DECISION DOCUMENT

11 Spencer Street
Brownfield Cleanup Program
Brooklyn, Kings County
Site No. C224204
December 2022

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

DECLARATION STATEMENT - DECISION DOCUMENT

11 Spencer Street
Brownfield Cleanup Program
Brooklyn, Kings County
Site No. C224204
December 2022

Statement of Purpose and Basis

This document presents the remedy for the 11 Spencer Street 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 the 11 Spencer Street 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, including:

- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u); and
- soils which exceed the protection of groundwater soil cleanup objectives (PGSCOs), as defined by 6 NYCRR Part 375-6.8 for those contaminants found in site groundwater above standards.

All soils in the upper four feet which exceed the restricted residential SCOs will be excavated and transported off-site for disposal. Source material in the former solvent pit area exceeding Protection of Groundwater SCOs will be excavated to nineteen feet and transported off-site for disposal. Source material along the eastern boundary of the site exceeding Protection of Groundwater SCOs will be excavated to twelve feet and transported off-site for disposal.

If a Track 2 restricted residential cleanup is achieved, a Cover System will not be a required element of the remedy.

Approximately 3,600 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 complete the backfilling of the excavation and establish the designed grades at the site.

4. Cover System

If a Track 2 restricted residential cleanup is not achieved, a site cover will be required in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs), to allow for restricted residential use of the site. 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 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. Groundwater Remedies

In-Situ Chemical Reduction

In-situ chemical oxidation (ISCO) and in-situ chemical reduction (ISCR) will be implemented to

treat chlorinated volatile organic compounds (CVOCs) in groundwater.

A chemical oxidizing agent will be injected into the shallow subsurface to 3,000 square foot area located in the central portion of the site where CVOC compounds were elevated in the groundwater and where naturally oxidizing conditions currently exist. A chemical reducing agent will be injected into the intermediate and deep subsurface to destroy the contaminants in an approximately 3,000 square foot area located in the central portion of the site where CVOC compounds were elevated in the groundwater and where naturally reducing conditions currently exist. Injection wells will be screened from approximately 15 to 55 feet below ground surface (bgs). It is estimated that ISCO and ISCR will be injected during multiple events. A secant wall will be installed downgradient of the injection area to limit the injected reagents from migrating to brownfield sites downgradient of 11 Spencer Street.

Prior to the full implementation of this technology, laboratory and on-site pilot scale studies will be conducted to more clearly define design.

Monitoring will be required up-gradient, down-gradient, and within the treatment zone.

Permeable Reactive Barrier

A permeable reactive barrier will be installed on the upgradient side of the site consistent with groundwater contours to mitigate contamination entering the site. The barriers will be installed to a terminal depth of 34 feet bgs.

A secant wall will be installed on the downgradient side of the site consistent with groundwater contours to mitigate contamination migrating from the site and to limit the on-site remedy from effecting neighboring remedial elements. The secant wall will be installed to a terminal depth of 25 feet bgs.

Prior to the full implementation of this technology, laboratory and on-site pilot scale studies will be conducted to more clearly define design.

Monitoring will be required up-gradient, down-gradient, and within the treatment zone. Monitoring will be conducted for chlorinated volatile organic compounds, dissolved oxygen, redox potential, and pH.

6. Vapor Mitigation

A soil vapor intrusion assessment will be completed at off-site buildings as part of this remedy. Continued attempts to access and assess off-site buildings identified must be performed. Any on-site buildings and off-site buildings impacted by the site will be required to have a sub-slab depressurization system, or other acceptable measures, to mitigate the migration of vapors into the building from soil and/or groundwater.

Engineering and Institutional Controls

Imposition of an institutional control in the form of an environmental easement and a Site Management Plan, as described below, will be required. The remedy will achieve a Track 4 restricted residential cleanup at a minimum and will include imposition of a site cover.

7. 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 NYCDOH; and
- require compliance with the Department approved Site Management Plan.

8. 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 above.
   - Engineering Controls: The soil cover system discussed in Paragraph 4, the ISCR and permeable reactive barrier in Paragraph 5 and the sub-slab depressurization system discussed in Paragraph 6 above.

