DECISION DOCUMENT

Willets Point Development
Operable Unit Number 01: Affordable Housing Parcel
Brownfield Cleanup Program
Queens, Queens County
Site No. C241146
May 2021

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

DECLARATION STATEMENT - DECISION DOCUMENT

Willets Point Development
Operable Unit Number: 01
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Statement of Purpose and Basis

This document presents the remedy for Operable Unit Number: 01: Affordable Housing Parcel of the Willets Point Development site, a brownfield cleanup site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for Operable Unit Number: 01 of the Willets Point Development site and the public's input to the proposed remedy presented by the Department.

Description of Selected Remedy

The elements of the selected remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;

- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings will include, at a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction.

2. Excavation

Excavation and off-site disposal of contaminant source areas primarily in the northern portion of OU-1, including:

- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u);
- soil with visual waste material or non-aqueous phase liquid;
- soils which exceed the protection of groundwater soil cleanup objectives (PGWSCOs), as defined by 6 NYCRR Part 375-6.8 for those contaminants found in site groundwater
- soils that create a nuisance condition, as defined in Commissioner Policy CP-51 Section G.

All soils in the upper two feet which exceed the restricted residential SCOs will be excavated and transported off-site for disposal.

Approximately 30,000 cubic yards of contaminated soil will be removed from the site.

3. Backfill

Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil or complete the backfilling of the excavation and establish the designed grades at the site.

4. Cover System

A site cover will be required to allow for restricted residential use of the site in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where a soil cover is to be used it will be a minimum of two feet of soil placed over a demarcation layer, with the upper six inches of soil of sufficient quality to maintain a vegetative layer. Soil cover material, including any fill material brought to the site, will meet the SCOs for cover material for the use of the site as set forth in 6 NYCRR Part 375-6.7(d). Substitution of other materials and components may be allowed where such components already exist or are a component of the tangible property to be placed as part of site redevelopment. Such components may include, but are not necessarily limited to pavement, concrete, paved surface parking areas, sidewalks, building foundations and building slabs.

5. In-Situ Chemical Oxidation or Reduction

In-situ chemical oxidation (ISCO) will be implemented to treat dissolved volatile organic compounds (VOCs) in groundwater. A chemical oxidant will be injected into the subsurface to destroy the contaminants, if levels of dissolved VOCs persist where petroleum light, non-aqueous phase liquid (LNAPL) was observed and compounds were elevated in the groundwater. The method and depth of injection will be determined during the remedial design.

Groundwater monitoring will be required up-gradient, down-gradient, within the treatment zone, and/or from the barrier. Monitoring will be conducted for contaminants of concern (VOCs) upgradient and downgradient of the treatment zone.

6. Groundwater Extraction & Treatment

Groundwater extraction and treatment will be implemented to facilitate deeper source area excavations. The extraction system will direct contaminated groundwater toward the extraction wells within the plume area. The extraction system will be designed to minimize the drawdown of the water table in order to reduce smearing of non-aqueous phase liquid in the area of drawdown.

The extracted groundwater will be treated using appropriate technology prior to discharge.

7. Groundwater Containment

Based on the presence of source material (e.g., petroleum LNAPL) immediately off-site and the possibility of re-contamination of the site, a containment wall will be installed from approximately 2 feet above the groundwater table to approximately 1 foot into the confining peat layer that exists across that portion of the site. The wall will require a permeability of 10^{-6} centimeter/second or less across the barrier to mitigate the potential for source material migration from an off-site source. A sheet pile wall with sealed seams will be installed along parts of the northern and eastern property boundaries, approximately 300 feet along the northern property boundary and 135 feet along the eastern property boundary.

8. Vapor Mitigation

Any on-site buildings will be required to have a sub-slab depressurization system, or other acceptable measures, to mitigate the migration of vapors into the building from groundwater.

9. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

- require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allow the use and development of the controlled property for restricted residential use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or NYC; and
- require compliance with the Department approved Site Management Plan.

10. Site Management Plan

A Site Management Plan is required, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:
    - Institutional Controls: The Environmental Easement discussed in Paragraph 8.

- Engineering Controls: The Cover System discussed in Paragraph 4, the Groundwater Remedies discussed on Paragraphs 5 and 7, and the Vapor Mitigation Systems discussed in Paragraph 8.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use or groundwater restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any occupied buildings on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- a provision that should a building foundation or building slab be removed in the future, a cover system consistent with that described in Paragraph 4 above will be placed in any areas where the upper two feet of exposed surface soil exceed the applicable soil cleanup objectives (SCOs);
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
    - monitoring of groundwater to assess the performance and effectiveness of the remedy;
    - a schedule of monitoring and frequency of submittals to the Department;
    - monitoring for vapor intrusion for any buildings on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

c. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, optimization, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to:
    - procedures for operating and maintaining the remedy;
    - compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
    - maintaining site access controls and Department notification; and
    - providing the Department access to the site and O&M records.

Declaration

The remedy conforms with promulgated standards and criteria that are directly applicable, or that are relevant and appropriate and takes into consideration Department guidance, as appropriate. The remedy is protective of public health and the environment.

