION is rated LOW for this criterion. This alternative would not result in the reduction of the level of impact, or volumes of impacted soil or groundwater other than from the potential effect of natural processes. Additionally, impacts would remain in place with no means to control off-site migration.

6.1.2.5 Short-Term Effectiveness

NO ACTION is rated HIGH for this criterion. This alternative poses no significant potential implementation risks to the public, remediation workers, or the environment as no intrusive site work is proposed.

6.1.2.6 Implementability

NO ACTION is rated HIGH for this criterion since implementation would require no coordination with stakeholder owners and would provide no disruption.

6.1.2.7 Cost Effectiveness

There would be no cost for this alternative. It is rated LOW based on an inability to meet the remedial goals for the site.

6.1.2.8 Land Use

The alternative is rated HIGH for Land Use since it will maintain the use of the property and surroundings for their current and intended purposes.

6.2 Alternative 2 – NAPL Recovery, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls

This alternative includes the following:

- Continued NAPL recovery within the Site using the system that was installed as an IRM.
- Natural Attenuation of dissolved-phase impacts throughout the Site Area.
- Revision of the existing ISMP for the Site and implementation of institutional controls on adjacent properties to address potential human health risk associated with exposure to residual impacts in soil and groundwater.

6.2.1 Description of Activities

The following discussion provides a summary of the activities associated with the on-going operation of the product recovery system, evaluation of natural attenuation processes and documentation of plume stability as well as the implementation of institutional controls to control potential exposure pathways.

6.2.1.1 NAPL Recovery in Site Areas

NAPL recovery wells are installed within the areas of the 222, 252 and 254 Maspeth Avenue parcels where lenses of impact have been observed. Five wells were installed at appropriate locations within the central areas of the Site to reduce the quantity of NAPL from likely source areas and an additional 18 wells along the perimeter of the Site to remove mobile NAPL and to control the potential for off-site migration.

Data collected during an initial monitoring period indicated that NAPL collection rates at 13 of the 23 locations (2 on-site and 11 perimeters) warranted the installation of fixed-speed pumps to support automated recovery. The pumps are controlled by timers to ensure that the NAPL at each location is contained within the well sump (5 ft length) at a level above the pump inlet. The remaining 10 locations are monitored as part of the quarterly site inspection activities, and NAPL is recovered on an as required basis to maintain the NAPL level within the sumps. The collection approach limits the potential for NAPL to "pool' at the depth of the screen and migrate downward into clean areas, while minimizing the amount of incidental groundwater that is recovered from the locations. Collected NAPL is accumulated in a small (500 gallon capacity) tank located above ground in the system's control trailer. The material is managed as an alternative fuel at the Tradebe facility in Cohoes, NY.

6.2.1.2 Natural Attenuation of Dissolved-Phase Impacts

The conceptual model for microbial activity at former MGP sites assumes that microorganisms will preferentially use oxygen as a terminal electron acceptor (TEA) as they oxidize the organic compounds to carbon dioxide and water. However, when oxygen is not present, microorganisms may use alternate electron acceptors in order to metabolize available organic constituents under anaerobic conditions. These alternate TEAs include nitrate (reduction), ferric iron (Fe^{+3}) (reduction), sulfate (reduction), and carbon dioxide (methanogenesis).

As part of the remedial activities, selected groundwater monitoring wells will be sampled for appropriate geochemical parameters to document evidence of, and to optimize, subsurface microbial activity. These parameters will include:

- Dissolved Oxygen (DO)—low levels of DO in the presence of residual constituents may indicate areas where microbial activity is taking place under aerobic conditions.
- Oxidation Reduction Potential (ORP)—highly positive ORP values indicate areas where reactions are taking place under aerobic conditions, while lower to negative values indicate areas where anaerobic reactions predominate.
- Sulfate—a decrease in sulfate concentrations in areas of residual COI may indicate that microbes are utilizing sulfate (SO_4^{2-}) as a TEA, reducing sulfate to sulfide (S^{2-}).
- Methane—the presence of methane in groundwater indicates the anaerobic biodegradation of organic compounds.

Levels of other TEAs including ferric iron, sulfate, and nitrate will also be evaluated to identify opportunities for biological enhancement to improve the rate of biological degradation.

Subsequently, selected monitoring wells will be sampled for COI, with the results subjected to statistical analysis to document the presence of a stable or shrinking plume. It is assumed that the monitoring program would be initiated once the majority of NAPL had been removed from the Site, e.g., the majority of perimeter wells had been transitioned to manual collection methods.

6.2.1.3 Institutional Controls

An ISMP is currently in effect at the Site. The document will be finalized to address the potential human health risk posed by remaining impacts within soil and groundwater at the Site. Specifically, the SMP will detail processes to manage remaining impacts at the site in support of the environmental easement granted to NYSDEC as a requirement of site closure, and address the means for implementing the institutional controls that will be mandated by the easement. The institutional controls will place restrictions on site use to prevent future exposure to remaining impacts, e.g., controlling disturbances of impacted soil and prohibit the use of groundwater without treatment to render it safe for intended use. The SMP will include the following information:

- Institutional and Engineering Control Plan—will include a description of the controls and define the criteria for their termination. The plan will provide specific details regarding the mechanisms that will be used to implement, maintain, monitor and enforce the controls, including the maintenance of a surface barrier (asphalt, concrete, clean soil) to control the exposure pathway for direct contact with impacted media.
- Excavation Work Plan—will be developed to support future activities that will disturb remaining impacted material. The plan will define notification requirements; soil screening methods; stockpiling methods; material excavation and load out requirements, methods for transport, disposal/cover system restoration, and include a contingency plan in the event that unanticipated sources of impact are encountered. Supporting information will include example site-specific health and safety and community air monitoring plans.
- Monitoring Plan—will define the inspection and maintenance requirements for site systems, including requirements for documenting site use; procedures for inspection of the recovery system and reporting for product recovery activities.
- Operation and Maintenance Plan—will define the requirements to documenting product recovery and the performance of associated monitoring activities. It will address routine and non-routine operation.

The SMP will include a provision for additional investigation and remediation should large-scale redevelopment of the Site occur. The SMP will be modified to address the adjacent properties located at 1 Rewe Street, 7/9 Rewe Street and 300 Maspeth Avenue. The SMP discussions for these properties will prohibit the use of groundwater without treatment to render it safe for intended use, and will include a provision for additional investigation/potential remediation should large-scale redevelopment occur. The SMP discussion for the 300 Maspeth Avenue property will also include an Excavation Work Plan for current use of the property since shallow soil impacts, potentially from multiple sources, have been identified. Note that specific requirements of any Institutional Controls will require the review and approval of site stakeholders.

An alternative approach will be used to control potential exposure risks in the adjacent municipal ROWs. National Grid has an in-place program to address the potential exposure pathways for construction workers in areas proximate to their former MGP sites through coordination with the NY 811 program. In the event that the municipality contacts NY 811 related to utility mark out within the Site Area, National Grid environmental staff will be notified, and will coordinate with municipality to ensure that impacted media is managed in accordance with health and safety and disposal requirements.

6.2.1.4 Summary of Remedial Processes

NAPL recovery at the Site and natural attenuation are the remedial processes included in Alternative 2.

1) Size and configuration of process options:
   a. 5 recovery wells in source areas
   b. 18 recovery wells along the perimeter of the Site
2) Time for remediation:
   a. Product Recovery—conducted to an endpoint negotiated with NYSDEC, assumed to be less than 10 years
   b. Natural Attenuation—monitoring conducted to demonstrate plume stability following source treatment/removal, assumed to be less than 5 years
3) Options for disposal:
   a. Recovered Product—use as an alternative fuel
4) Limitations or other factors necessary to evaluate the alternative:
   a. Natural Attenuation—evaluation of natural attenuation parameters
5) Permitting Requirements
6) No specific permits are anticipated

6.2.2 Evaluation Related to Remedial Goals

6.2.2.1 Elimination/Mitigation of Potential Exposure Pathways

The alternative will control potential exposure pathways through the implementation/enforcement of Institutional Controls.

6.2.2.2 Reduction in the Level of Impact

This alternative will provide the ability to collect/remove the most significant impacts (mobile NAPL) from the Site, as well as control the potential for residuals migrating to off-site properties. The approach will also reduce dissolved-phase impacts through biological processes.

6.2.3 Evaluation Related to Review Criteria

6.2.3.1 Overall Protection of Public Health and the Environment

The alternative is rated as MEDIUM for overall protection of public health and the environment since it addresses potential risk, but will rely on the use of institutional controls to eliminate potential exposure pathways.

6.2.3.2 Compliance with Standards, Criteria and Guidance

The alternative is rated MEDIUM for compliance with SCGs. It will meet the remedial goals, and the soil SCGs for migration to groundwater will no longer be applicable due to the use restrictions imposed by

the institutional controls; however, the alternative will not achieve compliance with NYSDEC criteria for groundwater or direct contact with soil.

6.2.3.3 Long-Term Effectiveness and Permanence

The alternative is rated HIGH for long-term effectiveness and permanence. The approaches are routinely used at MGP sites where NAPL is located at depths where direct contact is not likely. The restrictions of the institutional controls are consistent with current and anticipated future site activities.

6.2.3.4 Reduction in Toxicity, Mobility and Volume

The alternative is rated MEDIUM for the reduction in toxicity, mobility and volume. The approach will provide for the collection/removal of recoverable NAPL from the Site and control the migration of residuals. Additionally, biological processes will reduce the dissolved-phase concentrations of MGP constituents.

6.2.3.5 Short-Term Effectiveness

The alternative is rated HIGH for this criterion. This alternative poses no significant potential implementation risks to the public, remediation workers, or the environment as intrusive site work is limited to the installation of recovery wells.

6.2.3.6 Implementability

The alternative is rated HIGH for this criterion since the NAPL recovery system has already been implemented and is operational.

6.2.3.7 Cost Effectiveness

The current operating and maintenance costs for the system are approximately $130,000 per year, with annual disposal costs in the range of $10,000 per year. The capital upgrades are assumed to be $30,000 per year. Monitoring and oversight costs are estimated to be $101,000, based on 5 years of annual monitoring to evaluate natural attenuation processes ($7,000 per event) and 2 years of quarterly groundwater monitoring ($10,000 per event) to demonstrate plume stability. The total project costs, including contingency at 20% is estimated to be $1,713,000. The estimate is rated HIGH for cost effectiveness since it is implementable and meets the remedial goals in the most cost effective manner.

6.2.3.8 Land Use

The alternative is rated HIGH for Land Use since it will maintain the use of the property and surroundings for their current and intended purposes.

6.3 Alternative 3 – Excavation of Soil, NAPL Recovery, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls

This alternative includes the following:

- Installation of approximately 2,600 linear ft of sheet pile to a depth of 50 ft bgs to support excavation to a practical depth of 20 ft bgs and control the intrusion of water.
- Excavation of approximately 53,500 cy of on-site soil.

- Management of groundwater collecting within the open excavation.
- Continued NAPL recovery within the Site using the system that was installed as an IRM.
- Natural Attenuation of dissolved-phase impacts throughout the Site Area.
- Revision of the existing ISMP for the Site and implementation of institutional controls on adjacent properties/areas to address potential human health risk associated with exposure to residual impacts in soil and groundwater.

6.3.1 Description of Activities

Site preparation activities would include removal of the concrete surface from the Site, protection of the recovery wells, relocation of utilities, delineation of soil stockpile/loading areas, and construction of decontamination pads/facilities.

6.3.1.1 Installation of Sheet Pile

Sheet pile would be installed around the perimeter of each of the three Maspeth Avenue parcels to provide support for the excavation and minimize the intrusion of groundwater into the excavation. Approximately 2,600 linear ft of sheet pile would be needed to be installed to a total depth of 50 ft bgs to support an excavation to the practical depth of 20 ft bgs. The sheet pile would be placed to protect the existing NAPL recovery wells during excavation.

The sheet pile wall will consist of steel or synthetic interlocking, typically 1 to 3 ft wide, and will be installed (driven or vibrated) in a repeating, interlocking pattern that creates a “ribbed” wall. The installation of sheet pile will be completed within a 20-week period.

6.3.1.2 Excavation of Impacted Soil in Site Areas

After the sheet pile has been installed in a parcel, well points will then be installed within the sheet pile barrier to draw down groundwater as the excavation proceeds to the required depth. Collected water would be stored in transportable settling tanks, and pretreated (filtration/activated carbon) for subsequent management at the POTW under permit. It has been assumed, for the purpose of this evaluation that a 500 gallons per minute (gpm) water treatment system will be required.

Excavation will be conducted using a long-stick excavator will proceed as the groundwater is drawn down to a depth of 20 ft bgs. Note that the media includes concrete from 0 to1 ft bgs, fill from 1 to 6 ft bgs and MGP impacted media from 6 to 20 ft bgs. Excavated soil will be free drained within the excavation and subsequently placed in lined and covered stockpile areas on site or loaded directly into trucks. Excavated soil that exhibits residual free liquid would require additional treatment using drying/stabilization agents prior to shipment. Waste characterization sampling would be conducted either pre- or post-excavation for acceptance at the selected disposal facility. Material would be shipped by truck using appropriate procedures/documentation (waste profile sheets/manifests). Trucks would be inspected, decontaminated as necessary, and covered prior to leaving the site. Excavation activities are expected to be completed within a 25-week period.

Once the excavation depth is reached, samples would be collected from the base and sidewalls to document site conditions, and the excavation would be backfilled using clean overburden and common borrow from a clean off-site source and graded. It’s assumed that the concrete surface of the site would be replaced in kind.

Remediation support equipment (water treatment system, soil stockpile areas, decontamination area, and site trailers) would be removed, and site features would be restored. Restoration activities are expected to be completed within an 8-week period

6.3.1.3 NAPL Recovery in On-Site Areas

A description of the operation of the current NAPL recovery system has been provided previously in Section 6.2.1.1.

6.3.1.3.1 Natural Attenuation of Dissolved-Phase Impacts

A discussion of Natural Attenuation has been provided previously in Section 6.2.1.2.

6.3.1.4 Institutional Controls

A discussion of the proposed Institutional Controls has been provided previously in Section 6.2.1.3.

6.3.1.5 Summary of Remedial Processes

The installation of sheet pile, removal of subsurface soil to a depth of 20 ft bgs from on-site locations product recovery from off-site locations and natural attenuation of dissolved-phase impacts are the remedial processes included in Alternative 3. A summary of these remedial processes is provided below.

1) Size and configuration of process options:
    a. Sheet Pile – 2,600 linear ft to a depth of 50 ft bgs
    b. Excavation – conducted over a 78,300 sq ft; area to a depth of 20 ft bgs
    c. Product Recovery - 5 recovery wells in source areas, 18 recovery wells along the perimeter of the Site

2) Time for remediation:
    a. Sheet Pile (field work) – installation and removal can be completed within a 20-week period
    b. Excavation (field work) – will be conducted within a 25-week period
    c. Product Recovery – conducted to an endpoint negotiated with NYSDEC, assumed to be less than 10 years
    d. Natural Attenuation- monitoring conducted to demonstrate plume stability following source treatment/removal, assumed to be less than 5 years.

3) Spatial requirements:
    a. Excavation – active remediation – 78,300 sq ft phased and conducted sequentially on each of the three parcels.; water treatment plant - 1,000 sq ft; sq ft; disposal soil stockpile 2,700 sq ft
    b. Product Recovery – 23 wells with 4 ft x 4 ft traffic vaults (existing)

4) Options for disposal:
    a. Impacted Soil – thermal desorption
    b. Treated Groundwater – POTW

c. Recovered Product – use as an alternative fuel

5) Limitations or other factors necessary to evaluate the alternative:
   a. Sheet Pile – geotechnical testing
   b. Site Business – interrupted for up to a year
   c. Permitting Requirements
   d. Industrial Pretreatment Permit for the disposal of collected groundwater at the POTW.

6.3.2 Evaluation Related to Remedial Goals

6.3.2.1 Elimination/Mitigation of Potential Risk

The alternative will control potential exposure pathways through the implementation/enforcement of institutional controls.

6.3.2.2 Reduction in the Level of Impact

This alternative will provide the ability to collect/remove the most significant impacts (recoverable product) from the Site, controlling the potential migration to other locations within the Site Area. Additionally, the approach will remove MGP impacts in the top 20 ft bgs of Site soil. The approach will also reduce dissolved-phase impacts through biological processes.

6.3.3 Evaluation Related to Review Criteria

6.3.3.1 Overall Protection of Public Health and the Environment

The alternative is rated MEDIUM for overall protection of public health and the environment since it addresses potential risk, but will rely on the use of institutional controls to eliminate potential exposure pathways.

6.3.3.2 Compliance with Standards, Criteria and Guidance

The alternative is rated MEDIUM for compliance with SCGs. It will meet the remedial goals, and the soil SCGs for migration to groundwater will no longer be applicable due to the use restrictions imposed by the institutional controls; however, the alternative will not achieve compliance with NYSDEC criteria for groundwater or direct contact with soil.

6.3.3.3 Long-Term Effectiveness and Permanence

The alternative is rated HIGH for long-term effectiveness and permanence. The approaches are routinely used at MGP sites and excavation will remove the potential direct contact risk for the Site. The restrictions of the institutional controls are consistent with current and anticipated future site activities.

6.3.3.4 Reduction in Toxicity, Mobility and Volume

The alternative is rated MEDIUM for the reduction in toxicity, mobility and volume. The approach will reduce the quantity of impacted soil, and provide for the collection/removal of recoverable product from the site and to control the migration of residuals. Additionally, biological processes will reduce the dissolved-phase concentrations of MGP constituents.

6.3.3.5 Short-Term Effectiveness

The alternative is rated MEDIUM for this criterion. This alternative poses no significant potential implementation risks to the public or the environment; however, remediation workers would be exposed to impacted media during excavation.

6.3.3.6 Implementability

The alternative is rated LOW for this criterion since the excavation of soil would require the disruption of on-going business activities for up to a year.

6.3.3.7 Cost Effectiveness

The estimated prime contractor costs which include mobilization, temporary facilities and controls, site preparation, erosion and sediment controls, odor foam consumables, sheetpile installation, recovery well protection, excavation, dewatering, backfilling and site restoration is estimated to be $19,689,000. The waste disposal cost is estimated to be $11,055,000. Other costs such as engineering design, SMP, air monitoring/health and safety, natural attenuation monitoring, plume stability monitoring, product disposal and personnel is estimated to be $2,839,000. The total project costs (Table B-1 located in Appendix B), including contingency at 20% is estimated to be $33,583,000. The estimate is rated Low for cost effectiveness since it not readily implementable and does not meet the remedial goals in a cost effective manner.

