ALTERNATIVES ANALYSIS REPORT
FOR THE FORMER HUNTS POINT GAS WORKS
HALLECK STREET SIDEWALK AREA
Order on Consent 203112

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Certification

"I, Daniel Martoccia (of Parsons Main of New York, Inc.), certify that I am currently a New York State registered professional engineer and that this Alternatives Analysis Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER 10)."

Engineer's Seal

1/5/21

Date

PARSONS

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS

AAR	Alternatives Analysis Report
AMSL	Above Mean Sea Level
AWQS	Ambient Water Quality Standards
BCP	Brownfields Cleanup Program
bgs	below ground surface
CAMP	Community Air Monitoring Plan
Con Edison	Consolidated Edison Company of New York, Inc.
CPP	Citizen Participation Plan
ft	foot / feet
HASP	Health and Safety Plan
ISS	In-Situ Stabilization/Solidification
MAH	Monocyclic Aromatic Hydrocarbons
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
PAH	Polyaromatic Hydrocarbons
PDI	Pre-Design Investigation
PID	Photo-Ionization Detector
ppm	parts per million
PRR	Periodic Review Report
RAO	Remedial Action Objectives
SC	Site Characterization
SCGs	Standards, Criteria, and Guidance Values
SCO	Soil Cleanup Objectives
SCR	Site Characterization Report
SMP	Site Management Plan
SVOC	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List
TOGS	NYSDEC Technical and Operational Guidance Series
USCO	Unrestricted Soil Cleanup Objective
VCA	Voluntary Cleanup Agreement
VOC	Volatile Organic Compounds
WQS	Water Quality Standards

SECTION 1

INTRODUCTION

On behalf of Consolidated Edison Company of New York, Inc. (Con Edison), Parsons has prepared this Alternatives Analysis Report (AAR) for the former Hunts Point Gas Works Halleck Street Sidewalk Area, which is part of the former Hunts Point Gas Works, located in the Bronx, New York (Figure 1). This AAR addresses only the sidewalk and right-of-way of Halleck Street (the "Site"), also known as Hunts Point OU-3 (Figure 2). The purpose of this AAR is to identify an effective and implementable alternative that addresses the manufactured gas plant (MGP)-related impacts present at the Site.

Currently, the former Hunts Point Gas Works property is predominantly owned by the City of New York for use as the Hunts Point Food Distribution Center. The Site includes the street and sidewalk area of Halleck Street, is approximately 2,500 linear feet (ft) in length, and is owned by the City of New York.

Investigation activities previously conducted at the Site were carried out and completed pursuant to the terms of a Voluntary Cleanup Agreement (VCA) between Con Edison and the New York State Department of Environmental Conservation (NYSDEC). The Site transitioned from the VCA to an Order on Consent on July 25, 2018. A Site Characterization (SC) was performed in 2013, and a Site Characterization Report (SCR) for the Site was submitted to NYSDEC in July 2014 (Parsons, 2014). Data contained within the SCR provides the basis for the development of this AAR. This AAR has been prepared in accordance with the requirements set forth in *6 New York Codes, Rules and Regulations Part 375* (6 NYCRR 375) *Environmental Remediation Programs* (NYSDEC, 2006) and the NYSDEC's *Technical Guidance for Site Investigation and Remediation* (DER-10) (NYSDEC, 2010).

1.1 SITE DESCRIPTION AND HISTORY

Historical research was previously conducted and documented in the *Hunts Point Offsite Manufactured Gas Plant Site History Report, Bronx, New York* (Parsons, 2003). Based on this report, the former gas works was owned and/or operated as a MGP and gas holder station by Con Edison between 1926 and 1962. A large gas holder on the northern portion of the Hunts Point Gas Works was used until 1968, after which it was removed from service and demolished.

The City of New York acquired the majority of the former Hunts Point Gas Works property in the late 1960s. The property was then transitioned into warehouse space for a wholesale food cooperative. Reviews of historical aerial photos reveal that Halleck Street was not modified as part of redevelopment. It was extended to the south sometime after 1980 for use as an access road to the current Department of Corrections facility, located at the southwest portion of the Hunts Point Peninsula. The existing zone for the Site based on the New York City Planning Commission Zoning Maps 6c and 6d (Appendix A) is a manufacturing district.

The central portion of the Site is adjacent to Hunts Point Parcel A-2 (the A-2 site) which is in the New York State Brownfields Cleanup Program (BCP) as Site #C203094. The A-2 site contained MGP-related impacts in the form of visual coal tar and purifier waste (GEI, 2018). The

proposed remedy for the A-2 site included remedial excavations, installation of a reactive barrier, in-situ solidification, capping and institutional and engineering controls.

1.2 ALTERNATIVES ANALYSIS REPORT ORGANIZATION

This AAR has been organized in accordance with the *Technical Guidance for Site Investigation and Remediation* (NYSDEC, 2010) (DER-10) as follows:

Section	Purpose
Section 1 – Introduction	Provides definition of the Site, regulatory background, and history of Site use.
Section 2 – Site Investigation Summary	Provides a summary of physical Site conditions and a summary of the previous investigation performed at the Site.
Section 3 – Exposure Assessment	Summarizes exposure pathways as determined following Site investigation activities.
Section 4 – Remedial Goals, SCGs, and Remedial Action Objectives	Identifies remedial goals, standards, criteria, and guidelines, and remedial action objectives selected for the Site.
Section 5 – Description and Evaluation of Remedial Alternatives	Provides evaluation criteria and description of remedial alternatives developed for the Site.
Section 6 – Comparative Analysis of Remedial Alternatives	Provides comparison of each remedial alternative developed for the Site.
Section 7 – Conclusions and Preferred Remedy	Presents the preferred remedy for the Site, as determined based on the comparative analysis.
Section 8 – References	Provides relevant references.

SECTION 2

SITE INVESTIGATION SUMMARY

A SC was conducted at the Site in October and November 2013 to characterize MGP-related impacts to soil and groundwater. Figure 3 depicts the soil boring and monitoring well locations installed at the Site as part of this field effort. The collected data is presented in the SCR (Parsons, 2014) and a summary of the findings is presented in this section.

2.1 TOPOGRAPHY, GEOLOGY AND HYDROGEOLOGY

The 182-acre Former Hunts Point Gas Works is located on a peninsula at the confluence of the Bronx and East Rivers. Hunts Point is a generally flat-lying area near mean sea level, with little topographic relief. The Site is an approximately 2,500-foot linear stretch of Halleck Street, located on the western boundary of the Former Hunts Point Gas Works. The Site has minimal topographic relief, decreasing approximately 10 feet in elevation from the northern to southern boundaries.

The geology and subsurface conditions of the Hunts Point peninsula can vary depending upon the history of localized development. Prior to significant construction and development, Hunts Point was drained by small creeks which emptied to into the Bronx and East Rivers. Subsequent development filled and/or covered the creeks, however shallow groundwater movement may still be influenced by the former channels. Localized groundwater flow may also be influenced by pre-development stream deposits, sewer lines, and abandoned pipelines. Overall, groundwater flows to the south, towards the confluence of the Bronx and East Rivers (Hygienetics, 1997).

Three (3) groundwater monitoring wells were installed during SC field investigation activities. Monitoring wells were installed to depths ranging from 16 to 17 feet below ground surface (bgs), with screened intervals installed across the water table. Depth to groundwater was gauged in on-site groundwater monitoring wells during SC field investigation activities. Groundwater was encountered beneath the Site at 5.6 feet to 12.05 feet bgs and at elevations ranging from 1.56 feet above mean sea level (AMSL) at MW-3 (southern portion of the Site) to 5.09 feet AMSL at MW-2 (central portion of the Site). Groundwater elevations observed during SC activities are summarized on Table 1.

Subsurface geologic conditions at the Site were investigated during the SC field investigation activities, and a total of twelve (12) soil borings were advanced to depths ranging from 15 to 25 feet bgs. Soil borings advanced during the SC determined that the upper 5 to 18 feet contain fill materials (comprised of sand, gravel and cobble with trace amounts of brick, concrete, wood, silt and ash). The majority of fill material present at the Site is underlain by a clay layer with an observed thickness of 1 to 8 feet, the top of which was encountered at depths ranging from 11 to 17.5 feet bgs. Soil boring activities did not extend to materials underlying the clay layer. The northern portion of the Site contains sand deposits ranging from 6 to 13 feet in thickness, with an isolated peat deposit at the base of SB-1 at a depth of 18 feet bgs. Bedrock was not encountered during SC field activities. Soil boring logs generated during the Site Characterization were used to develop the representative cross section A-A' of the Site, as shown on Figure 4.

2.2 SOIL BORING RESULTS

A total of 30 soil samples (including applicable quality control samples) were collected during SC activities and analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), Target Analyte List (TAL) metals, and cyanide. Soil sample analytical results are summarized in Table 2 and presented on Figures 5 and 6. Soil analytical results have been compared to the Unrestricted Soil Cleanup Objectives (USCOs) provided by NYSDEC in 6 NYCRR Part 375 (NYSDEC, 2006). The USCOs assume that there are no imposed restrictions on the use of the Site; however, the Site functions solely as a public sidewalk and right-of-way infrastructure. Therefore, a comparison of soil sample results to the USCOs is conservative.

Photo-ionization detector (PID) readings for soil samples collected during soil boring/monitoring well installations ranged from 0.0 to 1,260 parts per million (ppm) above background. The highest PID reading of 1,260 ppm was observed in soil boring SB-4 at a depth interval of 15 feet to 17 feet bgs, co-located with observations of non-aqueous phase liquid (NAPL). The NAPL-saturated soil was observed between approximately 11 and 17 feet bgs. Staining associated with NAPL was observed within the top 0.5 feet of the clay underlying the NAPL-saturated interval at depths ranging from 17 to 17.5 feet bgs. No NAPL or NAPL staining was observed in the clay from 17.5 bgs to the bottom of the soil boring at 20 feet bgs. PID readings in the remaining eleven (11) soil borings ranged from 0.0 to 10.7 ppm. NAPL was not observed in any location other than SB-4.

A total of sixteen (16) VOCs were detected in soil samples submitted for laboratory analysis. Of these, seven (7) VOCs (acetone, methylene chloride, benzene, ethylbenzene, toluene, m/p-xylene, and o-xylene) were detected at concentrations exceeding their respective USCOs. Acetone, which is considered a common laboratory contaminant, was detected above its USCO in four (4) soil samples [SB-6 (10-15 feet), SB-7 (8-10 feet), SB-8 (15-16 feet), and SB-9 (10-15 feet)]. The remaining six (6) VOCs (methylene chloride, benzene, ethylbenzene, toluene, m/p-xyelene, and o-xylene) were detected above their respective USCOs in only one (1) soil sample [SB-4 (15-17 feet)]. Total VOC concentrations in all soil samples ranged from non-detect to 1,277 ppm, with the maximum concentration observed in soil collected from SB-4 at a depth of 15 to 17 feet bgs. Total VOC concentrations in the remaining twenty-three (23) soil samples ranged from non-detect to 0.195 ppm.

Twenty-nine (29) individual SVOCs were detected in soil samples submitted for laboratory analysis. Of these, fourteen (14) polyaromatic hydrocarbons (PAHs) [acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, flourene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene] were detected at concentrations exceeding their respective USCOs in at least one soil sample. Total SVOC concentrations ranged from 0.44 to 4,635 ppm, with the maximum concentration observed in soil collected from SB-4 at a depth of 15 feet to 17 feet bgs. Total SVOC concentrations in the remaining twenty-three (23) soil samples ranged from 0.44 to 238 ppm. With the exception of SB-4, PAH concentrations detected in soil samples were below the 95th percentile of background soil concentrations detected within soils composed of urban fill material encountered within street excavations within New York City (RETEC, 2007). Overall,

SVOCs exceeding USCOs were detected at nine (9) soil borings: SB-2, SB-3, SB-4, SB-5, SB-6, SB-7, SB-8, SB-89, and SB-10.

A total of twenty-four (24) inorganic constituents were detected in soil samples submitted for laboratory analysis. Twelve (12) of the detected inorganic constituents exceeded their respective USCOs (arsenic, barium, cadmium, copper, chromium, lead, mercury, nickel, selenium, silver, zinc, and cyanide).

2.3 GROUNDWATER SAMPLE RESULTS

A total of four (4) groundwater samples (including applicable quality control samples) were collected in November 2013 as part of SC field investigation activities. Groundwater samples were analyzed for TCL VOCs, TCL SVOCs, TAL metals, and total cyanide. The analytical results for groundwater samples are summarized on Table 3 and Figure 7. For evaluation purposes, analytical results were compared with ambient water quality standards (AWQS) and guidance values contained in NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 (NYSDEC, 1998).

During groundwater sampling activities, each monitoring well was monitored for the presence of NAPL. No NAPL or sheens were observed in any of the wells. Visual descriptions and observations made during the groundwater sampling activities were recorded on groundwater sampling logs, and are included as an attachment to the SCR.

Only one (1) VOC was detected in groundwater samples submitted for laboratory analysis. Methyl tert-butyl ether, which is not a MGP-related compound, was detected below its guidance value in two (2) groundwater samples.

Only one (1) SVOC was detected in groundwater samples submitted for laboratory analysis. Dimethyl phthalate, which is considered a laboratory contaminant, was detected at a concentration below its guidance value in one (1) sample. Seventeen (17) inorganic constituents (aluminum, arsenic, barium, cadmium, calcium, total chromium, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium, thallium, zinc, and cyanide) were detected in groundwater samples. Of these, eight (8) (barium, iron, lead, magnesium, manganese, sodium, thallium, and cyanide) were detected at concentrations exceeding their respective AWQS and guidance values.

2.4 VISUAL NAPL OBSERVATIONS

During SC soil boring and monitoring well installation activities, boring materials were logged for physical characteristics (e.g., soil type, color, texture, moisture content, etc.), along with physical evidence of any impacted material (e.g., oil-like or tar-like NAPL, staining, sheens, odors, etc). NAPL was observed in soil boring SB-4 from approximately 11 feet to 17 feet bgs. NAPL was not observed in any of the other soil borings. A sample of soil containing NAPL from soil boring SB-4 was collected and submitted to META Environmental, Inc. of Watertown, MA for forensic hydrocarbon fingerprint analysis. The fingerprinting sample was analyzed by Gas Chromatography – Flame Ionization Detector (GC/FID) (EPA 8100M) for fingerprinting and by Chromatography Mass Spectrometry in the Selected Ion Monitoring Mode (GC/MS/SIM) (EPA 8270M) for mono- and polycyclic aromatic hydrocarbons (MAHs and PAHs), alkyl PAH homologues and other selected compounds. Laboratory results indicate that the sample from SB-4 (15-17 feet) contained pyrogenic material and exhibited fluoranthene to pyrene ratios indicative

of tars formed from MGPs utilizing carbureted water gas processes. No additional NAPL was observed in any other soil boring, including the seven (7) soil borings installed to the south of SB-4 in the Site's inferred downgradient groundwater flow direction.

SECTION 3

EXPOSURE ASSESSMENT

The information collected during SC field investigation activities has been used to qualitatively assess potential exposure pathways for the constituents detected at the Site.

Analytical results from soil samples collected during SC activities indicate the presence of possible MGP-related constituents in the soil, primarily at the SB-4 soil boring sample location where MGP-related NAPL was detected. VOCs, PAHs, and inorganic constituents were detected at concentrations exceeding their respective USCOs at the Site in soil ranging from 5 feet to 20 feet bgs. No MGP-related impacts were noted in the top 5 feet of soil.

Groundwater analytical results indicated the presence of inorganic constituents in Site groundwater above their respective AWQS and guidance values. No VOCs or SVOCs, potentially associated with MGP-related impacts, were detected in exceedance of AWQS and GVs in any groundwater sample collected during SC activities.

Based on the results of the SC, the primary contaminants of concern identified by NYSDEC for the Site include PAHs (benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene), and inorganics, namely arsenic, lead, mercury, and cyanide.

The Site is located in a highly urbanized area, zoned for manufacturing purposes, and is currently utilized as a public street and sidewalk area. Therefore, the Site is covered with concrete or asphalt pavement with the exception of limited landscaped areas. Impacted soils on the Site therefore would only be encountered during future intrusive maintenance activities below five (5) feet (e.g., repair of underground utilities); however, it is unlikely that these materials would be encountered during day-to-day activities.

Groundwater at the Site is currently not used for a potable water source, and there are no plans for future use of potable or commercial/industrial groundwater at the Site. The depth to groundwater at the Site is approximately 5 feet to 12 feet bgs. Based on this, there is a limited potential for exposure to groundwater during intrusive subsurface activities at depths of less than 5 feet (e.g., repair of underground utilities) at the Site. Surface water and sediment are not present at the Site.

SECTION 4

REMEDIAL GOALS, SCGS, AND REMEDIAL ACTION OBJECTIVES

4.1 REMEDIAL GOAL

The remedial goal for the Site is to ensure that MGP-related contamination does not present a threat to human health or the environment considering the manner in which the Site is utilized. The goal will be achieved by putting into place a plan to prevent uncontrolled exposure to MGP-impacted soil.

4.2 APPLICABLE STANDARDS, CRITERIA AND GUIDANCE VALUES

NYSDEC *DER-10* includes a complete list of Standards, Criteria and Guidance Values (SCGs). The SCGs for soil and groundwater include the 6 NYCRR Part 375-6 RSCOs for unrestricted use and the NYSDEC *Division of Water Technical and Operational Guidance Series - Water Quality Standards* (*WQS*) - *6 NYCRR 700 to 706* (NYSDEC, 1998). The SCGs for soil and groundwater include the 6 NYCRR Part 375-6 Soil Cleanup Objectives (SCOs) for unrestricted use and protection of groundwater and the NYSDEC *Division of Water Technical and Operational Guidance Series - Water Quality Standards* (*WQS*) – *6 NYCRR 700 to 706* (NYSDEC, 1998) for the Site. The above SCGs represent available criteria and guidance used by the NYSDEC to evaluate soil and groundwater quality. It should be noted, however, that neither the 375-6 SCOs or WQS are directly applicable to the Site groundwater because the local groundwater is not used as a drinking water source, nor will it likely be used in the future due to New York City laws. The 6 NYCRR Part 375-6 SCOs and WQS are provided as SCGs for comparison purposes only.

4.3 REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are medium-specific objectives which achieve protection of public health and the environment. RAOs were established based on contaminated media, identified contaminants of concern, SCGs, and results of the exposure assessment. SCGs are promulgated requirements and non-promulgated guidance which guide site activities during investigation and remediation. The standards and criteria are set forth in Federal or New York State law and they are either directly applicable or relevant and appropriate to a contaminant, remedial action, location, or other circumstance. Guidance includes non-promulgated criteria which should be considered, for investigation and/or remediation. A series of generic RAOs are identified on the NYSDEC website for use dependent upon site specific conditions, as follows:

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation exposure to contaminants volatilizing from soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater contamination.

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAOs for Environmental Protection

- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent the discharge of contaminants to surface water.
- Remove the source of groundwater or surface water contamination.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site.

After evaluating the nature and extent of contamination, NYSDEC has identified the following Site-specific RAOs:

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

SECTION 5

DEVELOPMENT AND EVALUATION OF REMEDIAL ALTERNATIVES

This section describes the remedial action alternatives for the Site and evaluates them against criterion included in DER-10.

5.1 PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

As part of the remedial action selection process for the Site, a preliminary screening was performed to reduce the number of remedial technologies potentially applicable with respect to technical implementability. Technical implementability was determined by using the known Site conditions and investigation results to screen out technologies that cannot be effectively implemented at the Site.

The results of the preliminary screening for remedial technologies to address MGP-related impacts at the Site are presented on Table 4. Following preliminary screening, a summary of Site-specific remedial alternatives was developed for submittal to NYSDEC and was subsequently approved on August 27, 2019. The remedial alternatives summary is presented on Table 5. Based on preliminary screening, the types of remedial technologies listed below were identified as applicable technologies to retain for further evaluation:

- Institutional controls and engineering controls (ICs/ECs);
- *In-situ* stabilization and solidification (ISS) of MGP-impacted soils, and
- Excavation and off-site disposal and treatment of MGP-impacted soils.

The identification of alternatives using retained remedial technologies took into consideration the limitations posed by Site conditions, property access and the practical use of equipment. Based upon Site investigations, only isolated NAPL was observed in soil boring SB-4, and not in any of the other soil borings. Additionally, MGP-related impacts above their respective SCOs were detected below surficial soils at deeper than five feet bgs and NAPL was encountered between 11 and 17 feet of depth.

5.2 DEVELOPMENT OF REMEDIAL ALTERNATIVES

The Site is located within a public sidewalk area and active right-of-way and is essentially surrounded by off-site properties. In addition, the active right-of-way contains subsurface utilities and is heavily used by local commercial businesses resulting in space constraints. While considering the above Site challenges and risks, Con Edison has evaluated the following four remedial alternatives consistent with Table 5:

- Alternative 1 – No Action.
- Alternative 2 – Institutional and Engineering Controls.
- Alternative 3A – *In-Situ* Stabilization/Solidification of NAPL-impacted Material in the Vicinity of SB-4.
- Alternative 3B – Excavation of NAPL-impacted Material in the Vicinity of SB-4.
- Alternative 4 – Removal of Delineated MGP-impacted Site Soils Above USCOs.

5.3 EVALUATION CRITERIA

In accordance with 6 NYCRR 375-1.8(f) and in conjunction with the additional guidance provided in DER-10 subsection 4.2 (b) through (j), the remedial alternatives identified above are evaluated in subsequent sections with respect to the following nine evaluation criteria:

1. Overall protection of public health and the environment
2. Compliance with remedial goals, RAOs, and applicable SCGs
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility or volume
5. Short-term impacts and effectiveness
6. Implementability
7. Cost-effectiveness
8. Land Use
9. Community Acceptance

5.3.1 Overall Protection of Public Health and the Environment

This threshold criterion is an assessment of whether the remedial alternative meets requirements that are protective of human health and the environment. Overall protection of human health and the environment considers how the proposed remedial alternative prevents or mitigates potential risks. This evaluation also considers the ability of the remedial alternative to meet the RAOs.

5.3.2 Compliance with Remedial Goals, RAOs, and Applicable SCGs

As per 6 NYCRR Part 375 and DER-10 subsection 4.2(c), this threshold criterion conforms to officially promulgated standards and criteria that are either directly applicable, or that are not directly applicable but are relevant and appropriate, unless good cause exists why conformity should be dispensed with.

Such good cause is defined in both 6 NYCRR Part 375 and DER-10. DER-10 subsection 4.2(c) specifically states that good cause exists if any of the following are present:

- The proposed action is only part of a complete program or project that will, as a whole, conform to such standard or criterion upon completion;
- Conformity to such standard or criterion will result in greater risk to the public health and the environment than alternatives;
- Conformity to such standard or criterion is technically impracticable from an engineering or scientific perspective; or
- The program or project will attain a level of performance that is equivalent to that required by the standard or criterion through the use of another method or approach.

The RAO for the Site, detailed in Section 4.3, was identified based upon the SCGs applicable to the current, intended, and reasonably anticipated future use of the Site.

Included in 6 NYCRR Part 375 are SCOs that are chemical-specific SCGs and are based on current Site use and zoning. As such, they are appropriate and relevant to the Site. The soil analytical data collected during SC activities were compared to SCOs for unrestricted use. However, this comparison is conservative given that the Site is used for commercial purposes.

Chemical-specific SCGs appropriate for comparison to groundwater analytical data collected at the Site are presented in 6 NYCRR Parts 700 to 706 and in TOGs. However, these criteria are conservative as local groundwater is not used as a drinking water source, nor will it likely be used as such in the future.