May 21, 2021

Date

Gerard Burke, Director
Remedial Bureau B

DECISION DOCUMENT

Willets Point Development
Queens, Queens County
Site No. C241146
May 2021

SECTION 1: SUMMARY AND PURPOSE

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of contaminants at the site has resulted in threats to public health and the environment that would be addressed by the remedy. The disposal or release of contaminants at this site, as more fully described in this document, has contaminated various environmental media. Contaminants include hazardous waste and/or petroleum.

The New York State Brownfield Cleanup Program (BCP) is a voluntary program. The goal of the BCP is to enhance private-sector cleanups of brownfields and to reduce development pressure on "greenfields." A brownfield site is real property, the redevelopment or reuse of which may be complicated by the presence or potential presence of a contaminant.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in the site-related reports and documents.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies. A public comment period was held, during which the public was encouraged to submit comment on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for the site. Site-related reports and documents were made available for review by the public at the following document repositories:

DECInfo Locator - Web Application
https://gisservices.dec.ny.gov/gis/dil/index.html?rs=C241146

Queens Public Library
41-17 Main Street
Flushing, NY 11355
Phone: 718-661-1200

Queens Community Board 7
133-32 41st Road - Room 3B

Flushing, NY 11355
Phone: (718) 359-2800

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location:
The Willets Point Development BCP site is located in Queens County, comprises 56 tax lots within 8 city blocks, and has a total area of approximately 23.5 acres. The project area is property bordered on the west by 126th Street, on the south and east by Willets Point Boulevard, and on the north by Northern Boulevard.

Site Features:
The overall BCP site area is an assemblage of tax parcels, portions of which are contiguous. Some portions of city mapped streets are included in the site. Some of the lots are developed with commercial buildings but most are vacant.

Current Zoning/Use:
The current use of the site is commercial, industrial and vacant areas. The entire project area is zoned C4-4 (commercial) with a Special Willets Point District overlay. The intended use of the site is for residential and commercial purposes.

Past Use of the Site:
The area including and surrounding the site is part of a historic tidal wetland and salt meadow area that was filled in with over 50 million cubic yards of incinerator ash and other refuse generated throughout NYC during the first quarter of the 20th century. The dumping ceased in 1932. Since that time, the primary site uses have included a wide variety of automotive-related businesses. These include, but are not limited to, scrap yards for retail sale of parts, recycling of automotive parts, salvage yards, autobody repair and painting, mechanical repair including all components of passenger cars, commercial vehicle repair, sales of new and used parts, recycling of potential non-automotive parts, battery recycling, commercial vehicle storage, and construction equipment sales.

Operable Units:
The site was divided into two operable units. An operable unit represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to

investigate, eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. Operable unit 1 (OU-1) is the approximately 7.8-acre parcel generally west of Willets Point Blvd near Roosevelt Ave., which will be developed into affordable housing. OU-2 consists of the remaining 15.2 acres of the site where remediation will follow a to-be-determined development plan.

Site Geology and Hydrogeology:
The site is situated on a former tidal wetland that was filled in during use as a municipal landfill. The ash fill extends from the surface to a depth of approximately 25-44 feet below surface grade and is underlain by a native soil layer that consists of a soft gray clay with varying amounts of sand and silt interbedded with a layer of peat, which ranges in thickness from about 6 inches to 6 feet. Groundwater flows from east to west and is likely influenced by topographic relief and rainwater infiltration. Groundwater is shallow beneath the site and is present at depths ranging from 1.5 to 7.5 feet below surface grade.

Operable Unit Number 01 (OU-1) is the subject of this document.

A Decision Document will be issued for OU-02 in the future.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to restricted-residential use (which allows for commercial use and industrial use) as described in Part 375-1.8(g) were/was evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the Remedial Investigation (RI) to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is available in the RI Report.

SECTION 5: ENFORCEMENT STATUS

The Applicant(s) under the Brownfield Cleanup Agreement is a/are Volunteer(s). The Applicant(s) does/do not have an obligation to address off-site contamination. However, the Department has determined that this site does not pose a significant threat to public health or the environment; accordingly, no enforcement actions are necessary.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A remedial investigation (RI) serves as the mechanism for collecting data to:

- characterize site conditions;
- determine the nature of the contamination; and
- assess risk to human health and the environment.

The RI is intended to identify the nature (or type) of contamination which may be present at a site and the extent of that contamination in the environment on the site, or leaving the site. The RI reports on data gathered to determine if the soil, groundwater, soil vapor, indoor air, surface water or sediments may have been contaminated. Monitoring wells are installed to assess groundwater and soil borings or test pits are installed to sample soil and/or waste(s) identified. If other natural resources are present, such as surface water bodies or wetlands, the water and sediment may be sampled as well. Based on the presence of contaminants in soil and groundwater, soil vapor will also be sampled for the presence of contamination. Data collected in the RI influence the development of remedial alternatives. The RI report is available for review in the site document repository and the results are summarized in section 6.3.