6.3.3.8 Land Use

The alternative is rated MEDIUM for Land Use since it will maintain the use of the property and surroundings for their intended purposes, but will disrupt daily operations until excavation and backfilling procedures are complete.

6.4 Alternative 4 –Solidification of Impacted Media, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls

This alternative includes the following:

- Removal of 12,500 cy of vadose zone soils.
- *In Situ* Solidification of 141,200 cy of impacted soil on-site to a depth of approximately 50 ft bgs.
- Natural Attenuation of dissolved- phase impacts throughout the Site Area.
- Revision of the existing ISMP for the Site and implementation of institutional controls on adjacent properties/areas to address potential human health risk associated with exposure to residual impacts in soil and groundwater.

6.4.1 Description of Activities

Site preparation activities would include the removal of the concrete surface of the Site, relocation of utilities, delineation of soil stockpile/loading areas, and construction of decontamination pads/facilities.

6.4.1.1 Solidification of Impacted Soil in On-site Locations

Solidification would involve the introduction of cement slurry (grout) into impacted media to decrease permeability and increase strength. Treatment will create a solidified mass that will eliminate the potential for MGP residuals to migrate from the site and "isolate" the areas of impact from groundwater flow. Solidification will control the ability of Site source material to adversely affect groundwater.

Vadose zone soils) will be removed to provide access to the impacted saturated zone soil. The excavated soil (12,500 cy) will be transported off-site for disposal. The impacted media in the saturated zone 6 ft to 51 ft bgs (141,200 cy).

The grout will be produced in an on-site batch plant that consists of two large skid-mounted cone-bottomed mixing tanks. The tanks will be fed by two reagent silos equipped with internal bag houses. The silos will be charged as required throughout the program using a pneumatic truck unloading operation.

The grout mixture will be incorporated using an auger, typically 8 ft in diameter. The mixing action will distribute any NAPL that exists in seams, stringers or blebs throughout the column to eliminate its potential to be mobile. Subsequently, the cured grout/soil mixture will decrease the permeability of the treated area to form a solidified monolith that will effectively isolate the source material from the aquifer. It is expected that the permeability of the source area can be reduced to less than 10 to 6 cm/sec. The specific design requirements will be determined during a treatability test that will be conducted as part of a pre-design investigation.

The solidification process will generate an excess of the grout/soil mixture, or spoils, at a rate of up to 25%, by volume, of the area to be treated. This would provide for an estimated 14,200 cy of spoils to contain the solidified mass within the saturated zone. The spoils and impacted soil will be collected/managed in a Temporary Containment Building prior to transport and off-site disposal.

Backfill will be obtained from a commercial off-site source to restore the site grade and the concrete surface will be restored in kind. It is estimated that site mobilization, solidification, soil management, site restoration and demobilization can be completed within an 18-month period.

6.4.1.2 Natural Attenuation of Dissolved-phased Impacts

Details of Natural Attenuation to address dissolved-phase impacts were provided previously in Section 6.2.1.2.

6.4.1.3 Institutional Controls

Details of the Institutional Controls to address potential human health risk for soil and groundwater were provided previously in Section 6.2.1.3.

6.4.1.4 Summary of Remedial Processes

The solidification of on-site soil and natural attenuation of off-site properties are the remedial processes included in Alternative 4.

1) Size and configuration of process options:
    a. Removal of vadose zone soil – conducted over an 84,700 sq ft area to a depth of 6 ft bgs

b. Solidification – conducted over an 84,700 sq ft; area to a depth of 51 ft bgs

2) Time for remediation:
   a. Solidification (field work) – will be conducted within a 14-month period
   b. Natural Attenuation- monitoring conducted to demonstrate plume stability following source treatment/removal, assumed to be less than 5 years

3) Spatial requirements:
   a. Solidification – active remediation – 84,700 sq ft; batch plant – 1,500 sq ft; temporary soil stockpile –1,800 sq ft; spoils stockpile 2,700 sq ft

4) Options for disposal:
   a. Impacted Soil – thermal desorption
   b. Solidification Spoils – land disposal

5) Limitations or other factors necessary to evaluate the alternative:
   a. Solidification – treatability test to determine the composition of the grout mix
   b. Natural Attenuation – evaluation of natural attenuation parameters
   c. Site Business – interrupted for up to a year and a half

6) Permitting Requirements
   a. No specific permits are anticipated

6.4.2 Evaluation Related to Remedial Goals

6.4.2.1 Elimination/Mitigation of Potential Risk

The alternative will control potential exposure pathways through the implementation/enforcement of Institutional Controls.

6.4.2.2 Reduction in the Level of Impact

This alternative will provide the ability to solidify/immobilize the most significant impacts (recoverable product) on the Site and residuals migrating to off-site properties. The approach will also reduce dissolved-phase impacts through biological processes on off-site properties.

6.4.3 Evaluation Related to Review Criteria

6.4.3.1 Overall Protection of Public Health and the Environment

The alternative is rated MEDIUM for overall protection of public health and the environment since it addresses potential risk, but will rely on the use of institutional controls to eliminate potential exposure pathways.

6.4.3.2 Compliance with Standards, Criteria and Guidance

The alternative is rated MEDIUM for compliance with SCGs. It will meet the remedial goals, and the soil SCGs for migration to groundwater will no longer be applicable due to the use restrictions imposed by

the institutional controls. However, the alternative will not achieve compliance with NYSDEC criteria for groundwater or direct contact with soil.

6.4.3.3 Long-Term Effectiveness and Permanence

The alternative is rated HIGH for long-term effectiveness and permanence. The approaches are routinely used at MGP sites and soil impacts are located at depths where direct contact is not likely. The restrictions of the institutional controls are consistent with current and anticipated future site activities.

6.4.3.4 Reduction in Toxicity, Mobility and Volume

The alternative is rated MEDIUM for the reduction in toxicity, mobility and volume. The approach will immobilize impacts located on the Site. Additionally, biological processes will reduce the dissolved-phase concentrations of MGP constituents in the Site Area.

6.4.3.5 Short-Term Effectiveness

The alternative is rated MEDIUM for short-term effectiveness since its implementation will pose short-term risks, e.g. noise dust, odor, that can be controlled.

6.4.3.6 Implementability

The alternative is rated LOW for implementability. The approaches have been used previously at MGP sites and achieved the desired results; however, site activities will cause a disruption to the on-going business for up to 1.5 years.

6.4.3.7 Cost Effectiveness

The estimated prime contractor costs which include mobilization, temporary facilities and controls, site preparation, erosion and sediment controls, stockpiling, odor foam consumables, excavation, dewatering, *in situ* solidification, spoils management, backfilling and site restoration is estimated to be $16,866,000. The waste disposal cost is estimated to be $8,726,000. Other costs such as engineering design, SMP, air monitoring/health and safety, natural attenuation monitoring, plume stability monitoring, product disposal and personnel is estimated to be $4,492,000. The total project costs (Table B-2 located in Appendix B) including contingency at 20% is estimated to be $30,085,000. The estimate is rated Low for cost effectiveness since it is not readily implementable, and does not meet the remedial goals in the most cost effective manner.

6.4.3.8 Land Use

The alternative is rated MEDIUM for Land Use since it will maintain the use of the property and surroundings for their intended purposes but will disrupt daily operations until solidification procedures are complete.

6.5 Alternative 5 – Restoration of On-site and Off-Site Properties to Pre-Release Conditions

This alternative includes the following:

1) Installation of 2,900 linear ft of a secant pile wall to a depth of 70 ft bgs to support excavation of the accessible impacts on-site.

2) Excavation and disposal of 148,800 cy of soil from the on-site area, and 153,000 cy of soil from the off-site area.

6.5.1 Description of Activities

Site preparation activities would include erecting security fencing, relocation of utilities, installation of erosion controls, delineation of soil stockpile/loading areas, and construction of decontamination pads/facilities. It is anticipated that the work would only be conducted in conjunction with general re-development of the Site Area.

6.5.1.1 Excavation Shoring

Shoring would be required to support excavation up to 50 ft bgs. Excavation support could consist of a cross braced or tied-back wall. The wall could be sheet pile, soldier pile, or secant piles.

6.5.1.2 Dewatering and Water Treatment

After the installation of the excavation support, excavation dewatering would be achieved with a combination of well points, deep wells and/or sumps. Water would be pumped to a treatment system (1,000 gpm) and discharged to an existing storm water system under a NPDES permit.

6.5.1.3 Excavation of Impacted Soil

The estimated quantity of impacted media in the Site Area is provided in Table 4-1 (137,722 cy). The following evaluation assumes excavation to the average depth of MGP impacts, 50 ft bgs. It is not practical to address the limited impacts observed at depths of 93 and 99 ft bgs. It assumes excavation of about 140,000 cy of impacted media and 160,000 cy of non-impacted overburden.

Excavated soil will be free drained within the excavations and managed within a Temporary Containment Building prior to transport and off-site disposal. Excavated soil that exhibits residual free liquid would require additional treatment using drying/stabilization agents prior to shipment. Waste characterization sampling would be conducted either pre- or post-excavation for acceptance at the selected disposal facility. Material will be shipped by truck using appropriate procedures/documentation (waste profile sheets/manifests). Trucks would be inspected, decontaminated as necessary, and covered prior to leaving the site.

Once the excavation depth is reached, samples would be collected from the base to document site conditions, and the excavation would be backfilled using clean overburden and common borrow from a clean off-site source and graded. Remediation support equipment (water treatment system, soil stockpile areas, decontamination area, and site trailers) would be removed, and site features, including municipal roadways, would be restored.

6.5.1.4 Summary of Remedial Processes

The installation of shoring and the removal of impacted soil at accessible locations in the on-site and off-site properties are the remedial process included in Alternative 5. A summary of these remedial processes is provided below.

1) Size and configuration of process options:
    a. Shoring – 2,900 linear ft of shoring to a depth of up to 70 ft bgs
    b. Excavation – 300,000 cy to a depth of up to 50 ft bgs

2) Time for remediation:
   a. Shoring (field work) – 1 year
   b. Excavation (field work) – 1.5 years

3) Spatial requirements:
   a. Excavation
   b. Active remediation (within a Temporary Containment building, moved as required - 10,000 sq ft; water treatment plant - 1,000 sq ft; decontamination pad – 2,500 sq ft

4) Options for disposal:
   a. Impacted Soil – thermal desorption
   b. Treated Groundwater – permitted discharge to the storm water system

5) Limitations or other factors necessary to evaluate the alternative:
   a. Excavation shoring – geotechnical testing
   b. Site Business – interrupted for at least two years and building demolition required

6) Permitting Requirements
   a. NPDES Permit for the disposal of treated groundwater to the storm water system.

6.5.2 Evaluation Related to Remedial Goals

6.5.2.1 Elimination/Mitigation of Potential Risk

Alternate 5 will eliminate the potential human health risk without the need for institutional controls.

6.5.2.2 Reduction in the Level of Impact

Alternate 5 will remove the impacted media from the Site.

6.5.3 Evaluation Related to Review Criteria

6.5.3.1 Overall Protection of Public Health and the Environment

Alternate 5 is rated HIGH for overall protection of public health and the environment. It will permanently eliminate exposure pathways for any foreseeable future use.

6.5.3.2 Compliance with Standards, Criteria and Guidance

Alternate 5 is high rated HIGH since it would meet the SCGs and achieve the remedial objectives.

6.5.3.3 Long-Term Effectiveness and Permanence

Alternate 5 is rated HIGH for long-term effectiveness and permanence. Excavation is routinely used at MGP sites as a permanent remedy. The removal of all impacted media will eliminate all potential risks to human health and the environment without the need for institutional controls.

6.5.3.4 Reduction in Toxicity, Mobility and Volume

Alternate 5 is rated HIGH for the reduction in toxicity, mobility, and volume. Excavation of all impacted areas will eliminate the toxicity, mobility, and volume of the impacted media and eliminate any potential risks to human health and the environment.

6.5.3.5 Short-Term Effectiveness

Alternate 5 is rated LOW for short-term effectiveness, because it poses significant potential implementation risks to the public, remediation workers, and the environment. Demolition of the Pathmark building and full-scale excavation of all impacted areas will be extremely intrusive work.

6.5.3.6 Implementability

Alternate 5 is rated UNACCEPTABLE for implementability since the property owners are not likely to allow the demolition of the buildings and implementation of a multi-year construction project outside of an approved redevelopment plan that requires unrestricted use of the Site Area.

6.5.3.7 Cost

The estimated prime contractor costs which include mobilization, temporary facilities and controls, site preparation, erosion and sediment controls, odor foam consumables, sheetpile installation, excavation, dewatering, backfilling and site restoration is estimated to be $ 89,723,000. The waste disposal cost is estimated to be $58,711,000. Other costs such as engineering design, air monitoring, health and safety, natural attenuation monitoring, plume stability monitoring and personnel is estimated to be $4,373,000. The total project costs (Table B-3 located in Appendix B), including contingency at 20% is estimated to be $153,110,000. The estimate is rated Low for cost effectiveness since it not readily implementable and does not meet the remedial goals in a cost effective manner.

6.5.3.8 Land Use

Alternate 5 is rated HIGH for land use since it will elevate the use so that it is consistent above the zoning of its surroundings.

7.0 Recommended Alternative

The Recovery of NAPL on-site using recovery wells, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls (Alternative 2) is the proposed remedial alternative for the site. This alternative includes the following:

- Continued NAPL recovery within the Site using the system that was installed as an IRM.
- Natural Attenuation of dissolved-phase impacts throughout the Site Area.
- Revision of the existing ISMP for the Site and implementation of institutional controls on adjacent properties to address potential human health risk associated with exposure to residual impacts in soil and groundwater.

7.1 Description of the Recommended Alternative

National Grid installed the NAPL recovery system to collect NAPL while site-wide investigation activities were completed, and to develop data to support the recommendation of a final remedy. Based on the evaluation of GRAs and associated technologies presented in this document, the continued operation of the NAPL recovery system provides the most effective means to reduce the level of impact at the site, both through the reduction in the quantity of source material and the associated decrease in dissolved-phase impacts through natural attenuation. The following discussion provides information on the design and operation of the NAPL recovery system.

7.1.1 System Design

The locations of the 23 recovery wells are illustrated on Figure 7-1. The perimeter locations are spaced at approximately 18 ft on center, with the exception of the area along the driveway of 254 Maspeth Avenue where the presence of a subsurface structure has required spacing of approximately 30 ft between the three recovery wells (RW-6, RW-7 and RW-8). All locations were equipped with the infrastructure, i.e., conduits for electrical service and tubing, for the subsequent automation of NAPL recovery activities.

The recovery wells were designed to accommodate the potential variability in site conditions associated with long-term NAPL recovery. All well risers were constructed of 6-inch diameter schedule 40 polyvinyl chloride (PVC). Recovery well screens were constructed of 6-inch diameter 0.020-inch slot wire wrap stainless steel. Five-foot and ten-foot lengths of screen were used, as required, to address soil intervals where NAPL (i.e., saturated thickness greater than 1-inch) have been observed at the locations. Centralizers were installed at the top and bottom of each screen. The screen size was selected based on the grain-size information obtained during an initial site investigation. Each well was equipped with a 5-foot long, 6-inch diameter, stainless steel sump to collect NAPL. The annular space above the filter pack was filled with a bentonite seal (minimum of 3 to 4 ft thick). Note that additional bentonite seals were used at locations where multiple screen intervals were installed. The annular space above the bentonite seal was filled with a grout mixture from the bentonite seal to approximately 1 to 2 ft below the top of casing. Each recovery well was completed in a 4-foot by 4-foot traffic rated well vault. Illustrations of an in-place recovery well and completed well location are provided in Figure 7-2.

Ten of the locations were determined to have NAPL accumulation rates that were appropriate for manual recovery on a quarterly basis. The remaining locations were determined to have accumulation rates that were not compatible with cost effective manual recovery. These locations were equipped with fixed speed pumps that are operated by timers. The system for managing the automated collection of NAPL includes a control trailer, which is a free standing shipping container located in an open area of the 254 Maspeth property (Figure 7-3). System controls include a Supervisory Control and Data Acquisition (SCADA) system to control pumping rates, log data, track significant events as identified by system instrumentation and facilitate communications related to significant alarm conditions. The SCADA system is equipped with phone modem capabilities to provide notification of significant events, e.g. indications of fire/smoke in the control trailer, loss of electrical service and high level in the accumulation tank. It is equipped with a voice module to allow custom voice messages to communicate specific types of events. The system is supported by dedicated cellular phone service.

The results from routine gauging activities provide data to make adjustments to the pumping rates in an effort to contain NAPL within the sumps of the wells but at a level above the inlet to the pump to minimize the collection of groundwater. Collected NAPL accumulates in a 500 gallon capacity double walled polyethylene tank located above ground in the system's control trailer. The accumulation tank is equipped with a multi-level float switch. The low level provides a warning of high level in the tank (e.g. 400 gallon level); the high level (e.g. 450 gallon level) stops the flow of all well pumps into the tank and provides an associated notification. The secondary containment section of the tank is equipped with an interstitial leak detection switch to provide notification of a problem with the integrity of the tank as well as backup monitoring for an overfill condition of the tank.

7.1.2 System Permitting

The collected NAPL is designated as a solid waste under New York Codes Rules and Regulations (NYCRR) 6 Subpart 360-1.2 (a)(2)(iii), i.e., "it will be accumulated before being disposed of." Although the recovered NAPL will be a solid waste, NYSDEC guidance and regulations provide the following options for pursuing exemptions from associated permitting requirements for the accumulation tank.