5.3.3 Long-Term Effectiveness and Permanence

This criterion addresses the performance of a remedial alternative in terms of its permanence and the quantity/nature of waste or residuals remaining at the Site after implementation. An evaluation is made on the extent and effectiveness of controls required to manage residuals remaining at the Site and engineering and institutional controls necessary for the remedy to remain effective. The factors that are evaluated include permanence of the remedial alternative, magnitude of the remaining risk, adequacy of controls used to manage residual contamination, and the reliability of controls used to manage residual contamination.

5.3.4 Reduction of Toxicity, Mobility or Volume

This criterion assesses the remedial alternative's use of technologies that permanently and significantly reduce toxicity, mobility, or volume of the contamination as their principal element to the extent possible. Preference is given to remedies that permanently or significantly reduce the toxicity, mobility, or volume of the contamination at the Site.

5.3.5 Short-Term Impacts and Effectiveness

This criterion assesses the effects of the remedial alternative during the construction and implementation phase with respect to the effect on human health and the environment. The factors that are assessed include protection of the workers and the community at the Site and adjacent properties during the implementation of the remedial action, environmental impacts that result from the remedial action and the time required until the RAO is achieved.

5.3.6 Implementability

This criterion addresses the technical and administrative feasibility of implementing the remedial alternative and the availability of various services and materials required during implementation of the remedial action for the Site. The evaluation includes the feasibility of construction and operation, the reliability of the technology, the ease of undertaking additional remedial action, monitoring considerations, activities needed to coordinate with regulatory agencies, availability of adequate equipment, services and materials, off-site treatment, impacts to nearby utilities and structures, and storage and disposal services.

5.3.7 Cost-effectiveness

This criterion is an evaluation of the overall cost effectiveness of the remedial alternative. Cost estimates associated with alternatives include direct capital costs (e.g., equipment, labor and materials), indirect capital costs (e.g., permitting, engineering and design and contingencies), and costs associated with operation and maintenance (e.g., Site cover inspections). Total costs for a

remedial alternative are developed based on a 30-year present worth analysis of operation and maintenance, and the combined direct and indirection capital costs.

5.3.8 Land Use

This criterion addresses the current, intended, and reasonably anticipated future land use of the Site. 6 NYCRR 375 subchapter 1.8(f)9 requires that land use criterion be considered.

5.3.9 Community Acceptance

Concerns of the state and the community will be addressed separately in accordance with a Citizen Participation Plan (CPP) and requirements outlined in DER-10's citizen participation section. This criterion is evaluated, after the public review of the remedy selection process, as part of the final NYSDEC selection/approval of a remedy for the Site.

5.4 ALTERNATIVE 1 – NO ACTION

No action would be taken under this alternative to remediate MGP-related impacts. The "No Action" alternative serves as a baseline for comparison of overall effectiveness to other remedial alternatives.

5.4.1 Overall Protection of Public Health and the Environment

This alternative would not remove MGP or non-MGP impacted soils from the Site. Although there is no current pathway for exposure to impacted soils or groundwater during day-to-day operations, non-routine activities (e.g., intrusive activities associated with new construction or maintenance of an underground utility or structure) or a change in Site use could create an exposure pathway and potential unacceptable risks.

5.4.2 Compliance with Remedial Goals, RAOs, and Applicable SCGs

The remedial goals, RAO specified for the development of this AAR, and applicable SCGs would not be met under this alternative.

5.4.3 Long-Term Effectiveness and Permanence

This alternative would not be sufficient as an effective long-term remedy, as no remedial action would be performed.

5.4.4 Reduction of Toxicity, Mobility or Volume

This alternative does not address toxicity, mobility, or volume of MGP-related impacts to Site soils, and would not meet the remedial goal or RAO specified for the Site.

5.4.5 Short-Term Impacts and Effectiveness

No short-term impacts are introduced with this alternative, as no remedial action would be performed.

5.4.6 Implementability

This alternative does not require the implementation of any remedial activities and is therefore technically and administratively implementable.

5.4.7 Cost-effectiveness

There would be no costs associated with this alternative.

5.4.8 Land Use

The remedial alternative is consistent with the current use of the Site.

5.5 ALTERNATIVE 2 – INSTITUTIONAL AND ENGINEERING CONTROLS

This remedial alternative would consist of the development and implementation of a long-term inspection and monitoring program, engineering controls and institutional controls to avoid the creation of a completed exposure pathway.

This remedial alternative would involve the following major components:

- Engineering controls – The existing pavement, sidewalks and vegetative areas will serve as the cover system. The majority of the Site's existing cover consists of pavement and sidewalks with a few vegetative areas (e.g., around planted trees), and
- Institutional controls – The institutional controls may be in the form of a deed restriction that: (i) requires the remedial party or Site owner to complete and submit to the NYSDEC a periodic certification of the institutional and engineering controls in accordance with Part 375-1.8(h)(3); (ii) allows the use and development of the property for commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws; and (iii) requires compliance with the NYSDEC-approved Site Management Plan.

This alternative would utilize the existing cover system at the Site, and include land use restrictions through an environmental easement, enforcement and permit controls, annual monitoring of Site conditions, and informational devices.

Since this remedial alternative does not address Site soils that exceed USCOs, institutional controls and engineering controls will be the primary function of the remedial alternative to manage the long-term effectiveness for the remedy. To facilitate these institutional and engineering controls, a Site Management Plan (SMP) would be developed. The SMP will identify the implementation procedures required for institutional and engineering controls at the Site.

The purpose of the SMP is to provide:

- A description of the institutional and engineering controls for the Site;
- The basic operation and intended role of each implemented institutional and engineering control;
- A description of the features that should be evaluated during each periodic inspection and compliance certification period;
- A description of plans and procedures to be followed for implementation of institutional and engineering controls, such as the implementation of an Excavation Plan for the safe handling of MGP-impacted soils that may be present at depths greater than five (5) feet bgs that could be exposed during maintenance, redevelopment or subsurface utility repair/relocation;

- Any other provisions necessary to identify or establish methods for implementing the institutional and engineering controls required by the selected remedy, as determined by the NYSDEC, and
- A description of the reporting requirements for these controls.

The SMP will be developed for the boundaries of the Site shown on Figure 2. At a minimum, the SMP will include following items:

- The notification requirements for future soil disturbance activities that will encounter MGP-impacted materials that may be present at depths greater than five (5) feet bgs including subsurface utility line repair/relocation and new construction;
- Soil Excavation and Handling Plan;
- A flow chart showing guidelines for intrusive activities;
- Requirements for evaluation of the need for additional investigation or further delineation based on accessibility due to new site construction or changes in site use, and
- Requirements for annual inspections and certifications in accordance with DER-10.

In accordance with DER-10 Section 6.3 and 6 NYCRR Part 375-1.8(h)(3), a Periodic Review Report (PRR) will be submitted to the NYSDEC to document the efficacy of the institutional controls described in the SMP. The PRR will be signed by a professional engineer or other qualified environmental professional. If changes are noted, the PRR will include documentation explaining why the certification cannot be rendered and a statement of proposed corrective measures with a proposed schedule for implementing the corrective action.

5.5.1 Overall Protection of Public Health and the Environment

Although there is no current pathway for exposure to impacted soils or groundwater during day-to-day operations, non-routine activities (e.g., intrusive activities associated with new construction or maintenance of an underground utility or structure) or a change in Site use could create an exposure pathway and potential unacceptable risks. Therefore, in accordance with DER-10 and to protect public health and the environment, institutional and engineering controls will be established to mitigate risks associated with these soils and groundwater. Such controls would be facilitated by the development of an SMP which would identify the implementation procedures required for institutional and engineering controls at the Site. Assuming this is the case, this alternative would be protective of human health. However, MGP-impacted material would be left on-site which has the potential to adversely impact the environment. Based on data collected to date, the MGP-impacted material is not creating adverse impacts.

5.5.2 Compliance with Remedial Goals, RAOs, and Applicable SCGs

The remedial goals and the RAO specified for the development of this AAR would be met under this alternative. The RAO would be met through maintenance of the existing Site cover and implementation of institutional controls. A SMP would be employed, wherein future exposure to MGP-impacted materials through intrusive activities (e.g., underground utility maintenance) will be under controlled conditions, reducing potential risks to workers and the community.

The applicable chemical-specific SCGs would not be met under this alternative as MGP-impacted materials would remain on-site but will be addressed by a SMP.

5.5.3 Long-Term Effectiveness and Permanence

The long-term effectiveness of the remedy would be reliant on institutional and engineering controls. Annual inspections of the cover system would be required to ensure it continues to prevent direct contact and exposure to MGP-related impacts during day to day use of the Site. In the event of intrusive activities that extend to depths that would come in contact with MGP-impacted materials, a SMP will be utilized in order for work to be carried out in controlled manner. As long as the institutional and engineering controls are maintained, the remedial alternative would be effective long term.

5.5.4 Reduction of Toxicity, Mobility or Volume

Since the proposed remedial alternative does not involve intrusive activities, and instead utilizes the current asphalt, concrete and existing cover at the Site, there is no immediate reduction in the toxicity, mobility, or volume of MGP-impacted materials.

5.5.5 Short-Term Impacts and Effectiveness

No short-term risks are introduced with the implementation of this remedial alternative as it does not include construction activities that would adversely impact local businesses and the community. Property owners would be required to adhere to institutional controls and land use agreements.

5.5.6 Implementability

Considering a cover system is already in place at the Site, there are no challenges associated with utilizing the cover system. The engineering and institutional controls associated with SMP, as well as necessary coordination with the City of New York, have been implemented successfully on similar sites.

5.5.7 Cost-effectiveness

The total estimated 30-year present worth cost for this alternative is approximately $1,162,000. Capital costs associated with this alternative include coordination with the City of New York, the preparation of a SMP, field surveys, initiation of an annual Site inspection program, and the establishment of institutional controls at the Site.

5.5.8 Land Use

The remedial alternative is consistent with the current use of the Site.

5.6 ALTERNATIVE 3A – IN-SITU STABILIZATION OF NAPL-IMPACTED MATERIAL IN THE VICINITY OF SOIL BORING SB-4

This remedial alternative would involve the following major components:

- Removal and disposal of surface material in the vicinity of SB-4 to the extent necessary to allow for swelling associated with *In-Situ* Stabilization/Solidification (ISS) reagent;
- ISS of NAPL-impacted soils in the vicinity of SB-4, and
- Establishment of institutional and engineering controls for remaining Site contamination.

Implementation of ISS within the vicinity of SB-4 would involve the mixing of NAPL-impacted material to the underlying clay layer, with mixing continuing approximately 2 feet into the clay. The mixing depth in the area is estimated to be 19 feet bgs. The lateral extents of NAPL present within the subsurface have not been determined, and therefore the potential volume of impacted soil subject to ISS is unknown. Potential preliminary ISS boundaries are depicted on Figure 8.

Prior to the implementation of ISS, shallow subsurface obstructions and utilities would need to be addressed. As the Site is located within a sidewalk area and public right-of-way, underground utilities are present near or within the proposed ISS area. A detailed utility survey would need to be performed to determine the exact locations of subsurface utilities (either active or inactive) that are present near or within the proposed ISS area, and measures taken to address these utilities (e.g., removal, permanent relocation, or temporary re-routing).

Volume expansion occurs during the implementation of ISS due to swelling of the reagent. Some surface soils would require removal to maintain the current grade elevation subsequent to ISS treatment. The bulking factor of the ISS reagent is typically 20 to 30 percent and would be more accurately estimated for the Site during a treatability study. Removal of surface material would proceed to the depth necessary to account for swelling, or one foot above the water table (to provide adequate ground support for mixing equipment), whichever is shallower. Additional material, grout, or soil cuttings brought to the surface during mixing would require handling and off-site treatment/disposal. This material could also be sampled, analyzed, and re-used on-site below the Site cover and demarcation layer, provided it is below applicable SCOs.

Performance goals for ISS are determined during the remedial design based on the results of a treatability test. The effectiveness of ISS implementation is measured after the solidified material has cured. Post cure samples are collected and tested for a number of various physical and chemical tests, most commonly the permeability and unconfined compressive strength (UCS).

Treatability testing is typically required to determine the best Site-specific reagent addition. Cement-based mix designs are most commonly used for ISS application, however a variety of additives such as fly ash, hydrated lime, and bentonite can also be used to meet specific project requirements. Results from the treatability study generate bulking (volume expansion), unconfined compressive strength, permeability, and leachability of the solidified material. In addition, the potential volatilization and release of impacts during soil mixing, heat of hydration and curing can be evaluated during the treatability study.

Following implementation of ISS, a demarcation layer and cap will be installed over the treated area. The cap design will be consistent with the future use plans for the Site. The purpose of the cap is to minimize groundwater infiltration and potential disturbance of the solidified/stabilized materials.

This alternative would also require the implementation of institutional and engineering controls for remaining contamination at the Site. As previously mentioned, the Site is currently covered with either concrete or asphalt pavement, and only soil for surface landscaping is exposed. Portions of the Site subject to remedial action would likely be restored in kind. The cover system would remain intact in portions of the Site in which no intrusive remedial activities are conducted. As per DER-10, a SMP (as detailed in Section 5.5) would be prepared to specify the methods

necessary to ensure compliance with the institutional and engineering controls for the Site. This would include inspections to verify the Site use has not changed and that the potential for direct contact with the remaining contamination has not been created.

5.6.1 Overall Protection of Public Health and the Environment

Alternative 3A is protective of human health and the environment through the solidification/stabilization of NAPL-impacted soil, the maintenance of a cover system across the Site, the implementation of institutional and engineering controls to address contaminated soils remaining at the Site.

5.6.2 Compliance with Remedial Goals, RAOs, and Applicable SCGs

The remedial goals and the RAO specified for the development of this AAR would be met under this alternative. The RAO would be met through the implementation of ISS within the vicinity of SB-4, maintenance of the existing Site cover and implementation of institutional controls. A SMP would be employed following implementation of the remedial action, wherein future exposure to MGP-impacted materials through intrusive activities (e.g., underground utility maintenance) will be under controlled conditions, reducing potential risks to workers and the community.

The applicable chemical-specific SCGs would not be met under this alternative as MGP-impacted materials would remain on-site but will be addressed by a SMP.

5.6.3 Long-Term Effectiveness and Permanence

This alternative would be effective long-term and permanent. No direct exposure pathways would exist due to the presence of a cover system across the Site. In addition, the institutional controls, including the SMP, would prevent exposure to the ISS monolith and any remaining contamination that is present on Site (e.g., the remaining portions of the Halleck Street area).

5.6.4 Reduction of Toxicity, Mobility or Volume

Implementation of this remedial alternative would treat and solidify approximately 4,400 cubic yards of NAPL-impacted soils in the area depicted on Figure 8, which would reduce the toxicity and mobility of MGP-related constituents in the subsurface at the Site.

5.6.5 Short-Term Impacts and Effectiveness

The major short-term impact for this alternative is the significant disruptions to ongoing businesses and the local community. It is estimated that approximately 200 truckloads of material would be transported from the Site as a result of pre-excavation clearances as well as removal of swell associated with ISS. An additionally estimated 100 truckloads of material would be transported to the Site for receiving reagent, backfilling, and placement of the final surface cover. There are short-term risks of exposure and safety concerns associated with this alternative including increased truck traffic, noise, and dust and odors during the implementation of the remedial action and construction-related health and safety issues.

The potential exists for adverse impacts to adjacent utilities and the roadway due injected reagents and vibration from construction activities.

It is expected that approximately one month would be required to implement this remedial alternative. During this time, access to the eastern portion of the sidewalk area and the eastern

portion of the Halleck Street right-of-way in the vicinity of the remedial area would be restricted. This alternative would result in lane closures and the re-routing of both pedestrian and vehicle traffic.

The effectiveness of this remedy will be dependent on the extent of NAPL-impacted soils in proximity of SB-4. Should NAPL-impacted soils extend beyond the Site boundaries or further into Halleck Street, this alternative would not be effective in treating all NAPL-impacted soils. Additionally, there is a potential for off-site migration of ISS reagents, if pressurized technologies (e.g., jet grouting) are used.

5.6.6 Implementability

The ISS technology has been implemented on several former MGP sites located in New York State, including the New York City area. However, this alternative is not readily implementable at this Site. The challenges associated with the implementability of ISS techniques are primarily associated with the potential presence of subsurface obstructions and adjacent utilities. As discussed above, the nature of the fill material at the Site suggests that the subsurface contains obstructions that would need to be addressed prior to the implementation of ISS. In addition, buried utilities are present within or adjacent to the ISS target area. A subsurface utility survey would need to be conducted to determine if utilities are present, and if so, whether they can be temporarily or permanently re-routed. The presence of subsurface utilities and non-uniform subsurface materials (fill) may prevent ISS reagents from reaching targeted areas when utilizing certain ISS methods (e.g., jet grouting) due to the presence of preferential pathways. Once subsurface obstructions and utilities are addressed, mixing of subsurface materials and reagents is expected to be consistent and acceptable.

This alternative would require approval from the City of New York to open the roadway, as well as re-route vehicular and pedestrian traffic on Halleck Street.

A detailed engineering evaluation would be conducted during the remedial design to develop the construction details of this remedial alternative. The engineering evaluation would consider the delineated remediation areas, building records on adjacent properties, all adjacent utilities, geotechnical properties of the subsurface stratigraphy and materials, subsurface obstructions, and aquifer properties. A pre-design investigation (PDI) would need to be conducted to delineate the nature and extent of the NAPL present within the vicinity of SB-4. A treatability study would be conducted in order to develop the necessary reagent mixture to be used at the Site. In addition, the potential presence of purifier waste and the effect of ISS reagent materials on cyanide bound to Site soils will need to be evaluated.

5.6.7 Cost-Effectiveness

The total estimated 30-year present worth cost for this alternative is approximately $5,571,000. The primary capital costs associated with this alternative are the handling and transportation of material excavated to account for reagent swell, purchase, transport and installation of backfill and cap material, ISS reagent, and mobilization and setup. The primary indirect capital costs associated with this alternative include coordination with the City of New York, the preparation of a SMP, field surveys, initiation of an annual Site inspection program, and the establishment of institutional controls at the Site.

5.6.8 Land Use

The remedial alternative is consistent with the current use of the Site.

5.7 ALTERNATIVE 3B – EXCAVATION OF NAPL-IMPACTED MATERIAL IN THE VICINITY OF SB-4

This remedial alternative would involve the following major components:

- Removal and disposal of MGP-impacted soils containing NAPL to a depth of approximately 19 feet bgs in the vicinity of SB-4;
- Backfilling of excavation area with certified clean material and Site restoration, and
- Establishment of institutional and engineering controls for remaining Site contamination.

Based on the SC investigation conducted at the Site, the estimated conceptual remediation area for MGP-impacted soils containing NAPL is depicted on Figure 8. A conceptual depth of 19 feet bgs has been selected based on observations during SC activities. Prior to the initiation of remedial activities, a PDI would need to be performed in order to distinguish the geotechnical properties of the proposed remediation area, and to further delineate subsurface NAPL in the vicinity of SB-4.

In order to remove NAPL-impacted materials to a depth of 19 feet bgs, excavation shoring/bracing systems would be installed around the perimeter of the remediation area, which would be determined based on the results of a PDI program. Furthermore, additional data collected during the PDI would be utilized to determine the type of shoring system that would be feasible at the Site. The potential presence of significant obstructions in the subsurface may dictate the use of soldier pile and lagging systems. This process involves drilling through obstructions in the subsurface to install soldier piles, followed by excavation to install the lagging as the excavation progresses.

As with Alternative 3A, the presence of public right-of-ways (Halleck Street and the sidewalk areas), as well as underground utilities in the vicinity of the SB-4 excavation area are expected to pose a challenge during the implementation of this remedy and will require further evaluation. Shored excavations have the potential to cause ground movements which could potentially be damaging to the adjacent roadway and underground utilities. A utility study would need to be performed and a determination would be made as to whether or not they could be supported. Underground utilities that could not be supported would need to be permanently or temporarily relocated. In addition, excavations within the public right-of-ways would require approval from the City of New York to open the roadway, as well as re-routing of vehicular and pedestrian traffic on Halleck Street.

Since the remedial excavation depths would extend below the Site's water table, a temporary dewatering system would be required, and generated construction water would require either on-site treatment or off-site disposal for this alternative. If a permeable shoring system such as soldier pile and lagging were utilized dewatering would need to be continuous, and the volume of water removed could be significant. The necessary storage tanks and/or groundwater treatment equipment would require a significant area of the Site for staging. If groundwater is treated on-site

through the duration of excavation activities, permitting would be required in order to discharge to storm and/or sanitary sewers.

This alternative would also require the implementation of institutional and engineering controls for remaining contamination at the Site. As previously mentioned, the Site is currently covered with either concrete or asphalt pavement and only limited surface soil for landscaping purposes. Portions of the Site subject to remedial action would likely be restored in kind. The cover system would remain intact in portions of the Site in which no intrusive remedial activities are conducted. As per DER-10, a SMP (as detailed in Section 5.5) would be prepared to specify the methods necessary to ensure compliance with the institutional and engineering controls for the Site. This would include inspections to verify the Site use has not changed and that the potential for direct contact with the remaining contamination has not been created.

5.7.1 Overall Protection of Public Health and the Environment

Alternative 3B is protective of human health and the environment through the removal of NAPL-impacted soils, the maintenance of the cover system across the remaining portion of the Site, and the implementation of institutional and engineering controls to address remaining MGP-impacted soils at the Site.

5.7.2 Compliance with Remedial Goals, RAOs, and Applicable SCGs

The remedial goals and the RAO specified for the development of this AAR would be met under this alternative. The RAO would be met through the excavation of MGP-related source material within the vicinity of SB-4, maintenance of the existing Site cover and implementation of institutional controls. A SMP would be employed following implementation of the remedial action, wherein future exposure to MGP-impacted materials through intrusive activities (e.g., underground utility maintenance) will be under controlled conditions, reducing potential risks to workers and the community.

The applicable chemical-specific SCGs would not be met under this alternative as MGP-impacted materials would remain on-site but will be addressed by a SMP.

5.7.3 Long-Term Effectiveness and Permanence

This alternative would be effective long-term and permanent. MGP-related source material would be removed from within the vicinity of SB-4. No direct exposure pathways would exist due to the presence of a cover system across the remaining portions of the Site. In addition, the institutional controls, including the SMP, would prevent exposure to the any remaining MGP-impacted materials that may be present on Site.

5.7.4 Reduction of Toxicity, Mobility or Volume

Implementation of this remedial alternative would remove MGP-related source material from the area in the vicinity of SB-4, which would reduce the overall volume of MGP-impacted materials at the Site.

5.7.5 Short-Term Impacts and Effectiveness

The major short-term impact for this alternative is the significant disruptions to ongoing businesses and the local community. It is estimated that 410 truckloads of material would be transported from the Site as a result of excavation activities, and an additional 410 truckloads of

material would be transported to the Site for backfilling and surface repairs. There are short-term risks of exposure and safety concerns associated with this alternative including increased truck traffic, noise, and dust and odors during the implementation of the remedial action and construction-related health and safety issues.

Remedial action in the vicinity of SB-4 involving excavations would require the closure of portions of Halleck Street and adjacent sidewalk areas, with each requiring re-routing. Underground utilities in the vicinity of the excavation area requiring relocation would potentially result in service interruption during relocation. Excavation and dewatering activities would be required under this alternative. The necessary storage tanks and/or groundwater treatment equipment would require a significant area of the Site for staging. Discharge of treated construction water could potentially result in flooding of storm and sanitary sewers if discharged during periods of elevated flow rates (e.g., storm events).

The potential exists for adverse impacts to adjacent utilities and the roadway due to dewatering of Site soils and vibration from construction activities.

It is expected that approximately six to eight weeks would be required to implement this remedial alternative. During this time, access to the eastern portion of the sidewalk area and the eastern portion of the Halleck Street right-of-way in the vicinity of the remedial area would be restricted. This alternative would result in lane closures and the re-routing of both pedestrian and vehicle traffic.