The analytical data collected on this site includes data for:

- groundwater
- soil
- soil vapor

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Results

The data have identified contaminants of concern. A "contaminant of concern" is a contaminant that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized below. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified for this Operable Unit at this site is/are:

1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
benzene
naphthalene
toluene
fluoranthene
phenanthrene
benzo(a)anthracene

lead	2,2,4-trimethylpentane
arsenic	hexane
MTBE (methyl-tert-butyl ether)	tetrachloroethene (PCE)
o-xylene	polychlorinated biphenyls (PCB)
xylenol	trichloroethene (TCE)
phenol	petroleum products

The contaminant(s) of concern exceed the applicable SCGs for:

- groundwater
- soil

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Decision Document.

The following IRM(s) has/have been completed at this site based on conditions observed during the RI.

IRM OU1- Petroleum and Lead Hotspot Removal
The following activities were undertaken as part of an approved IRM Work Plan:

- Excavation and disposal of a hazardous lead soil hotspot in the northwestern portion of the site to approximately 5 feet below grade surface (bgs);
- Excavation and disposal of three petroleum-impacted source areas in the northern and southern areas of the site;
- Collection of documentation samples from the base and sidewalls of each excavation;
- Installation of a two-foot clean cover system over each excavation;
- Reinstallation of three monitoring wells (A-MW112, C-MW205, and C-MW206).

Results of the IRM were documented in the approved Construction Completion Report for OU-1, dated December 30, 2020.

6.3: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water. The RI report presents a detailed discussion of any existing and potential impacts from the site to fish and wildlife receptors.

In Operable Unit 1 (OU-1) soil and groundwater were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, poly-chlorinated biphenyls (PCBs), metals and per- and polyfluoroalkyl substances (PFAS). Soil vapor was analyzed for VOCs.

Soil - Several petroleum VOCs were detected in soil exceeding the applicable restricted residential soil cleanup objectives (RRSCOs) and/or protection of groundwater SCOs (PGSCOs). 1,2,4-trimethylbenzene (1,2,4-TMB) was detected at a maximum concentration of 2,200 parts per million (ppm) compared to the RRSCO of 52 ppm and PGSCO of 3.6 ppm, 1,3,5- TMB was detected at a maximum concentration of 530 ppm (RRSCO is 52 ppm; PGSCO is 8.4 ppm), benzene was detected at a maximum concentration of 65 ppm (RRSCO is 4.8 ppm; PGSCO is 0.06 ppm), naphthalene was detected at a maximum concentration of 500 ppm (RRSCO is 100 ppm; PGSCO is 12 ppm), and toluene was detected at a maximum concentration of 960 ppm (RRSCO is 100 ppm; PGSCO is 0.7 ppm). In addition, light non-aqueous phase liquid (LNAPL) petroleum was identified primarily in the northern portion of OU-1 near the boundary with OU-2. The LNAPL extends onto OU-2 and will be fully delineated on OU-2 during the OU-2 Remedial Investigation. The following SVOCs were detected: fluoranthene at a maximum concentration of 160 ppm (RRSCO is 100 ppm and PGSCO is 1,000 ppm); phenanthrene at a maximum concentration of 190 ppm (RRSCO is 100 ppm; PGSCO is 1,000 ppm); and benzo(a)anthracene at a maximum concentration of 82 ppm (RRSCO is 1 ppm; PGSCO is 1 ppm). With respect to metals, arsenic was detected at a maximum concentration of 30.2 ppm (RRSCO and PGSCO is 16 ppm) and lead was detected at a maximum concentration of 2,320 ppm (RRSCO is 400 ppm; PGSCO is 450 ppm). Polychlorinated biphenyls (PCBs) were detected at a maximum concentration of 7.9 ppm (RRSCO is 1 ppm; PGSCO is 3.2 ppm). No pesticides were detected at concentrations exceeding the RRSCOs. No PFAS were detected at concentrations exceeding the PGSCO of 0.001 ppm. Data do not indicate off-site impacts in soil related to the site.

Groundwater - Several petroleum and chlorinated VOCs were detected in groundwater samples exceeding their respective Ambient Water Quality Standards (AWQS). 1,2,4-TMB was detected at a maximum concentration of 340 parts per billion (ppb) exceeding the AWQS of 5 ppb, benzene was detected at a maximum concentration of 560 ppb (AWQS is 1 ppb), methyl tert-butyl ether (MTBE) was detected at a maximum concentration of 29,000 ppb (AWQS is 10 ppb), o-xylene was detected at a maximum concentration of 410 ppb (AWQS is 5 ppb), naphthalene at a maximum concentration of 98 ppb (AWQS is 10 ppb), tetrachloroethene (PCE) at a maximum concentration of 160 ppb (AWQS is 5 ppb), and trichloroethene (TCE) at a maximum concentration of 110 ppb (AWQS is 5 ppb). SVOCs detected above their AWQS include 2,4-dimethylphenol (xylenol) at a maximum concentration of 91 ppb (AWQS is 1 ppb), phenol at a maximum concentration of 470 ppb (AWQS is 1 ppb), naphthalene at a maximum concentration of 55 ppb (AWQS is 10 ppb), and benzo(a)anthracene at a maximum concentration of 2.2 ppb (AWQS is 0.002 ppb). Regarding dissolved metals, arsenic was detected at a maximum concentration of 44.34 ppb (AWQS is 25 ppb). Polychlorinated biphenyls (PCBs) was detected at a maximum concentration of 0.106 ppb (AWQS is 0.09 ppb). No pesticides were detected at concentrations exceeding their respective AWQS. Regarding PFAS, perfluorooctanesulfonic acid (PFOS) was detected at a maximum concentration of 297 parts per trillion (ppt) and perfluorooctanoic acid (PFOA) at a maximum concentration of 828 ppt, which exceed the NYSDEC screening level of 10 ppt each. Data do not indicate any off-site impacts in groundwater related to the site.