- NYSDEC Guidance DER-10, "Technical Guidance for Site Investigation and Remediation" (NYSDEC, 2010a) provides an exemption from certain permitting requirements for activities that are conducted as a component of a remedial program. Section 1.10 of DER-10 states that the NYSDEC will typically grant an exemption from state permits/ authorizations for activities conducted under appropriate oversight, e.g. an Order on Consent or Voluntary Cleanup Agreement, and in instances where NYSDEC determines that the proposed procedures/ activities will comply with the substantive technical requirements of the permit. Appendix 1-C of the guidance specifically lists the construction/ operation of solid waste management units as activities that are subject to the exemption described in Section 1.10 of the guidance. The potential for an exemption in instances where remedial activities meet the substantive technical requirements of a state permit is also incorporated in the referenced Consent Order for the Site (Section XIV, C.1). A review of the background information presented above demonstrates that the proposed operating practices for the NAPL accumulation tank are consistent with the technical and administrative requirements of the NYSDEC Solid Waste Management regulations, NYCRR, 6 Subpart 360, and should make the system subject to a solid waste permitting exemption.
- NYCRR 6 Subpart 360-1.7 (b)(4) provides a separate and specific exemption from solid waste permitting for temporary storage facilities located at a single industry/commercial establishment and used exclusively for the management of waste at that facility. The intended

purpose of the accumulation tank is also consistent with the requirements of this exemption from solid waste permitting.

Additionally, NYCRR 6 Part 373-1.1(d)(1)(iv) provides a separate and specific exemption to hazardous waste permitting requirements for accumulation units if the contents are removed in less than 90-days, secondary containment is used and certain administrative requirements, including prevention and preparedness training for staff, and preparation of contingency/closure plans are met. National Grid developed the following documents to meet the administrative requirements of the permitting approach for the system:

- Preparedness and Prevention Plan—identifies communication/alarm systems and their associated maintenance/testing schedule, and will define staff training procedures. The document is used to familiarize local police, fire department and emergency response teams with the layout of the facility, nature of the waste, places where facility staff would normally be located and evacuation routes for site staff.
- Contingency Plan—describes the actions to be taken in response to unplanned releases of waste. It provides lists of emergency contacts/support equipment; describe the arrangements with local police, fire department and emergency responders and identifies an evacuation route for site personnel.
- Closure Plan—describes the approach for decommissioning the system, as well as detailing the steps necessary to decontaminate all of the system components and manage waste residuals.

Copies of the documents have been provided to Cooper Tank staff, as well as local police, fire and emergency responders.

7.1.3 Waste Management

Accumulated NAPL is collected as required for transport by a licensed contractor to the Tradebe Facility in Cohoes, New York for use as an alternative fuel. Representative samples of the contents of the tank are collected and submitted for waste characterization on an annual basis as required by the disposal facility.

Initial analytical results indicated that the NAPL has the potential to be classified a Resource Conservation and Recovery Act (RCRA) D018 Waste due to its benzene content. NYSDEC Guidance DER-4, “Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment” (NYSDEC, 2002) provides conditional hazardous waste exclusion for D018 wastes at former MGP sites in instances when the waste is managed in accordance with New York State solid waste management requirements and is thermally treated at a facility permitted to receive non-hazardous media.

Recent experience indicates that the results of the waste analysis for flashpoint are subject to sampling variability due to the stratification of water and organic layers in the tank. Given the potential for infrequent classification as a D001 Ignitable Waste, National Grid has obtained RCRA ID number NYR 000 225 615 for the Site.

7.1.4 System Performance

During the first two years of operation, the system has operated with an on-line factor of 93% without incidents or unplanned releases from the system. Approximately 11,470 gallons of mixed fluids were

collected from the system during this period and managed as an alternative fuel. An estimate of the organic/water ratios over the current monitoring period indicates that the collected material likely contains over 6,800 gallons of NAPL assuming a NAPL to water ratio of 60:40.

National Grid provides a report on the system's performance to NYSDEC on an annual basis. The report documents system performance and proposed upgrades to improve the collection of NAPL.

7.2 Alternatives Summary

A brief discussion of the reasons that the other Alternatives were not recommended is provided below.

- Alternative 1—NO ACTION—The alternative does not address potential risks and does not meet the remedial goals for the project.
- Alternative 3—Excavation of Soil, NAPL Recovery, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls—The additional excavation of soil to a practical depth of 20 ft bgs does not provide additional risk-reduction benefit and is not readily implementable given the on-going commercial activity at the Site.
- Alternative 4—On-Site Solidification of Impacted Media, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls—The alternative is not readily implementable given the on-going commercial activity at the Site.
- Alternative 5—Restoration of On-Site and Off-Site Properties to Pre-Release Conditions—The alternative is not implementable given the on-going commercial activity in the Site Area.

When coupled with institutional controls to address the potential exposure pathways, the continued operation of the NAPL recovery system provides the most effective and implementable means to achieve the remedial goals for the Site Area given the on-going level of commercial activity.

8.0 References

AECOM, 2016a. Second Annual Report, Interim Remedial Measure for NAPL Recovery, June 2015 through July 2016, Former Equity Works MGP Site, Brooklyn, NY, November 2016.

AECOM, 2016b. Remedial Investigation Report for the Former Equity Works MGP Site, Brooklyn, Kings County, New York, March 2016.

NYSDEC, 2010a. DER-10 Technical Guidance for Site Investigation and Remediation, NYSDEC, May 2010.

NYSDEC, 2006. NYCRR Subpart 375-6 Remedial Program Soil Cleanup Objectives, NYSDEC, December 2006.

NYSDEC, 2002. DER-4 Management of Coal Tar Waste and Coal tar Contaminated Soils and Sediment from Former Manufactured Gas Plants, NYSDEC January 2002.

New York State Department of Health (NYSDOH), 2006. Final NYSDOH CEH BEEI Vapor Intrusion Guidance, Appendix C: Volatile Organic Chemicals in Air – Summary of Background Databases, October 2006.

Tables

Table 4-1
Equity Former Manufactured Gas Plant Site
Estimated Quantities of Impacted Soil [1]

Property		Zone	Average Thickness (ft)	Area (sq. ft.)	Quantity (cu. yds.)
On-Site	222 Maspeth	Upper Saturated Zone (8-20 ft bgs)	10	31,000	11,481
		Lower Saturated zone (20-80 ft bgs)	31	40,100	46,041
	252 Maspeth	Upper Saturated Zone (5-20 ft bgs)	10	17,700	6,556
		Lower Saturated zone (20-47 ft bgs)	27	17,700	17,700
	254 Maspeth	Upper Saturated Zone (1-20 ft bgs)	6	27,900	6,200
		Lower Saturated zone (20-93 ft bgs)	29	27,900	29,967
Off-Site	300 Maspeth	Upper Saturated Zone (15-20 ft bgs)	3	10,440	1,160
		Lower Saturated zone (20-30 ft bgs)	14	5,000	2,593
	1 Rewe Street	Upper Saturated Zone (6-20 ft bgs)	5	27,000	5,000
		Lower Saturated zone (20-45 ft bgs)	9	25,200	8,400
	7/9 Rewe Street	Upper Saturated Zone (15-20 ft bgs)	5	4,200	778
		Lower Saturated zone (32-48 ft bgs)	5	30,240	5,600
	Vandervoort Avenue	Upper Saturated Zone (14-20 ft bgs)	5	13,600	2,519
		Lower Saturated zone (78-99 ft bgs)	2	6,200	459
	Maspeth Avenue	Upper Saturated Zone (17-20 ft bgs)	3	30,900	3,433
		Lower Saturated zone (26-35 ft bgs)	9	30,000	10,000
	Total On-site				117,944
	Total Off-site [2]				19,778
	Total Site				137,722

Notes:

1 Contains significant impact, i.e. saturated thickness of product, or constituent exceedances of NYSDEC Part 375 Restricted Commercial Use Soil Cleanup Objectives, or criteria provided in NYSDEC Soil Cleanup Guidance CP-51; and less significant impacts such as stringers, blebs and coating.

2 Areas/quantities of impacted media identified in the areas adjacent to the Site may also be attributed to a number of historic/current non-MGP sources

bgs = below ground surface

Table 4-2
Equity Former Manufactured Gas Plant Site
Summary of General Response Actions

Media	General Response Actions	Appropriatness for MGP Residuals	Site Applicability
Soil	Removal/Treatment	Implementable in areas that have reasonable clearance/access. They are routinely used at former MGP sites.	Could be used to remove/treat up down to 20 ft. bgs. NAPL Recovery could be used to remove MGP impacts at deeper intervals. NAPL Recovery has been proven to be successful on-site.
	Containment	A cap could be placed to cover impacts in subsurface soil, and a barrier wall could be used to control the migration of mobile MGP residuals.	Site data indicates that the majority of the impacts are located deep below the ground surface, so a cap and barrier wall would not be effective. Removal/treatment of subsurface soil will provide a permanent means to address the migration of MGP residauls.
	Elimination of Exposure	Engineering Controls would likely be limited to Containment measures listed above. See Containment (above). Institutional Controls are routinely used at MGP sites to control potential exposure pathways.	Engineering controls are not likely to provide significant benefit (see Containment above), but insitutional controls would be implementable with agreement by the property owners, and provide the ability to eliminate risk.
	Treatment at Point of Exposure	Not appropriate for media that pose a potential direct contact risk.	Not Applicable.
Groundwater [1]	Removal/Treatment	Infrequently used at MGP sites because source material is often left in place continuing to contaminate groundwater.	Groundwater is not currently used at the site. Removal or treatment would not provide a benefit given that the presence of residual soil impacts would likely re-contaminate water. Source material removal/treatment is likely to reduce source strength to facilitate natural attenuation.
	Containment	Would require Removal/Treatment of groundwater to affect hydraulic control. See Removal/Treatment (above).	See Removal/Treatment (above).
	Elimination of Exposure	Engineering Controls would be limited to hydraulic containment. See Containment (above). Institutional Controls are routinely used at MGP sites to control potential exposure pathways.	Engineering controls are not likely to provide significant benefit (see Containment above), but insitutional controls would be implementable with agreement by the property owners, and provide the ability to eliminate risk.
	Treatment at Point of Exposure	Not appropriate for media that pose a potential direct contact risk.	Not Applicable.

Notes:
1 Since the principal improvement in GW quality will result from the removal/treament of source material, i.e. impacted soil, respose action evaluations are limited to dissolved-phase impacts.

Table 5-1
Equity Former Manufactured Gas Plant Site Summary of Technology Screening for Soil

Media	General Response Action	Technology/Approach	Ability to Meet Remedial Goals [1]		Preferred Technology
			Eliminate Risk	Reduction in the Level of Impact	
On-Site	Removal	Excavation - implementable, but would not be able to access impacts below a practical depth of 20 ft bgs.	No - would not eliminate the direct contact risk in on-site areas since residual material would still be present at depths below 20 ft bgs.	Yes - would reduce some shallow contamination (above 20 ft bgs), but would not reduce the majority of contamination located deeper.	Excavation provides the ability to remove the contamination located up to 20 ft bgs.
		Product Recovery - recovery wells have been installed throughout the entire depth of impacts in the source area (and along the downgradient site perimeter) to reduce the concentrations of MGP by-product to its residual saturation point.	No - would not eliminate risk in on-site areas since residuals would be left in place, but would eliminate the potential for off-site migration of MGP residuals.	Yes - contaminants would be removed and enhance conditions for the aerobic degradation of source material providing for a decrease in contaminants over time.	Product Recovery provides the ability to remove the most highly concentrated impacts from all depths of the on-site area.
	Treatment	In-situ Oxidation - introduction of oxidant could reduce the strength of some source material, but effectiveness is highly dependent on subsurface conditions and the nature of the impacts.	No - would not eliminate the risk from direct contact in on-site areas or eliminate the source of dissolved-phase impacts.	Yes - would reduce contamination, but may not be effective in areas with saturated product.	Solidification provides the ability to effectively contact impacted media at subsurface locations and would be effective at eliminating the potential for residuals to migrate off-site.
		Solidification - could access the entire depth of on-site impacts and reduce the permeability of site media to isolate source material.	No - would not eliminate risk since residual contamination would be left in-place, but would eliminate the potential for off-site migration of residuals.	Yes - would not significantly reduce contaminant levels in soil, but would reduce the levels of dissolved-phase impacts.	
	Elimination of Exposure	Site Management Plan - restrictions on site activities would require agreement with property owners, but would be implementable.	Yes - would eliminate the potential exposure pathway for human health risk.	No - would not reduce contaminant levels.	Site Management Plan to address potential human health risk.
Off-Site	Removal	Excavation - implementable, but would not be able to access impacts below a practical depth of 20 ft bgs.	No - would not eliminate the direct contact risk in accesible off-site areas since the most significant impacts below 20 ft. bgs.	No - most impacts are located at depths below 20 ft bgs or in areas with extensive daily activity. Not likely to be effective.	Removal technologies will not be carried over to the evaluation of remedial alternatives.
		Product Recovery - recovery wells could be installed throughout the entire depth of impacts to reduce the concentrations of MGP by-product to its residual saturation point.	No - would not eliminate risk in the accessible off-site areas, but would reduce the potential for source material to migrate.	No - NAPL is approaching or at residual conditions as the distance from on-site sources increases. The effectiveness of recovery activities would likely be limited.	
	Treatment	In-situ Oxidation - introduction of oxidant could reduce the strength of some source material, but effectiveness is highly dependent on subsurface conditions and the nature of the impacts.	No - would not eliminate the risk from direct contact in off-site areas or eliminate the source of dissolved-phase impacts.	No - off-site residuals do not appear to have an incremental impact on groundwater so there would be limited benefits of treatment.	Treatment technologies will not be carried over to the evaluation of remedial alternatives.
		Solidification could access the entire depth of on-site impacts and reduce the permeability of site media to isolate source material.	No - would not eliminate risk since residual contamination would be left in-place, but would eliminate the potential for off-site migration of residuals.	No - off-site residuals do not appear to have an incremental impact on groundwater so there would be limited benefits of treatment.	
	Elimination of Exposure	Institutional Controls - restrictions on site activities would require agreement with property owners, but would be implementable.	Yes - would eliminate the potential exposure pathway for human health risk.	No - would not reduce contaminant levels.	Institutional Controls will be carried over to address potential human health risk.

Notes:

1 Remedial Goals

Soil: -Eliminate the potential for direct contact with MGP residuals, and to the extent feasible reduce constituent concentrations that exceed CP-51 and Part 375 Soil Cleanup objectives for non-residential use

-Reduce MGP impacts that are adversely impacting GW quality to the extent feasible

Table 5-2
Equity Former Manufactured Gas Plant Site Summary of Technology Screening for Groundwater [1]

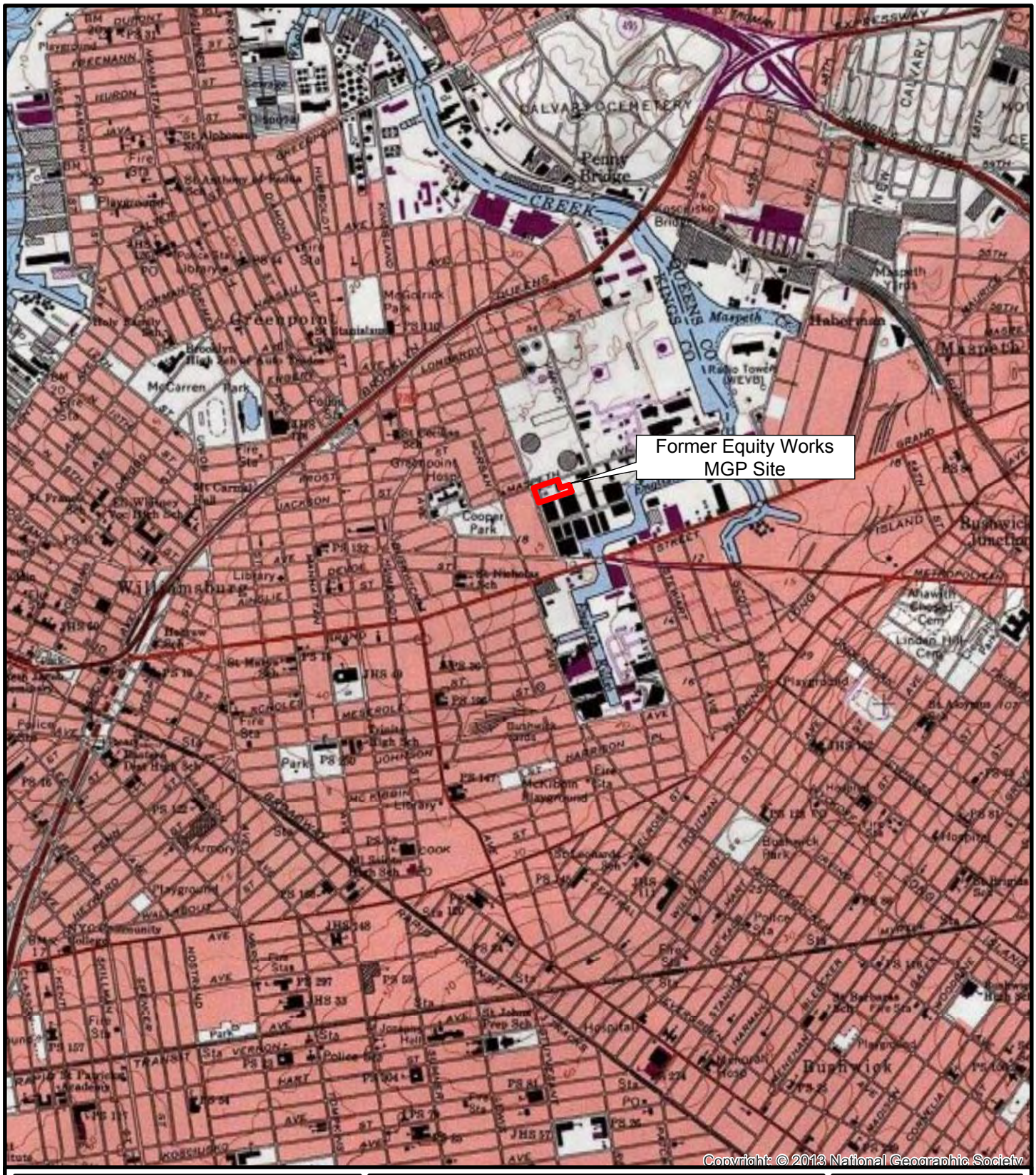
Media	General Response Action	Technology/Approach	Ability to Meet Remedial Goals [2]		Preferred Technology
			Eliminate Risk	Reduction in the Level of Impact	
On-Site	Treatment	Natural Attenuation - naturally occuring bacteria in soil and groundwater can reduce dissolved-phase concentrations of MGP constituents.	No - natural attenuation can provide a stable plume, but is not likely to eliminate potential risk .	Yes - natural attenuation can reduce contamination to a steady-state condition	Natural Attenuation will provide an appropriate means to improve groundwater quality. Biological enhancement could be implemented in the future, if required.
		Biological Enhancement - introduction of nutrients to facilitate aerobic biological processes and increase the rate of degradation.	No - enhanced natural attenuation can provide a stable plume, but is not likely to eliminate potential risk .	Yes - enhanaced natural attenuation can reduce contamination to a steady-state condition.	
	Elimination of Exposure	Site Management Plan - restrictions on site activities would require agreement with property owners, but would be implementable.	Yes - would eliminate the potential exposure pathway.	No - would not reduce contaminant levels.	Site Management Plan to address potential human health risk.
Off-site	Treatment	Natural Attenuation - naturally occuring bacateria in soil and groundwater can reduce dissolved-phase concentrations of MGP constituents.	No - natural attenuation can provide a stable plume, but is not likely to eliminate potential risk.	Yes - natural attenuation can reduce contamination to a steady-state condition.	Natural Attenuation will provide an appropriate means to improve groundwater quality. Biological enhancement could be implemented in the future, if required.
		Biological Enhancement - introduction of nutrients to facilitate aerobic biological processes and increase the rate of degradation.	No - enhanced natural attenuation can provide a stable plume, but is not likely to eliminate potential risk.	Yes - enhanaced natural attenuation can reduce contamination to a steady-state condition.	
	Elimination of Exposure	Institutional Controls - restrictions on site activities would require agreement with property owners, but would be implementable.	Yes - would eliminate the potential exposure pathway.	No - would not reduce contaminant levels.	Institutional Controls to address potential human health risk.