The effectiveness of this remedy will be dependent on the extent of NAPL-impacted soils in proximity to SB-4. Should NAPL-impacted soils extend beyond the Site boundaries or further into Halleck Street, this alternative may not be effective in treating all NAPL-impacted soils in proximity to SB-4. In addition, the potential exists for certified clean material brought on-site to backfill the excavation to potentially become contaminated by adjacent MGP-related impacts.

5.7.6 Implementability

The challenges associated with the implementability of this alternative at the Site are primarily associated excavation dewatering, the potential presence of subsurface obstructions, and the location within and adjacent to public right-of-ways, and overall this alternative is not readily implementable at this Site. As the excavation would extend to depths beneath the water table, the volume of water that would require removal, treatment, and discharge is anticipated to be significant. The nature of the fill material at the Site suggests that the subsurface contains obstructions that would need to be addressed prior to the design of the shoring system and implementation of the excavation. In addition, a subsurface utility survey would need to be conducted to determine the locations of nearby utilities and whether they can be temporarily or permanently re-routed.

This alternative would require approval from the City of New York to open the roadway, as well as re-route vehicular and pedestrian traffic on Halleck Street.

A detailed engineering evaluation would be conducted during the remedial design to develop the construction details of this remedial alternative. The engineering evaluation would consider the delineated remediation areas, building records on adjacent properties, all adjacent utilities, geotechnical properties of the subsurface stratigraphy and materials, subsurface obstructions, and

aquifer properties. A PDI would need to be conducted to delineate the nature and extent of the NAPL present within the vicinity of SB-4.

5.7.7 Cost-Effectiveness

The total estimated 30-year present worth cost for this alternative is approximately $5,331,000. The primary capital costs associated with this alternative are the excavation shoring and bracing systems, temporary dewatering and treatment systems, transportation and disposal of impacted materials, and purchase, transport and installation of backfill material. The primary indirect capital costs associated with this alternative include coordination with the City of New York, the preparation of a SMP, field surveys, initiation of an annual Site inspection program, and the establishment of institutional controls at the Site.

5.7.8 Land Use

The remedial alternative is consistent with the current use of the Site.

5.8 ALTERNATIVE 4 – REMOVAL OF DELINEATED MGP-IMPACTED SITE SOILS ABOVE USCOS

This remedial alternative would involve the following major components:

- Removal and disposal of MGP-impacted soils observed in exceedance of USCOs, and
- Backfilling of excavation area with certified clean material and Site restoration.

Under this alternative, all Site soils in exceedance of applicable USCOs based on the SC investigation results would be excavated and transported off-site for disposal. Based on the SC investigation conducted at the Site, the estimated conceptual remediation areas for MGP-impacted soils are depicted on Figure 9. Excavation depths would range from 12 to 19 feet bgs. Prior to the initiation of remedial activities, a PDI would need to be performed in order to distinguish the geotechnical properties of the proposed remediation area, and to further delineate the nature and extent of MGP-related impacts to soils resulting in exceedances of USCOs.

Excavation under this alternative would likely be implemented via a series of separate excavations to various target depths, dependent upon the depth to clay, and the depth of MGP-related impacts within a given area. Significant excavation shoring/bracing systems would be installed around the perimeter of each excavation within the remediation area, as determined by the results of the PDI. While PDI data would be utilized to determine the type of shoring system utilized, it is assumed that extensive subsurface obstructions are present across the entire Site, and therefore soldier pile and lagging systems would likely be utilized within each excavation area. As such, a dewatering system and water treatment system, as well as necessary discharge permitting, would be required under this alternative. As the portions of the Site in which remedial excavations would be implemented occupies approximately 1,700 linear feet along Halleck Street, significant infrastructure pertaining to any dewatering and treatment system would be required. Following implementation, each excavation would be backfilled with certified clean material, and the Site surfaces would be restored in-kind.

5.8.1 Overall Protection of Public Health and the Environment

This alternative is protective of human health and the environment through the removal of MGP-impacted soils where exceedances of USCOs are observed.

5.8.2 Compliance with Remedial Goals, RAOs, and Applicable SCGs

The remedial goals, RAO specified for the development of this AAR, and applicable SCGs would be met under this alternative. The RAO would be met through the excavation of MGP-impacted soils throughout the Site.

5.8.3 Long-Term Effectiveness and Permanence

This alternative would be effective long-term and permanent. Delineated MGP-related source material and other MGP-impacted soils would be removed from the Site. No direct exposure pathways would exist due to the presence of a cover system across the remaining portions of the Site.

5.8.4 Reduction of Toxicity, Mobility or Volume

Implementation of this remedial alternative would remove delineated MGP-related source material and MGP-impacted soils throughout the Site, greatly reducing the volume of MGP-related impacts. Therefore, there would be an immediate and significant reduction in the toxicity and mobility of MGP-related impacts.

5.8.5 Short-Term Impacts and Effectiveness

The major short-term impact for this alternative is the significant disruptions to ongoing businesses and the local community. It is estimated that 2,600 truckloads of material would be transported from the Site as a result of excavation activities, and an additional 2,600 truckloads of material would be transported to the Site for backfilling and surface repairs. There are short-term risks of exposure and safety concerns associated with this alternative including increased truck traffic, noise, and dust and odors during the implementation of the remedial action and construction-related health and safety issues.

Excavations along Halleck Street would require the closure of portions of the right-of-way and adjacent sidewalk areas, with each requiring re-routing. Buried utilities in the vicinity of the excavation area requiring relocation would potentially result in service interruption during relocation. Excavation and dewatering activities would be required under this alternative. The necessary storage tanks and/or groundwater treatment equipment would require a significant area of the Site for staging. Discharge of treated construction water could potentially result in flooding of storm and sanitary sewers if discharged during periods of elevated flow rates (e.g., storm events).

The potential exists for adverse impacts to adjacent utilities, buildings, and the roadway due to dewatering of Site soils and vibration from construction activities.

It is expected that approximately 22 to 26 months would be required to implement this remedial alternative. During this time, access to the portions of the sidewalk area and the portions of the Halleck Street right-of-way in the vicinity of the active excavations would be restricted. However, excavations would likely be sequenced, and therefore disruptions and closures would be isolated to specific areas during implementation. Overall, this alternative would result in lane closures and the re-routing of both pedestrian and vehicle traffic.

5.8.6 Implementability

The challenges associated with the implementability of this alternative are primarily associated with excavation dewatering, the potential presence of subsurface obstructions, subsurface utilities and traffic within to public right-of-ways, and overall this alternative is not readily implementable at this Site. As the excavation would extend to depths beneath the water table, the volume of water that would require removal, treatment, and discharge is anticipated to be highly significant. The nature of the fill material at the Site suggests that the subsurface contains obstructions that would need to be addressed prior to the design of the shoring system and implementation of the excavation. In addition, underground utilities are present within or adjacent to the remedial excavation areas. Therefore, a subsurface utility survey would need to be conducted to determine the locations of nearby utilities and whether they can be temporarily or permanently re-routed.

This alternative would require approval from the City of New York to open the roadway, as well as re-route vehicular and pedestrian traffic on Halleck Street.

A detailed engineering evaluation and PDI would be conducted during the remedial design to develop the construction details of this remedial alternative. The engineering evaluation would consider the delineated remediation areas, building records on adjacent properties, all adjacent utilities, geotechnical properties of the subsurface stratigraphy and materials, subsurface obstructions, and aquifer properties.

5.8.7 Cost-Effectiveness

The total estimated 30-year present worth cost for this alternative is approximately $28,469,000. The primary capital costs associated with this alternative are the excavation shoring and bracing systems, temporary dewatering and treatment systems, transportation and disposal of impacted materials, and purchase, transport and installation of backfill material. The primary indirect capital costs associated with this alternative include coordination with the City of New York, and field surveys.

5.8.8 Land Use

The remedial alternative is consistent with the current use of the Site.

SECTION 6

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

6.1 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Four alternatives were developed and evaluated in Section 5 to assess the relative merits of each for addressing MGP-related impacts at the Site. A relative comparison of the alternatives for each of the evaluation criteria is presented below. The purpose of the analyses was to identify the advantages and disadvantages of each alternative relative to the other so that key comparisons can be made.

6.1.1 Overall Protection of Public Health and the Environment

Alternatives 1 does not take any action to address MGP-related impacts at the Site. Alternative 2 does not employ any intrusive activities to address MGP-related impacts at the Site. Alternatives 2 through 4 are protective of public health through the implementation of engineering and institutional controls. Alternatives 3A and 3B address MGP-impacts at the Site by immobilizing or removing NAPL-impacted soils in vicinity of SB-4 and Alternative 4 addresses MGP-impacts at the Site by removing delineated MGP-impacted soils exceeding USCOs in Site areas where excavation is deemed feasible and practicable.

Alternatives 2, 3A, and 3B share the development and use of a SMP, since under these alternatives MGP-impacted materials would remain on the Site.

6.1.2 Compliance with Remedial Goals, RAOs, and Applicable SCGs

Alternative 1 would not achieve remedial goals or the Site-specific RAO. Alternatives 2 through 4 would achieve the remedial goals and the Site-specific RAO.

Alternative 2 would achieve the RAO through the implementation of engineering and institutional controls. Alternative 3A would achieve the RAO through implementation of ISS in the vicinity of SB-4, and engineering and institutional controls. Alternative 3B would achieve the RAO through excavation of MGP-related source materials in the vicinity of SB-4, and engineering and institutional controls. Alternative 4 would achieve the RAO through excavation of MGP-impacted soils throughout the Site.

Compliance with SCGs would not be achieved by Alternatives 2, 3A, and 3B but will be addressed by engineering and institutional controls. Alternative 4 would achieve compliance with applicable SCGs.

6.1.3 Long-Term Effectiveness and Permanence

Alternatives 2, 3A, and 3B would be considered effective in the long-term through the implementation of engineering and institutional controls in order to address remaining MGP-impacted materials at the Site. Alternative 4 would be considered permanent and effective long-term through the removal and disposal of MGP-impacted soils throughout the Site.

6.1.4 Reduction of Toxicity, Mobility or Volume

Alternatives 1 and 2 do not provide a direct reduction in the toxicity, mobility, or volume of the MGP-related impacts on the Site.

Alternatives 3A and 3B would reduce the toxicity, mobility, and volume of MGP-impacted materials via the immobilization or removal of NAPL-impacted soils in the vicinity of SB-4. However, the effectiveness of ISS reagent materials on Site soils will need to be evaluated. Additionally, MGP-impacted soils would remain on-site in areas outside of the vicinity of SB-4.

Alternative 4 would reduce the toxicity, mobility, and volume of delineated MGP-impacted materials over the entire Site via excavation and off-site disposal of soils.

6.1.5 Short-Term Impacts and Effectiveness

Under Alternative 1, no action would be taken and therefore would incur no short-term impacts.

Under Alternative 2, no intrusive action would be implemented. Therefore, there would be no significant short-term impacts or disruptions to local businesses.

Alternatives 3A, 3B and 4 would include short-term risks of exposure and safety concerns associated with the implementation of each remedial action. These alternatives would result in associated truck traffic, noise, road, and sidewalk closures. These impacts would be significantly greater under Alternative 4.

Due to the intrusive activities associated with Alternatives 3A, 3B, and 4, odor and dust may be issues that would affect the community in the short-term. Alternatives 3A, 3B and 4 would require restricted access to Halleck Street and the associated sidewalk area, with Alternative 4 having the greatest impact to local businesses.

6.1.6 Implementability

Alternative 1 is readily implementable, as no remedial construction activities would be conducted, and therefore no significant challenges are posed.

Alternative 2 is readily implementable, as the cover system is already in place at the Site, and there are no challenges associated with its utilization. The engineering and institutional controls associated with a SMP have been implemented successfully on similar sites. Most pertinent to this alternative are the activities required to coordinate with New York City and New York State regulatory bodies in establishing institutional controls.

Alternatives 3A and 3B are not readily implementable and will require the need for PDI activities such as a geotechnical investigation, structural evaluations/preconstruction surveys of adjacent utilities and infrastructure and approvals/permits from local government agencies. In addition, Alternative 3A would require that a treatability study and an evaluation of the potential presence of purifier waste and the effect of ISS reagent materials on cyanide bound to Site soils to be completed during the PDI program. Alternative 3B would require an evaluation of dewatering and construction water treatment methods.

Alternative 4 is not readily implementable, and would have significant implementability challenges associated with adverse impacts to local businesses, on-site space constraints, existing

utilities and infrastructure, subsurface obstructions and would require the need for PDI activities such as a geotechnical investigation, evaluation of dewatering and treatment methods, structural evaluation/pre-construction surveys of adjacent buildings and infrastructure and approvals/permits from local government agencies.

6.1.7 Cost-Effectiveness

The cost effectiveness of each remedial alternative is summarized as follows:

Alternative	Estimated Capital Cost	Estimated Cost of O&M	Estimated Total Cost
Alternative 1	$0	$0	$0
Alternative 2	$244,000	$918,000	$1,162,000
Alternative 3A	$4,653,000	$918,000	$5,571,000
Alternative 3B	$4,413,000	$918,000	$5,331,000
Alternative 4	$28,469,000	$0	$28,469,000

Estimated costs are based on a 30-year present worth and the breakdown of these estimated costs for each remedial alternative is provided as Appendix B.

6.1.8 Land Use

None of the analyzed alternatives would change the current land use of the Site.

6.1.9 Community Acceptance

Concerns of the state and the community will be addressed separately in accordance with a CPP and requirements outlined in DER-10's citizen participation section.

SECTION 7

CONCLUSIONS AND PREFERRED REMEDY

7.1 CONCLUSIONS

The following conclusions have been made based upon the results of the SC and subsequent alternative analysis:

- The primary constituents of concern at the Site consist of PAHs and inorganics, namely arsenic, lead, mercury, and cyanide;
- NAPL was encountered in one soil boring (SB-4) during field investigation activities;
- MGP-related impacts in excess of USCOs were encountered in Site soils;
- There is no current pathway for human exposure to impacted soils during day-to-day Site operations. However, exposure to MGP-impacted materials may be possible during intrusive activities (e.g., repair of underground utilities and structures).

Based on the findings of the SC, the following Site-specific RAO was identified by the NYSDEC:

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

Based on the findings of the SC and the Site-specific RAO identified by the NYSDEC, the following alternatives were developed for the Site:

- Alternative 1 – No Action.
- Alternative 2 – Institutional and Engineering Controls.
- Alternative 3A – ISS of NAPL-impacted Material in the Vicinity of SB-4.
- Alternative 3B – Excavation of NAPL-impacted Material in the Vicinity of SB-4.
- Alternative 4 – Removal of Delineated MGP-impacted Site Soils Above USCOs.

The Site presents significant challenges for any alternative in which intrusive methods are employed (e.g., ISS or targeted excavations), as the Site is an active sidewalk area and public right-of-way (Halleck Street). Further, any intrusive activity would require approval from the City of New York as vehicular and pedestrian traffic would need to be re-routed, an extensive subsurface utility inventory would need to be performed, and a significant PDI program would need to be conducted under each intrusive alternative. Additional challenges are posed for excavation-based Alternatives 3B and 4, as excavations would extend beyond the groundwater table and likely require significant dewatering, treatment, and discharge infrastructure.

7.2 PREFFERED REMEDY

An extensive evaluation of remedial alternatives has been conducted for the Site while considering the challenges associated with existing utilities and infrastructure, adjacent buildings and structures, subsurface obstructions, Site geology, etc.

Most importantly, this alternatives analysis evaluated short-term impacts to the local community, interruptions to local businesses, and interruptions within the public sidewalk areas and active right-of-ways. Short-term term impacts to the community and public infrastructure would be significant under Alternatives 3A, 3B, and 4, as they include varying degrees of remedial construction activities.

In addition, the effectiveness of Alternatives 3A and 3B would be dependent on the extent of NAPL-impacted soils in proximity to SB-4. Should NAPL-impacted soils extend beyond the Site boundaries, these alternatives would not be effective in treating all NAPL-impacted soils in proximity to SB-4.

Alternative 4 would have significant implementability challenges and short term impacts associated with local businesses, on-site space constraints, existing utilities and infrastructure, subsurface obstructions and would require the need for substantial engineering evaluations (i.e., geotechnical investigations, dewatering and treatment methods, structural evaluations/pre-construction surveys of adjacent buildings and infrastructure, etc.) and would require approvals/permits from local government agencies. In addition, certified clean material brought on-site to backfill remedial excavations may potentially become contaminated by off-site MGP-related impacts.

Based on the above, Alternative 2 (Institutional and Engineering Controls) is the preferred remedy for the Site, and includes the following:

- Utilization of the Site's existing cover system as an engineering control, and
- Preparation of a SMP that will identify the implementation procedures required for institutional and engineering controls at the Site.

Alternative 2 would achieve established remedial goals, achieve the RAO for public health protection in soil identified by the NYSDEC, and would be compliant with SCGs through the implementation of engineering and institutional controls without resulting in significant interruptions to local businesses and adverse impacts to the local community.

SECTION 8

REFERENCES

Hygienetics, 1997. Phase I Environmental Site Assessment Report of Hunts Point Produce Market Complex Parcels A, B, C, D, and E.

GEI, 2018. Remedial Action Work Plan and Alternatives Analysis Hunts Point Parcel A-2 (Former VCA Site A OU-2) NE Corner of the Southern Intersection of Food Center Drive and Halleck Street Bronx, NY 10474 NYSDEC BCP No. C203094. July, 2018.

NYSDEC, 1998. Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Division of Water. June 1998.

NYSDEC, 2002. Draft Voluntary Cleanup Program Guide, NYSDEC, May 2002.

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Parsons, 2003. Hunts Point Offsite Manufactured Gas Plant Site History report, Bronx, New York, Parsons, February 2003.

Parsons, 2014. Site Characterization Report for the Former Hunts Point Gas Works Halleck Street Sidewalk Area, Parsons, July 2014.

RETEC, 2007. Characterization of Soil Background PAH and Metal Concentrations, Manhattan, New York, The RETEC Group, Inc., March 2007.

TABLES

Table 1
Groundwater Elevation Summary
Hunts Point Halleck Street Sidewalk Area - Alternatives Analysis Report
Consolidated Edison Company of New York

Monitoring Well Number	Total Well Depth (feet)	Top of Casing Elevation (feet AMSL)	Depth to Water (feet)[(1)]	Groundwater Elevation (feet AMSL)
MW-1	17.15	15.64	12.05	3.59
MW-2	16.10	14.56	9.47	5.09
MW-3	17.25	7.16	5.60	1.56

Notes:
(1) Measured from top of PVC casing on November 27, 2013
AMSL = Above Mean Sea Level
Elevations are based on the North American Vertical Datum of 1988 (NAVD88).

Table 2
Summary of Soil Analytical Results
Hunts Point Halleck Street Sidewalk Area - Alternatives Analysis Report
Consolidated Edison Company of New York

Con Ed - Halleck Street Validated Soil Analytical Data Detected Compound Summary		Unrestricted Use Soil Cleanup Objectives	Location ID: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled: Validated:	MW-1 MW-1(5-10)-20131104 E4340-01 5 - 10 ft CTECH E4340 SOIL 11/4/2013 10:50 2/4/2014	Dup of MW-1(5-10)-20131104 MW-1 MW-11(5-10)-20131104 E4340-05 5 - 10 ft CTECH E4340 SOIL 11/4/2013 10:40 2/4/2014	MW-1 MW-1(10-15)-20131104 E4340-02 10 - 15 ft CTECH E4340 SOIL 11/4/2013 11:00 2/4/2014	SB-1 SB-1(10-12)-20131101 E4277-25 10 - 12 ft CTECH E4277 SOIL 11/1/2013 13:45 2/4/2014	SB-1 SB-1(15-17)-20131101 E4277-26 15 - 17 ft CTECH E4277 SOIL 11/1/2013 13:55 2/4/2014	SB-2 SB-2(5-10)-20131101 E4277-21 5 - 10 ft CTECH E4277 SOIL 11/1/2013 9:45 2/4/2014	SB-2 SB-2(10-15)-20131101 E4277-22 10 - 15 ft CTECH E4277 SOIL 11/1/2013 9:55 2/4/2014
CAS NO.	COMPOUND		UNITS:							
	VOLATILES									
67-64-1	ACETONE	0.05	mg/kg	0.0077 J	ND	0.016 J	ND	ND	ND	ND
75-15-0	CARBON DISULFIDE	NS	mg/kg	ND	ND	0.0025 J	ND	ND	ND	ND
98-82-8	ISOPROPYLBENZENE (CUMENE)	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
108-10-1	METHYL ISOBUTYL KETONE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
108-87-2	METHYLCYCLOHEXANE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
75-09-2	METHYLENE CHLORIDE	0.05	mg/kg	0.0068 J	ND	ND	0.0037 J	0.0052 J	0.0034 J	0.006 J
100-42-5	STYRENE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
1634-04-4	TERT-BUTYL METHYL ETHER	0.93	mg/kg	ND	ND	ND	ND	ND	ND	ND
87-61-6	1,2,3-TRICHLOROBENZENE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
120-82-1	1,2,4-TRICHLOROBENZENE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
106-46-7	1,4-DICHLOROBENZENE	1.8	mg/kg	ND	ND	ND	ND	ND	ND	ND
	BTEX									
71-43-2	BENZENE	0.06	mg/kg	ND	ND	ND	ND	ND	ND	ND
100-41-4	ETHYLBENZENE	1	mg/kg	ND	ND	ND	ND	ND	ND	ND
108-88-3	TOLUENE	0.7	mg/kg	ND	ND	ND	ND	ND	ND	ND
XYLMP	M,P-XYLENE (SUM OF ISOMERS)	0.26	mg/kg	ND	ND	ND	ND	ND	ND	ND
95-47-6	O-XYLENE (1,2-DIMETHYLBENZENE)	0.26	mg/kg	ND	ND	ND	ND	ND	ND	ND
	SEMIVOLATILES									
100-52-7	BENZALDEHYDE	NS	mg/kg	R	R	R	R	R	R	R
85-68-7	BENZYL BUTYL PHTHALATE	NS	mg/kg	ND	ND	ND	ND	ND	0.31 J	ND
92-52-4	BIPHENYL (DIPHENYL)	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
117-81-7	BIS(2-ETHYLHEXYL) PHTHALATE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
86-74-8	CARBAZOLE	NS	mg/kg	ND	ND	ND	ND	ND	0.0928 J	0.29 J
132-64-9	DIBENZOFURAN	NS	mg/kg	ND	ND	ND	ND	ND	ND	0.35 J
84-66-2	DIETHYL PHTHALATE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
131-11-3	DIMETHYL PHTHALATE	NS	mg/kg	0.61	0.8	0.53	0.48	0.44 J	0.45	0.89
105-67-9	2,4-DIMETHYLPHENOL	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
95-48-7	2-METHYLPHENOL (O-CRESOL)	0.33	mg/kg	ND	ND	ND	ND	ND	ND	ND
MEPH3MEPH4	3- AND 4- METHYLPHENOL (TOTAL)	0.33	mg/kg	ND	ND	ND	ND	ND	ND	ND
108-95-2	PHENOL	0.33	mg/kg	ND	ND	ND	ND	ND	ND	ND
	PAHs									
83-32-9	ACENAPHTHENE	20	mg/kg	ND	0.0905 J	ND	ND	ND	ND	0.36 J
208-96-8	ACENAPHTHYLENE	100	mg/kg	0.24 J	0.26 J	ND	ND	ND	0.19 J	0.23 J
120-12-7	ANTHRACENE	100	mg/kg	0.19 J	0.24 J	0.12 J	ND	ND	0.38 J	1.5
56-55-3	BENZO(A)ANTHRACENE	1	mg/kg	0.36 J	0.56	0.34 J	ND	ND	1.4	3.6
50-32-8	BENZO(A)PYRENE	1	mg/kg	0.44 J	0.63	0.29 J	ND	ND	1.6	3.2
205-99-2	BENZO(B)FLUORANTHENE	1	mg/kg	0.48 J	0.72	0.36 J	ND	ND	1.8	3.8
191-24-2	BENZO(G,H,I)PERYLENE	100	mg/kg	0.3 J	0.42 J	0.19 J	ND	ND	1.2	1.8
207-08-9	BENZO(K)FLUORANTHENE	0.8	mg/kg	0.15 J	0.24 J	0.11 J	ND	ND	0.84	1.1
218-01-9	CHRYSENE	1	mg/kg	0.4 J	0.63	0.26 J	ND	ND	1.4	2.4
53-70-3	DIBENZ(A,H)ANTHRACENE	0.33	mg/kg	ND	0.11 J	ND	ND	ND	0.25 J	0.69
206-44-0	FLUORANTHENE	100	mg/kg	0.65	0.99	0.52	ND	ND	2	7
86-73-7	FLUORENE	30	mg/kg	0.1 J	0.12 J	ND	ND	ND	0.13 J	0.74
193-39-5	INDENO(1,2,3-C,D)PYRENE	0.5	mg/kg	0.21 J	0.33 J	0.17 J	ND	ND	0.97	1.7
91-57-6	2-METHYLNAPHTHALENE	NS	mg/kg	ND	0.14 J	ND	ND	ND	ND	ND
91-20-3	NAPHTHALENE	12	mg/kg	0.23 J	0.3 J	ND	ND	ND	0.29 J	0.2 J
85-01-8	PHENANTHRENE	100	mg/kg	0.45 J	0.62	0.32 J	ND	ND	1.2	5
129-00-0	PYRENE	100	mg/kg	0.69	1	0.54	ND	ND	1.8	5.5