Soil Vapor - Petroleum VOCs were detected in soil vapor. 1,2,4-TMB was detected at a maximum concentration of 9,340 micrograms per cubic meter (ug/m^3), 2,2,4-trimethylpentane was detected at a maximum concentration of 603,000 ug/m^3, benzene was detected at a maximum concentration of 175,000 ug/m^3, and. n-hexane was detected in soil vapor samples at a maximum concentration of 359,000 ug/m^3. Chlorinated VOCs such as tetrachloroethene (PCE) was detected at a maximum concentration of 283 ug/m^3. Data do not indicate any off-site impacts in soil vapor related to the site.

A comprehensive remedial investigation will be implemented for Operable Unit 2 (OU-2).

6.4: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure.*

Site access is restricted, but persons who enter the site may come in contact with contaminants in soil by walking on, digging, or otherwise disturbing the soil. People are not drinking contaminated groundwater because the area is served by a public water supply that is not affected by site contamination. Volatile organic compounds in the soil vapor (air spaces within the soil) can move into buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Because the site is currently vacant, inhalation of site-related contaminants due to soil vapor intrusion on-site is not a current concern. The potential exists for inhalation of site contaminants due to soil vapor intrusion for any future on-site redevelopment and building occupancy. Environmental sampling indicates that soil vapor intrusion is not a concern for off-site buildings.

6.5: Summary of the Remediation Objectives

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial action objectives for this site are:

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 ground water aquifer to pre-disposal/pre-release conditions, to the extend practicable.
- Remove the source of ground or surface water contamination.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in 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 a site.

SECTION 7: ELEMENTS OF THE SELECTED REMEDY

The alternatives developed for the site and the evaluation of the remedial criteria are presented in the Alternative Analysis. The remedy is selected pursuant to the remedy selection criteria set forth in DER-10, Technical Guidance for Site Investigation and Remediation and 6 NYCRR Part 375.

The selected remedy is a Track 4: Restricted Residential use remedy.

The selected remedy is referred to as the Excavation, Groundwater Treatment and Containment and Cover System remedy.

The elements of the selected remedy, as shown in Figure 2, are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;

- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings will include, at a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction.

2. Excavation

Excavation and off-site disposal of contaminant source areas primarily in the northern portion of OU-1, including:

- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u);
- soil with visual waste material or non-aqueous phase liquid;
- soils which exceed the protection of groundwater soil cleanup objectives (PGWSCOs), as defined by 6 NYCRR Part 375-6.8 for those contaminants found in site groundwater
- soils that create a nuisance condition, as defined in Commissioner Policy CP-51 Section G.

All soils in the upper two feet which exceed the restricted residential SCOs will be excavated and transported off-site for disposal.

Approximately 30,000 cubic yards of contaminated soil will be removed from the site.

3. Backfill

Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil or complete the backfilling of the excavation and establish the designed grades at the site.

4. Cover System

A site cover will be required to allow for restricted residential use of the site in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where a soil cover is to be used it will be a minimum of two feet of soil placed over a demarcation layer, with the upper six inches of soil of sufficient quality to maintain a vegetative layer. Soil cover material, including any fill material brought to the site, will meet the SCOs for cover material for the use of the site as set forth in 6 NYCRR Part 375-6.7(d). Substitution of other materials and components may be allowed where such components already exist or are a component of the tangible property to be placed as part of site redevelopment. Such components may include, but are not necessarily limited to pavement, concrete, paved surface parking areas, sidewalks, building foundations and building slabs.

5. In-Situ Chemical Oxidation or Reduction

In-situ chemical oxidation (ISCO) will be implemented to treat dissolved volatile organic compounds (VOCs) in groundwater. A chemical oxidant will be injected into the subsurface to destroy the contaminants, if levels of dissolved VOCs persist where petroleum light, non-

aqueous phase liquid (LNAPL) was observed and compounds were elevated in the groundwater. The method and depth of injection will be determined during the remedial design.

Groundwater monitoring will be required up-gradient, down-gradient, within the treatment zone, and/or from the barrier. Monitoring will be conducted for contaminants of concern (VOCs) upgradient and downgradient of the treatment zone.

6. Groundwater Extraction & Treatment

Groundwater extraction and treatment will be implemented to facilitate deeper source area excavations. The extraction system will direct contaminated groundwater toward the extraction wells within the plume area. The extraction system will be designed to minimize the drawdown of the water table in order to reduce smearing of non-aqueous phase liquid in the area of drawdown.