Notes:
1 Since the principal improvement in GW quality will result from the removal/treament of source material, i.e. impacted soil, technology evaluations are limited to dissolved-phase impacts.
2 Remedial Goals
GW: -Eliminate the potential for direct contact/use at locations having MGP constituent concentrations that exceed AWQSGVs

Table 6-1
Equity Former MGP Site Summary of Alternatives Evaluation

Objective/Media to be Addressed	1 No Action	2 NAPL Recovery, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls	3 Excavation of Soil, NAPL Recovery, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls	4 Solidification of Impacted Media, Natural Attenuation of Dissolved-Phase Impacts and Institutional Controls	5 Restoration of On-site and Off-Site Properties to Pre-Release Conditions
On-Site Area					
Exposure Pathway Elimination	No Activity	Site Management Plan	Site Management Plan	Site Management Plan	Excavation of Impacted Soil
Reduction in the Level of Impact - Impacted Soil	No Activity	Product Recovery	Excavation of Shallow Soil Impacts, Product Recovery	Solidification of Impacted Soil	Excavation of Impacted Soil
- Groundwater	No Activity	Source Removal and Natural Attenuation	Source Removal and Natural Attenuation	Source Treatment and Natural Attenuation	Source Removal, Natural Attenuation
Off-Site Area (Accessible)					
Exposure Pathway Elimination	No Activity	Institutional Controls	Institutional Controls	Institutional Controls	Source Removal, Natural Attenuation
Reduction in the Level of Impact - Impacted Soil	No Activity	No Activity	No Activity	No Activity	Source Removal
- Groundwater	No Activity	Natural Attenuation	Natural Attenuation	Natural Attenuation	Source Removal and Natural Attenuation
1 Overall Protection of Public Health and Environment	**Low** - does not address potential risks.	**Medium** - controls potential human health risk, but relies on long-term institutional controls to eliminate exposure pathways.	**Medium** - controls potential human health risk, but relies on long-term institutional controls to eliminate exposure pathways.	**Medium** - controls potential human health risk, but relies on long-term institutional controls to eliminate exposure pathways.	**High** - will permanently eliminate exposure pathways for any foreseeable future use.
2 Compliance with Standards, Criteria and Guidance	**Low** - does not achieve the remedial goals and does not result in site-wide compliance with SCGs.	**Medium** - achieves the remedial goals. The soil SCGs for migration to groundwater will no longer be applicable due to the use restrictions imposed by the institutional controls; however, the alternative will not achieve compliance with NYSDEC criteria for groundwater or direct contact with soil.	**Medium** - achieves the remedial goals. The soil SCGs for migration to groundwater will no longer be applicable due to the use restrictions imposed by the institutional controls; however, the alternative will not achieve compliance with NYSDEC criteria for groundwater or direct contact with soil.	**Medium** - achieves the remedial goals. The soil SCGs for migration to groundwater will no longer be applicable due to the use restrictions imposed by the institutional controls; however, the alternative will not achieve compliance with NYSDEC criteria for groundwater or direct contact with soil.	**High** - would meet the SCGs and achieve the remedial objectives.
3 Long-Term Effectiveness and Permanence	**Low** - contaminants will remain in place with no means to control potential exposure pathways.	**High** - approaches are routinely used at MGP sites, and restrictions to control potential exposure pathways are consistent with current and future site use.	**High** - approaches are routinely used at MGP sites, and restrictions to control potential exposure pathways are consistent with current and future site use.	**High** - approaches are routinely used at MGP sites, and restrictions to control potential exposure pathways are consistent with current and future site use.	**High** - Excavation is routinely used at MGP sites as a permanent remedy. The removal of all impacted media will eliminate all potential risks to human health and the environment without the need for institutional controls.
4 Reduction of Toxicity, Mobility or Volume	**Low** - provides no significant reduction in contaminant levels.	**Medium** - will provide for the collection/removal of the most significant impacts (mobile product), control the migration of residuals, and reduce dissolved-phase impacts through biological processes.	**Medium -** will provide for the collection/removal of the most significant impacts (mobile product), control the migration of residuals, and reduce dissolved-phase impacts through biological processes.	**Medium -** will immobilize impacts located on the Site. Additionally, biological processes will reduce the dissolved-phase concentrations of MGP constituents in the Site Area.	**High** - Excavation of all impacted areas will eliminate the toxicity, mobility, and volume of the contaminants and eliminate any potential risks to human health and the environment.
5 Short-Term Effectiveness	**High** - involves no intrusive site work.	**High** - involves a minimum of intrusive site work.	**Medium** - poses no significant potential implementation risks to the public or the environment; however, remediation workers would be exposed to contaminated media during excavation.	**Medium** - the alternative poses no significant risks to the public. There would be short term risks such as noise, dust, odor, that can be controlled.	**Low** - poses significant potential implementation risks to the public, remediation workers, and the environment. Demolition of the Pathmark building and full-scale excavation of all impacted areas will be extremely intrusive work.
6 Implementability	**High** - involves no coordination with, or disruption to, stakeholders.	**High** - the NAPL recovery system has already been implemented and is operational.	**Low** - the excavation of soil would require the disruption of on-going business activities for up to a year.	**Low** - the treatment of soil would require the disruption of on-going business activities for up to a year and a half.	**UNACCEPTABLE** - The property owners are not likely to allow the demolition of the buildings and implementation of a multi-year construction project outside of an approved redevelopment plan that requires unrestricted use of the Site Area.
Duration					
Implementation	NA	10 years	10 years	14 months	2.5 years
Monitoring	NA	5 years	5 years	5 years	NA
7 Cost Effectiveness	Low	High	Low	Low	Low
Estimated Cost (including contingency)	No Cost	$1,713,000	$33,583,000	$30,085,000	$153,810,000
Capitol Costs	No Capitol Cost	$413,000	$32,283,000	$30,085,000	$153,810,000
Annual O & M Costs	No O&M Cost	$130,000	$130,000	NA	NA
8 Land Use	**High** - will maintain the use of the property and surroundings for their current and intended purposes.	**High** - will maintain the use of the property and surroundings for their current and intended purposes.	**Medium** - will maintain the use of the property and surroundings for their intended purposes, but will disrupt daily operations until excavation and backfilling procedures are complete.	**Medium** - will maintain the use of the property and surroundings for their intended purposes, but will disrupt daily operations until solidification procedures are complete.	**High** - it will elevate the use so that it is consistent above the zoning of its surroundings.

Figures



AECOM Environment
125 Broad Street
16th Floor
New York, NY 10004
(212) 377-8400
www.aecom.com

National Grid
Former Equity Works MGP Site, Brooklyn NY

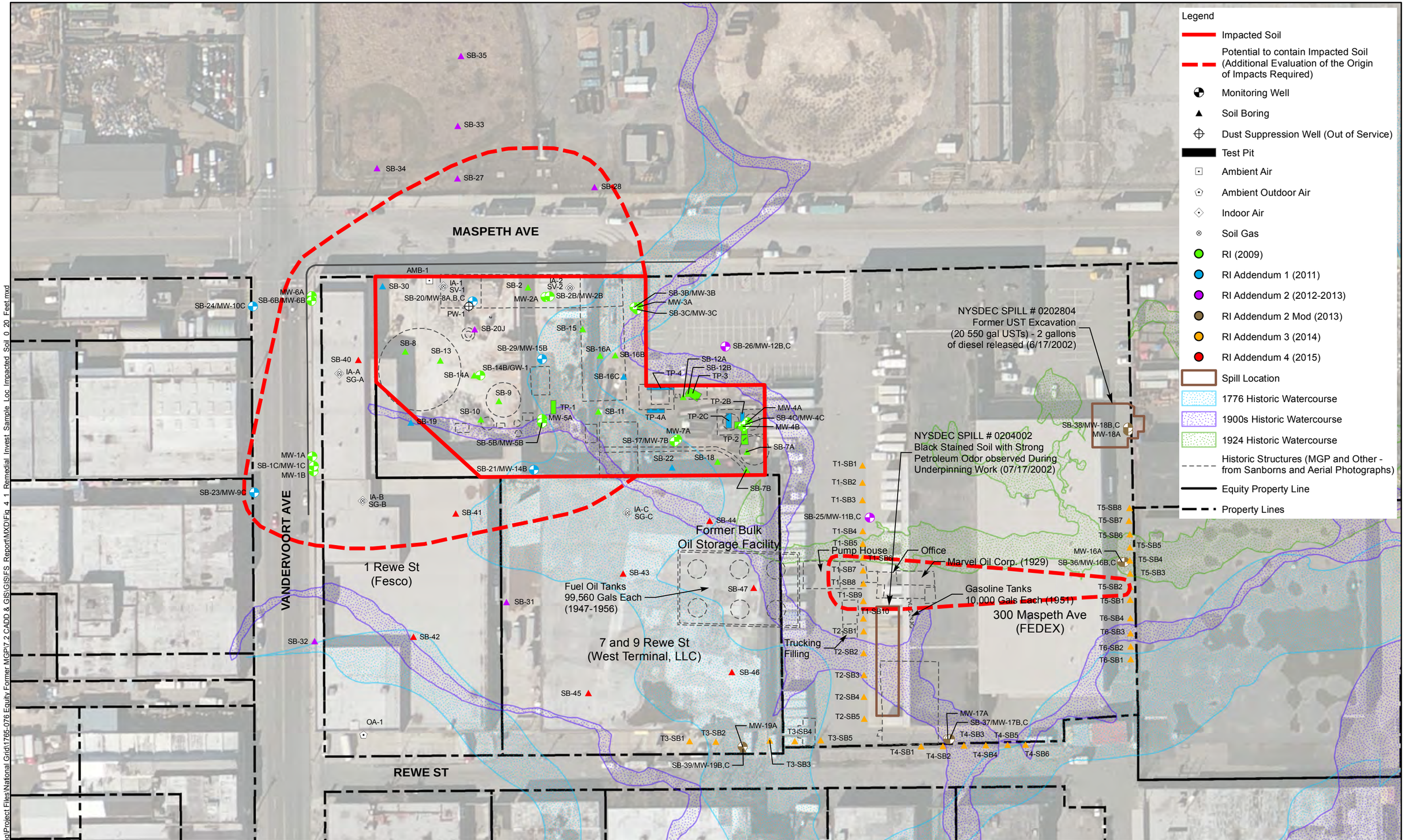
Data Source: USGS Topographic Quadrangle - Brooklyn, 2009

Scale:	Date:	Project Number:
1"=2000'	December 2013	60137362

Site Location Map

Figure 2-1

\\usnycs01\gis\work\60137362\Mxd\



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AECOM

Note
The areas/quantities of impacted media identified within the areas adjacent to the Site may also be attributed to a number of historical/current non-MGP sources.

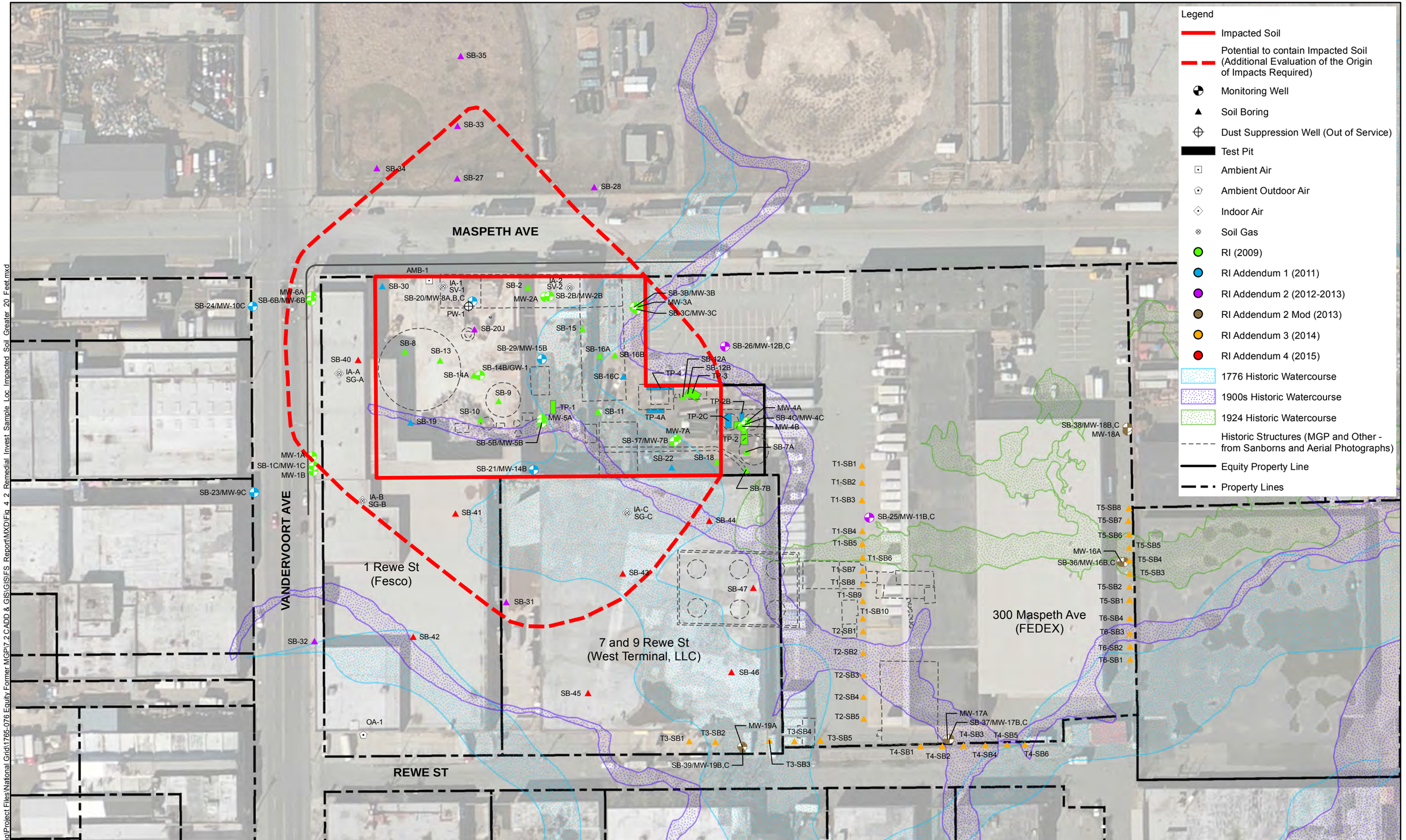
N

0 50 100
Scale in Feet

NATIONAL GRID
FORMER EQUITY WORKS MGP SITE
BROOKLYN, NY
60137362.680

DATE: 05/10/2017 | DRWN: JB

FIGURE 4-1
REMEDIAL INVESTIGATION SAMPLE LOCATIONS
IMPACTED SOIL 0-20 FEET
BELOW GROUND SURFACE



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AECOM

Note
The areas/quantities of impacted media identified within the areas adjacent to the Site may also be attributed to a number of historical/current non-MGP sources.