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CAS NO.	COMPOUND		UNITS:							
	INORGANICS									
7429-90-5	ALUMINUM	NS	mg/kg	14900 J	13800 J	13000 J	12000	5900	3100	11100
7440-36-0	ANTIMONY	NS	mg/kg	ND	ND	ND	ND	ND	2.67 J	ND
7440-38-2	ARSENIC	13	mg/kg	10.8	6.94	8.22	1.48	2.44	10.67	10.43
7440-39-3	BARIUM	350	mg/kg	134 J	108 J	80.4 J	71	17.6	416	168
7440-41-7	BERYLLIUM	7.2	mg/kg	0.435	0.361	0.52	0.365	0.16 J	0.087 J	0.426
7440-43-9	CADMIUM	2.5	mg/kg	2.6	2.18	ND	ND	0.372	1.33	ND
7440-70-2	CALCIUM	NS	mg/kg	4200 J	4200 J	4300 J	8100	1300	13500	5900
7440-47-3	CHROMIUM, TOTAL	NS	mg/kg	36.1 J	30.1 J	28.3 J	25.1	14.9	30.7	25.9
7440-48-4	COBALT	NS	mg/kg	12.4 J	10.47 J	14.1 J	13.2	5.15	6.78	12.3
7440-50-8	COPPER	50	mg/kg	99.3 J	53.8 J	49.1 J	21.1	10.34	595	35.3
7439-89-6	IRON	NS	mg/kg	36900	33900	34700	22600	10500	31000	32900
7439-92-1	LEAD	63	mg/kg	493	352	390	17.3 J	4.24 J	727 J	168 J
7439-95-4	MAGNESIUM	NS	mg/kg	5500 J	5000 J	6800 J	5600	2400	1800	6100
7439-96-5	MANGANESE	1600	mg/kg	323 J	270 J	641 J	440	129	229	695
7439-97-6	MERCURY	0.18	mg/kg	2.33	1.54	0.268	0.039	ND	0.67	0.765
7440-02-0	NICKEL	30	mg/kg	29.4	25.3	29.6	21.6 J	10.84 J	17.8 J	26.7 J
7440-09-7	POTASSIUM	NS	mg/kg	2900 J	2700 J	3300 J	2000 J	1300 J	906 J	2700 J
7782-49-2	SELENIUM	3.9	mg/kg	2.56	2.62	2.74	1.36	0.556 J	2.96	2.22
7440-22-4	SILVER	2	mg/kg	1.43	1.18	1.82	1.3	0.252 J	2.21	2.29
7440-23-5	SODIUM	NS	mg/kg	271 J	245 J	607 J	116	762	649	1100
7440-28-0	THALLIUM	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
7440-62-2	VANADIUM	NS	mg/kg	50.5 J	44.9 J	50.5 J	40	23.2	17.7	43.9
7440-66-6	ZINC	109	mg/kg	346	329	227	58.5	26.2	830	187
57-12-5	CYANIDE	27	mg/kg	0.649	0.672	0.244 J	0.093 J	ND	1.86	0.158 J

Notes:
(1) 6NYCRR Part 375 Environmental Remediation Programs (December 14, 2006)
(2) NS indicates no cleanup objective or background level is available.
(3) ND indicates compound was not detected.
(4) J indicates an estimated concentration.
(5) Shaded values exceed 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives.
(6) NA indicates compound was not analyzed.
(7) R indicates rejected value

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CAS NO.	COMPOUND		UNITS:						
	VOLATILES								
67-64-1	ACETONE	0.05	mg/kg	ND	ND	ND	0.0408 J	ND	ND
75-15-0	CARBON DISULFIDE	NS	mg/kg	ND	ND	ND	0.008 J	ND	ND
98-82-8	ISOPROPYLBENZENE (CUMENE)	NS	mg/kg	ND	ND	29 J	0.0065 J	ND	ND
108-10-1	METHYL ISOBUTYL KETONE	NS	mg/kg	ND	ND	ND	ND	ND	ND
108-87-2	METHYLCYCLOHEXANE	NS	mg/kg	ND	ND	0.66 J	ND	ND	ND
75-09-2	METHYLENE CHLORIDE	0.05	mg/kg	0.0063 J	0.0069 J	1.7 J	0.0175	ND	0.004 J
100-42-5	STYRENE	NS	mg/kg	ND	ND	ND	ND	ND	ND
1634-04-4	TERT-BUTYL METHYL ETHER	0.93	mg/kg	ND	ND	ND	0.0106 J	ND	ND
87-61-6	1,2,3-TRICHLOROBENZENE	NS	mg/kg	ND	ND	9.9	ND	ND	ND
120-82-1	1,2,4-TRICHLOROBENZENE	NS	mg/kg	ND	ND	63.2 J	ND	ND	ND
106-46-7	1,4-DICHLOROBENZENE	1.8	mg/kg	ND	ND	ND	0.0025 J	ND	ND
	BTEX								
71-43-2	BENZENE	0.06	mg/kg	ND	ND	85.3	0.0384	ND	ND
100-41-4	ETHYLBENZENE	1	mg/kg	ND	ND	518.3 J	0.0379	ND	ND
108-88-3	TOLUENE	0.7	mg/kg	ND	ND	18.4	ND	ND	ND
XYLMP	M,P-XYLENE (SUM OF ISOMERS)	0.26	mg/kg	ND	ND	438.1	0.0146 J	ND	ND
95-47-6	O-XYLENE (1,2-DIMETHYLBENZENE)	0.26	mg/kg	ND	ND	112.9	0.016	ND	ND
	SEMIVOLATILES								
100-52-7	BENZALDEHYDE	NS	mg/kg	R	R	R	R	R	R
85-68-7	BENZYL BUTYL PHTHALATE	NS	mg/kg	ND	ND	ND	ND	ND	ND
92-52-4	BIPHENYL (DIPHENYL)	NS	mg/kg	ND	ND	74.5	ND	ND	ND
117-81-7	BIS(2-ETHYLHEXYL) PHTHALATE	NS	mg/kg	ND	ND	ND	ND	ND	ND
86-74-8	CARBAZOLE	NS	mg/kg	ND	ND	3.6 J	ND	1.4	ND
132-64-9	DIBENZOFURAN	NS	mg/kg	ND	ND	23.2	ND	0.44	ND
84-66-2	DIETHYL PHTHALATE	NS	mg/kg	ND	ND	ND	ND	ND	ND
131-11-3	DIMETHYL PHTHALATE	NS	mg/kg	ND	1	ND	0.6	0.66	0.31 J
105-67-9	2,4-DIMETHYLPHENOL	NS	mg/kg	ND	ND	ND	ND	ND	ND
95-48-7	2-METHYLPHENOL (O-CRESOL)	0.33	mg/kg	ND	ND	ND	ND	ND	ND
MEPH3MEPH4	3- AND 4- METHYLPHENOL (TOTAL)	0.33	mg/kg	ND	0.26 J	ND	ND	ND	ND
108-95-2	PHENOL	0.33	mg/kg	ND	ND	ND	ND	ND	ND
	PAHs								
83-32-9	ACENAPHTHENE	20	mg/kg	ND	ND	233.2	ND	ND	ND
208-96-8	ACENAPHTHYLENE	100	mg/kg	ND	ND	33.3	ND	2.4	ND
120-12-7	ANTHRACENE	100	mg/kg	0.97 J	ND	133.6	0.13 J	5.4	ND
56-55-3	BENZO(A)ANTHRACENE	1	mg/kg	6.3	0.31 J	80.2	0.23 J	8.2	0.13 J
50-32-8	BENZO(A)PYRENE	1	mg/kg	7.2	0.31 J	72.2	0.21 J	7.3	0.12 J
205-99-2	BENZO(B)FLUORANTHENE	1	mg/kg	8.7	0.37 J	59.1	0.24 J	7.7	0.15 J
191-24-2	BENZO(G,H,I)PERYLENE	100	mg/kg	5.1	0.2 J	29.2	ND	3.1	ND
207-08-9	BENZO(K)FLUORANTHENE	0.8	mg/kg	3.3 J	0.15 J	14.1	ND	3.8	ND
218-01-9	CHRYSENE	1	mg/kg	5.9	0.24 J	73.4	0.18 J	7.3	0.11 J
53-70-3	DIBENZ(A,H)ANTHRACENE	0.33	mg/kg	1.2 J	ND	6.9	ND	0.87	ND
206-44-0	FLUORANTHENE	100	mg/kg	9.9	0.75	145.4	0.41 J	14.8	0.21 J
86-73-7	FLUORENE	30	mg/kg	ND	ND	165	ND	1.1	ND
193-39-5	INDENO(1,2,3-C,D)PYRENE	0.5	mg/kg	4.5	0.17 J	21.6	ND	3.2	ND
91-57-6	2-METHYLNAPHTHALENE	NS	mg/kg	ND	ND	766.4	0.16 J	0.3 J	ND
91-20-3	NAPHTHALENE	12	mg/kg	ND	0.17 J	1899.2	0.48 J	1.2	0.19 J
85-01-8	PHENANTHRENE	100	mg/kg	4.3	0.25 J	547.3	0.38 J	12.3	0.17 J
129-00-0	PYRENE	100	mg/kg	7	0.65	253.6	0.37 J	13	0.2 J

Table 2
Summary of Soil Analytical Results
Hunts Point Halleck Street Sidewalk Area - Alternatives Analysis Report
Consolidated Edison Company of New York

Con Ed - Halleck Street Validated Soil Analytical Data Detected Compound Summary		Unrestricted Use Soil Cleanup Objectives	Location ID: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled: Validated:	SB-3 SB-3(5-10)-20131101 E4277-23 5 - 10 ft CTECH E4277 SOIL 11/1/2013 11:15 2/4/2014	SB-3 SB-3(12-14)-20131101 E4277-24 12 - 14 ft CTECH E4277 SOIL 11/1/2013 11:25 2/4/2014	SB-4 SB-4(15-17)-20131031 E4277-19 15 - 17 ft CTECH E4277 SOIL 10/31/2013 14:15 2/4/2014	SB-4 SB-4(19-20)-20131031 E4277-20 19 - 20 ft CTECH E4277 SOIL 10/31/2013 14:15 2/4/2014	SB-5 SB-5(5-10)-20131031 E4277-17 5 - 10 ft CTECH E4277 SOIL 10/31/2013 12:40 2/4/2014	SB-5 SB-5(10-15)-20131031 E4277-18 10 - 15 ft CTECH E4277 SOIL 10/31/2013 12:50 2/4/2014
CAS NO.	COMPOUND		UNITS:						
	INORGANICS								
7429-90-5	ALUMINUM	NS	mg/kg	3900	2300	4000	15500	2700	6300
7440-36-0	ANTIMONY	NS	mg/kg	9.52 J	15 J	1.74 J	ND	ND	ND
7440-38-2	ARSENIC	13	mg/kg	27.6	11.8	12	10.52	5.42	7.29
7440-39-3	BARIUM	350	mg/kg	354	369	78.3	54.5	170	377
7440-41-7	BERYLLIUM	7.2	mg/kg	ND	ND	0.291 J	0.643	0.204 J	0.474
7440-43-9	CADMIUM	2.5	mg/kg	2.73	1.31	0.3 J	ND	ND	0.619
7440-70-2	CALCIUM	NS	mg/kg	38300	7700	2000	3700	3200	5000
7440-47-3	CHROMIUM, TOTAL	NS	mg/kg	24.9	10.95	16.7	35	24.8	20
7440-48-4	COBALT	NS	mg/kg	9.71	16.8	9.46	17.2	5.01	7.22
7440-50-8	COPPER	50	mg/kg	361	64.9	92.1	28.2	129	120
7439-89-6	IRON	NS	mg/kg	68200	102200	46400	40100	13000	18200
7439-92-1	LEAD	63	mg/kg	1500 J	595 J	292 J	63.9 J	737 J	494 J
7439-95-4	MAGNESIUM	NS	mg/kg	3800	721	374	8700	1200	2300
7439-96-5	MANGANESE	1600	mg/kg	331	1300	113	808	49.9	128
7439-97-6	MERCURY	0.18	mg/kg	3.85	0.879	3.11	0.461	0.199	0.319
7440-02-0	NICKEL	30	mg/kg	35.7 J	12.4 J	21.6 J	37.2 J	11.2 J	18.5 J
7440-09-7	POTASSIUM	NS	mg/kg	476 J	597 J	597 J	4100 J	584 J	1200 J
7782-49-2	SELENIUM	3.9	mg/kg	3.95	1.24 J	3.67	2.49	1.95	1.94
7440-22-4	SILVER	2	mg/kg	4.94	5.72	2.97	2.81	0.862	1.31
7440-23-5	SODIUM	NS	mg/kg	658	1500	430	3400	299	1600
7440-28-0	THALLIUM	NS	mg/kg	ND	1.07 J	ND	ND	ND	ND
7440-62-2	VANADIUM	NS	mg/kg	23.4	36.3	19.5	58.1	24.5	29
7440-66-6	ZINC	109	mg/kg	1100	781	495	219	72	259
57-12-5	CYANIDE	27	mg/kg	2.94	9.8	34.9	1.84	0.79	4.13

Notes:
(1) 6NYCRR Part 375 Environmental Remediation Programs (December 14, 2006)
(2) NS indicates no cleanup objective or background level is available.
(3) ND indicates compound was not detected.
(4) J indicates an estimated concentration.
(5) Shaded values exceed 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives.
(6) NA indicates compound was not analyzed.
(7) R indicates rejected value

Table 2
Summary of Soil Analytical Results
Hunts Point Halleck Street Sidewalk Area - Alternatives Analysis Report
Consolidated Edison Company of New York

Con Ed - Halleck Street Validated Soil Analytical Data Detected Compound Summary		Unrestricted Use Soil Cleanup Objectives	Location ID: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled: Validated:	SB-6 SB-6(8-10)-20131031 E4277-12 8 - 10 ft CTECH E4277 SOIL 10/31/2013 10:20 2/4/2014	SB-6 SB-6(10-15)-20131031 E4277-15 10 - 15 ft CTECH E4277 SOIL 10/31/2013 10:30 2/4/2014	SB-7 SB-7(8-10)-20131031 E4277-10 8 - 10 ft CTECH E4277 SOIL 10/31/2013 8:35 2/4/2014	Dup of SB-7(8-10)-20131031 SB-7 SB-17(8-10)-20131031 E4277-16 8 - 10 ft CTECH E4277 SOIL 10/31/2013 8:45 2/4/2014	SB-7 SB-7(16-18)-20131031 E4277-11 16 - 18 ft CTECH E4277 SOIL 10/31/2013 10:20 2/4/2014	SB-8 SB-8(15-16)-20131030 E4277-07 15 - 16 ft CTECH E4277 SOIL 10/30/2013 14:55 2/4/2014	SB-8 SB-8(17-19)-20131030 E4277-08 17 - 19 ft CTECH E4277 SOIL 10/30/2013 14:55 2/4/2014
CAS NO.	COMPOUND		UNITS:							
	VOLATILES									
67-64-1	ACETONE	0.05	mg/kg	ND	0.0637	0.0337	0.0616	0.0391 J	0.0525	ND
75-15-0	CARBON DISULFIDE	NS	mg/kg	ND	ND	ND	ND	0.0019 J	0.0023 J	0.003 J
98-82-8	ISOPROPYLBENZENE (CUMENE)	NS	mg/kg	ND	ND	ND	ND	ND	0.0025 J	ND
108-10-1	METHYL ISOBUTYL KETONE	NS	mg/kg	ND	ND	ND	ND	ND	0.0061 J	ND
108-87-2	METHYLCYCLOHEXANE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
75-09-2	METHYLENE CHLORIDE	0.05	mg/kg	0.0078 J	ND	0.0044 J	ND	0.006 J	0.0025 J	0.0022 J
100-42-5	STYRENE	NS	mg/kg	ND	ND	ND	ND	ND	0.0037 J	ND
1634-04-4	TERT-BUTYL METHYL ETHER	0.93	mg/kg	ND	ND	ND	ND	ND	ND	ND
87-61-6	1,2,3-TRICHLOROBENZENE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
120-82-1	1,2,4-TRICHLOROBENZENE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
106-46-7	1,4-DICHLOROBENZENE	1.8	mg/kg	ND	ND	ND	ND	ND	ND	ND
	BTEX									
71-43-2	BENZENE	0.06	mg/kg	ND	ND	ND	ND	ND	0.0137	ND
100-41-4	ETHYLBENZENE	1	mg/kg	ND	ND	ND	ND	ND	0.0045 J	ND
108-88-3	TOLUENE	0.7	mg/kg	ND	ND	ND	ND	ND	0.0093	ND
XYLMP	M,P-XYLENE (SUM OF ISOMERS)	0.26	mg/kg	ND	ND	ND	ND	ND	0.0266	ND
95-47-6	O-XYLENE (1,2-DIMETHYLBENZENE)	0.26	mg/kg	ND	ND	ND	ND	ND	0.013	ND
	SEMIVOLATILES									
100-52-7	BENZALDEHYDE	NS	mg/kg	R	R	R	R	R	R	R
85-68-7	BENZYL BUTYL PHTHALATE	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
92-52-4	BIPHENYL (DIPHENYL)	NS	mg/kg	ND	ND	ND	ND	ND	0.63	ND
117-81-7	BIS(2-ETHYLHEXYL) PHTHALATE	NS	mg/kg	ND	ND	ND	0.11 J	ND	ND	ND
86-74-8	CARBAZOLE	NS	mg/kg	ND	0.12 J	0.0801 J	0.13 J	ND	0.97 J	ND
132-64-9	DIBENZOFURAN	NS	mg/kg	ND	0.15 J	ND	0.0847 J	ND	1.4	ND
84-66-2	DIETHYL PHTHALATE	NS	mg/kg	ND	0.15 J	ND	ND	ND	ND	ND
131-11-3	DIMETHYL PHTHALATE	NS	mg/kg	0.45	0.68	0.24 J	0.61 J	0.43 J	0.72	0.61
105-67-9	2,4-DIMETHYLPHENOL	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
95-48-7	2-METHYLPHENOL (O-CRESOL)	0.33	mg/kg	ND	ND	ND	ND	ND	ND	ND
MEPH3MEPH4	3- AND 4- METHYLPHENOL (TOTAL)	0.33	mg/kg	ND	ND	ND	ND	0.22 J	0.14 J	ND
108-95-2	PHENOL	0.33	mg/kg	ND	ND	ND	ND	ND	0.14 J	ND
	PAHs									
83-32-9	ACENAPHTHENE	20	mg/kg	ND	ND	ND	ND	ND	0.7	ND
208-96-8	ACENAPHTHYLENE	100	mg/kg	0.34 J	0.5	0.23 J	0.32 J	ND	2.5	ND
120-12-7	ANTHRACENE	100	mg/kg	0.32 J	0.67	0.33 J	0.58 J	0.2 J	3.9	ND
56-55-3	BENZO(A)ANTHRACENE	1	mg/kg	0.75	1.7	1.2	1.7	0.99	4.9	ND
50-32-8	BENZO(A)PYRENE	1	mg/kg	0.73	1.5	1.2	1.9	0.89	3.1	ND
205-99-2	BENZO(B)FLUORANTHENE	1	mg/kg	0.79	1.8	1.5	2	1.1	2.7 J	ND
191-24-2	BENZO(G,H,I)PERYLENE	100	mg/kg	0.55	0.9	0.89 J	1.6 J	0.53	1.9 J	ND
207-08-9	BENZO(K)FLUORANTHENE	0.8	mg/kg	0.38 J	0.5	0.36 J	0.9 J	0.39 J	1.9	ND
218-01-9	CHRYSENE	1	mg/kg	0.71	1.3	1.2	1.5	0.89	2.7	ND
53-70-3	DIBENZ(A,H)ANTHRACENE	0.33	mg/kg	0.12 J	0.24 J	0.21 J	0.25 J	0.14 J	0.76	ND
206-44-0	FLUORANTHENE	100	mg/kg	1.4	2.8	1.7	2.7	1.3	9.2	ND
86-73-7	FLUORENE	30	mg/kg	0.25 J	0.36 J	0.15 J	0.25 J	ND	3.2	ND
193-39-5	INDENO(1,2,3-C,D)PYRENE	0.5	mg/kg	0.45	0.79	0.83	1.3	0.49	1.6	ND
91-57-6	2-METHYLNAPHTHALENE	NS	mg/kg	0.17 J	0.13 J	0.0869 J	0.15 J	ND	1.9	ND
91-20-3	NAPHTHALENE	12	mg/kg	0.18 J	0.3 J	0.13 J	0.27 J	ND	6.5	ND
85-01-8	PHENANTHRENE	100	mg/kg	1.2	2.2	1	1.7	0.51	15	ND
129-00-0	PYRENE	100	mg/kg	1.5	2.6	1.8	2.8	1.4	9.7	ND

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CAS NO.	COMPOUND		UNITS:							
	INORGANICS									
7429-90-5	ALUMINUM	NS	mg/kg	7300	6000	6800	7500	2400	4100	2000
7440-36-0	ANTIMONY	NS	mg/kg	1.36 J	0.971 J	0.76 J	1.11 J	3.91 J	4.33 J	3.23 J
7440-38-2	ARSENIC	13	mg/kg	15.9	14.3	4.36	5.98	12.8	13.4	5.75
7440-39-3	BARIUM	350	mg/kg	203	420	195	201	240	275	157
7440-41-7	BERYLLIUM	7.2	mg/kg	0.34	0.29 J	0.317	0.36	0.097 J	0.226 J	0.183 J
7440-43-9	CADMIUM	2.5	mg/kg	0.404	4.22	2.36	2.58	5.08	1.42	ND
7440-70-2	CALCIUM	NS	mg/kg	15000	5100	6400	9800	14200	6500	18900
7440-47-3	CHROMIUM, TOTAL	NS	mg/kg	62.1	79.2	20.6	21.9	17	20.5	19.1
7440-48-4	COBALT	NS	mg/kg	7.31	8.37	9.55	10.81	6.35	7.93	7.17
7440-50-8	COPPER	50	mg/kg	79.6	310	120	126	414	390	63.6
7439-89-6	IRON	NS	mg/kg	34300	58900	22400	28900	52900	24000	21000
7439-92-1	LEAD	63	mg/kg	227 J	870 J	301 J	283 J	719 J	884 J	261 J
7439-95-4	MAGNESIUM	NS	mg/kg	3200	1800	2800	5100	1400	2500	3900
7439-96-5	MANGANESE	1600	mg/kg	165	134	237	342	336	200	185
7439-97-6	MERCURY	0.18	mg/kg	0.39	1.46	0.361	0.454	1.12	2.18	0.131
7440-02-0	NICKEL	30	mg/kg	55.1 J	59.4 J	29.4 J	37.5 J	212 J	96.2 J	20.1 J
7440-09-7	POTASSIUM	NS	mg/kg	1100 J	1600 J	2300 J	2400 J	419 J	799 J	410 J
7782-49-2	SELENIUM	3.9	mg/kg	2.5	2.25	1.1	0.856 J	2.62	2.35	1.66
7440-22-4	SILVER	2	mg/kg	2.41	2.36	0.661	0.99	1.86	2.08	1.58
7440-23-5	SODIUM	NS	mg/kg	1300	371	242	245	684	387	460
7440-28-0	THALLIUM	NS	mg/kg	ND	ND	ND	ND	ND	ND	ND
7440-62-2	VANADIUM	NS	mg/kg	41.2	43.4	41.8	50.9	20.8	24.1	23.1
7440-66-6	ZINC	109	mg/kg	336	528	315	372	719	3200	197
57-12-5	CYANIDE	27	mg/kg	7.32	5.4	ND	1.3 J	1.78	2	0.109 J