The extracted groundwater will be treated using appropriate technology prior to discharge.

7. Groundwater Containment

Based on the presence of source material (e.g., petroleum LNAPL) immediately off-site and the possibility of re-contamination of the site, a containment wall will be installed from approximately 2 feet above the groundwater table to approximately 1 foot into the confining peat layer that exists across that portion of the site. The wall will require a permeability of 10^{-6} centimeter/second or less across the barrier to mitigate the potential for source material migration from an off-site source. A sheet pile wall with sealed seams will be installed along parts of the northern and eastern property boundaries, approximately 300 feet along the northern property boundary and 135 feet along the eastern property boundary.

8. Vapor Mitigation

Any on-site buildings will be required to have a sub-slab depressurization system, or other acceptable measures, to mitigate the migration of vapors into the building from groundwater.

9. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

- require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allow the use and development of the controlled property for restricted residential use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or NYC; and
- require compliance with the Department approved Site Management Plan.

10. Site Management Plan

A Site Management Plan is required, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements

necessary to ensure the following institutional and/or engineering controls remain in place and effective:

- Institutional Controls: The Environmental Easement discussed in Paragraph 8.
- Engineering Controls: The Cover System discussed in Paragraph 4, the Groundwater Remedies discussed on Paragraphs 5 and 7, and the Vapor Mitigation Systems discussed in Paragraph 8.

This plan includes, but may not be limited to:

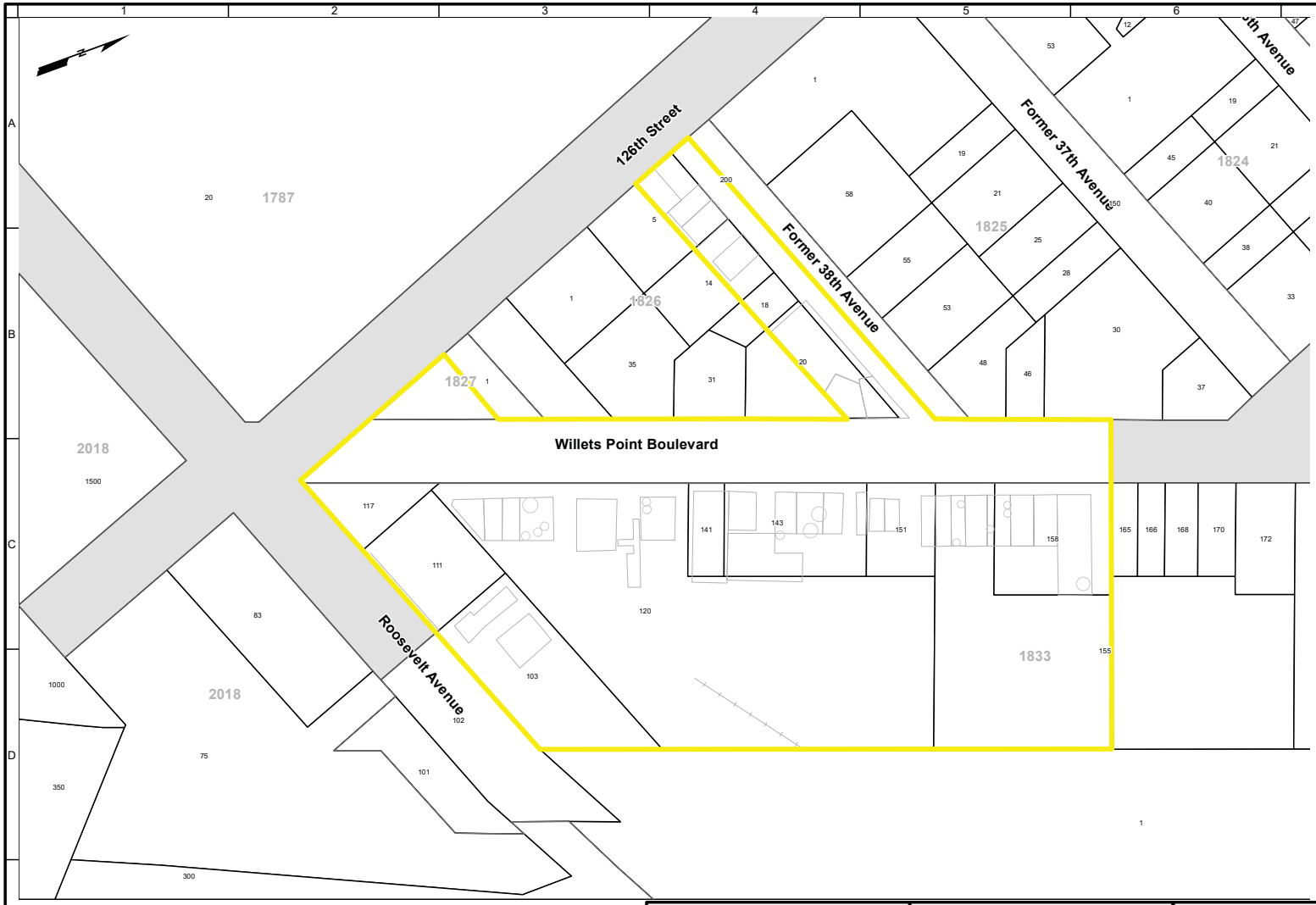
- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use or groundwater restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any occupied buildings on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- a provision that should a building foundation or building slab be removed in the future, a cover system consistent with that described in Paragraph 4 above will be placed in any areas where the upper two feet of exposed surface soil exceed the applicable soil cleanup objectives (SCOs);
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
    - monitoring of groundwater to assess the performance and effectiveness of the remedy;
    - a schedule of monitoring and frequency of submittals to the Department;
    - monitoring for vapor intrusion for any buildings on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

c. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, optimization, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to:
    - procedures for operating and maintaining the remedy;
    - compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
    - maintaining site access controls and Department notification; and
    - providing the Department access to the site and O&M records.

NOTES:
TOPOGRAPHIC BASEMAP PROVIDED BY UNITED STATES GEOLOGICAL SURVEY. QUADRANGLES: FLUSHING, JAMAICA, NEW YORK, DATE: 2016

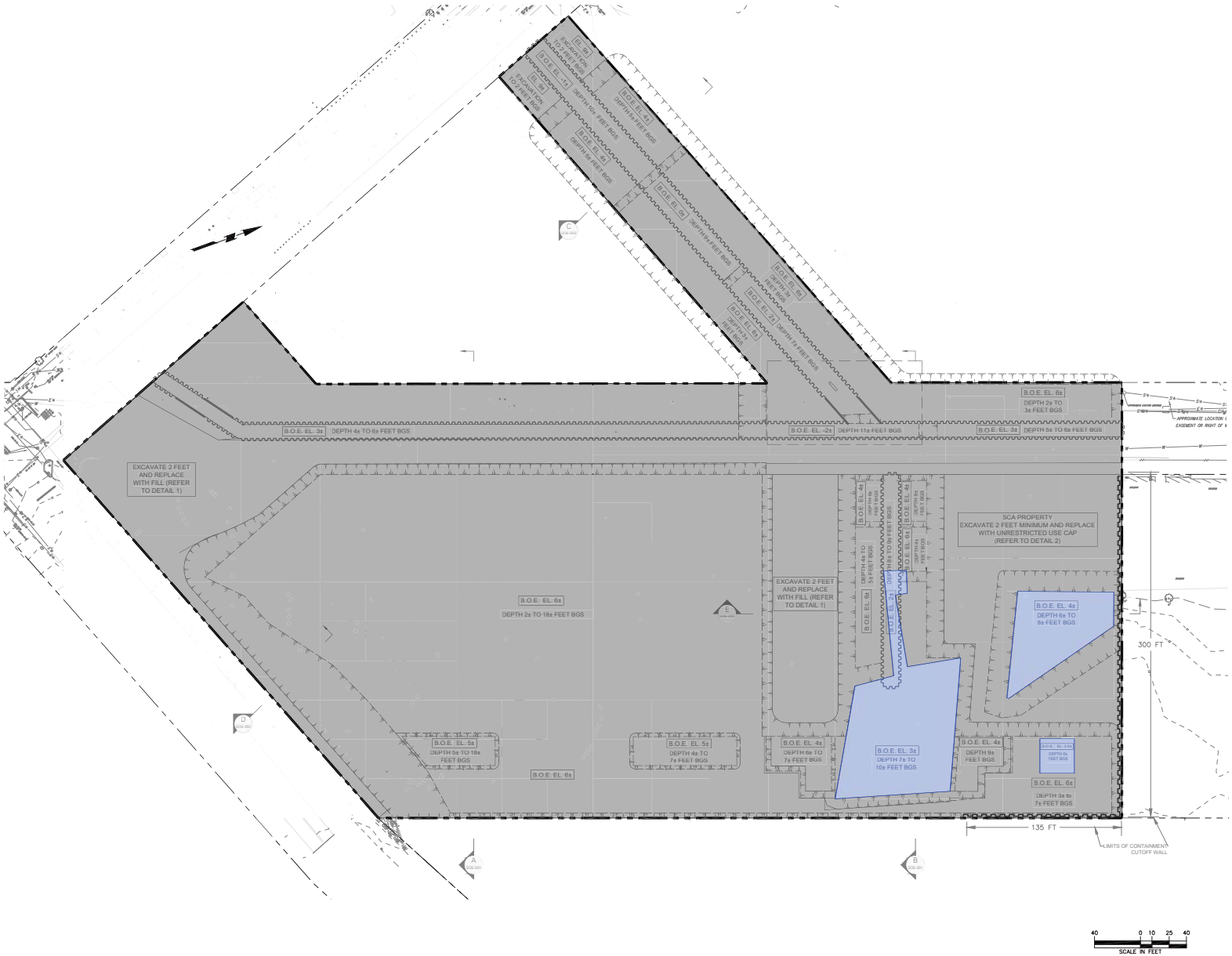
	Project **WILLETS POINT OU-1 (PHASE 1A)** **REMEDIAL ACTION WORK PLAN** QUEENS NEW YORK	Figure Title **SITE LOCATION MAP**		Figure 1



NOTES

1. TAX PARCELS PROVIDED BY THE NEW YORK CITY DEPARTMENT OF CITY PLANNING, PLUTO 19V1 COPYRIGHT 2019.
2. FORMER BUILDING FOOTPRINTS, HISTORICAL USES, AND SITE FEATURES ARE REFERENCED FROM THE SANBORN FIRE INSURANCE MAPS AND SEPTEMBER 2014 REMEDIAL INVESTIGATION WORK PLAN, PREPARED BY INTEGRAL P.C.