N

0 50 100
Scale in Feet

NATIONAL GRID
FORMER EQUITY WORKS MGP SITE
BROOKLYN, NY
60137362.680

DATE: 05/10/2017 | DRWN: JB

FIGURE 4-2
REMEDIAL INVESTIGATION SAMPLE LOCATIONS
IMPACTED SOIL GREATER 20 FEET
BELOW GROUND SURFACE

Legend

- Cross-Section Location
- Monitoring Well
- Soil Boring
- Dust Suppression Well (Out of Service)
- Recovery Well
- Location Installed By Others
- RI (2009)
- RI Addendum 1 (2011)
- RI Addendum 2 (2012-2013)
- RI Addendum 2 Mod (2013)
- RI Addendum 3 (2014)
- RI Addendum 4 (2015)
- Shallow Soil IRM (2011)
- 1776 Historic Watercourse
- 1900s Historic Watercourse
- 1924 Historic Watercourse
- Equity Property Line
- Property Lines
- Historic Structures (MGP and Other - from Sanborns and Aerial Photographs)

MASPETH AVE

REWE ST

VANDERVOORT AVE

1 Rewe St (Fesco)

7 and 9 Rewe St (West Terminal, LLC)

300 Maspeth Ave (FEDEX)

A

A'

B

B'

SB-35 SB-33 SB-34 SB-27 SB-28 GPEC-SB334 GPEC-SB333 GPEC-SB222 GPEC-MW222D GPEC-MW222S GPEC-SB331 GPEC-GT-1 (MW-18)

SB-30 SB-20/MW-8B,C PW-1 SB-20J SB-2 MW-2A SB-2B/MW-2B SB-24/MW-10C MW-6A SB-6B/MW-6B SB-8 SB-13 SB-14B/MW-1 SB-14A SB-40 SB-29/MW-15B SB-15 RW-1 RW-2 RW-3 SB-16A SB-16B SB-16C SB-9 SB-10 SB-19 TP-18 TP-1 SB-11 MW-5A SB-5B/MW-5B RW-4 RW-5 RW-21 RW-22 RW-23 TP-21 TP-20 SB-21/MW-14B RW-20 RW-19 RW-18 RW-17 TP-17 TP-16 TP-15A SB-22 TP-15 TP-14 SB-7B SB-41 SB-44 SB-43 SB-47 SB-31 SB-32 SB-42 SB-46 SB-45 MW-1A SB-1C/MW-1C MW-1B SB-23/MW-9C

RW-5 RW-7 RW-8 RW-6 TP-5 TP-6 SB-3B/MW-3B MW-3A SB-3C/MW-3C RW-9 RW-10 TP-7 RW-11 RW-12 RW-13 TP-8 RW-14 RW-15 RW-16 TP-4 TP-4A TP-3 TP-11 TP-10 TP-2B SB-12A SB-26/MW-12B,C MW-4A SB-4C/MW-4C MW-4B TP-12 TP-2C TP-2 TP-12A SB-7A SB-17/MW-7B MW-7A SB-18 TP-13 TP-12 SB-25/MW-11B,C T1-SB1 T1-SB2 T1-SB3 T1-SB4 T1-SB5 T1-SB6 T1-SB7 T1-SB8 T1-SB9 T1-SB10 T2-SB1 T2-SB2 T2-SB3 T2-SB4 T2-SB5 MW-19A T3-SB1 T3-SB2 T3-SB4 T3-SB5 T3-SB3 SB-39/MW-19B,C MW-17A SB-37/MW-17B,C T4-SB1 T4-SB2 T4-SB3 T4-SB4 T4-SB5 T4-SB6 SB-38/MW-18B,C MW-18A T5-SB8 T5-SB7 T5-SB6 T5-SB5 MW-16A SB-36/MW-16B,C T5-SB4 T5-SB3 T5-SB2 T5-SB1 T6-SB4 T6-SB3 T6-SB2 T6-SB1

AECOM

N

0 50 100

Scale in Feet

NATIONAL GRID
FORMER EQUITY WORKS MGP SITE
BROOKLYN, NY
60137362.680

DATE: 05/04/2017 | DRWN: JB

FIGURE 4-3
GEOLOGIC CROSS-SECTION LOCATIONS

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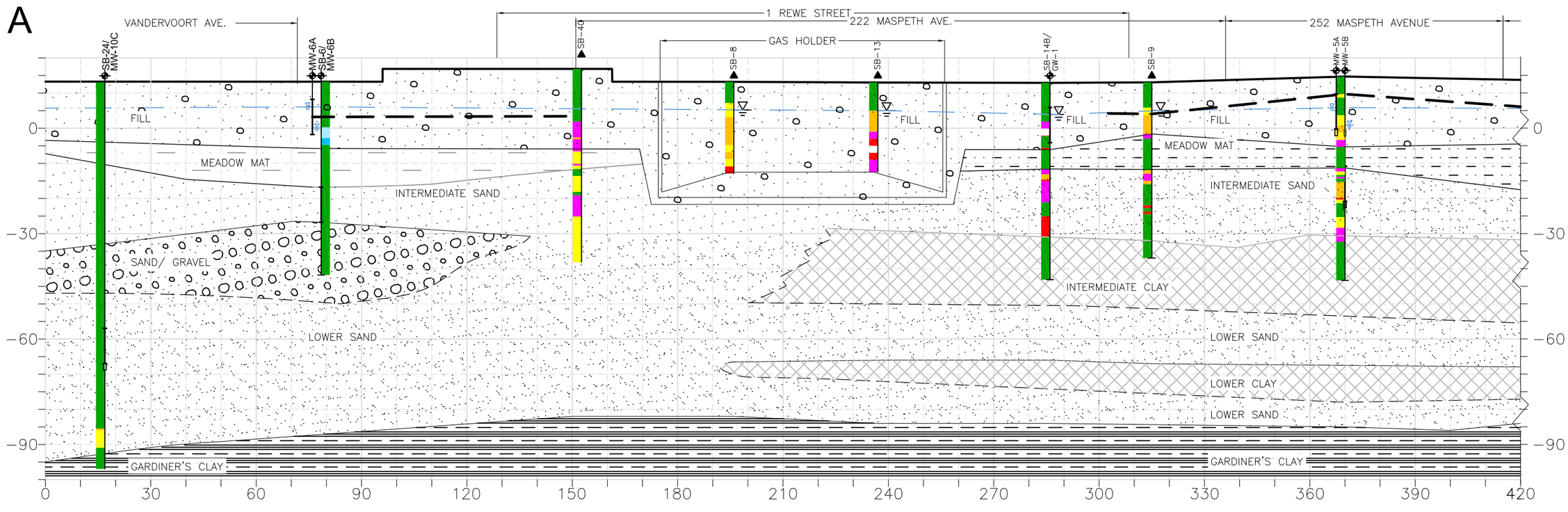

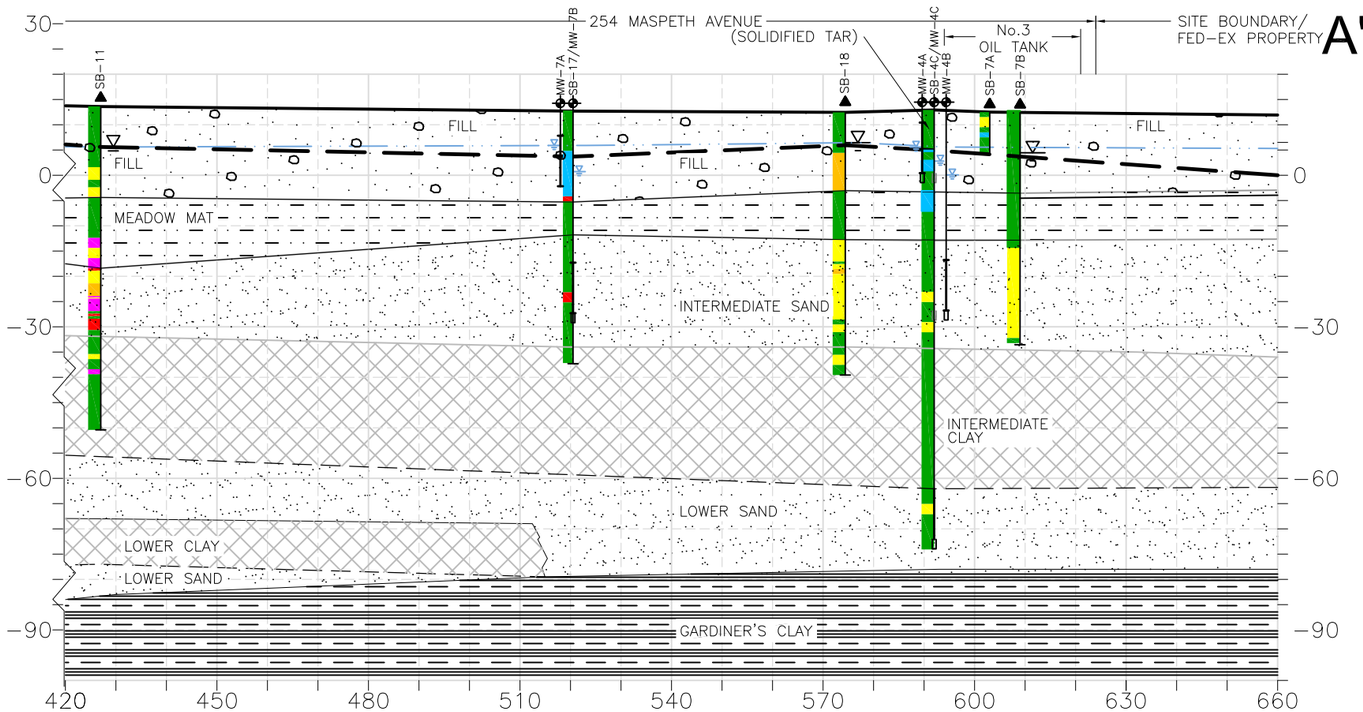

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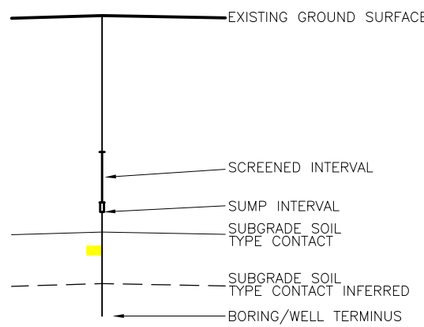


- NAPL SATURATED
- COATED MATERIAL, LENSES
- BLEBS, GLOBS, SHEENS
- STAINING ODOR
- HARDENED NAPL
- PETROLEUM IMPACTS, SATURATION AND SHEEN
- PETROLEUM IMPACTS, STAINING AND ODOR
- NO OBSERVED IMPACTS
- MW-4A — RI MONITORING WELL
- SB-4 — RI SOIL BORING

- FILL
- MEADOW MAT
- SAND/GRAVEL
- INTERBEDDED SAND, SILT AND CLAY
- GARDINERS CLAY
- CLAY

NOTE:

Monitoring wells MW-6A, MW-5A, MW-7A, MW-4A, and MW-4B have been added to the cross-section adjacent to the deeper well pair/triplet for comparison. These locations were graphically adjusted for clarity and do not represent field locations.

MW-4C is offset by 35' from the cross-section. Lithology from -30 to -74 feet has been projected onto the cross-section.

* Gardiners Clay at SB-6B based on stratigraphy at SB-1C.

AECOM

NATIONAL GRID FORMER EQUITY WORKS MGP SITE, BROOKLYN NY 60137362-400			**GEOLOGIC CROSS SECTION A-A'**
DATE: 12/2015	DRWN: BcV/C-MA		**FIGURE 4-3A**

File: P:\Jobs\Rem_Eng\Project Files\National Grid\1765-076 Equity Former MGP\7.2 CADD & GIS\2012-IRM_PRODUCT-RECOVERY\WorkPlan_figures\60137362-660-A1.dwg Layout: XSECT-AA User: Lambertt Plotted: M.

B

GAS HOLDER

SB-23 MW-9C

MW-4B SB-4/ MW-4C MW-4A

SB-19

SB-14B

SB-29/ MW-15B

FILL

SAND

SAND/ GRAVEL

SAND

GARDINERS CLAY

MEADOW MAT

INTERMEDIATE CLAY

LOWER SAND

LOWER CLAY

0 30 60 90 120 150 180 210 240 270 300 330 360 390 42

0 −30 −60 −90

RW-1

SB-3B/ MW-3B

SB-3C/ MW-2C

MW-3A

RW-8

GPEC-SB331

FILL

MEADOW MAT

SAND

INTERMEDIATE CLAY

LOWER SAND

LOWER CLAY

GARDINERS CLAY

450 480 510 540 570 600 630 660 690 720

0 −30 −60 −90

B'

LEGEND:

EXISTING GROUND SURFACE

SCREENED INTERVAL

SUMP INTERVAL

SUBGRADE SOIL TYPE CONTACT

SUBGRADE SOIL TYPE CONTACT INFERRED

BORING/WELL TERMINUS

NAPL SATURATED

COATED MATERIAL, LENSES

BLEBS, GLOBS, SHEENS

STAINING ODOR

HARDENED NAPL

PETROLEUM IMPACTS, SATURATION AND SHEEN

PETROLEUM IMPACTS, STAINING AND ODOR

NO OBSERVED IMPACTS

FILL

MEADOW MAT

SAND/GRAVEL

INTERBEDDED SAND, SILT AND CLAY

GARDINERS CLAY

CLAY

AECOM

NATIONAL GRID
FORMER EQUITY WORKS MGP SITE, BROOKLYN NY

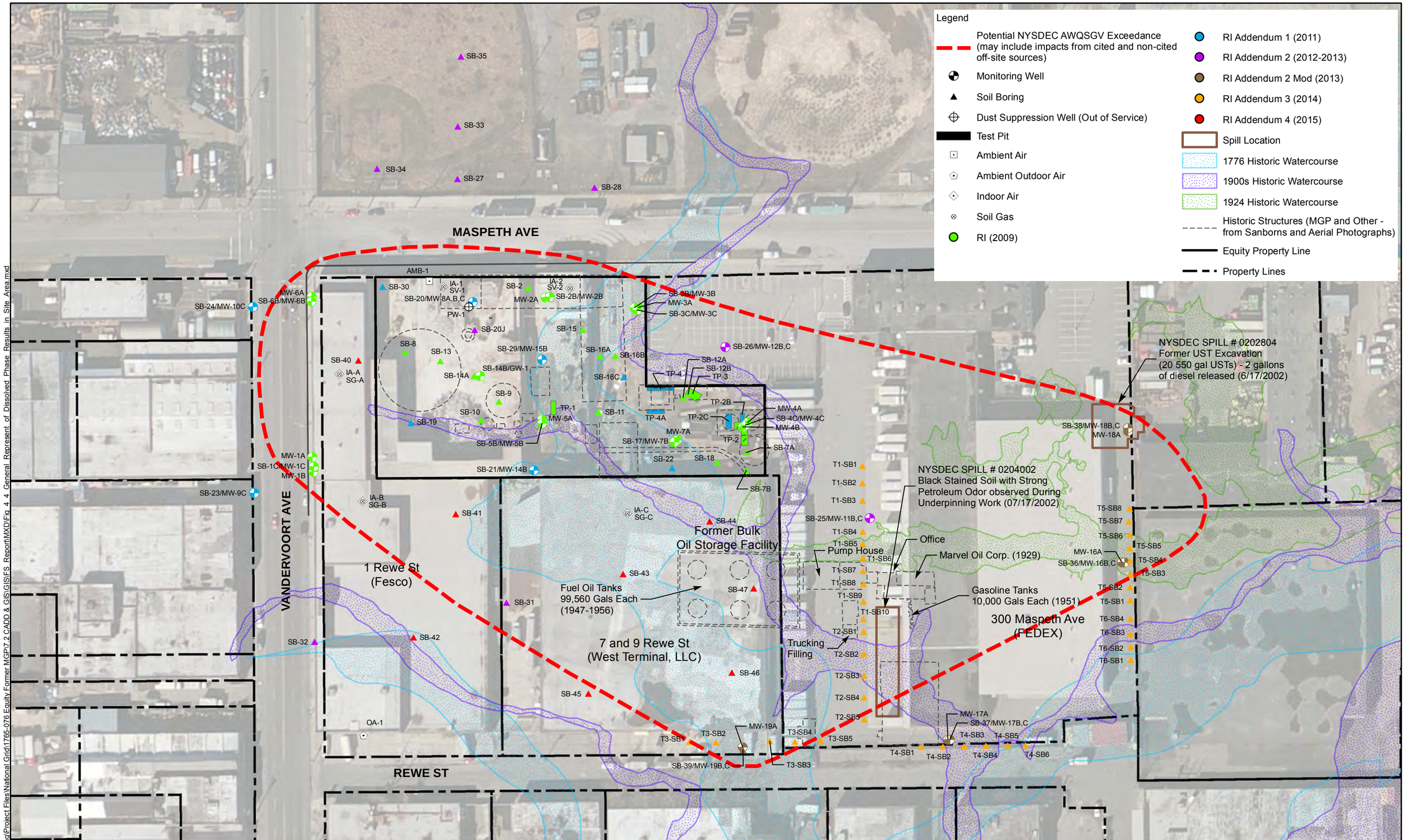
60137362-400

DATE: 12/28/2015 | DRWN: TDL

GEOLOGIC CROSS SECTION B-B'

FIGURE 4-3B

File: P:\Jobs\Rem_Eng\Project Files\National Grid\1765-076 Equity Former MGP\7.2 CADD & GIS\4-2012\60137362-310_A4.dwg Layout: X-sect_BB User: Lambertt Plotted: Mar 24, 2016 - 7:56pm



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AECOM

Note
The areas/quantities of impacted media identified within the areas adjacent to the Site may also be attributed to a number of historical/current non-MGP sources.