Notes:
(1) 6NYCRR Part 375 Environmental Remediation Programs (December 14, 2006)
(2) NS indicates no cleanup objective or background level is available.
(3) ND indicates compound was not detected.
(4) J indicates an estimated concentration.
(5) Shaded values exceed 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives.
(6) NA indicates compound was not analyzed.
(7) R indicates rejected value

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Con Ed - Halleck Street Validated Soil Analytical Data Detected Compound Summary		Unrestricted Use Soil Cleanup Objectives	Location ID: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled: Validated:	SB-9 SB-9(5-10)-20131030 E4277-05 5 - 10 ft CTECH E4277 SOIL 10/30/2013 13:30 2/4/2014	SB-9 SB-9(10-15)-20131030 E4277-06 10 - 15 ft CTECH E4277 SOIL 10/30/2013 13:40 2/4/2014	SB-10 SB-10(5-10)-20131030 E4277-03 5 - 10 ft CTECH E4277 SOIL 10/30/2013 11:20 2/4/2014	SB-10 SB-10(10-12)-20131030 E4277-04 10 - 12 ft CTECH E4277 SOIL 10/30/2013 11:30 2/4/2014	SB-11 SB-11(5-10)-20131030 E4277-01 5 - 10 ft CTECH E4277 SOIL 10/30/2013 9:45 2/4/2014	SB-11 SB-11(15-20)-20131030 E4277-02 15 - 20 ft CTECH E4277 SOIL 10/30/2013 10:05 2/4/2014
CAS NO.	COMPOUND		UNITS:						
	VOLATILES								
67-64-1	ACETONE	0.05	mg/kg	0.0236 J	0.0814	0.0476	0.018 J	0.0295 J	0.0362 J
75-15-0	CARBON DISULFIDE	NS	mg/kg	0.0035 J	0.0017 J	0.002 J	0.0026 J	ND	0.0036 J
98-82-8	ISOPROPYLBENZENE (CUMENE)	NS	mg/kg	ND	ND	ND	ND	ND	ND
108-10-1	METHYL ISOBUTYL KETONE	NS	mg/kg	0.0054 J	ND	ND	ND	ND	ND
108-87-2	METHYLCYCLOHEXANE	NS	mg/kg	0.0014 J	ND	ND	ND	ND	ND
75-09-2	METHYLENE CHLORIDE	0.05	mg/kg	0.0035 J	0.0028 J	0.0048 J	0.005 J	0.0042 J	0.0056 J
100-42-5	STYRENE	NS	mg/kg	0.0094	ND	ND	ND	ND	ND
1634-04-4	TERT-BUTYL METHYL ETHER	0.93	mg/kg	ND	ND	ND	ND	ND	ND
87-61-6	1,2,3-TRICHLOROBENZENE	NS	mg/kg	ND	ND	ND	ND	ND	ND
120-82-1	1,2,4-TRICHLOROBENZENE	NS	mg/kg	ND	ND	ND	ND	ND	ND
106-46-7	1,4-DICHLOROBENZENE	1.8	mg/kg	ND	ND	ND	ND	ND	ND
	BTEX								
71-43-2	BENZENE	0.06	mg/kg	0.0097	ND	ND	ND	ND	ND
100-41-4	ETHYLBENZENE	1	mg/kg	0.004 J	ND	ND	ND	ND	ND
108-88-3	TOLUENE	0.7	mg/kg	0.0213	ND	ND	ND	ND	ND
XYLMP	M,P-XYLENE (SUM OF ISOMERS)	0.26	mg/kg	0.0768	ND	ND	ND	ND	ND
95-47-6	O-XYLENE (1,2-DIMETHYLBENZENE)	0.26	mg/kg	0.0367	ND	ND	ND	ND	ND
	SEMIVOLATILES								
100-52-7	BENZALDEHYDE	NS	mg/kg	R	R	0.0993 J	R	R	R
85-68-7	BENZYL BUTYL PHTHALATE	NS	mg/kg	ND	ND	ND	ND	ND	ND
92-52-4	BIPHENYL (DIPHENYL)	NS	mg/kg	0.4	ND	ND	ND	ND	ND
117-81-7	BIS(2-ETHYLHEXYL) PHTHALATE	NS	mg/kg	ND	ND	ND	ND	0.0886 J	ND
86-74-8	CARBAZOLE	NS	mg/kg	4.1 J	0.11 J	ND	0.13 J	ND	ND
132-64-9	DIBENZOFURAN	NS	mg/kg	2.2	ND	ND	0.13 J	ND	ND
84-66-2	DIETHYL PHTHALATE	NS	mg/kg	ND	ND	ND	ND	ND	ND
131-11-3	DIMETHYL PHTHALATE	NS	mg/kg	0.41	0.59	0.59	0.54	0.65	0.72
105-67-9	2,4-DIMETHYLPHENOL	NS	mg/kg	0.11 J	ND	ND	ND	ND	ND
95-48-7	2-METHYLPHENOL (O-CRESOL)	0.33	mg/kg	0.12 J	ND	ND	ND	ND	ND
MEPH3MEPH4	3- AND 4- METHYLPHENOL (TOTAL)	0.33	mg/kg	0.33 J	ND	ND	ND	ND	ND
108-95-2	PHENOL	0.33	mg/kg	0.24 J	ND	ND	ND	ND	ND
	PAHs								
83-32-9	ACENAPHTHENE	20	mg/kg	0.47	ND	ND	0.21 J	ND	ND
208-96-8	ACENAPHTHYLENE	100	mg/kg	3.6	0.24 J	0.17 J	0.0942 J	ND	ND
120-12-7	ANTHRACENE	100	mg/kg	13.5	0.48	0.16 J	0.92	0.14 J	0.12 J
56-55-3	BENZO(A)ANTHRACENE	1	mg/kg	22	0.95	0.38 J	1.4	0.72	0.24 J
50-32-8	BENZO(A)PYRENE	1	mg/kg	12.3	0.77	0.31 J	0.92	0.66	0.19 J
205-99-2	BENZO(B)FLUORANTHENE	1	mg/kg	15.3 J	0.86 J	0.31 J	1.1 J	0.76 J	0.18 J
191-24-2	BENZO(G,H,I)PERYLENE	100	mg/kg	6.8 J	0.76 J	0.21 J	0.5 J	0.48 J	0.12 J
207-08-9	BENZO(K)FLUORANTHENE	0.8	mg/kg	4.9	0.29 J	0.18 J	0.5	0.3 J	ND
218-01-9	CHRYSENE	1	mg/kg	12.9	0.75	0.36 J	1.1	0.5	0.17 J
53-70-3	DIBENZ(A,H)ANTHRACENE	0.33	mg/kg	3	0.19 J	ND	0.24 J	0.19 J	ND
206-44-0	FLUORANTHENE	100	mg/kg	46.7	1.7	0.57	2.6	0.82	0.37 J
86-73-7	FLUORENE	30	mg/kg	5.2	0.23 J	ND	0.31 J	ND	ND
193-39-5	INDENO(1,2,3-C,D)PYRENE	0.5	mg/kg	7.3	0.55	0.18 J	0.49	0.42	0.0999 J
91-57-6	2-METHYLNAPHTHALENE	NS	mg/kg	1.3	ND	0.12 J	ND	ND	ND
91-20-3	NAPHTHALENE	12	mg/kg	2.3	0.2 J	0.15 J	ND	ND	ND
85-01-8	PHENANTHRENE	100	mg/kg	39	1.2	0.47	2.1	0.41	0.38 J
129-00-0	PYRENE	100	mg/kg	33.2	1.7	0.65	2.2	0.83	0.42 J

Table 2
Summary of Soil Analytical Results
Hunts Point Halleck Street Sidewalk Area - Alternatives Analysis Report
Consolidated Edison Company of New York

Con Ed - Halleck Street Validated Soil Analytical Data Detected Compound Summary		Unrestricted Use Soil Cleanup Objectives	Location ID:	SB-9	SB-9	SB-10	SB-10	SB-11	SB-11
			Sample ID:	SB-9(5-10)-20131030	SB-9(10-15)-20131030	SB-10(5-10)-20131030	SB-10(10-12)-20131030	SB-11(5-10)-20131030	SB-11(15-20)-20131030
			Lab Sample Id:	E4277-05	E4277-06	E4277-03	E4277-04	E4277-01	E4277-02
			Depth:	5 - 10 ft	10 - 15 ft	5 - 10 ft	10 - 12 ft	5 - 10 ft	15 - 20 ft
			Source:	CTECH	CTECH	CTECH	CTECH	CTECH	CTECH
			SDG:	E4277	E4277	E4277	E4277	E4277	E4277
			Matrix:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampled:	10/30/2013 13:30	10/30/2013 13:40	10/30/2013 11:20	10/30/2013 11:30	10/30/2013 9:45	10/30/2013 10:05
			Validated:	2/4/2014	2/4/2014	2/4/2014	2/4/2014	2/4/2014	2/4/2014
CAS NO.	COMPOUND		UNITS:						
	INORGANICS								
7429-90-5	ALUMINUM	NS	mg/kg	7600	5200	5400	7800	4300	9600
7440-36-0	ANTIMONY	NS	mg/kg	1.19 J	1.15 J	0.996 J	0.732 J	1.5 J	2.26 J
7440-38-2	ARSENIC	13	mg/kg	7.18	6.71	7.74	4.85	5.77	20.8
7440-39-3	BARIUM	350	mg/kg	136	99.1	137	135	237	207
7440-41-7	BERYLLIUM	7.2	mg/kg	0.296 J	0.323	0.308 J	0.25 J	0.348	0.271 J
7440-43-9	CADMIUM	2.5	mg/kg	0.405	0.862	ND	0.14 J	ND	0.839
7440-70-2	CALCIUM	NS	mg/kg	21500	49900	5000	22900	4300	7300
7440-47-3	CHROMIUM, TOTAL	NS	mg/kg	21.9	17.2	13.1	19.3	12.6	34
7440-48-4	COBALT	NS	mg/kg	20.9	9.24	5.8	9.87	11.7	13.9
7440-50-8	COPPER	50	mg/kg	72	70.3	84.1	56.3	346	130
7439-89-6	IRON	NS	mg/kg	32600	17000	17700	22200	22300	77700
7439-92-1	LEAD	63	mg/kg	232 J	161 J	231 J	173 J	884 J	338 J
7439-95-4	MAGNESIUM	NS	mg/kg	7600	18200	2500	7600	1300	4700
7439-96-5	MANGANESE	1600	mg/kg	237	176	483	229	128	564
7439-97-6	MERCURY	0.18	mg/kg	0.826	0.573	0.373	0.303	0.709	2.67
7440-02-0	NICKEL	30	mg/kg	43.2 J	32.3 J	18.6 J	26.5 J	14.5 J	33.2 J
7440-09-7	POTASSIUM	NS	mg/kg	2200 J	912 J	801 J	1800 J	871 J	2300 J
7782-49-2	SELENIUM	3.9	mg/kg	2.53	1.27	2.09	1.2	1.97	3.85
7440-22-4	SILVER	2	mg/kg	1.87	1.41	1.3	1.34	1.64	5.38
7440-23-5	SODIUM	NS	mg/kg	279	258	481	623	508	2300
7440-28-0	THALLIUM	NS	mg/kg	ND	ND	ND	ND	ND	ND
7440-62-2	VANADIUM	NS	mg/kg	88	25.6	32.5	34.8	19.4	41
7440-66-6	ZINC	109	mg/kg	210	246	233	151	112	288
57-12-5	CYANIDE	27	mg/kg	5.36	0.104 J	0.609	0.522	8.79	9.13

Notes:
(1) 6NYCRR Part 375 Environmental Remediation Programs (December 14, 2006)
(2) NS indicates no cleanup objective or background level is available.
(3) ND indicates compound was not detected.
(4) J indicates an estimated concentration.
(5) Shaded values exceed 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives.
(6) NA indicates compound was not analyzed.
(7) R indicates rejected value

Table 3
Summary of Groundwater Analytical Results
Hunts Point Halleck Street Sidewalk Area - Alternatives Analysis Report
Consolidated Edison Company of New York

Con Ed - Halleck Street Validated Groundwater Analytical Data Detected Compound Summary		NYSDEC Ambient Water Quality Standards/Guidance Criteria	Location ID: Sample ID: Lab Sample Id: Depth: Source: SDG: Matrix: Sampled: Validated:	MW-1 MW-1-20131127 E4638-06 - CTECH E4638 WATER 11/27/2013 12:20 2/4/2014	MW-2 MW-2-20131127 E4638-05 - CTECH E4638 WATER 11/27/2013 10:50 2/4/2014	MW-3 MW-3-20131127 E4638-01 - CTECH E4638 WATER 11/27/2013 8:45 2/4/2014	Dup of MW-3-20131127 MW-3 MW-3A-20131127 E4638-04 - CTECH E4638 WATER 11/27/2013 9:10 2/4/2014
CAS NO.	COMPOUND		UNITS:				
	VOLATILES						
1634-04-4	TERT-BUTYL METHYL ETHER	10 (G)	ug/l	ND	6.8	ND	0.56 J
	SEMIVOLATILES						
131-11-3	DIMETHYL PHTHALATE	50 (G)	ug/l	ND	ND	ND	8.6 J
	INORGANICS						
7429-90-5	ALUMINUM	NS	ug/l	920	252	48.2 J	53.6
7440-38-2	ARSENIC	25	ug/l	ND	8.81 J	ND	ND
7440-39-3	BARIUM	1000	ug/l	319	84.3	1400	1400
7440-43-9	CADMIUM	5	ug/l	0.833 J	ND	ND	ND
7440-70-2	CALCIUM	NS	ug/l	148200	142000	175900	170000
7440-47-3	CHROMIUM, TOTAL	50	ug/l	34.8	1.97 J	ND	5.67 J
7439-89-6	IRON	300	ug/l	50500	28100	33500	31300
7439-92-1	LEAD	25	ug/l	3.31 J	25.3	6.64	6.74
7439-95-4	MAGNESIUM	35000 (G)	ug/l	34600	18400	58900	59400
7439-96-5	MANGANESE	300	ug/l	2900	472	719	698
7440-02-0	NICKEL	100	ug/l	13.4 J	ND	ND	ND
7440-09-7	POTASSIUM	NS	ug/l	24100	18500	41000	40000
7782-49-2	SELENIUM	10	ug/l	5.78 J	ND	ND	ND
7440-23-5	SODIUM	20000	ug/l	610600	186000	635100	628900
7440-28-0	THALLIUM	0.5 (G)	ug/l	3.56 J	ND	ND	ND
7440-66-6	ZINC	2000 (G)	ug/l	11.2 J	12.3 J	ND	ND
57-12-5	CYANIDE	200	ug/l	12	28	687	681

Notes:

	Indicates concentration exceeds standard or guidance value.
(G)	Indicates guidance value.
NS	No standard or guidance value available.
ND	Indicates compound was not detected.
J	Indicates an estimated concentration.
ug/L	Micrograms per liter

Table 4
Preliminary Screening of Alternatives
Hunts Point Halleck Street Sidewalk Area - Alternatives Analysis Report
Consolidated Edison Company of New York

Remedial Alternative	Technology	Process	Applicability
No Action		Does not include any remedial activities or institutional controls	***Retained***
Limited Action	Institutional Controls	Site Management Plan	***Retained***
	Engineering Controls	Maintenance and monitoring of cover systems (i.e., asphalt in parking areas, concrete under the building structure, and fill meeting CSCOs/top soil in landscaped areas)	***Retained***
Containment	Barrier Wall	Lateral containment of the MGP impacts migrating off-site.	***Not Retained***
Removal	Excavation and Off-Site Disposal and Treatment	Removal of MGP-impacted soil material for off-site disposal and treatment.	***Retained***
	Free Product Recovery	Removal of DNAPL from MGP-impacted soil via pumping from recovery wells	***Retained***
In-Situ Physical/Chemical Treatment	*In Situ* Stabilization/Solidification (ISS) via augers or excavator	Mixing contaminated soils with cementitious grout rendering contaminant constituents immoble due to the reduction in hydraulic conductivity.	***Retained***
	In Situ Stabilization/Solidification (ISS) - via jet grouting	Mixing contaminated soils with cementitious grout rendering contaminant constituents immoble due to the reduction in hydraulic conductivity.	***Not Retained***
	In situ Thermal Treatment (TSTD/ISTT)	Electro resistant heating for removal of MGP impacts	***Not Retained***
	In Situ Chemical Oxidation (ISCO)	Injection of strong oxidants at high concentrations to destroy organic contaminants.	***Not Retained***
	Surfactant Aided ISCO	Injection of surfactants to loosen the bonds of hydrocarbons and reduce the contaminant mass.	***Not Retained***
	Enhanced Bioremediation (EB)	Nitrate, oxygen release compound or percarbonate is injected to enhance the microbial activity. If necessary, nutrients will be injected as needed.	***Not Retained***

"Retained" indicates that the technology is technically capable of meeting the Remedial Action Objectives by itself or in combination with other technologies.

Table 5
Summary of Soil Remedial Alternatives Retained for Detailed Analysis
Halleck Street Sidewalk Area - Alternatives Analysis Report
Consolidated Edison Company of New York

Soil Remedial Alternatives		Evaluation Criteria			
		Implementability	Effectiveness	Short-Term Impacts	Relative Cost
Remedial Action Objectives (RAOs): 1. *Prevent ingestion/direct contact with contaminated soil.* [(1)]					
Alternative 1	**No Action** No remedial activities would be completed under this alternative to address MGP-related impacts at the Site. The "No Action" alternative serves as a baseline for comparison of the overall effectiveness of other remedial alternatives.	Implementable This alternative does not require implementation of any remedial activities, therefore; the alternative is technically and administratively implementable.	Not effective This alternative does not address toxicity, mobility, or volume of MGP-related impacts to Site soils, and would not meet the RAOs established for the Site.	None Since no remedial action would be implemented under this alternative, there would be no short-term potential adverse impacts or risks posed to the property owners or the surrounding community.	Low
Alternative 2	**Institutional Controls (ICs)/Engineering Controls (ECs)** This alternative would utilize the existing cover system at the Site and include land use restrictions through an environmental easement, enforcement and permit controls, annual monitoring of Site conditions, and informational devices. ICs/ECs would be summarized in a Site Management Plan and would be utilized to limit permissible site uses, specify monitoring requirements, and to establish health and safety requirements to be followed during subsurface activities that could result in worker exposure to MGP-impacted materials.	Implementable Requires development of a Site Management Plan, negotiation with the City of New York, and the implementation of an inspection program.	Effective Implementation of this alternative would achieve the Site RAO.	Limited Requires property owners' adherence to ICs and land use agreements.	Low
Alternative 3	**Remediation of Source Material in the Vicinity of Soil Boring SB-4** Comparison of the following remedial alternatives: 3A: In-Situ Stabilization and Solidification (ISS) of Source Material in the Vicinity of SB-4 3B: Excavation of Source Material in the Vicinity of SB-4	See Alternatives 3A and 3B for specific implementability.	Both alternatives, combined with ECs and ICs, would achieve the Site RAO.	Yes. See Alternatives 3A and 3B for specific short-term adverse impacts.	3A: High 3B: High

Table 5
Summary of Soil Remedial Alternatives Retained for Detailed Analysis
Halleck Street Sidewalk Area - Alternatives Analysis Report
Consolidated Edison Company of New York