	Project	Figure Title		Figure
	WILLETS POINT OU-1 (PHASE 1A) REMEDIAL ACTION WORK PLAN QUEENS NEW YORK	SITE LAYOUT PLAN		2



LEGEND

- APPROXIMATE REMEDIAL EXCAVATION AREA TO 2 FEET BGS
- APPROXIMATE REMEDIAL EXCAVATION AREA GREATER THAN 2 FEET BGS
- BOTTOM OF SLOPE
- TOP OF SLOPE
- ASSUMED SHEETING LIMITS
- EXISTING CONTOURS
- B.O.E. EL. X± — BOTTOM OF EXCAVATION ELEVATION (NAVD88) EXCAVATION DEPTH BELOW GRADE SURFACE (BGS) NOTED
- EXISTING WATER MAIN
- LIMIT OF REMEDIATION (OU-1 BOUNDARY)
- RIGHT OF WAY
- APPROXIMATE CONTAINMENT CUT-OFF WALL EXTENTS

NOTES:

1. BASE MAP IS REFERENCED FROM LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C. DRAWING SOE-101.00 EXCAVATION DEPTH, DATED OCTOBER 14, 2019.
2. EXCAVATION EXTENTS AND ELEVATIONS ARE APPROXIMATE.THE EXCAVATION DEPTHS CORRESPONDING TO THE BOTTOM OF EXCAVATION ELEVATIONS ARE APPROXIMATED, PROVIDED FOR REFERENCE ONLY, AND VARY BASED ON EXISTING SITE GRADE.
3. ELEVATIONS SHOWN ON THIS FIGURE DO NOT REFLECT POST-INTERIM REMEDIAL MEASURE CONDITIONS. REFER TO FIGURE 8 AND THE CONSTRUCTION COMPLETION REPORT FOR COMPLETED INTERIM REMEDIAL MEASURES EXCAVATION AND BACKFILL GRADES.
4. REMEDIAL EXCAVATION EXTENTS AND DEPTHS ARE SUBJECT TO CHANGE BASED ON FIELD OBSERVATIONS. SOURCE MATERIAL ENCOUNTERED OUTSIDE OF THE REMEDIAL EXCAVATION EXTENTS ON THIS FIGURE WILL BE REMOVED AS PART OF THE REMEDY.
5. ELEVATION ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
6. AN ENGINEERED COMPOSITE COVER SYSTEM CONSISTING OF A MINIMUM OF 2-FEET CERTIFIED CLEAN BACKFILL WILL BE INSTALLED ACROSS THE ENTIRE SITE FOOTPRINT. SEE TEXT FOR BACKFILL REQUIREMENTS.
7. BGS = BELOW GRADE SURFACE

Project

WILLETS POINT OU-1 (PHASE 1A)