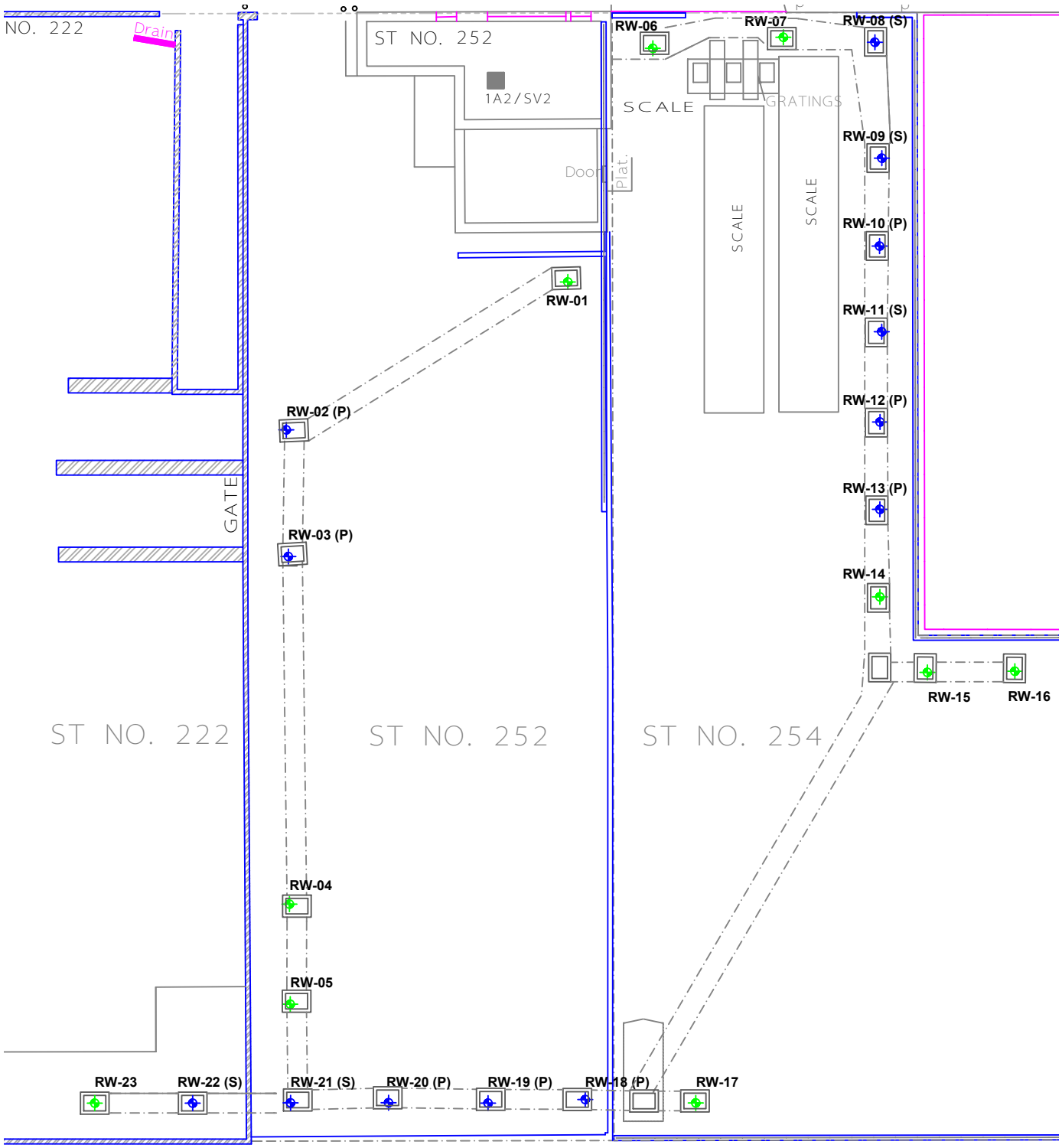
N

0 50 100
Scale in Feet

NATIONAL GRID
FORMER EQUITY WORKS MGP SITE
BROOKLYN, NY
60137362.680

DATE: 05/16/2017 | DRWN: JB

FIGURE 4-4
GENERAL REPRESENTATION OF DISSOLVED PHASE RESULTS IN THE SITE AREA



LEGEND

RW-02 (P) AUTOMATED WELLS - PRIMARY (APPROX. COLLECTION RATE > 1 GPD)

RW-08 (S) AUTOMATED WELLS - SECONDARY (APPROX. COLLECTION RATE 0.5-0.1 GPD)

RW-01 GAUGING WELLS (APPROX. COLLECTION RATE < 0.1GPD)

15 0 30

GRAPHIC SCALE IN FEET

AECOM

NATIONAL GRID
FORMER EQUITY WORKS MGP SITE,
BROOKLYN NY
60137362.660

DATE: 10/30/2013 | DRWN: BcV/C-MA

LOCATION OF AUTOMATED WELLS

FIGURE 7-1

AECOM

NATIONAL GRID
FORMER EQUITY WORKS MGP SITE,
BROOKLYN, NY
60137362.660

COMPLETED WELL LOCATION

FIGURE 7-2

AECOM

NATIONAL GRID
FORMER EQUITY WORKS MGP SITE, BROOKLYN, NY
60137362.660

CONTROL TRAILER

FIGURE 7 3

Appendix A

Summary of Soil Impacts

MGP Impact Summary
222 Maspeth Parcel

Location	Top Depth (ft bgs)	Bottom Depth (ft bgs)	NYSDEC Part 375 Soil Cleanup Objectives Commercial BTEX	CP-51 Total PAHs	Visible Impacts					
					Saturated	Lenses/ Stingers	Blebs	Coating	Sheen	Staining
SB-8	6	8								x
	8	10								x
	10	12						x		
	12	14							x	
	14	18							x	
	20	22							x	
	24	26.1	x	x	x					
SB-9	7.2	9.3								x
	9.3	10					x			
	10	12					x			
	12	14					x			
	14	14.7					x			
	14.7	16						x		
	25	26						x		
	26	28				x				
	28	29							x	
	35	35.8			x					
	36.8	37.5			x					
SB-10	12	14								x
	14	16						x		
	16	19	x		x					
	25	26				x				
	26	28				x				
	28	30				x				
	30	32				x				
	32	32.5				x				
	36	38				x				
	38	40		x						
	40	41.5				x				
	44	46				x				
SB-13	8	14		x					x	
	14	16			x					
	16	18			x					
	18	24		x						
	20	22		x	x					
	24	25.5						x		
SB-14B	11	13		x				x		
	15	15.2			x					
	18.5	19			x					
	19	24.5		x						
	24.5	26						x		
	26	27.5							x	
	27.5	28			x					
	28	30				x				
	30	32				x				
	32	34				x				
	38	44		x	x					
SB-19	17	18						x		
	25	27.5						x		
	27.7	28.1						x		
	30	32.5						x		
	44	44.5			x					
SB-20 A,B,C	0.5	2								x
	15	18.5						x		
	63.5	65					x			
	70	73						x		
	73	75				x				
	75	80				x				

MGP Impact Summary (continued)
222 Maspeth Parcel

Location	Top Depth (ft bgs)	Bottom Depth (ft bgs)	NYSDEC Part 375 Soil Cleanup Objectives Commercial BTEX	CP-51 Total PAHs	Visible Impacts					
					Saturated	Lenses/ Stingers	Blebs	Coating	Sheen	Staining
SB-20-J	55	70						x		
	75	80						x		
SB-30	10	15						x		
	26	26.2						x		
	35	35.5					x			
	78.5	79							x	
RW-22	18	20						x		
	25	35				x				
	35	41			x					
RW-23	25	30			x					
	30	39			x					

MGP Impact Summary
252 Maspeth Parcel

Location	Top Depth (ft bgs)	Bottom Depth (ft bgs)	NYSDEC Part 375 Soil Cleanup Objectives Commercial BTEX	CP-51 Total PAHs	Visible Impacts					
					Saturated	Lenses/ Stingers	Blebs	Coating	Sheen	Staining
SB-2B/MW-2B	10	12							x	
	12	14					x			
	14	16								x
	16	18				x				
	29	32				x				
	37	37.5				x				
SB-5B/MW-5B	5	6								x
	12	14								x
	14	16					x			
	16	17.3		x						
	17.3	17.5		x			x			
	17.5	18		x						
	18	20						x		
	26	27				x				
	28.5	29				x				
	30	34.5							x	
	34.5	35						x		
	43	43.5				x				
	43.5	47				x				
SB-15	10	12						x		
	12	16.5		x			x			
	16.5	18						x		
	24	26				x				
	26	30					x			
	30	32				x				
	32	36.25				x				
	38.5	38.7			x					
SB-21/MW-14B	5	10						x		
	15	20						x		
	20	22					x			
	30	33						x		
	39	40						x		
	40	43						x		
SB-29/MW-15B	10	15						x		
	15	17								x
	17	18						x		
	18	20								x
	20	21						x		
	21	23						x		
	30	35						x		
	38.5	40								x
	41	43			x					
	45	47.5					x			
	63	65						x		
	69	70								x
	75	80			x					
	80	81			x					
	91	92.5								x
	96	96.25							x	

MGP Impact Summary (Cont.)
252 Maspeth Parcel

Location	Top Depth (ft bgs)	Bottom Depth (ft bgs)	NYSDEC Part 375 Soil Cleanup Objectives Commercial BTEX	CP-51 Total PAHs	Visible Impacts					
					Saturated	Lenses/ Stingers	Blebs	Coating	Sheen	Staining
PDI-8	15	17							x	
	17	19					x			
	31	35							x	
	36.8	37						x		
	37	39								x
	39	41			x					
	41	43			x					
	43	47			x					
RW-1	17	20						x		
	20	24				x				
	24	25						x		
	25	26.5			x					
	26.5	40						x		
RW-2	15	16			x					
	18	19						x		
	34.5	35			x					
	36.5	46			x					
RW-3	20.5	21						x		
	32	32.5			x					
	37	43			x					
	45	46			x					
RW-4	20	21			x					
	44	46			x					
RW-5	18	21						x		
	32	35				x				
	38.5	42			x					
RW-18	19	21						x		
	33	40						x		
	40	45			x					
RW-19	15	20						x		
	43	47			x					
RW-20	19	21						x		
	37	47			x					
RW-21	16	17						x		
	17	18			x					
	39	45			x					

MGP Impact Summary
254 Maspeth Parcel

Location	Top Depth (ft bgs)	Bottom Depth (ft bgs)	NYSDEC Part 375 Soil Cleanup Commercial BTEX	CP-51 Total PAHs	Visible Impacts					
					Saturated	Lenses/ Stingers	Blebs	Coating	Sheen	Staining
SB-3B/MW-3B	10	12						x		
	12	14							x	
	14	17						x		
	27	27.5						x		
	27.5	28				x				
	28	28.5						x		
	28.5	29			x					
	29	30				x				
	30	32				x				
	33	33.5				x				
	35	38	x	x	x					
	38	40				x				
SB-3C/MW-3C	68.25	68.35								x
SB-4	1	3		x				x		
	3	5					x			
SB-4C/MW-4C	8	8.2						x		
	10	12								x
	18	20								x
SB-7A	4	5							x	
SB-11	17.9	18						x		
	26	28				x				
	30	32			x					
	32	32.5		x	x					
	35	37.5						x		
	37.5	37.8				x				
	38	40			x					
	40	40.5			x					
	41	41.5			x					
	42	44.25			x					
	50	52								
	52	53			x					
SB-12A	4.3	4.5		x		x				
	8	11							x	
	11	12.2						x		
SB-12B	12	16							x	
	34	36							x	
	40	42				x				
	42	44							x	
SB-16A	8	10							x	
SB-16B	20	23						x		
	24	26						x		
	26	30				x				
	30	32		x		x				
	32	34			x					
	34	34.25				x				

MGP Impact Summary (Cont.)
254 Maspeth Parcel

Location	Top Depth (ft bgs)	Bottom Depth (ft bgs)	NYSDEC Part 375 Soil Cleanup Commercial BTEX	CP-51 Total PAHs	Visible Impacts					
					Saturated	Lenses/ Stingers	Blebs	Coating	Sheen	Staining
SB-16C	13	15						x		
	15	20							x	
	20	23						x		
	23	25						x		
	25	35						x		
	35	36			x					
	36	37.5			x					
	74	75			x					
	75	77.5			x					
	79	82			x					
	82	85				x				
SB-7/MW-17B	8	10					x			
	10	17						x		
	17	18				x				
	36	38			x					
SB-18	8	10							x	
	10	15.5							x	
	31	32							x	
SB-22	0	2								x
	2	3								x
	3	4								x
	4	5								x
	15	21							x	
	83	84								x
	84	84.1			x					
	85	86			x					
	86	89.5			x					
	89.5	90				x				
	90	92.5			x					
PDI-1	7	9							x	
	9	13						x		
	13	15			x					
	27	35						x		
	35	36.8								
	37	45			x					
	45	47							x	
PDI-2	11	15							x	
	33	35						x		
	35	42			x					
PDI-3	13	15							x	
	15	20			x					
	29	29.5						x		
	30.5	31			x					
	32	32.5			x					
	33	35						x		
	36	37			x					
	37	39				x				
PDI-4	17	18			x					
	26	31						x		
	31	39							x	
PDI-5	15	16						x		
	26.5	27						x		
	28.5	33			x					
	33	39						x		
	39	41				x				

MGP Impact Summary (Cont.)
254 Maspeth Parcel

Location	Top Depth (ft bgs)	Bottom Depth (ft bgs)	NYSDEC Part 375 Soil Cleanup Commercial BTEX	CP-51 Total PAHs	Visible Impacts					
					Saturated	Lenses/ Stingers	Blebs	Coating	Sheen	Staining
PDI-6	11	13							x	
	13	15					x			
	28.5	35			x					
	35	37						x		
	37	39						x		
	39	42.5						x		
	42.5	43			x					
RW-6	0	19			x					
	24	25			x					
	25	26.5						x		
	26.5	30			x					
	32	42			x					
RW-7	28	28.1				x				
	33	43			x					
RW-8	35	43				x				
RW-9	0	16			x					
	16	17								x
	17	19			x					
	35	44.5			x					
RW-10	14	15						x		
	15	17						x		
	25	34						x		
	34	41			x					
RW-11	16	18			x					
	24	30						x		
	30	34			x					
	34	40			x					
RW-12	16	17			x					
	17	34				x				
	34	40.5			x					
RW-13	27	32						x		
	32	40			x					
RW-14	16.5	18			x					
	26	32				x				
	32	39			x					
RW-15	25	30						x		
	30	40			x					
RW-16	27	30						x		
	30	32			x					
	32	35						x		
	35	40			x					
	40	45			x					
RW-17	26	26.5			x					
	26.5	40						x		
	40	43			x					
TP-2	0	1						x		
	1	4						x		
	4	6						x		
TP-2B	2.85	3						x		
	4	4.5						x		
TP-2C	4.5	7.5							x	
TP-4	2	4							x	

MGP Impact Summary
Off-Site Locations

Location		Top Depth (ft bgs)	Bottom Depth (ft bgs)	NYSDEC Part 375 Soil Cleanup Commercial BTEX	CP-51 Total PAHs	Visible Impacts					
						Saturated	Lenses/ Stingers	Blebs	Coating	Sheen	Staining
300 Maspeth	T1-SB4	20	21							x	
	T1-SB7	17	17.5						x		
		17.5	19				x				
	T1-SB8	18	18.5		x	x					
		18.5	21				x				
	T1-SB9	15	18		x				x		
	T1-SB10	10	21							x	
	T2-SB1	15	20					x			
	T2-SB3	9	15							x	
	T3-SB5	10	17							x	
	T3-SB4	10	17							x	
	T5-SB1	14	16								x
	T5-SB2	18	18.5						x		
		18.5	30		x						
	T5-SB4	10.5	11								x
	T5-SB5	10	12.5								x
	T5-SB7	7	7.5							x	
		20	20.5							x	
	T5-SB8	10	11.5							x	
	T6-SB2	10	11							x	
Vandervoort Ave.	SB-1C/MW-1C	77	78							x	
		78	80				x				
		80	82		x			x			
		82	82.2			x					
		82.2	83						x		
		83.5	83.6				x				
		85	87.9					x			
		87.9	88.15				x				
		88.15	90					x			
	SB-6B/MW-6B	16	18							x	
	SB-23/MW-09C	14	19						x		
	SB-24/MW-10C	98.5	99							x	
Greenpoint	SB-27	17.2	17.6			x					
		18.3	18.8						x		
		20	21						x		
		33.6	33.9								x
		34.3	36			x					
		80	86		x	x					
		86	88.5				x				
	SB-28	12.7	12.9						x		
	SB-33	32	34					x	x		
		34	36		x	x					
		48	48.4						x		
1 Rewe Street	SB-40	9	10								
		15	19.5						x		
		19.5	20						x		
		20	23.5		x	x					
		27	27.5				x				
		36	42				x				
	SB-41	6	8		x						
		28.5	32.5						x		
		34.5	37						x		
		37	45								
7/9 Rewe Street	SB-31	32	35						x		
		36	100								
	SB-43	38.5	43						x		
		43	48		x	x					
	SB-44	19	50								
	SB-45	17	18							x	
		25	27							x	

Appendix B

Summary of Cost Estimates for Alternatives

Table B-1

Project Name:	Former Equity MGP	**Revision No.:**	8
Cost Estimate No.:	Alternative 3	**Date:**	2/14/17
Client	National Grid	**Status:**	Draft
Location	Suffolk County NY	**Author:**	LAW
		Office:	Chelmsford
Project Element:	Excavation and Product Recovery Excavation to 20' with Sheetpile to 50'	**Reviewed By:**	
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:	Brooklyn, NY
Project Start Date:	2017
Project Duration:	7 Mo
Type of Contract:	Direct Owner
Level of Accuracy:	*-30% to +50%*
Contingency:	20%

Scope Summary

Excavation and disposal of soils using Sheetpile

Soil Excavation Vol	53,500	CY
Total Excavation Volume	53,500	CY

Document Source: _____ **Rev. Date:** _____ **Site Visit?** Yes

Document Source: _____ **Rev. Date:** _____

Document Source: _____ **Rev. Date:** _____

Table B-1

Cost Summary		
Prime Contractor Costs	$	19,689,000
Other Contracts & Purchases	$	11,055,000
Subcontractor Costs		
Project Total Estimated Cost	$	33,583,000

Notes:

1. Note intended use and audience

2. List major project assumptions

3. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

4. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

Former Equity MGP
Alternative 3
National Grid
Suffolk County NY

AECOM

Excavation and Product Recovery

By: LAW Rev Date: 2/14/2017

Prime Contractor Costs				0%	20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	MU	Contingency	Total Cost	Unit Rate	%
1	Mobilization	LS	1	$150,000	$0	$30,000	$180,000	$180,000	1%
2	Temporary Facilities and Controls	MO	7	$286,950	$0	$57,390	$344,340	$49,191	2%
3	Site Preparation-Asphalt and Concrete Removal	CY	2,200	$330,000	$0	$66,000	$396,000	$180	2%
4	Erosion and Sediment Controls	LF	1,700	$70,175	$0	$14,035	$84,210	$50	0%
5	Odor Foam Consumables	Wk	28	$137,000	$0	$27,400	$164,400	$5,871	1%
6	Excavation For SP installation	CY	560	$15,680	$0	$3,136	$18,816	$34	0%
7	Recovery Well System Protection	SF	44,900	$1,122,500	$0	$224,500	$1,347,000	$30	7%
8	Sheetpile Installation	SF	85,000	$6,375,000	$0	$1,275,000	$7,650,000	$90	39%
9	Excavation	CY	53,500	$1,498,000	$0	$299,600	$1,797,600	$34	9%
10	Excavation Dewatering	Day	100	$1,060,000	$0	$212,000	$1,272,000	$12,720	6%
11	Fill Placement	CY	66,840	$5,347,200	$0	$1,069,440	$6,416,640	$96	33%
12	Product Recovery Well and Monitoring Well Installation	Ea	-	$0	$0	$0	$0	-	0%
13	Site Restoration	LS	1	$14,750	$0	$2,950	$17,700	$17,700	0%
				$16,407,255	$0	$3,281,451	$19,688,706		100%

Other Contracts & Purchases				0%	20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	MU	Contingency	Total Cost	Unit Rate	%
1	Waste Disposal	Ton	89,560	$9,212,400	$0	$1,842,480	$11,054,880	$123	100%
				$9,212,400	$0	$1,842,480	$11,054,880		100%