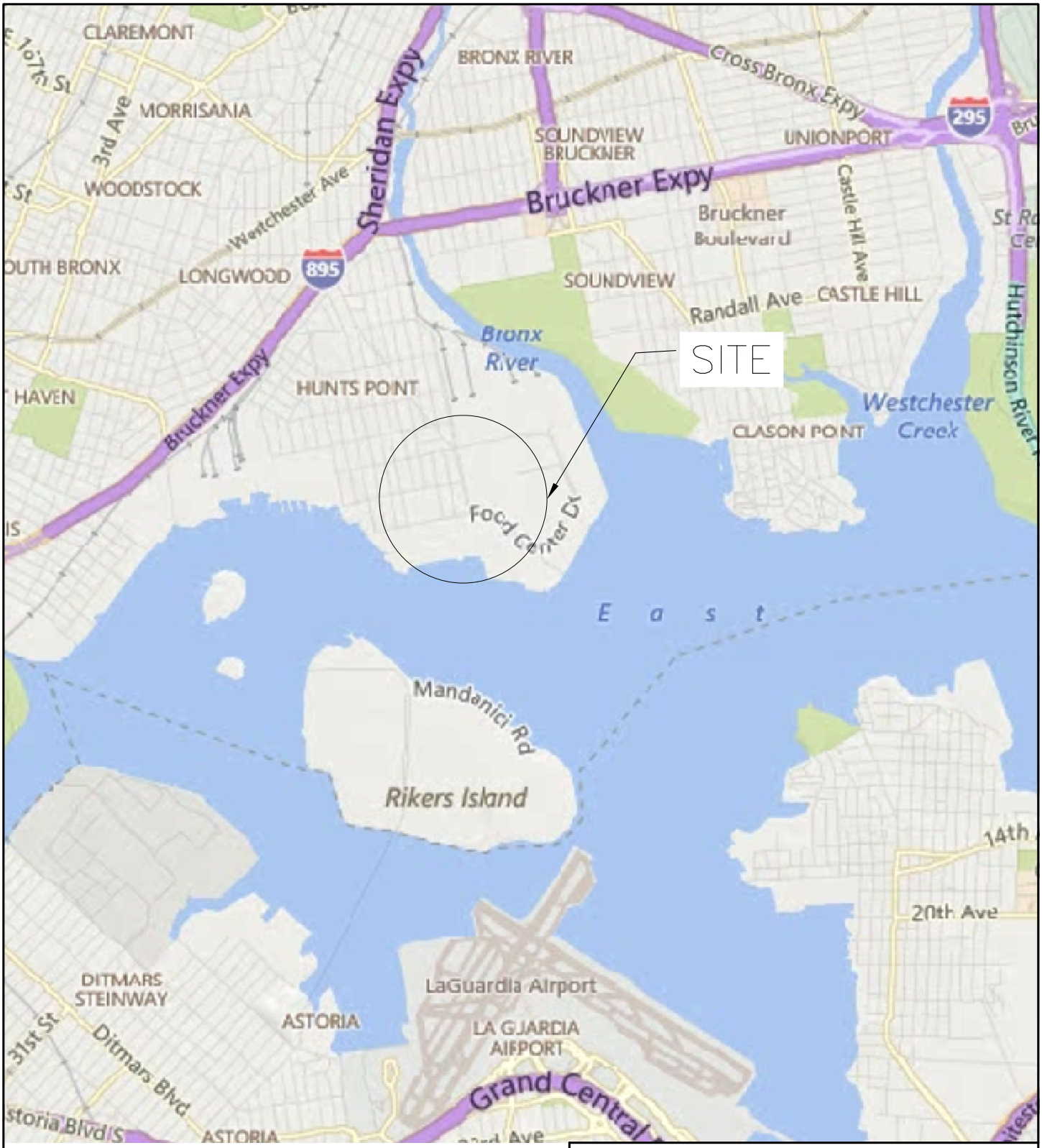
Soil Remedial Alternatives		Evaluation Criteria			
		Implementability	Effectiveness	Short-Term Impacts	Relative Cost
Alternative 3A	**ISS of Source Material in the Vicinity of Soil Boring SB-4 and ICs/ECs** This alternative would consist of auger or bucket mixing methods to solidfy source material observed at 11 to 19 feet below ground surface (bgs) in the vicinity of SB-4. Following completion of ISS activities, ICs/ECs would be implemented per Alternative 2. This remedial alternative would include: ▪ Mobilization of ISS equipment to the Site; ▪ Relocation of utilities within the treatment area (if any); ▪ Removal of shallow soils and obstructions within the treatment area; ▪ ISS via auger or bucket mixing; ▪ Installation of demarcation layer, backfill with clean fill material and Site restoration; and ▪ Implementation of ICs/ECs per Alternative 2.	Not Readily Implementable ▪ Would require approval from the City of New York to open the road, as well as re-route vehicular and pedestrian traffic on Halleck Street; ▪ Would require a Pre-Design Investigation (PDI) to gather geotechnical information and further delineate the source material in the vicinity of SB-4; ▪ Would require a Treatability Study to determine viable reagent mixtures and assess reagent reaction with the characteristics of subsurface soils; ▪ Would require a subsurface utility inventory to determine utilities in the area; ▪ The presence of non-uniform subsurface material (fill) may prevent sufficient advancement of ISS equipment (auger or bucket based); and ▪ The presence of subsurface utilities and non-uniform subsurface materials (fill) may prevent reagents from reaching targeted areas when utilizing certain methods (e.g., jet grouting) due to the presence of preferential pathways.	Effective This alternative would reduce the volume of source material within the vincinty of SB-4. When combined with Alternative 2, the Site RAO would be achieved.	Yes ▪ Closures and/or modifications to streets and sidewalks areas along Halleck Street; ▪ Increased truck traffic along Halleck Street; ▪ Increased noise due to operation of heavy equipment; ▪ Potential for adverse impacts to adjacent utilities due to injected reagents; and ▪ Potential for off-site migration of injected reagents.	HIgh
Alternative 3B	**Excavation of Source Material in the Vicinity of SB-4** This remedial alternative would include: ▪ Installation of a shoring system to support targeted excavation activities to depths of approximately 19 feet bgs; ▪ Removal of source material to a depth of approximately 19 feet bgs within the vicinity of SB-4; ▪ Backfilling of the excavation area with certified clean material and Site restoration; ▪ Implementation of ICs/ECs per Alternative 2.	Not Readily Implementable ▪ Would require approval from the City of New York to open the road, as well as re-route vehicular and pedestrian traffic on Halleck Street; ▪ Would require a (PDI) to gather geotechnical information and further delineate the source material in the vicinity of SB-4; ▪ Would require a subsurface utility inventory to determine utilities in the area and their ability to be supported during the excavation, or permanently/temporarily re-routed; ▪ Since the water table is shallower than 19 feet bgs, a de-watering design would be necessary to de-water, treat, and discharge groundwater during the excavation; and ▪ Would require all necessary permits for discharge of treated water to storm sewer and/or sanitary sewers.	Effective This alternative would reduce the volume of source material within the vincinty of SB-4. When combined with Alternative 2, the Site RAO would be achieved.	Yes ▪ Closures and/or modifications to streets and sidewalk areas along Halleck Street; ▪ Increased truck traffic along Halleck Street; ▪ Potential interruption of utility services in the vicinity of the excavation area during utility relocation activities; ▪ Increased noise in vicinity of excavation area due to active construction and water treatment activities; ▪ Potential for adverse impacts to adjacent utilities and roadway due to dewatering of Site soils and vibrations from construction activities; ▪ Potential flooding of storm or sanity sewers if treated groundwater is discharged during periods of elevated flow rates (e.g., storm events); and ▪ Would require a large construction footprint to accomodate de-watering equipment.	High

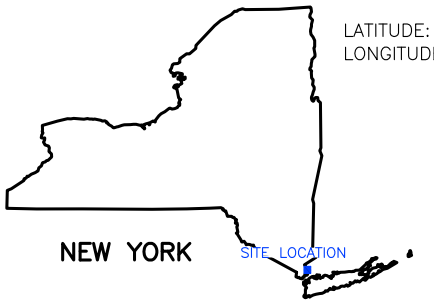
Table 5
Summary of Soil Remedial Alternatives Retained for Detailed Analysis
Halleck Street Sidewalk Area - Alternatives Analysis Report
Consolidated Edison Company of New York

Soil Remedial Alternatives		Evaluation Criteria			
		Implementability	Effectiveness	Short-Term Impacts	Relative Cost
Alternative 4	**Removal of MGP-impacted Site Soils to Below Applicable Soil Guidance Values Throughout the Site** This alternative would include the removal of subsurface soils throughout the Site observed to contain MGP-related impacts in exceedance of applicable soil guidance values for the Site. This remedial alternative would include: ▪ Installation of shoring systems or sloping back excavations to support excavation activities throughout the Site; ▪ Removal of MGP-impacted Site soils at various depths ranging from 5 ft bgs to 19 ft bgs; and ▪ Backfilling of excavation areas with certified clean material and Site restoration.	Not Readily Implementable ▪ An extensive PDI program would be required to further delineate MGP-impacted soils throughout the Site. In addition, the collection of geotechnical information on subsurface soils will be required. ▪ Removal of Site soils from depth would necessitate the extensive closure of street and sidewalk public right-of-ways, and therefore would require approval from the City of New York for the extended closure of portions of Halleck Street. Re-routing of vehicular and pedestrian traffic would be required. ▪ A study on the underground utilities in the vicinity of the excavation areas would need to be completed to determine if adjacent utilities could be supported during excavation activities, or if they would need to be permanently/temporarily re-routed. ▪ The presence of fill materials composed of various debris and gravel/cobbles would limit the options for the installation of excavation support systems (e.g., sheet pile walls). ▪ Since the water table is shallower than 19 feet bgs, a de-watering design would be necessary to de-water, treat, and discharge groundwater during the excavation; and ▪ Would require all necessary permits for discharge of treated water to storm sewer and/or sanitary sewers.	Effective This alternative would reduce the volume of MGP-related impacts observed at the Site, and the Site RAO would be achieved.	Yes ▪ Significant disruption due to closures and/or modifications to streets and sidewalk areas along Halleck Street; ▪ Increased truck traffic along Halleck Street; ▪ Potential interruption of utility services in the vicinity of the excavation area(s) during utility relocation activities; ▪ Increased noise in vicinity of excavation area(s) due to active construction and water treatment activities; ▪ Significant potential for adverse impacts to adjacent utilities and roadways due to dewatering of Site soils and vibrations from construction activities over potentially expansive excavation areas; ▪ Potential flooding of storm or sanity sewers if treated groundwater is discharged during periods of elevated flow rates (e.g., storm events); and ▪ Would require a large construction footprint to accomodate de-watering equipment, which would potentially need to be relocated multiple times.	Significantly High

Notes:
1 - As per the 9/23/14 NYSDEC approval letter of the Halleck Street Sidewalk Area Site Characterization Report, this is the site-specific RAO that has been identified by the NYSDEC.

FIGURES





LATITUDE: N40° 48' 33"
LONGITUDE: W73° 52' 48"

N

3000 1500 0

SCALE: 1"=3000'

FIGURE 1

CONSOLIDATED EDISON
HALLECK STREET AAR
BRONX, NEW YORK

SITE VICINITY MAP

PARSONS
200 COTTONTAIL LANE SOUTH, SOMERSET, N.J. 08873, PHONE: 732-537-3500

FILE NAME: P:\CONED\448468 HALLECK STREET\CAD\FIGURES\448468-SLM.DWG
PLOT DATE: 10/24/2019 1:36 PM PLOTTED BY: RUSSO, JILL

Legend

- Approximate Halleck Street Area Boundary (Hunts Point MGP OU-3)
- Approximate Boundary of Former Gas Works Facility
- Approximate Boundary of Parcels

0 150 300 600 900 1,200 Feet

FIGURE 2

CONSOLIDATED EDISON COMPANY OF NEW YORK
FORMER HUNTS POINT GAS WORKS
HALLECK STREET SIDEWALK AREA
BRONX, NEW YORK

OU-3 SITE LOCATION MAP

PARSONS
200 COTTONTAIL LANE SOUTH, SOMERSET, NJ 08873 PHONE: (732) 537-3500

Path: \\nysyr04fs01\PrjData\GIS\Projects\ConEd\Helleck\Figure SLM.mxd Date: 11/12/2019

LEGEND:

- HALLECK STREET AREA BOUNDARY
- MGP FACILITIES
- SOIL BORING LOCATION
- MONITORING WELL LOCATION

200 100 0 200 400

SCALE: 1"=200'

FIGURE 3

CONSOLIDATED EDISON
HALLECK STREET AAR
BRONX, NEW YORK

SAMPLE LOCATION MAP

PARSONS
200 COTTONTAIL LANE SOUTH, SOMERSET, N.J. 08873, PHONE: 732-537-3500

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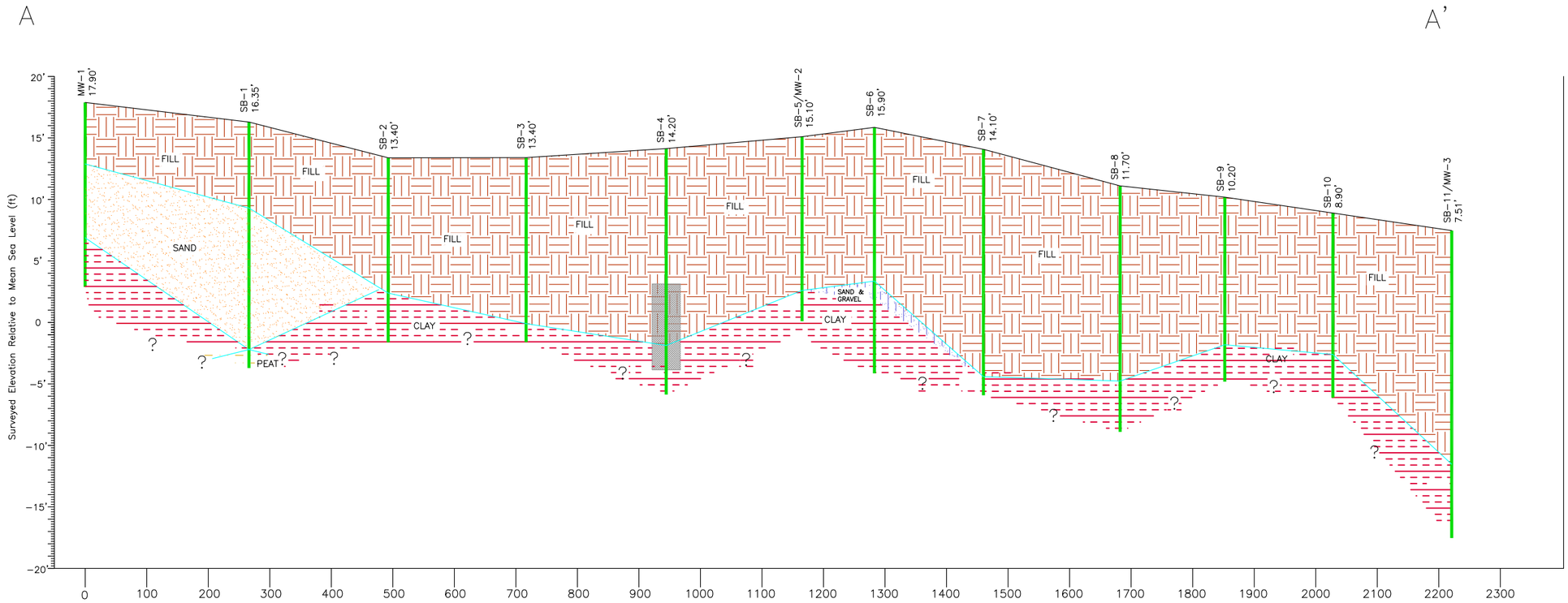

LEGEND:

- FILL
- SAND
- SAND AND GRAVEL
- CLAY
- PEAT
- SOIL BORING
- VISIBLE NAPL

VERTICAL

10 5 0 10 20

SCALE: 1"=10'

HORIZONTAL

200 100 0 200 400

SCALE: 1"=200'

FIGURE 4

CONSOLIDATED EDISON
HALLECK STREET AAR
BRONX, NEW YORK

CROSS SECTION A-A'

PARSONS
200 COTTONTAIL LANE SOUTH, SOMERSET, N.J. 08873, PHONE: 732-537-3500

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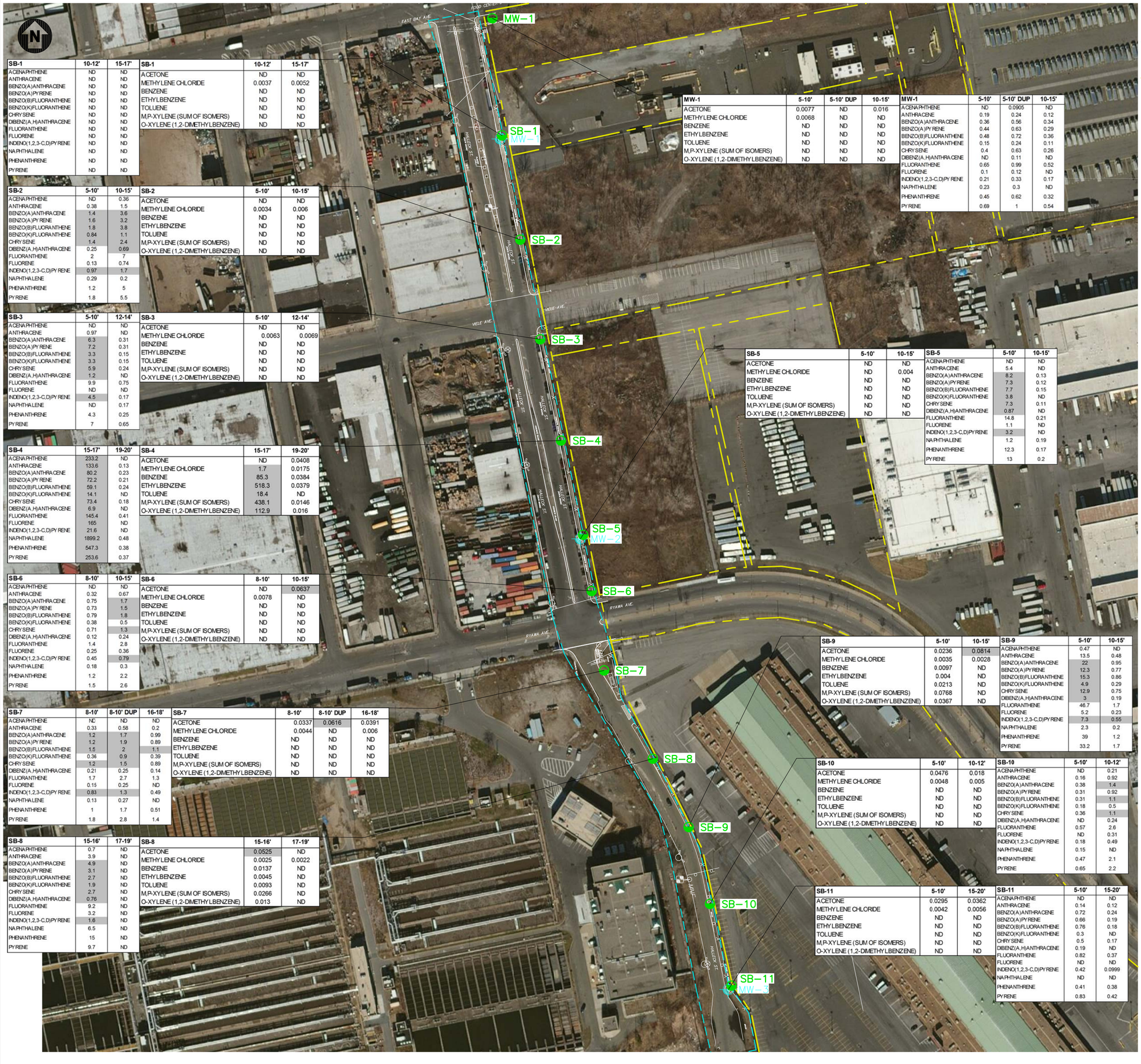

SB-1	10-12'	15-17'
ACENAPHTHENE	ND	ND
ANTHRACENE	ND	ND
BENZO(A)ANTHRACENE	ND	ND
BENZO(A)PYRENE	ND	ND
BENZO(B)FLUORANTHENE	ND	ND
BENZO(K)FLUORANTHENE	ND	ND
CHRYSENE	ND	ND
DIBENZ(A,H)ANTHRACENE	ND	ND
FLUORANTHENE	ND	ND
FLUORENE	ND	ND
INDENO(1,2,3-C,D)PYRENE	ND	ND
NAPHTHALENE	ND	ND
PHENANTHRENE	ND	ND
PYRENE	ND	ND

SB-1	10-12'	15-17'
ACETONE	ND	ND
METHYLENE CHLORIDE	0.0037	0.0052
BENZENE	ND	ND
ETHYLBENZENE	ND	ND
TOLUENE	ND	ND
M,P-XYLENE (SUM OF ISOMERS)	ND	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	ND	ND

SB-2	5-10'	10-15'
ACENAPHTHENE	ND	0.36
ANTHRACENE	0.38	1.5
BENZO(A)ANTHRACENE	1.4	3.6
BENZO(A)PYRENE	1.6	3.2
BENZO(B)FLUORANTHENE	1.8	3.8
BENZO(K)FLUORANTHENE	0.84	1.1
CHRYSENE	1.4	2.4
DIBENZ(A,H)ANTHRACENE	0.25	0.69
FLUORANTHENE	2	7
FLUORENE	0.13	0.74
INDENO(1,2,3-C,D)PYRENE	0.97	1.7
NAPHTHALENE	0.29	0.2
PHENANTHRENE	1.2	5
PYRENE	1.8	5.5

SB-2	5-10'	10-15'
ACETONE	ND	ND
METHYLENE CHLORIDE	0.0034	0.006
BENZENE	ND	ND
ETHYLBENZENE	ND	ND
TOLUENE	ND	ND
M,P-XYLENE (SUM OF ISOMERS)	ND	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	ND	ND

SB-3	5-10'	12-14'
ACENAPHTHENE	ND	ND
ANTHRACENE	0.97	ND
BENZO(A)ANTHRACENE	6.3	0.31
BENZO(A)PYRENE	7.2	0.31
BENZO(B)FLUORANTHENE	3.3	0.15
BENZO(K)FLUORANTHENE	3.3	0.15
CHRYSENE	5.9	0.24
DIBENZ(A,H)ANTHRACENE	1.2	ND
FLUORANTHENE	9.9	0.75
FLUORENE	ND	ND
INDENO(1,2,3-C,D)PYRENE	4.5	0.17
NAPHTHALENE	ND	0.17
PHENANTHRENE	4.3	0.25
PYRENE	7	0.65

SB-3	5-10'	12-14'
ACETONE	ND	ND
METHYLENE CHLORIDE	0.0063	0.0069
BENZENE	ND	ND
ETHYLBENZENE	ND	ND
TOLUENE	ND	ND
M,P-XYLENE (SUM OF ISOMERS)	ND	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	ND	ND

SB-4	15-17'	19-20'
ACENAPHTHENE	233.2	ND
ANTHRACENE	133.6	0.13
BENZO(A)ANTHRACENE	80.2	0.23
BENZO(A)PYRENE	72.2	0.21
BENZO(B)FLUORANTHENE	59.1	0.24
BENZO(K)FLUORANTHENE	14.1	ND
CHRYSENE	73.4	0.18
DIBENZ(A,H)ANTHRACENE	6.9	ND
FLUORANTHENE	145.4	0.41
FLUORENE	165	ND
INDENO(1,2,3-C,D)PYRENE	21.6	ND
NAPHTHALENE	1899.2	0.48
PHENANTHRENE	547.3	0.38
PYRENE	253.6	0.37

SB-4	15-17'	19-20'
ACETONE	ND	0.0408
METHYLENE CHLORIDE	1.7	0.0175
BENZENE	85.3	0.0384
ETHYLBENZENE	518.3	0.0379
TOLUENE	18.4	ND
M,P-XYLENE (SUM OF ISOMERS)	438.1	0.0146
O-XYLENE (1,2-DIMETHYLBENZENE)	112.9	0.016

SB-6	8-10'	10-15'
ACENAPHTHENE	ND	ND
ANTHRACENE	0.32	0.67
BENZO(A)ANTHRACENE	0.75	1.7
BENZO(A)PYRENE	0.73	1.5
BENZO(B)FLUORANTHENE	0.79	1.8
BENZO(K)FLUORANTHENE	0.38	0.5
CHRYSENE	0.71	1.3
DIBENZ(A,H)ANTHRACENE	0.12	0.24
FLUORANTHENE	1.4	2.8
FLUORENE	0.25	0.36
INDENO(1,2,3-C,D)PYRENE	0.45	0.79
NAPHTHALENE	0.18	0.3
PHENANTHRENE	1.2	2.2
PYRENE	1.5	2.6

SB-6	8-10'	10-15'
ACETONE	ND	0.0637
METHYLENE CHLORIDE	0.0078	ND
BENZENE	ND	ND
ETHYLBENZENE	ND	ND
TOLUENE	ND	ND
M,P-XYLENE (SUM OF ISOMERS)	ND	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	ND	ND

SB-7	8-10'	8-10' DUP	16-18'
ACENAPHTHENE	ND	ND	ND
ANTHRACENE	0.33	0.58	0.2
BENZO(A)ANTHRACENE	1.2	1.7	0.99
BENZO(A)PYRENE	1.2	1.9	0.89
BENZO(B)FLUORANTHENE	1.5	2	1.1
BENZO(K)FLUORANTHENE	0.36	0.9	0.39
CHRYSENE	1.2	1.5	0.89
DIBENZ(A,H)ANTHRACENE	0.21	0.25	0.14
FLUORANTHENE	1.7	2.7	1.3
FLUORENE	0.15	0.25	ND
INDENO(1,2,3-C,D)PYRENE	0.83	1.3	0.49
NAPHTHALENE	0.13	0.27	ND
PHENANTHRENE	1	1.7	0.51
PYRENE	1.8	2.8	1.4

SB-7	8-10'	8-10' DUP	16-18'
ACETONE	0.0337	0.0616	0.0391
METHYLENE CHLORIDE	0.0044	ND	0.006
BENZENE	ND	ND	ND
ETHYLBENZENE	ND	ND	ND
TOLUENE	ND	ND	ND
M,P-XYLENE (SUM OF ISOMERS)	ND	ND	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	ND	ND	ND

SB-8	15-16'	17-19'
ACENAPHTHENE	0.7	ND
ANTHRACENE	3.9	ND
BENZO(A)ANTHRACENE	4.9	ND
BENZO(A)PYRENE	3.1	ND
BENZO(B)FLUORANTHENE	2.7	ND
BENZO(K)FLUORANTHENE	1.9	ND
CHRYSENE	2.7	ND
DIBENZ(A,H)ANTHRACENE	0.76	ND
FLUORANTHENE	9.2	ND
FLUORENE	3.2	ND
INDENO(1,2,3-C,D)PYRENE	1.6	ND
NAPHTHALENE	6.5	ND
PHENANTHRENE	15	ND
PYRENE	9.7	ND