REMEDIAL ACTION WORK PLAN

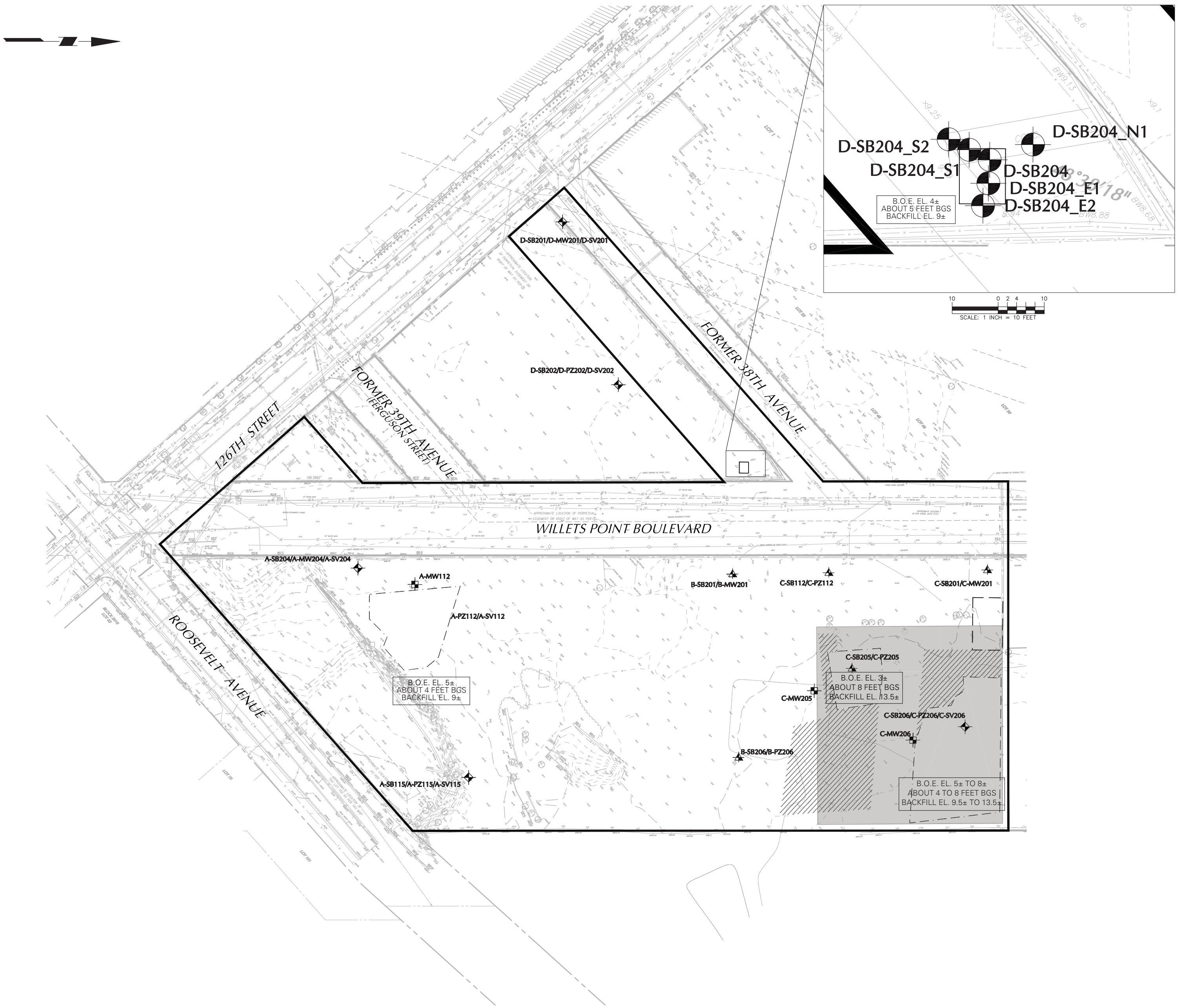
QUEENS COUNTY NEW YORK

Figure Title

ALTERNATIVE II - TRACK 4 REMEDIAL EXCAVATION PLAN

Figure No.

3



LEGEND:

- LIMIT OF REMEDIATION (OU-1 BOUNDARY)
- B-SB202 — RI SOIL BORING LOCATION (LANGAN, 2019)
- C-SB201/C-MW201 — RI CO-LOCATED SOIL BORING/MONITORING WELL LOCATION (LANGAN, 2019)
- A-SB204/A-MW204/A-SV204 — RI CO-LOCATION SOIL BORING/MONITORING WELL/SOIL VAPOR PROBE LOCATION (LANGAN, 2019)
- A-MW112 — APPROXIMATE LOCATION OF REINSTALLED MONITORING WELL
- IRM 1: HAZARDOUS LEAD SOIL REMOVAL
- COMPLETED IRM PETROLEUM-CONTAMINATED SOIL REMOVAL AREA - A-SB112
- REMAINING IRM PETROLEUM-CONTAMINATED SOIL REMOVAL AREA - C-SB205 AND C-SB206
- B.O.E. EL. 4± / ABOUT 5 FEET BGS / BACKFILL EL. 9± — BOTTOM OF EXCAVATION ELEVATION, APPROXIMATE DEPTH BELOW GRADE SURFACE, AND POST-IRM BACKFILL ELEVATION
- APPROXIMATE CONTINGENCY GROUNDWATER TREATMENT AREA

NOTES:

1. REMEDIAL INVESTIGATION SAMPLE LOCATION COORDINATES WERE COLLECTED USING A TRIMBLE GPS UNIT.
2. INTERIM REMEDIAL MEASURE (IRM) SAMPLE LOCATION AND EXTENT COORDINATES WERE SURVEYED BY LANGAN ON FEBRUARY 4, 2020.
3. ELEVATIONS SHOWN ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) BASED UPON GPS METHODS.
4. IRM WERE DEVELOPED BASED ON REMEDIAL INVESTIGATION DATA COLLECTED BETWEEN MARCH 18 AND JUNE 5, 2019.
5. REMAINING EXTENTS OF SOIL TO BE REMOVED IN IRM LOCATIONS 3 AND 4 ARE APPROXIMATE AND SUBJECT TO CHANGE BASED ON FIELD OBSERVATIONS DURING THE RAWP.

50 0 25 50
SCALE: 1 INCH = 50 FEET

Project

WILLETS POINT OU-1 (PHASE 1A)

REMEDIAL ACTION WORK PLAN

QUEENS COUNTY NEW YORK

Figure Title

COMPLETED INTERIM REMEDIAL MEASURES AND CONTINGENCY REMEDIAL MEASURES PLAN

Figure No.

4