Costs				0%	20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	MU	Contingency	Total Cost	Unit Rate	%
1	Engineering Design	LS	1	$164,073	$0	$32,815	$196,887	$196,887	7%
2	Site Management Plan	LS	1	$75,000	$0	$15,000	$90,000		
3	Air Monitoring and Health and Safety	Mo	7	$280,000	$0	$56,000	$336,000	$48,000	12%
4	Natural Attenuation Monitoring-analyticals	Yr	5	$35,000	$0	$7,000	$42,000	$8,400	
5	Plume Stability Monitoring	Qtr	8	$80,000	$0	$16,000	$96,000	$12,000	
6	Product recovery/disposal -10 Yr Period	Yr	10	$1,312,695	$0	$262,539	$1,575,234	$157,523	55%
7	Personnel	Man Hours	3,707	$419,000	$0	$83,800	$502,800	$136	18%
				$2,365,767	$0	$473,153	$2,838,921		92%

Grand Total	$33,582,507

Former Equity MGP
Alternative 3
National Grid
Suffolk County NY

AECOM

Excavation and Product Recovery

Add Task | Delete Row | Add 1 Blank Row

By: LAW Rev Date: 2/14/17

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
Prime Contractor Costs		**NOTE- All costs include contractor Overhead and Profit**					
1	**Mobilization**	**LS**	**1**		**$150,000.00**		**NOTES**
	Excavation Equipment	LS	1	50000	$50,000.00		Price from Engineers estimate for Equiptment moves in/out
	Sheetpile Mobilization	LS	1	100000	$100,000.00		Recent Far Rockaway Bids
2	**Temporary Facilities and Controls**	**MO**	**7**		**$286,950.00**		**Est**
	Temporary Facilities- Trailers/PortaJohn	MO	7	750	$5,250.00		5 mos excavation, 2 mos SP install
	Office Equipment	MO	7	500	$3,500.00		500 CY/day
	Office Supplies	MO	7	500	$3,500.00		--
	Cell Phones	MO	7	1000	$7,000.00		--
	Electric	MO	7	250	$1,750.00		--
	Water	MO	7	750	$5,250.00		--
	Cleaning	MO	7	350	$2,450.00		--
	Pick Up	MO	7	750	$5,250.00		--
	Fuel/Maint	MO	7	400	$2,800.00		--
	Misc. Supplies	MO	7	500	$3,500.00		--
	Decontamonation Supplies	MO	7	500	$3,500.00		--
	Water Truck	MO	7	2000	$14,000.00		--
	Dumpster	Wk	32	50	$1,600.00		--
	Survey	LS	1	5000	$5,000.00		--
	Project Manager	Day	140	750	$105,000.00		--
	Admin Support	Day	140	340	$47,600.00		--
	Superintendent	Day	140	500	$70,000.00		--
3	**Site Preparation-Asphalt and Concrete Removal**	**CY**	**2200**		**$330,000.00**		**1' concrete over 3/4 of the site**
	Asphalt Removal	CY	0	10	$0.00		Assume 8"
	Concrete Removal	CY	2200	150	$330,000.00		Means-02 41 13.30-4300
4	**Erosion and Sediment Controls**	**LF**	**1700**		**$70,175.00**		**Est**
	Privacy Fabric	SF	8500	0.5	$4,250.00		--
	Silt Fence	LF	1700	1.25	$2,125.00		--
	Hay Bales	LF	1700	6	$10,200.00		--
	Temporary Fencing	LF	1700	8	$13,600.00		--
	Stockpile Construction -	LS	2	20000	$40,000.00		--
5	**Odor Foam Consumables**	**Wk**	**28**		**$137,000.00**		**Estimated project time 1 mo.**
					$0.00		
	Foam Unit Mob	LS	1	500	$500.00		--
	Foam Unit Rental	MO	7	2500	$17,500.00		--
	Foam Labor	Day	140	450	$63,000.00		--
	Foam (drums)	Drum	140	400	$56,000.00		Approximately $7/gallon based on recent Augusta rates
6	**Excavation For SP installation**	**CY**	**560**		**$15,680.00**		**EST 3' deep 1700 LF**
	Excavation, stockpling	CY	560	28	$15,680.00		--
7	**Recovery Well System Protection**	**SF**	**44900**		**$1,122,500.00**		**Assume 900 LF and 50'depth**
	Recovery Well System Protection	SF	44900	25	$1,122,500.00		Leave Recovery system in place.
					$0.00		
					$0.00		
8	**Sheetpile Installation**	**SF**	**85000**		**$6,375,000.00**		**1700 lf approximately 50 feet deep**
	Sheetpile Installation	SF	85000	75	$6,375,000.00		Excavate to 20' SP to 50' Total SF =10,000/pricing from recent Far rockaway bid. $40-50/sf/ Metro $150/sf 60'deep
9	**Excavation**	**CY**	**53500**		**$1,498,000.00**		**78,300 SF 0-20 ft bgs**
	Excavation and Stockpiling of Soils	CY	53500	28	$1,498,000.00		--
	FALSE	FALSE	0	0	$0.00		--

Former Equity MGP
Alternative 3
National Grid
Suffolk County NY

AECOM

Excavation and Product Recovery

By: LAW **Rev Date: 2/14/17**

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
10	**Excavation Dewatering**	**Day**	**100**		**$1,060,000.00**		**500 GPM system-Metro pricing (from recent clifton bids)**
	Construction Water Treatment Operation	DAY	100	5000	$500,000.00		Assume only when excavating (5 mos)
	Mobilization of Water Treatment System Mob-500 GPM	LS	1	450000	$450,000.00		500 GPM system-Metro pricing (from recent clifton bids)
	Construction Water Management	LS	1	100000	$100,000.00		--
	Indirect Dishcarge permit	LS	1	10000	$10,000.00		Estimate
11	**Fill Placement**	**CY**	**66840**		**$5,347,200.00**		**200 cy/day**
					$0.00		
	Backfill and Grading: Common Fill	CY	66840	80	$5,347,200.00		From Recent Far Rockaway Bids
	Backfill and Grading-Reused Soils	CY	0	35	$0.00		--
12	**Product Recovery Well and Monitoring Well Installation**	**Ea**	**0**		**$0.00**		**Cost from recent Equity Install**
	Installation of 4" diameter, 10' SS Screen Wells to 50'	Ea	0	10000	$0.00		Use exisitng wells
	Monitoring well Installation	Ea	0	5000	$0.00		--
13	**Site Restoration**	**LS**	**1**		**$14,750.00**		**Est**
	Excavator	Day	5	1200	$6,000.00		Based on Metropolitan unit rates
	Dozer	Day	5	400	$2,000.00		--
	Equip Oper	Day	5	750	$3,750.00		--
	Laborer	Day	5	600	$3,000.00		--
	Topsoil	cy	0	22	$0.00		--
	Seeding	Acre	0	2500	$0.00		--
	Paving	SF	0	40	$0.00		Mike H. Recent Hempstead bid
	Concrete Restoration	CY	0	200	$0.00		--
	SUB-TOTAL CONTRACTOR				**$16,407,255.00**	**$16,407,255.00**	
	Mark-up	0%				**$0.00**	
	Contingency	20%				**$3,281,451.00**	
	Total Subcontractor					**$19,688,706.00**	

Former Equity MGP
Alternative 3
National Grid
Suffolk County NY

AECOM

Excavation and Product Recovery

By: LAW **Rev Date: 2/14/17**

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
Other Contracts & Purchases							
1	**Waste Disposal**	**Ton**	**89560**		**$9,212,400.00**		**NOTES**
	Transportation and Disposal (Non-Haz) Soils	ton	85600	90	$7,704,000.00		--
	Water Disposal	gallon	115200000	0.01	$1,152,000.00		500 GPM/8 mos/indirect discharge permit
	Transportation and Disposal Concrete	Ton	3960	90	$356,400.00		--
	SUB-TOTAL OTHER CONTRACTS				**$9,212,400.00**	**$9,212,400.00**	
	Mark-up	0%				**$0.00**	
	Contingency	20%				**$1,842,480.00**	
	Total Subcontractor					**$11,054,880.00**	
Costs							
1	**Engineering Design**	**LS**	**1**		**$164,072.55**		**NOTES**
	Engineering Design	LS	1	$164,072.55	$164,072.55		--
2	**Site Management Plan**	**LS**	**1**		**$75,000.00**		**Estimate**
	Site Management Plan	LS	1	$75,000.00	$75,000.00		--
					$0.00		
3	**Air Monitoring and Health and Safety**	**Mo**	**7**		**$280,000.00**		**NOTES**
	Air Monitoring-Equip	Mo	0	$8,000.00	$0.00		--
	Suma Canisters	Mo	0	$4,000.00	$0.00		--
	HSO-Air Monitoring/Office Support	Hr	0	$100.00	$0.00		6 mos 10 hr days
	Air Monitoring	MO	7	40000	$280,000.00		--
4	**Natural Attenuation Monitoring-analyticals**	**Yr**	**5**		**$35,000.00**		**From metro**
	Natural Attenuation Monitoring-analyticals/sampling	Yr	5	7000	$35,000.00		--
					$0.00		
5	**Plume Stability Monitoring**	**Qtr**	**8**		**$80,000.00**		**Mark M.**
	Plume Stability Monitoring-BTEX, PAH	Qtr	8	10000	$80,000.00		--
					$0.00		
					$0.00		
					$0.00		
6	**Product recovery/disposal -10 Yr Period**	**Yr**	**10**		**$1,312,694.94**		**NOTES**
	Product recovery/disposal -10 Yr Period	LS	1	$1,312,694.94	$1,312,694.94		NPV 5% discount - Notes sheet. Includes $130K/yr O&M;30Kyear upgrades;10K /yr disposal
					$0.00		
7	**Personnel**	**Man Hours**	**3707**		**$419,000.00**		**NOTES**
	Project Manager	Hr	700	$130.00	$91,000.00		--
	Construction Manager	HR	1400	$90.00	$126,000.00		--
	Engineer	Hr	1400	$110.00	$154,000.00		--
	Adiministration (Home Office)	HR	200	$65.00	$13,000.00		--
	Travel Expenses	Mo	7	$5,000.00	$35,000.00		--
	SUB-TOTAL COSTS				**$2,365,767.49**	**$2,365,767.49**	
	Mark-up (ODCs Only)	0%			**(no m/u on labor)**	**$0.00**	
	Contingency	20%				**$473,153.50**	
	Total					**$2,838,920.99**	
	GRAND TOTAL					**$33,582,506.99**	

Table B-2

AECOM

Project Name:	Former Equity MGP	**Revision No.:**	5
Cost Estimate No.:	Alternative 4	**Date:**	2/14/17
Client	National Grid	**Status:**	Draft
Location	Brooklyn, NY	**Author:**	LAW
		Office:	Chelmsford
Project Element:	Solidification	**Reviewed By:**	
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:	Brooklyn, NY
Project Start Date:	2017
Project Duration:	22 Mo-
Type of Contract:	Direct Owner
Level of Accuracy:	*-30% to +50%*
Contingency:	20%

Scope Summary

ISS of soils

Soil ISS Vol	141,200	CY
Total ISS Volume	141,200	CY

Document Source: _____ **Rev. Date:** _____ **Site Visit?** _____
Document Source: _____ **Rev. Date:** _____
Document Source: _____ **Rev. Date:** _____

Table B-2

Cost Summary

Prime Contractor Costs	$	16,866,000
Other Contracts & Purchases	$	8,726,000
Subcontractor Costs		
Project Total Estimated Cost	$	30,085,000

Notes:

1. Note intended use and audience

2. List major project assumptions

3. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

4. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

Former Equity MGP
Alternative 4
National Grid
Brooklyn, NY

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Solidification

By: LAW Rev Date: 2/14/2017

Prime Contractor Costs					0%	20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	MU	Contingency	Total Cost	Unit Rate	%
1	Mobilization	LS	1	$400,000	$0	$80,000	$480,000	$480,000	3%
2	Temporary Facilities and Controls	MO	22	$890,500	$0	$178,100	$1,068,600	$48,573	6%
3	Erosion and Sediment Controls/Stockpile Area	LF	2,000	$65,500	$0	$13,100	$78,600	$39	0%
4	Site Preparation	CY	2,400	$360,000	$0	$72,000	$432,000	$180	3%
5	Odor Foam Consumables	Wk	72	$315,500	$0	$63,100	$378,600	$5,258	2%
6	ISS Standard 8' Columns	CY	141,200	$9,997,667	$0	$1,999,533	$11,997,201	$85	71%
7	Surface Soil Excavation and Stockpiling	CY	12,500	$350,000	$0	$70,000	$420,000	$34	2%
8	Spoils Management	CY	35,300	$214,703	$0	$42,941	$257,643	$7	2%
9	Recovery Well Installation and Monitoring Well Installation	Ea	-	$0	$0	$0	$0	-	0%
10	Backfill of Surface Soils	CY	17,900	$1,432,000	$0	$286,400	$1,718,400	$96	10%
11	Site Restoration	LS	1	$29,500	$0	$5,900	$35,400	$35,400	0%
				$14,055,370	$0	$2,811,074	$16,866,444		100%

Other Contracts & Purchases					0%	20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	MU	Contingency	Total Cost	Unit Rate	%
1	Waste Disposal	Ton	80,800	$7,272,000	$0	$1,454,400	$8,726,400	$108	100%
				$7,272,000	$0	$1,454,400	$8,726,400		100%

Costs					0%	20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	MU	Contingency	Total Cost	Unit Rate	%
1	Engineering Design	LS	1	$140,554	$0	$28,111	$168,664	$168,664	4%
2	Site Management Plan	LS	1	$75,000	$0	$15,000	$90,000		
3	Air Monitoring and Health and Safety	Mo	1	$880,000	$0	$176,000	$1,056,000	$1,056,000	24%
4	Natural Attenuation Monitoring-analyticals	YR	5	$35,000	$0	$7,000	$42,000	$8,400	1%
5	Plume Stability Monitoring	Qtr	8	$80,000	$0	$16,000	$96,000		
6	Product Recovery/Disposal-10Yr Period	YR	10	$1,312,695	$0	$262,539	$1,575,234		
7	Personnel	Man Hours	11,522	$1,220,500	$0	$244,100	$1,464,600	$127	33%
				$3,743,749	$0	$748,750	$4,492,498		61%

Grand Total	$30,085,342	

Former Equity MGP
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Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
Prime Contractor Costs		**NOTE- All costs include contractor Overhead and Profit**					
1	**Mobilization**	**LS**	**1**		**$400,000.00**		**NOTES**
	ISS Equipment	LS	1	350000	$350,000.00		Recent Hempstead bids.
	Excavation Equipment	LS	1	50000	$50,000.00		--
2	**Temporary Facilities and Controls**	**MO**	**22**		**$890,500.00**		**Est**
	Temporary Facilities- Trailers/PortaJohn	MO	22	750	$16,500.00		--
	Office Equipment	MO	22	500	$11,000.00		--
	Office Supplies	MO	22	500	$11,000.00		--
	Cell Phones	MO	22	1000	$22,000.00		--
	Electric	MO	22	250	$5,500.00		--
	Water	MO	22	750	$16,500.00		--
	Cleaning	MO	22	350	$7,700.00		--
	Pick Up	MO	22	750	$16,500.00		--
	Fuel/Maint	MO	22	400	$8,800.00		--
	Misc. Supplies	MO	22	500	$11,000.00		--
	Decontamonation Supplies	MO	22	500	$11,000.00		--
	Water Truck	MO	22	2000	$44,000.00		--
	Dumpster	Wk	88	50	$4,400.00		--
	Survey	LS	1	5000	$5,000.00		--
	Project Manager	Day	440	750	$330,000.00		--
	Admin Support	Day	440	340	$149,600.00		--
	Superintendant	Day	440	500	$220,000.00		--
3	**Erosion and Sediment Controls/Stockpile Area**	**LF**	**2000**		**$65,500.00**		**Est**
	Privacy Fabric	SF	10000	0.5	$5,000.00		--
	Silt Fence	LF	2000	1.25	$2,500.00		--
	Hay Bales	LF	2000	6	$12,000.00		--
	Temporary Fencing	LF	2000	8	$16,000.00		--
	Stockpile Construction	LS	1	30000	$30,000.00		--
4	**Site Preparation**	**CY**	**2400**		**$360,000.00**		**1' concrete over 3/4 of site**
	Asphalt Removal	CY	0	10	$0.00		Assume 8" thick
	Concrete Removal	CY	2400	150	$360,000.00		Means-02 41 13.30-4300
5	**Odor Foam Consumables**	**Wk**	**72**		**$315,500.00**		**Estimated project time 18 mo. With 2 rigs**
	Foam Unit Mob.	LS	1	500	$500.00		--
	Foam Unit Rental	MO	18	500	$9,000.00		--
	Foam Labor	Day	360	450	$162,000.00		--
	Foam (drums)	Drum	360	400	$144,000.00		Approximately $7/gallon based on recent Augusta rates

Former Equity MGP
Alternative 4
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By: LAW **Rev Date: 2/14/17**