SB-8	15-16'	17-19'
ACETONE	0.0525	ND
METHYLENE CHLORIDE	0.0025	0.0022
BENZENE	0.0137	ND
ETHYLBENZENE	0.0045	ND
TOLUENE	0.0093	ND
M,P-XYLENE (SUM OF ISOMERS)	0.0266	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	0.013	ND

MW-1	5-10'	5-10' DUP	10-15'
ACETONE	0.0077	ND	0.016
METHYLENE CHLORIDE	0.0068	ND	ND
BENZENE	ND	ND	ND
ETHYLBENZENE	ND	ND	ND
TOLUENE	ND	ND	ND
M,P-XYLENE (SUM OF ISOMERS)	ND	ND	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	ND	ND	ND

MW-1	5-10'	5-10' DUP	10-15'
ACENAPHTHENE	ND	0.0905	ND
ANTHRACENE	0.19	0.24	0.12
BENZO(A)ANTHRACENE	0.36	0.56	0.34
BENZO(A)PYRENE	0.44	0.63	0.29
BENZO(B)FLUORANTHENE	0.48	0.72	0.36
BENZO(K)FLUORANTHENE	0.15	0.24	0.11
CHRYSENE	0.4	0.63	0.26
DIBENZ(A,H)ANTHRACENE	ND	0.11	ND
FLUORANTHENE	0.65	0.99	0.52
FLUORENE	0.1	0.12	ND
INDENO(1,2,3-C,D)PYRENE	0.21	0.33	0.17
NAPHTHALENE	0.23	0.3	ND
PHENANTHRENE	0.45	0.62	0.32
PYRENE	0.69	1	0.54

SB-5	5-10'	10-15'
ACETONE	ND	ND
METHYLENE CHLORIDE	ND	0.004
BENZENE	ND	ND
ETHYLBENZENE	ND	ND
TOLUENE	ND	ND
M,P-XYLENE (SUM OF ISOMERS)	ND	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	ND	ND

SB-5	5-10'	10-15'
ACENAPHTHENE	ND	ND
ANTHRACENE	5.4	ND
BENZO(A)ANTHRACENE	8.2	0.13
BENZO(A)PYRENE	7.3	0.12
BENZO(B)FLUORANTHENE	7.7	0.15
BENZO(K)FLUORANTHENE	3.8	ND
CHRYSENE	7.3	0.11
DIBENZ(A,H)ANTHRACENE	0.87	ND
FLUORANTHENE	14.8	0.21
FLUORENE	1.1	ND
INDENO(1,2,3-C,D)PYRENE	3.2	ND
NAPHTHALENE	1.2	0.19
PHENANTHRENE	12.3	0.17
PYRENE	13	0.2

SB-9	5-10'	10-15'
ACETONE	0.0236	0.0814
METHYLENE CHLORIDE	0.0035	0.0028
BENZENE	0.0097	ND
ETHYLBENZENE	0.004	ND
TOLUENE	0.0213	ND
M,P-XYLENE (SUM OF ISOMERS)	0.0768	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	0.0367	ND

SB-9	5-10'	10-15'
ACENAPHTHENE	0.47	ND
ANTHRACENE	13.5	0.48
BENZO(A)ANTHRACENE	22	0.95
BENZO(A)PYRENE	12.3	0.77
BENZO(B)FLUORANTHENE	15.3	0.86
BENZO(K)FLUORANTHENE	4.9	0.29
CHRYSENE	12.9	0.75
DIBENZ(A,H)ANTHRACENE	3	0.19
FLUORANTHENE	46.7	1.7
FLUORENE	5.2	0.23
INDENO(1,2,3-C,D)PYRENE	7.3	0.55
NAPHTHALENE	2.3	0.2
PHENANTHRENE	39	1.2
PYRENE	33.2	1.7

SB-10	5-10'	10-12'
ACETONE	0.0476	0.018
METHYLENE CHLORIDE	0.0048	0.005
BENZENE	ND	ND
ETHYLBENZENE	ND	ND
TOLUENE	ND	ND
M,P-XYLENE (SUM OF ISOMERS)	ND	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	ND	ND

SB-10	5-10'	10-12'
ACENAPHTHENE	ND	0.21
ANTHRACENE	0.16	0.92
BENZO(A)ANTHRACENE	0.38	1.4
BENZO(A)PYRENE	0.31	0.92
BENZO(B)FLUORANTHENE	0.31	1.1
BENZO(K)FLUORANTHENE	0.18	0.5
CHRYSENE	0.36	1.1
DIBENZ(A,H)ANTHRACENE	ND	0.24
FLUORANTHENE	0.57	2.6
FLUORENE	ND	0.31
INDENO(1,2,3-C,D)PYRENE	0.18	0.49
NAPHTHALENE	0.15	ND
PHENANTHRENE	0.47	2.1
PYRENE	0.65	2.2

SB-11	5-10'	15-20'
ACETONE	0.0295	0.0362
METHYLENE CHLORIDE	0.0042	0.0056
BENZENE	ND	ND
ETHYLBENZENE	ND	ND
TOLUENE	ND	ND
M,P-XYLENE (SUM OF ISOMERS)	ND	ND
O-XYLENE (1,2-DIMETHYLBENZENE)	ND	ND

SB-11	5-10'	15-20'
ACENAPHTHENE	ND	ND
ANTHRACENE	0.14	0.12
BENZO(A)ANTHRACENE	0.72	0.24
BENZO(A)PYRENE	0.66	0.19
BENZO(B)FLUORANTHENE	0.76	0.18
BENZO(K)FLUORANTHENE	0.3	ND
CHRYSENE	0.5	0.17
DIBENZ(A,H)ANTHRACENE	0.19	ND
FLUORANTHENE	0.82	0.37
FLUORENE	ND	ND
INDENO(1,2,3-C,D)PYRENE	0.42	0.0999
NAPHTHALENE	ND	ND
PHENANTHRENE	0.41	0.38
PYRENE	0.83	0.42

LEGEND:

- HALLECK STREET AREA BOUNDARY
- MGP FACILITIES
- SOIL BORING LOCATION
- MONITORING WELL LOCATION

NOTES:

1. ALL CONCENTRATIONS ARE IN PARTS PER MILLION (mg/Kg)
2. SHADED VALUES EXCEED 6 NYCRR PART 375 UNRESTRICTED SOIL USE CLEANUP OBJECTIVES
3. COMPOUNDS THAT EXCEEDED 6 NYCRR PART 375 UNRESTRICTED SOIL USE CLEANUP OBJECTIVES IN ONE OR MORE SOIL SAMPLES ARE SHOWN.

Unrestricted Use Soil Cleanup Objectives Exceedence Criteria		
COMPOUND	VALUE	UNITS
ACETONE	0.05	mg/kg
METHYLENE CHLORIDE	0.05	mg/kg
BENZENE	0.06	mg/kg
ETHYLBENZENE	1.00	mg/kg
TOLUENE	0.70	mg/kg
M,P-XYLENE (SUM OF ISOMERS)	0.26	mg/kg
O-XYLENE (1,2-DIMETHYLBENZENE)	0.26	mg/kg

Unrestricted Use Soil Cleanup Objectives Exceedence Criteria		
COMPOUND	VALUE	UNITS
ACENAPHTHENE	20	mg/kg
ANTHRACENE	100	mg/kg
BENZO(A)ANTHRACENE	1	mg/kg
BENZO(A)PYRENE	1	mg/kg
BENZO(B)FLUORANTHENE	1	mg/kg
BENZO(K)FLUORANTHENE	0.8	mg/kg
CHRYSENE	1	mg/kg
DIBENZ(A,H)ANTHRACENE	0.33	mg/kg
FLUORANTHENE	100	mg/kg
FLUORENE	30	mg/kg
INDENO(1,2,3-C,D)PYRENE	0.5	mg/kg
NAPHTHALENE	12	mg/kg
PHENANTHRENE	100	mg/kg
PYRENE	100	mg/kg

150 0 150 300

SCALE: 1"=150'

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FIGURE 5

CONSOLIDATED EDISON
HALLECK STREET AAR
BRONX, NEW YORK

SUMMARY OF VOCs AND SVOCs IN SOIL

PARSONS
200 COTTONTAIL LANE, SOMERSET, N.J. 08873, PHONE: 732-537-3500

MW-1	5-10'	5-10' DUP	10-15'
ARSENIC	10.8	694	8.22
BARIUM	134	108	80.4
CADMIUM	2.6	2.18	ND
CHROMIUM	36.1 J	30.1 J	28.3 J
COPPER	99.3	53.8	49.1
LEAD	493	352	390
MERCURY	2.33	1.54	0.268
NICKEL	29.4	25.3	29.6
SELENIUM	2.56	2.62	2.74
SILVER	1.43	1.18	1.82
ZINC	346	329	227
CYANIDE	0.649	0.672	0.244

SB-1	10-12'	15-17'
ARSENIC	1.48	2.44
BARIUM	71	17.6
CADMIUM	ND	0.372
CHROMIUM	25.1	14.9
COPPER	21.1	10.34
LEAD	17.3	4.24
MERCURY	0.039	ND
NICKEL	21.6	10.84
SELENIUM	1.36	0.556
SILVER	1.3	0.252
ZINC	5.85	26.2
CYANIDE	0.093	ND

SB-2	5-10'	10-15'
ARSENIC	10.67	10.43
BARIUM	416	168
CADMIUM	1.33	ND
CHROMIUM	30.7	25.9
COPPER	595	35.3
LEAD	727	168
MERCURY	0.67	0.765
NICKEL	17.8	26.7
SELENIUM	2.96	2.22
SILVER	2.21	2.29
ZINC	830	187
CYANIDE	1.86	0.158

SB-5	5-10'	10-15'
ARSENIC	5.42	7.29
BARIUM	170	377
CADMIUM	ND	0.619
CHROMIUM	24.8	20
COPPER	129	120
LEAD	737	494
MERCURY	0.199	0.319
NICKEL	11.2	18.5
SELENIUM	1.95	1.94
SILVER	0.862	1.31
ZINC	72	259
CYANIDE	0.79	4.13

SB-3	5-10'	12-14'
ARSENIC	27.6	11.8
BARIUM	354	369
CADMIUM	2.73	1.31
CHROMIUM	24.9	10.95
COPPER	361	64.9
LEAD	1500	595
MERCURY	3.85	0.879
NICKEL	35.7	12.4
SELENIUM	3.95	1.24
SILVER	4.94	5.72
ZINC	1100	781
CYANIDE	2.94	9.8

SB-4	15-17'	19-20'
ARSENIC	12	10.52
BARIUM	78.3	54.5
CADMIUM	0.3	ND
CHROMIUM	16.7	35
COPPER	92.1	28.2
LEAD	292	63.9
MERCURY	3.11	0.461
NICKEL	21.6	37.2
SELENIUM	3.67	2.49
SILVER	2.97	2.81
ZINC	495	219
CYANIDE	34.9	1.84

SB-9	5-10'	10-15'
ARSENIC	7.18	6.71
BARIUM	136	99.1
CADMIUM	0.405	0.862
CHROMIUM	21.9	17.2
COPPER	72	70.3
LEAD	232	161
MERCURY	0.826	0.573
NICKEL	43.2	32.3
SELENIUM	2.53	1.27
SILVER	1.87	1.41
ZINC	210	246
CYANIDE	5.36	0.104

SB-6	8-10'	10-15'
ARSENIC	15.9	14.3
BARIUM	203	420
CADMIUM	0.404	4.22
CHROMIUM	62.1	79.2
COPPER	79.6	310
LEAD	227	870
MERCURY	0.39	1.46
NICKEL	55.1	59.4
SELENIUM	2.5	2.25
SILVER	2.41	2.36
ZINC	336	528
CYANIDE	7.32	5.4

SB-10	5-10'	10-12'
ARSENIC	7.74	4.85
BARIUM	137	135
CADMIUM	ND	0.14
CHROMIUM	13.1	19.3
COPPER	84.1	56.3
LEAD	231	173
MERCURY	0.373	0.303
NICKEL	18.6	26.5
SELENIUM	2.09	1.2
SILVER	1.3	1.34
ZINC	233	151
CYANIDE	0.609	0.522

SB-7	8-10'	8-10' DUP	16-18'
ARSENIC	4.36	5.98	12.8
BARIUM	195	201	240
CADMIUM	2.36	2.58	5.08
CHROMIUM	20.6	21.9	17
COPPER	120	126	414
LEAD	301	283	719
MERCURY	0.361	0.454	1.12
NICKEL	29.4	37.5	212
SELENIUM	1.1	0.856	2.62
SILVER	0.661	0.99	1.86
ZINC	315	372	719
CYANIDE	ND	1.3	1.78

SB-11	5-10'	15-20'
ARSENIC	5.77	20.8
BARIUM	237	207
CADMIUM	ND	0.839
CHROMIUM	12.6	34
COPPER	346	130
LEAD	884	338
MERCURY	0.709	2.67
NICKEL	14.5	33.2
SELENIUM	1.97	3.85
	1.64	5.38
ZINC	112	288
CYANIDE	8.79	9.13

SB-8	15-16'	17-19'
ARSENIC	13.4	5.75
BARIUM	275	157
CADMIUM	1.42	ND
CHROMIUM	20.5	19.1
COPPER	390	63.6
LEAD	884	261
MERCURY	2.18	0.131
NICKEL	96.2	20.1
SELENIUM	2.35	1.66
SILVER	2.08	1.58
ZINC	3200	197
CYANIDE	2	0.109

LEGEND:

- HALLECK STREET AREA BOUNDARY
- MGP FACILITIES
- SOIL BORING LOCATION
- MONITORING WELL LOCATION

NOTES:

1. ALL CONCENTRATIONS ARE IN PARTS PER MILLION (mg/Kg)
2. SHADED VALUES EXCEED 6 NYCRR PART 375 UNRESTRICTED SOIL USE CLEANUP OBJECTIVES
3. COMPOUNDS THAT EXCEEDED 6 NYCRR PART 375 UNRESTRICTED SOIL USE CLEANUP OBJECTIVES IN ONE OR MORE SOIL SAMPLES SHOWN.

Unrestricted Use Soil Cleanup Objectives Exceedence Criteria		
COMPOUND	VALUE	UNITS
ARSENIC	13	mg/kg
BARIUM	350	mg/kg
CADMIUM	2.5	mg/kg
COPPER	50	mg/kg
LEAD	63	mg/kg
MERCURY	0.18	mg/kg
NICKEL	30	mg/kg
SELENIUM	3.9	mg/kg
SILVER	2	mg/kg
ZINC	109	mg/kg
CYANIDE	27	mg/kg

200 100 0 200 400

SCALE: 1"=200'

FIGURE 6

CONSOLIDATED EDISON
HALLECK STREET AAR
BRONX, NEW YORK

SUMMARY OF INORGANICS IN SOIL

PARSONS
200 COTTONTAIL LANE SOUTH, SOMERSET, N.J. 08873, PHONE: 732-537-3500

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COMPOUND	MW-1
INORGANICS	
BARIUM	319
IRON	50500
LEAD	3.31
MAGNESIUM	34600
MANGANESE	2900
SODIUM	610600
THALLIUM	3.56
CYANIDE	12

COMPOUND	MW-2
INORGANICS	
BARIUM	84.3
IRON	28100
LEAD	25.3
MAGNESIUM	18400
MANGANESE	472
SODIUM	186000
THALLIUM	ND
CYANIDE	28

COMPOUND	MW-3	MW-3 DUP
INORGANICS		
BARIUM	1400	1400
IRON	33500	31300
LEAD	6.64	6.74
MAGNESIUM	58900	59400
MANGANESE	719	698
SODIUM	635100	628900
THALLIUM	ND	ND
CYANIDE	687	681

LEGEND:

- HALLECK STREET AREA BOUNDARY
- MGP FACILITIES
- SOIL BORING LOCATION
- MONITORING WELL LOCATION

NOTES:

1. ALL CONCENTRATIONS ARE IN PARTS PER BILLION (ug/l).
2. SHADED VALUES EXCEED NYSDEC AMBIENT WATER QUALITY CLEANUP OBJECTIVES.
3. COMPOUNDS THAT EXCEED NYSDEC AMBIENT WATER QUALITY CLEANUP OBJECTIVES IN ONE OR MORE GROUNDWATER SAMPLES ARE SHOWN.
4. NO VOCs OR SVOCs EXCEEDED NYSDEC AMBIENT WATER QUALITY CLEANUP OBJECTIVES.

NYSDEC Ambient Water Quality Standards/Guidance Criteria		
COMPOUND	VALUE	UNITS
BARIUM	1000	ug/l
IRON	300	ug/l
LEAD	25	ug/l
MAGNESIUM	35000	ug/l
MANGANESE	300	ug/l
SODIUM	20000	ug/l
THALLIUM	0.5	ug/l
CYANIDE	200	ug/l

200 100 0 200 400

SCALE: 1"=200'

FIGURE 7

CONSOLIDATED EDISON
HALLECK STREET AAR
BRONX, NEW YORK

SUMMARY OF GROUNDWATER SAMPLE RESULTS

PARSONS
200 COTTONTAIL LANE SOUTH, SOMERSET, N.J. 08873, PHONE: 732-537-3500

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LEGEND:

- HALLECK STREET AREA BOUNDARY
- MGP FACILITIES
- SOIL BORING LOCATION
- MONITORING WELL LOCATION
- AREA OF NAPL MITIGATION

NOTE:
BOUNDARY OF NAPL MITIGATION AREA IS CONCEPTUAL, FOR ILLUSTRATIVE PURPOSES, AND SUBJECT TO CHANGE BASED ON RESULTS OF THE PRE-DESIGN INVESTIGATION.

250 0 250 500

SCALE: 1"=250'

FIGURE 8

CONSOLIDATED EDISON
HALLECK STREET AAR
BRONX, NEW YORK

ALTERNATIVE 3A & 3B IN-SITU STABILIZATION AND SOLIDIFICATION OR EXCAVATION OF NAPL IMPACTED SOILS

PARSONS
200 COTTONTAIL LANE SOUTH, SOMERSET, N.J. 08873, PHONE: 732-537-3500

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LEGEND:

- HALLECK STREET AREA BOUNDARY
- MGP FACILITIES
- SOIL BORING LOCATION
- MONITORING WELL LOCATION
- SOIL EXCAVATION WITH AREA OF NAPL MITIGATION
- AREA OF SOIL EXCAVATION

NOTE:
BOUNDARY OF EXCAVATION AREAS IS CONCEPTUAL, FOR ILLUSTRATIVE PURPOSES, AND SUBJECT TO CHANGE BASED ON RESULTS OF THE PRE-DESIGN INVESTIGATION.

250 0 250 500

SCALE: 1"=250'

FIGURE 9

CONSOLIDATED EDISON
HALLECK STREET AAR
BRONX, NEW YORK

ALTERNATIVE 4
REMOVAL OF DELINEATED MGP-IMPACTED SITE SOILS ABOVE USCOs

PARSONS
200 COTTONTAIL LANE SOUTH, SOMERSET, N.J. 08873, PHONE: 732-537-3500

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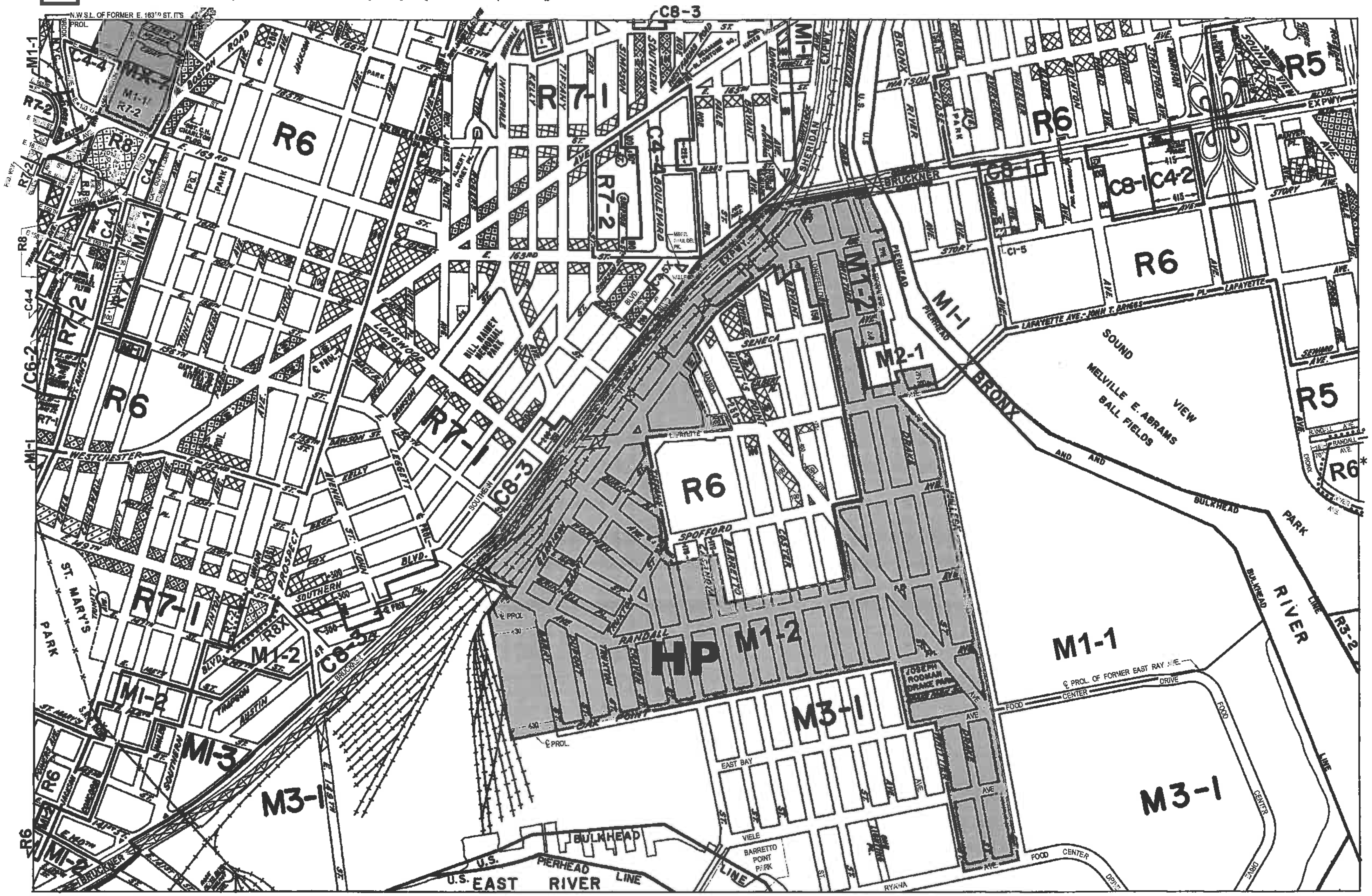
PLOT DATE: 11/13/2019 4:45 PM PLOTTED BY: RUSSO, JILL

APPENDIX A

ZONING MAP

Click blue box on map to view sketch map of **proposed** map change



600 0 600 1200 1800 FEET

C1-1 C1-2 C1-3 C1-4 C1-5 C2-1 C2-2 C2-3 C2-4 C2-5

NOTE: Where no dimensions for zoning district boundaries appear on the zoning maps, such dimensions are determined in Article VII, Chapter 6 (Location of District Boundaries) of the Zoning Resolution.

ZONING MAP

THE NEW YORK CITY PLANNING COMMISSION

Major Zoning Classifications:

The number(s) and/or letter(s) that follows an **R**, **C** or **M** District designation indicates use, bulk and other controls as described in the text of the Zoning Resolution.

R — RESIDENTIAL DISTRICT

C — COMMERCIAL DISTRICT

M — MANUFACTURING DISTRICT

SPECIAL PURPOSE DISTRICT
The letter(s) within the shaded area designates the special purpose district as described in the text of the Zoning Resolution.