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
6	**ISS Standard 8' Columns**	**CY**	**141200**		**$9,997,667.40**		**Assumes 300-350CY Day or 5 columns**
	ISS Labor	LS	1	0	$0.00		Pricing from recent Hempstead project
	ISS Superintendent	Day	434	635.44	$275,780.96		--
	ISS Engineer	Day	434	444.8	$193,043.20		--
	ISS Laborers-3	Day	434	2760.12	$1,197,892.08		--
	ISS Lead	Day	434	983.2	$426,708.80		--
	ISS Steward	Day	434	784.91	$340,650.94		--
	ISS Foreman	Day	434	784.91	$340,650.94		--
	Additional ISS Union Member	Day	434	724.36	$314,372.24		--
	ISS Crew Travel and Per Diem	DAY	434	1071	$464,814.00		--
					$0.00		
	ISS Material Cost-Cement	Day	434	465.695	$202,111.63		--
	ISS Material Cost-Slag	Day	434	2850.125	$1,236,954.25		--
	ISS Material Cost-Bentonite	Day	434	995.28	$431,951.52		--
	Water For Grout (1.4:1)-City $30/7480 Gal	Day	434	41.425	$17,978.45		--
					$0.00		
	Site Truck (2)	Day	434	132.28	$57,409.52		--
	Survey GPS	Day	434	243.02	$105,470.68		--
	330 Excavator w/thumb	Day	434	687.71	$298,466.14		--
	644 Wheel Loader w/Forks	Day	434	496.19	$215,346.46		--
	Operators-2	Day	434	920.04	$399,297.36		--
	6" Trash pump	Day	434	194.03	$84,209.02		--
	Batch Plant	Day	434	719.11	$312,093.74		--
	Manlift 135'	Day	434	466.44	$202,434.96		--
	Soil Mec SR100	Day	434	5343.6	$2,319,122.40		--
	Frac Tank	Day	434	66.83	$29,004.22		--
	Welder	Day	434	46.4	$20,137.60		--
	Water Truck	Day	434	136.01	$59,028.34		--
	Pressure Washer Trailer	Day	434	62.47	$27,111.98		--
	Rusmar Foaming Unit	Day	434	271.19	$117,696.46		--
	Electric Service- 1 batch plant	Day	434	279.36	$121,242.24		--
	PPE- Modified Level D	Day	434	430.155	$186,687.27		--
7	**Surface Soil Excavation and Stockpiling**	**CY**	**12500**		**$350,000.00**		**0-6 ft bgs excavation**
	Excavation, Stockpiling	CY	12500	28	$350,000.00		Recent Far Rockaway Bid
	Loading-30% of soils	CY	0	15	$0.00		--
8	**Spoils Management**	**CY**	**35300**		**$214,702.58**		**25% of ISS treated soil**
	330 Excavator	Day	71	687.71	$48,827.41		Assume 500 CY/Day
	644 Wheel Loader	Day	71	496.19	$35,229.49		--
	Laborer (2)	Day	71	1840.08	$130,645.68		--

Former Equity MGP
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Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
9	**Recovery Well Installation and Monitoring Well Installation**	**Ea**	**0**		**$0.00**		**Price from Equity**
	Monitoring Well Installation	Ea	0	5000	$0.00		--
	Installation of 4" diameter, 10' SS Screen Wells to 50'	Ea	0	10000	$0.00		--
10	**Backfill of Surface Soils**	**CY**	**17900**		**$1,432,000.00**		**Vadose zone**
	Soil Backfill with Exisiting Soils	CY	0	35	$0.00		0% of surface soils re-usable
	Common Fill	CY	17900	80	$1,432,000.00		--
11	**Site Restoration**	**LS**	**1**		**$29,500.00**		**Est**
	Excavator	Day	10	1200	$12,000.00		--
	Dozer	Day	10	400	$4,000.00		--
	Equip Oper	Day	10	750	$7,500.00		--
	Laborer	Day	10	600	$6,000.00		--
	Topsoil	CY	0	22	$0.00		--
	Seeding	Acre	0	2500	$0.00		--
	Paving	SF	0	40	$0.00		--
	Concrete Restoration	CY	0	200	$0.00		--
	SUB-TOTAL CONTRACTOR				**$14,055,369.98**	**$14,055,369.98**	
	Mark-up	0%				**$0.00**	
	Contingency	20%				**$2,811,074.00**	
	Total Subcontractor					**$16,866,443.98**	
Other Contracts & Purchases							
1	**Waste Disposal**	**Ton**	**80800**		**$7,272,000.00**		**NOTES**
	Transportation and Disposal (Non Haz)-Soils	Ton	20000	90	$1,800,000.00		Haz would be $157
	Transportation and Disposal (Non-Haz)-Spoils	Ton	56480	90	$5,083,200.00		Based on Hempstead/Clifton Bids
	Water Disposal	gallon	0	0.6	$0.00		Estimate. Assumes 15 days, 12 hours/day at 200 gpm
	Transportation and Disposal -Concrete	Ton	4320	90	$388,800.00		assume 1cy=2.0 T add 3
	SUB-TOTAL OTHER CONTRACTS				**$7,272,000.00**	**$7,272,000.00**	
	Mark-up	0%				**$0.00**	
	Contingency	20%				**$1,454,400.00**	
	Total Subcontractor					**$8,726,400.00**	
Costs							
1	**Engineering Design**	**LS**	**1**		**$140,553.70**		**NOTES**
	Engineering Design	LS	1	$140,553.70	$140,553.70		1%
2	**Site Management Plan**	**LS**	**1**		**$75,000.00**		**Est**
	Site Management Plan	LS	1	75000	$75,000.00		From AECOM Proposal

Former Equity MGP
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Brooklyn, NY

Solidification

By: LAW **Rev Date: 2/14/17**

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
3	**Air Monitoring and Health and Safety**	**Mo**	**1**		**$880,000.00**		**NOTES**
	Air Monitoring-Equip	Mo	0	$8,000.00	$0.00		--
	Suma Canisters	Mo	0	$4,000.00	$0.00		--
	HSO-Air Monitoring/Office Support	Hr	0	$100.00	$0.00		--
	Air Monitoring	MO	22	40000	$880,000.00		--
4	**Natural Attenuation Monitoring-analyticals**	**YR**	**5**		**$35,000.00**		**NOTES**
	Natural Attenuation Monitoring-analyticals/sampling	YR	5	7000	$35,000.00		--
5	**Plume Stability Monitoring**	**Qtr**	**8**		**$80,000.00**		**Est**
	Plume Stability Monitoring	Qtr	8	10000	$80,000.00		--
					$0.00		
6	**Product Recovery/Disposal-10Yr Period**	**YR**	**10**		**$1,312,694.94**		**NPV 5% discount, see Note sheet. Includes 130K/yr O&M; 3**
	Product recovery/disposal -10 Yr Period	LS	1	$1,312,694.94	$1,312,694.94		--
					$0.00		
					$0.00		
7	**Personnel**	**Man Hours**	**11522**		**$1,220,500.00**		**NOTES**
	Project Manager	Hr	2200	$130.00	$286,000.00		--
	Construction Manager	HR	4400	$90.00	$396,000.00		--
	Engineer	Hr	4400	$110.00	$484,000.00		--
	Adiministration (Home Office)	HR	500	$65.00	$32,500.00		--
	Travel Expenses	MO	22	$1,000.00	$22,000.00		--
	SUB-TOTAL COSTS				**$3,743,748.64**	**$3,743,748.64**	
	Mark-up (ODCs Only)	0%			**(no m/u on labor)**	**$0.00**	
	Contingency	20%				**$748,749.73**	
	Total					**$4,492,498.37**	
	GRAND TOTAL					**$30,085,342.34**	

Former Equity MGP
Alternative 5
National Grid
Brooklyn , NY

AECOM

Restoration of On-Site and Commercial Off-site

By: LAW Rev Date: 5/16/2017

Prime Contractor Costs					0%	20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	MU	Contingency	Total Cost	Unit Rate	%
1	Mobilization	LS	1	$150,000	$0	$30,000	$180,000	$180,000	0%
2	Temporary Facilities and Controls	MO	30	$1,227,500	$0	$245,500	$1,473,000	$49,100	2%
3	Site Preparation	CY	7,200	$576,000	$0	$115,200	$691,200	$96	1%
4	Erosion and Sediment Controls	LF	410	$50,025	$0	$10,005	$60,030	$146	0%
5	Odor Foam Consumables	MO	30	$585,500	$0	$117,100	$702,600	$23,420	1%
6	Sheetpile Installation	SF	203,000	$30,450,000	$0	$6,090,000	$36,540,000	$180	41%
7	Excavation	CY	301,800	$8,450,400	$0	$1,690,080	$10,140,480	$34	11%
8	Excavation Dewatering	Day	600	$4,010,000	$0	$802,000	$4,812,000	$8,020	5%
9	Fill Placement	CY	362,160	$28,972,800	$0	$5,794,560	$34,767,360	$96	39%
10	Site Restoration	LS	1	$297,320	$0	$59,464	$356,784	$356,784	0%
				$74,769,545	$0	$14,953,909	$89,723,454		100%
Other Contracts & Purchases					0%	20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	MU	Contingency	Total Cost	Unit Rate	%
1	Waste Disposal	Ton	495,624	$48,926,160	$0	$9,785,232	$58,711,392	$118	100%
				$48,926,160	$0	$9,785,232	$58,711,392		100%
Costs					0%	20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	MU	Contingency	Total Cost	Unit Rate	%
1	Engineering Design	LS	1	$373,848	$0	$74,770	$448,617	$448,617	10%
2	Air Monitoring and Health and Safety	Mo	30	$1,200,000	$0	$240,000	$1,440,000	$48,000	33%
3	Natural Attenuation Monitoring	Yr	5	$35,000	$0	$7,000	$42,000	$8,400	1%
4	Plume Stability Monitoring	Qtr	8	$80,000	$0	$16,000	$96,000		
5	Personnel	Man Hours	16,030	$1,955,000	$0	$391,000	$2,346,000	$146	54%
				$3,643,848	$0	$728,770	$4,372,617		98%
Grand Total							$152,807,463		

Former Equity MGP
Alternative 5
National Grid
Brooklyn , NY

AECOM

Restoration of On-Site and Commercial Off-site

Add Task | Delete Row | Add 1 Blank Row

By: LAW Rev Date: 5/16/17

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost	Estimate/Source Notes
Prime Contractor Costs		NOTE- All costs include contractor Overhead and Profit				
1	**Mobilization**	**LS**	**1**		**$150,000.00**	**NOTES**
	Excavation Equipment	LS	1	50000	$50,000.00	Price from Engineers estimate for Equiptment moves in/out
	Sheetpile Mobilization	LS	1	100000	$100,000.00	Recent Far Rockaway Bids
2	**Temporary Facilities and Controls**	**MO**	**30**		**$1,227,500.00**	**Est**
	Temporary Facilities- Trailers/PortaJohn	MO	30	750	$22,500.00	--
	Office Equipment	MO	30	500	$15,000.00	--
	Office Supplies	MO	30	500	$15,000.00	--
	Cell Phones	MO	30	1000	$30,000.00	--
	Electric	MO	30	250	$7,500.00	--
	Water	MO	30	750	$22,500.00	--
	Cleaning	MO	30	350	$10,500.00	--
	Pick Up	MO	30	750	$22,500.00	--
	Fuel/Maint	MO	30	400	$12,000.00	--
	Misc. Supplies	MO	30	500	$15,000.00	--
	Decontamonation Supplies	MO	30	500	$15,000.00	--
	Water Truck	MO	30	2000	$60,000.00	--
	Dumpster	Wk	120	50	$6,000.00	--
	Survey	LS	1	20000	$20,000.00	--
	Project Manager	Day	600	750	$450,000.00	--
	Admin Support	Day	600	340	$204,000.00	--
	Superintendant	Day	600	500	$300,000.00	--
3	**Site Preparation**	**CY**	**7200**		**$576,000.00**	**Est**
	Asphalt Removal	CY	3600	10	$36,000.00	Assume 8" thick
	Concrete Removal	CY	3600	150	$540,000.00	Assume 1' thick over 3/4 on-site
4	**Erosion and Sediment Controls**	**LF**	**410**		**$50,025.00**	**Est**
	Privacy Fabric	SF	11600	0.5	$5,800.00	8'
	Silt Fence	LF	2900	1.25	$3,625.00	--
	Hay Bales	LF	2900	6	$17,400.00	--
	Temporary Fencing	LF	2900	8	$23,200.00	--
5	**Odor Foam Consumables**	**MO**	**30**		**$585,500.00**	**Estimated project time 1 mo.**
	Foam Unit Mob	LS	1	500	$500.00	--
	Foam Unit Rental	MO	30	2500	$75,000.00	--
	Foam Labor	Day	600	450	$270,000.00	--
	Foam (drums)	Drum	600	400	$240,000.00	Approximately $7/gallon based on recent Augusta rates
6	**Sheetpile Installation**	**SF**	**203000**		**$30,450,000.00**	**1800 lf approximately 70 feet deep onsite and 1100 LF to 70' offsite**
	Sheetpile Wall Onsite-70'bgs	SF	126000	150	$18,900,000.00	--
	Sheetpile Wall Offsite-70'bgs	SF	77000	150	$11,550,000.00	--
7	**Excavation**	**CY**	**301800**		**$8,450,400.00**	
	Excavation and Loading-Onsite	CY	148800	28	$4,166,400.00	--
	Excavation and Stockpiling-Offsite	CY	153000	28	$4,284,000.00	30% of stockpiled suface soils cannot be reused
	Loading-30% stockpiled soils	CY	0	15	$0.00	0-8' Excavation
8	**Excavation Dewatering**	**Day**	**600**		**$4,010,000.00**	**500 GPM System**
	Construction Water Treatment Operation	DAY	600	5000	$3,000,000.00	at 500 CY/Day-
	Mobilization of Water Treatment System Mob-500 GPM	LS	2	450000	$900,000.00	Move to offsite and onsite locations
	Construction Water Management	LS	1	100000	$100,000.00	--
	Indirect Dishcarge permit	LS	1	10000	$10,000.00	--
9	**Fill Placement**	**CY**	**362160**		**$28,972,800.00**	**200 cy/day**
	Backfill and Grading: Onsite Property	CY	178560	80	$14,284,800.00	From Recent Far Rockaway Bids
	Backfill and Grading- Offsite Property	CY	183600	80	$14,688,000.00	No Reuse of soils
10	**Site Restoration**	**LS**	**1**		**$297,320.00**	**Est**
	Excavator	Day	60	1200	$72,000.00	--
	Dozer	Day	60	400	$24,000.00	--
	Equip Oper	Day	60	750	$45,000.00	--
	Laborer	Day	60	600	$36,000.00	--
	Topsoil	cy	0	22	$0.00	--
	Concrete Replacement	CY	0	200	$0.00	--
	Paving-Street Replacement	SY	6016	20	$120,320.00	Means plus escalation-54140 SF area

Former Equity MGP
Alternative 5
National Grid
Brooklyn , NY

AECOM

Restoration of On-Site and Commercial Off-site

Add Task | Delete Row | Add 1 Blank Row

By: LAW Rev Date: 5/16/17

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
	SUB-TOTAL CONTRACTOR				**$74,769,545.00**	**$74,769,545.00**	
	Mark-up	0%				**$0.00**	
	Contingency	20%				**$14,953,909.00**	
	Total Subcontractor					**$89,723,454.00**	
Other Contracts & Purchases							
1	**Waste Disposal**	**Ton**	**495624**		**$48,926,160.00**		**NOTES**
	Transportation and Disposal (Non Haz)-Onsite Soils	ton	238080	90	$21,427,200.00		--
	Transportation and Disposal (Non-Haz)-Offsite Soils	Ton	244800	90	$22,032,000.00		Based on Far Rockaway
	Water Disposal	gallon	432000000	0.01	$4,320,000.00		Estimate. Assumes 15 days, 12 hours/day at 200 gpm
	Transportation and Disposal concrete	Ton	6480	90	$583,200.00		Recent Hempstead,
	Transportation and Disposal Asphalt	Ton	6264	90	$563,760.00		--
	SUB-TOTAL OTHER CONTRACTS				**$48,926,160.00**	**$48,926,160.00**	
	Mark-up	0%				**$0.00**	
	Contingency	20%				**$9,785,232.00**	
	Total Subcontractor					**$58,711,392.00**	
Costs							
1	**Engineering Design**	**LS**	**1**		**$373,847.73**		**NOTES**
	Engineering Design	LS	1	$373,847.73	$373,847.73		--
2	**Air Monitoring and Health and Safety**	**Mo**	**30**		**$1,200,000.00**		**NOTES**
	Air Monitoring-Equip	Mo	0	$8,000.00	$0.00		--
	Suma Canisters	Mo	0	$4,000.00	$0.00		--
	HSO-Air Monitoring/Office Support	Hr	0	$100.00	$0.00		--
	Air Monitoring	MO	30	40000	$1,200,000.00		--
3	**Natural Attenuation Monitoring**	**Yr**	**5**		**$35,000.00**		**NOTES**
	Natural Attenuation Monitoring	YR	5	$7,000.00	$35,000.00		--
4	**Plume Stability Monitoring**	**Qtr**	**8**		**$80,000.00**		**Est**
	Plume Stability Monitoring-BTEX, PAH	Qtr	8	$10,000.00	$80,000.00		--
					$0.00		
	FALSE	FALSE	0	0	$0.00		--
5	**Personnel**	**Man Hours**	**16030**		**$1,955,000.00**		**NOTES**
	Project Manager	Hr	3000	$130.00	$390,000.00		24 MOS AT 160HRS/MO
	Construction Manager	HR	6000	$90.00	$540,000.00		--
	Engineer	Hr	6000	$110.00	$660,000.00		--
	Adiministration (Home Office)	HR	1000	$65.00	$65,000.00		--
	Travel Expenses	MO	30	$10,000.00	$300,000.00		--
	SUB-TOTAL COSTS				**$3,643,847.73**	**$3,643,847.73**	
	Mark-up (ODCs Only)	0%			(no m/u on labor)	**$0.00**	
	Contingency	20%				**$728,769.55**	
	Total					**$4,372,617.27**	
	GRAND TOTAL					**$152,807,463.27**	

Table B-3

AECOM

Project Name:	Former Equity MGP	**Revision No.:**	5
Cost Estimate No.:	Alternative 5	**Date:**	5/16/17
Client	National Grid	**Status:**	Draft
Location	Brooklyn , NY	**Author:**	LAW
		Office:	Chelmsford
Project Element:	Restoration of On-Site and Commercial Off-site Properties ot Unrestricted Use	**Reviewed By:**	
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:	Brooklyn, NY	
Project Start Date:	2018	
Project Duration:	30	Monthes
Type of Contract:	Direct Owner	
Level of Accuracy:	*-30% to +50%*	
Contingency:	20%	

Scope Summary

Excavation and disposal of soils using Sheetpile/On-Site and Off-site

Soil Excavation Vol	301,800	CY
Total Excavation Volume	301,800	CY

Document Source: RI Report **Rev. Date:** 12/1/2012 **Site Visit?** Yes

Document Source: **Rev. Date:**

Document Source: **Rev. Date:**

Table B-3

Cost Summary

Prime Contractor Costs	$	89,723,000
Other Contracts & Purchases	$	58,711,000
Subcontractor Costs		
Project Total Estimated Cost	$	152,807,000

Notes:

1. Note intended use and audience

2. List major project assumptions

3. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual Engineering	*-30% to +50%*
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

4. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*