AREA(S) REZONED

Effective Date(s) of Rezoning:

*09-24-2012 C 120173 ZMX
05-31-2012 C 120165 ZMX

Special Requirements:

For a list of lots subject to CEQR environmental requirements, see APPENDIX C.

For a list of lots subject to "D" restrictive declarations, see APPENDIX D.

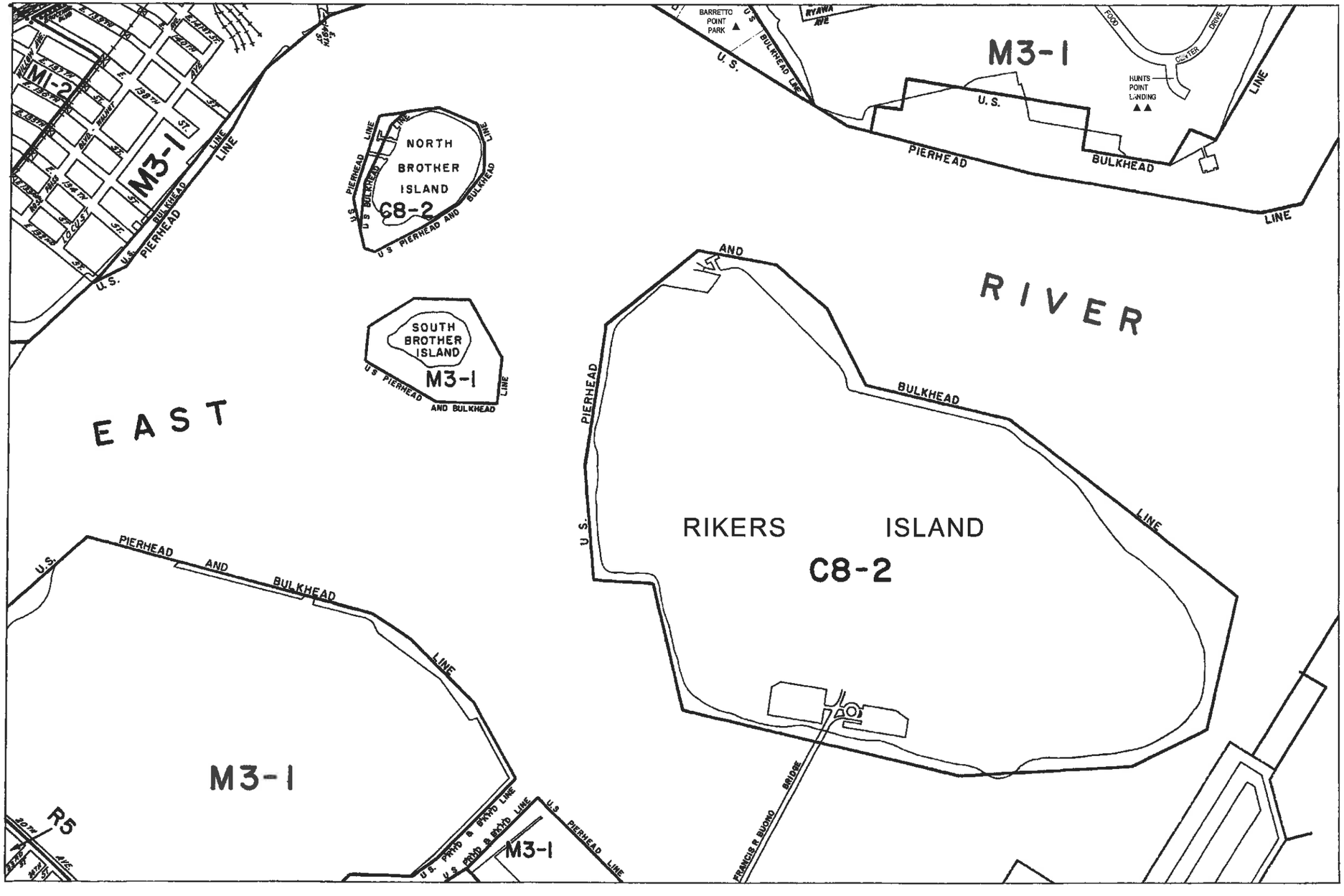
For Inclusionary Housing designated areas on this map, see APPENDIX F.

MAP KEY

3b	3d	4b
6a	**6c**	7a
6b	6d	7b

ZONING MAP 6c

NOTE: Zoning information as shown on this map is subject to change. For the most up-to-date zoning information for this map check the Department of City Planning website: http://www.nyc.gov/planning or contact the Zoning Information Desk at (212) 720-3291.



600 0 600 1200 1800 FEET

C1-1 C1-2 C1-3 C1-4 C1-5 C2-1 C2-2 C2-3 C2-4 C2-5

NOTE: Where no dimensions for zoning district boundaries appear on the zoning maps, such dimensions are determined in Article VII, Chapter 6 (Location of District Boundaries) of the Zoning Resolution.

ZONING MAP

THE NEW YORK CITY PLANNING COMMISSION

Major Zoning Classifications:

The number(s) and/or letter(s) that follows an **R, C** or **M** District designation indicates use, bulk and other controls as described in the text of the Zoning Resolution.

R – RESIDENTIAL DISTRICT

C – COMMERCIAL DISTRICT

M – MANUFACTURING DISTRICT

SPECIAL PURPOSE DISTRICT
The letter(s) within the shaded area designates the special purpose district as described in the text of the Zoning Resolution.

AREA(S) REZONED

Effective Date(s) of Rezoning:

05-28-1964 CP-18356

Special Requirements:

For a list of lots subject to CEQR environmental requirements, see APPENDIX C.

For a list of lots subject to "D" restrictive declarations, see APPENDIX D.

For Inclusionary Housing designated areas on this map, see APPENDIX F.

CITY MAP CHANGE(S):

▲▲ 06-20-2009 C 070443 MMX
▲ 09-03-2011 C 070009 MMX

N

MAP KEY

6a	6c	7a
6b	**6d**	7b
9a	9c	10a

ZONING MAP **6d**

NOTE: Zoning information as shown on this map is subject to change. For the most up-to-date zoning information for this map, visit the Zoning section of the Department of City Planning website: **www.nyc.gov/planning** or contact the Zoning Information Desk at (212) 720-3291.

APPENDIX B

REMEDIAL ALTERNATIVE COST ESTIMATES

Remedial Alternative Cost Estimates
Alternative 2 - Institutional and Engineering Controls
Halleck Street Sidewalk Area
Bronx, NY

Item No.	Item Description	Estimated Quantity	Unit of Measure	Unit Cost (Material, Equipment, Labor)	Estimated Cost
A	**ESTABLISHMENT OF INSTITUTIONAL CONTROLS**				
1	Preparation of Site Management Plan (SMP)	1	LS	$50,000	$50,000
2	Establish Institutional Controls	1	LS	$100,000	$100,000
3	Field Surveys	1	LS	$45,000	$45,000
B	**OPERATION AND MAINTENANCE COST**				
4	Periodic Review of SMP Requirements with NYC	1	Annually	$25,000	$25,000
5	Annual Inspections of ICs/ECs and Reporting	1	Per Event	$20,000	$20,000
				Subtotal Annual O&M Costs	$45,000
				Present Worth (30 years 4.5%)*	16.3
				Present Worth O&M Costs	$734,000
				Contingency for O&M Costs (25%)	$184,000
				Estimated Total O&M Costs	**$918,000**
				Subtotal Capital Costs	$195,000
				Contingency for Capital Costs (25%)	$49,000
				Estimated Total Capital Costs	**$244,000**
				TOTAL ESTIMATED COSTS	**$1,162,000**

GENERAL ASSUMPTIONS

1. These Rough Order of Magnitude cost estimates are conceptual and are to be used only for planning purposes only.
2. Suitability of the evaluated remedial alternatives is dependent on a variety of factors including actual site conditions, engineering/constructability analyses, project-specific effectiveness, implementability and cost.
3. These cost estimates are subject to change based on additional information generated during supplemental field investigations, pre-design investigation activities, remedial design, and constructibility reviews.
4. Parsons has assumed 30 years of O&M for the engineering control. The annual monitoring report would include evaluation of ICs/ECs and notifications to NYSDEC, NYSDOH and property owners to demonstrate that the controls are being maintained and remain effective.
5. Development of costs assumes that work is being performed in Level D personal protective equipment.

Alternative 2 - Cost Specific Assumptions

1) Costs for SMP preparation assumes utilizing the NYSDEC template.
2) Costs for establishing institutional controls cannot be determined at this time and an allowance has been included.
3) Costs for field surveys include visual observations of existing cover systems and professional surveying.
4) It is anticipated that the NYC will contact Con Ed periodically regarding questions on the SMP. Those costs cannot be determined at this time and an annual allowance has been included.

* = Present worth factor calculated using Civil Engineering Reference Manual by Michael Lindeburg.

Remedial Alternative Cost Estimates
Alternative 3A - In-Situ Stabilization of NAPL-impacted Material in the Vicinity of SB-4
Halleck Street Sidewalk Area
Bronx, NY

Item No.	Item Description	Estimated Quantity	Unit of Measure	Unit Cost (Material, Equipment, Labor)	Estimated Cost
A	**PRE-DESIGN INVESTIGATION PROGRAM**				
1	Preparation of NYSDEC Submittals	1	LS	$60,000	$60,000
2	Delineation Borings, Treatability Study and Utility Survey	1	LS	$200,000	$200,000
B	**ACCESS AGREEMENTS, SUBMITTALS, ICs**				
3	Permitting/Access Agreements	1	LS	$50,000	$50,000
4	Preparation of NYSDEC Submittals	1	Each	$250,000	$250,000
5	Field Surveys	1	LS	$45,000	$45,000
6	Establish Institutional Controls	1	LS	$100,000	$100,000
7	Traffic Control Plans for NYC	1	LS	$75,000	$75,000
C	**REMEDIAL CONSTRUCTION**				
8	Mobilization - Excavation and ISS	1	Each	$150,000	$150,000
9	Site Preparation and Soil Erosion Controls	1	Each	$60,000	$60,000
10	Traffic Controls	20	Day	$2,500	$50,000
11	Soil Mixing and Reagents	4400	CY	$350	$1,540,000
12	Pre-Excavation and Surface Soils	1200	CY	$40	$48,000
13	Transport and Disposal of Excavated Soils	1200	CY	$70	$84,000
14	Transport and Disposal of ISS Swell (at 30% of ISS volume)	1320	CY	$70	$92,400
15	Backfill to Grade	1200	CY	$30	$36,000
16	Odor Control	4	WK	$3,500	$14,000
17	Site Surveying	4	WK	$5,000	$20,000
18	Perimeter Air and Vibration Monitoring	4	WK	$5,000	$20,000
E	**WASTE DISPOSAL**				
19	Disposal of Construction Fluids	10000	Gal	$1	$10,000
20	Miscellaneous Waste	1	LS	$10,000	$10,000
F	**CONSTRUCTION OVERSIGHT**				
21	Contractor Site Management	4	WK	$20,000	$80,000
G	**SITE RESTORATION**				
22	Restoration of Sidewalk	4000	SF	$7	$28,000
23	Asphalt Pavement - 6 inch	4000	SF	$20	$80,000
H	**OPERATION AND MAINTENANCE COST**				
24	Periodic Review of SMP Requirements with NYC	1	Annually	$25,000	$25,000
25	Annual Inspections of ICs/ECs and Reporting	1	Per Event	$20,000	$20,000
				Subtotal Annual O&M Costs	$45,000
				Present Worth (30 years 4.5%)*	16.3
				Present Worth O&M Costs	$734,000
				Contingency for O&M Costs (25%)	$184,000
				Estimated Total O&M Costs	**$918,000**
				Subtotal of Capital Costs	$3,102,000
				Engineering Field Support (10%)	$310,000
				Bonds and Insurance (7%)	$217,000
				Testing and Inspection (3%)	$93,000
				Total Capital Costs	$3,722,000
				Contingency for Capital Costs (25%)	$931,000
				Estimated Total Capital Costs	**$4,653,000**
				TOTAL ESTIMATED COST	**$5,571,000**

GENERAL ASSUMPTIONS

1. These Rough Order of Magnitude cost estimates are conceptual and are to be used only for planning purposes only.
2. Suitability of the evaluated remedial alternatives is dependent on a variety of factors including actual site conditions, engineering/constructability analyses, project-specific effectiveness, implementability and cost.
3. These cost estimates are subject to change based on additional information generated during supplemental field investigations, pre-design investigation activities, remedial design, and constructibility reviews.
4. Parsons has assumed 30 years of O&M for the engineering control. The annual monitoring report would include evaluation of ICs/ECs and notifications to NYSDEC, NYSDOH and property owners to demonstrate that the controls are being maintained and remain effective.
5. Development of costs assumes that work is being performed in Level D personal protective equipment.

Alternative 3a - Cost Specific Assumptions

1) Costs for PDI submittals for the NYSDEC based on preparation of letter work plans for delineation borings and treatability study.
2) Costs for establishing institutional controls cannot be determined at this time and an allowance has been included.
3) Costs for field surveys include visual observations of existing cover systems and professional surveying.
4) Costs for NYC requirements for traffic control plans and required traffic controls cannot be determined at this time and an allowance has been included.
5) Costs based on remedial construction duration of 4 weeks.
6) Costs for remedial excavations based on 1,200 in-place cubic yards.
7) Costs for ISS based on 4,400 in-place cubic yards and assumes no obstructions would be encountered.
8) Disposal costs for excavated soils based on 1,200 in-place cubic yards.
9) Disposal costs for ISS swell based on 30% of total ISS volume or 1,320 cubic yards.
10) Costs for construction fluids disposal, stakeholder requirements, soil erosion control, etc. cannot be determined at this time and allowances have been included.
11) It is anticipated that the NYC will contact Con Ed periodically regarding questions on the SMP. Those costs cannot be determined at this time and an annual allowance has been included.
12) Costs for post-excavation sampling and laboratory analyses are assumed to be not required.

* = Present worth factor calculated using Civil Engineering Reference Manual by Michael Lindeburg.

Remedial Alternative Cost Estimates
Alternative 3B - Excavation of NAPL-impacted Material in the Vicinity of SB-4
Halleck Street Sidewalk Area
Bronx, NY

Item No.	Item Description	Estimated Quantity	Unit of Measure	Unit Cost (Material, Equipment, Labor)	Estimated Cost
A	**PRE-DESIGN INVESTIGATION PROGRAM**				
1	Preparation of NYSDEC Submittals	1	LS	$25,000	$25,000
2	Delineation Borings and Utility Survey	1	Each	$150,000	$150,000
B	**PREPARATION OF ACCESS AGREEMENTS/SUBMITTALS**				
3	Permitting/Access Agreements	1	LS	$50,000	$50,000
4	Preparation of NYSDEC Submittals	1	Each	$250,000	$250,000
5	Field Surveys	1	LS	$45,000	$45,000
6	Establish Institutional Controls	1	LS	$100,000	$100,000
7	Traffic Control Plans for NYC	1	LS	$75,000	$75,000
C	**REMEDIAL CONSTRUCTION**				
8	Mobilization	1	Each	$175,000	$175,000
9	Site Preparation and Soil Erosion Controls	1	Each	$75,000	$75,000
10	Traffic Controls	30	Day	$2,500	$75,000
11	Perimeter Air and Vibration Monitoring	6	WK	$5,000	$30,000
12	Excavation Shoring (Soldier Pile and Lagging)	9000	VSF	$75	$675,000
13	Soil Excavation and Handling	5500	CY	$40	$220,000
14	Transport and Disposal of Site Soils	5500	CY	$70	$385,000
15	Purchase and Installation of Backfill to Grade	5500	CY	$30	$165,000
16	Site Surveying	6	WK	$5,000	$30,000
17	Odor Control	6	WK	$3,500	$21,000
18	Excavation Dewatering and Treatment	1.5	Month	$75,000	$112,500
D	**WASTE DISPOSAL**				
19	Disposal of Construction Fluids	40000	Gal	$1	$40,000
20	Miscellaneous Waste	1	Each	$15,000	$15,000
E	**CONSTRUCTION OVERSIGHT**				
21	Contractor Site Management	6	WK	$20,000	$120,000
F	**SITE RESTORATION**				
22	Restoration of Sidewalk	4000	SF	$7	$28,000
23	Asphalt pavement - 6 inch	4000	SF	$20	$80,000
G	**OPERATION AND MAINTENANCE COST**				
24	Periodic Review of SMP Requirements with NYC	1	Annually	$25,000	$25,000
25	Annual Inspections of ICs/ECs and Reporting	1	Per Event	$20,000	$20,000
				Subtotal Annual O&M Costs	$45,000
				Present Worth (30 years 4.5%)*	16.3
				Present Worth O&M Costs	$734,000
				Contingency for O&M Costs (25%)	$184,000
				Estimated Total O&M Costs	**$918,000**
				Subtotal of Capital Costs	$2,942,000
				Engineering Field Support (10%)	$294,000
				Bonds and Insurance (7%)	$206,000
				Testing and Inspection (3%)	$88,000
				Total Capital Costs	$3,530,000
				Contingency for Capital Costs (25%)	$883,000
				Estimated Total Capital Costs	**$4,413,000**
				TOTAL ESTIMATED COST	**$5,331,000**

GENERAL ASSUMPTIONS

1. These Rough Order of Magnitude cost estimates are conceptual and are to be used only for planning purposes only.
2. Suitability of the evaluated remedial alternatives is dependent on a variety of factors including actual site conditions, engineering/constructability analyses, project-specific effectiveness, implementability and cost.
3. These cost estimates are subject to change based on additional information generated during supplemental field investigations, pre-design investigation activities, remedial design, and constructibility reviews.
4. Parsons has assumed 30 years of O&M for the engineering control. The annual monitoring report would include evaluation of ICs/ECs and notifications to NYSDEC, NYSDOH and property owners to demonstrate that the controls are being maintained and remain effective.
5. Development of costs assumes that work is being performed in Level D personal protective equipment.

Alternative 3b - Cost Specific Assumptions

1) Costs for PDI submittals for the NYSDEC based on preparation of letter work plan for delineation borings.
2) Costs for establishing institutional controls cannot be determined at this time and an allowance has been included.
3) Costs for field surveys include visual observations of existing cover systems and professional surveying.
4) Costs for NYC requirements for traffic control plans and required traffic controls cannot be determined at this time and an allowance has been included.
5) Costs based on remedial construction duration of 6 weeks.
6) Costs for excavation shoring based on 9,000 vertical SF and actual shoring system will be determined during engineering design.
7) Costs for remedial excavations based on 5,500 in-place cubic yards.
8) Costs for excavation dewatering, treatment and discharge cannot be determined at this time and dewatering system needs to be designed. As such, a monthly allowance has been included.
9) Disposal costs for excavated soils based on 5,500 in-place cubic yards.
10) Costs for construction fluids disposal, stakeholder requirements, soil erosion controls, etc. cannot be determined at this time and allowances have been included.
11) It is anticipated that the NYC will contact Con Ed periodically regarding questions on the SMP. Those costs cannot be determined at this time and an annual allowance has been included.
12) Costs for post-excavation sampling and laboratory analyses are assumed to be not required.

* = Present worth factor calculated using Civil Engineering Reference Manual by Michael Lindeburg.

Remedial Alternative Cost Estimates
Alternative 4 - Removal of Delineated MGP-impacted Site Soils Above USCOs
Halleck Street Sidewalk Area
Bronx, NY

Item No.	Item Description	Estimated Quantity	Unit of Measure	Unit Cost (Material, Equipment, Labor)	Estimated Cost
A	**PRE-DESIGN INVESTIGATION PROGRAM**				
1	Preparation of NYSDEC Submittals	1	LS	$75,000	$75,000
2	Delineation Borings and Utility Survey	1	Each	$500,000	$500,000
B	**PREPARATION OF ACCESS AGREEMENTS/SUBMITTALS**				
3	Permitting/Access Agreements	1	LS	$225,000	$225,000
4	Preparation of NYSDEC Submittals	1	Each	$500,000	$500,000
5	Field Surveys	1	LS	$45,000	$45,000
6	Traffic Control Plans for NYC	1	LS	$225,000	$225,000
C	**REMEDIAL CONSTRUCTION**				
7	Mobilization	1	Each	$1,000,000	$1,000,000
8	Site Preparation and Soil Erosion Controls	1	Each	$450,000	$450,000
9	Traffic Controls	480	Day	$2,500	$1,200,000
10	Perimeter Air and Vibration Monitoring	96	WK	$7,500	$720,000
11	Excavation Shoring (Soldier Pile and Lagging)	45000	VSF	$75	$3,375,000
12	Soil Excavation and Handling	34500	CY	$40	$1,380,000
13	Transport and Disposal of Site Soils	34500	CY	$70	$2,415,000
14	Purchase and Installation of Backfill to Grade	34500	CY	$30	$1,035,000
15	Site Surveying	96	WK	$5,000	$480,000
16	Odor Control	96	WK	$3,500	$336,000
17	Excavation Dewatering and Treatment	24	Month	$75,000	$1,800,000
D	**WASTE DISPOSAL**				
18	Disposal of Construction Fluids	180,000	Gal	$1	$180,000
19	Miscellaneous Waste	1	Each	$125,000	$125,000
E	**CONSTRUCTION OVERSIGHT**				
20	Contractor Site Management	96	WK	$20,000	$1,920,000
F	**SITE RESTORATION**				
21	Restoration of Sidewalks	18,500	SF	$7	$129,500
22	Asphalt pavement - 6 inch	43,150	SF	$20	$863,000
				Subtotal Annual O&M Costs	$0
				Present Worth (30 years 4.5%)*	16.3
				Present Worth O&M Costs	$0
				Contingency for O&M Costs (25%)	$0
				Estimated Total O&M Costs	**$0**
				Subtotal of Capital Costs	$18,979,000
				Engineering Field Support (10%)	$1,898,000
				Bonds and Insurance (7%)	$1,329,000
				Testing and Inspection (3%)	$569,000
				Total Capital Costs	$22,775,000
				Contingency for Capital Costs (25%)	$5,694,000
				Estimated Total Capital Costs	**$28,469,000**
				TOTAL ESTIMATED COST	**$28,469,000**

GENERAL ASSUMPTIONS

1. These Rough Order of Magnitude cost estimates are conceptual and are to be used only for planning purposes only.
2. Suitability of the evaluated remedial alternatives is dependent on a variety of factors including actual site conditions, engineering/constructability analyses, project-specific effectiveness, implementability and cost.
3. These cost estimates are subject to change based on additional information generated during supplemental field investigations, pre-design investigation activities, remedial design, and constructibility reviews.
4. Development of costs assumes that work is being performed in Level D personal protective equipment.

Alternative 4 - Cost Specific Assumptions

1) Costs for PDI submittals for the NYSDEC based on preparation of work plan for delineation borings.
2) Costs for establishing institutional controls cannot be determined at this time and an allowance has been included.
3) Costs for field surveys include visual observations of existing cover systems and professional surveying.
4) Costs for NYC requirements for traffic control plans and required traffic controls cannot be determined at this time and an allowance has been included.
5) Costs based on remedial construction duration of 24 months.
6) Costs for excavation shoring based on 45,000 vertical SF and actual shoring system will be determined during engineering design.
7) Costs for remedial excavations based on 34,500 in-place cubic yards.
8) Costs for excavation dewatering, treatment and discharge cannot be determined at this time and dewatering system needs to be designed. As such, a monthly allowance has been included.
9) Disposal costs for excavated soils based on 34,500 in-place cubic yards.
10) Costs for construction fluids disposal, stakeholder requirements, soil erosion controls, etc. cannot be determined at this time and allowances have been included.
11) Costs for post-excavation sampling and laboratory analyses are assumed to be not required.

* = Present worth factor calculated using Civil Engineering Reference Manual by Michael Lindeburg.