   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, and groundwater use restrictions;
   - provisions for the management and inspection of the identified engineering controls;
   - a provision for evaluation of the potential for soil vapor intrusion for any occupied buildings off-site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
   - 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 and vapor 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 and off-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.

December 21, 2022

Date

Gerard Burke, Director
Remedial Bureau B

DECISION DOCUMENT

11 Spencer Street
Brooklyn, Kings County
Site No. C224204
December 2022

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, where a contaminant is present at levels exceeding the soil cleanup objectives or other health-based or environmental standards, criteria or guidance, based on the reasonably anticipated use of the property.

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=C224204

Brooklyn Public Library - Clinton Hill Library
380 Washington Avenue
Brooklyn, NY 11238
Phone: 718-398-8713

Brooklyn Community Board 3
1360 Fulton Street
Rm. 202
Brooklyn, NY 11216
Phone: 718-622-6601

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 site is located in the Bedford Stuyvesant section of Brooklyn, NY and is comprised of one tax parcel identified as Block 1716, Lots 24 on the New York City Tax Map. The lot totals 18,774 square feet (0.43 acres). The site has 167.25 feet of street frontage on Spencer Street and 75 feet of street frontage on Flushing Avenue. Two Brownfield sites with co-mingled contaminant plumes are adjacent to the site. 8 Walworth (C224239) and 480 Flushing Avenue (C224259), both to the east.

Site Features:
The site is currently vacant with no structures present and is not being used. An 8-foot high construction fence borders the property on the north and west sides to prevent unauthorized access.

Current Zoning and Land Use:
The property is currently zoned M1-2 (manufacturing). M1 districts are often buffers between M2 or M3 districts and adjacent residential or commercial districts. M1 districts typically include light industrial uses, such as woodworking shops, repair shops, and wholesale service and storage facilities. Surrounding land use includes commercial to the south and west, mixed-use (residential with ground floor retail) properties to the east, residential properties to the northwest, and commercial/industrial properties to the north.

The area surrounding the property is highly urbanized and predominantly consists of older industrial/commercial buildings with mixed use buildings along main corridors such as Bedford Avenue, Flushing Avenue and Park Avenue.

There are eight schools located within 1,200 feet of the site including Bnei Shimon Yisroel of Sopron approximately 200 feet to the east. There are no nursing homes or hospitals identified

within 1,000 feet of the site.

Past Use of the Site:
The site was formerly comprised of three lots (Block 1716, Lots 20, 21 and 24) prior to being merged. Former Lot 21 was originally developed prior to 1887 with a 2-story residential home along Spencer Street and a "stone yard" which fronted on Flushing Avenue. The most recent building was constructed in 1935 and was used as a garage. By 1947, the main portion of the building was used as a sheet metal works with the Spencer Street portion used as a private garage. By 1950 the private garage became part of the sheet metal works and was used for painting and spraying and making wire and wire products. The building remained in this use through at least the 1990s. Former Lot 20 was originally a storefront but has been a vacant lot used for parking since 1935. Former Lot 24 was used as a lumber shed in 1918, then as a tire shop from 1935 to 1950, storage from 1965 to 1996. The current owner purchased the property in March 2015. The buildings on lot 21 and 20 were demolished in 2018.

Site Geology and Hydrogeology:

The geologic setting of Long Island is well documented and consists of crystalline bedrock overlain by layers of unconsolidated deposits. According to geologic maps of the area created by the United States Geologic Survey (USGS), the bedrock in this area of Brooklyn is an igneous intrusive classified as the Ravenswood grano-diorite of middle Ordovician to middle Cambrian age. Unconsolidated sediments overlie the bedrock and consist of Pleistocene aged sand, gravel and silty clays, deposited by glacial-fluvial activity. Non-native fill materials consisting of dredge spoils, rubble and / or other materials have historically been used to reinforce and extend shoreline areas and to raise and improve the drainage of low-lying areas. Subsurface soils at the site include a silty non-native fill with ash and other rubble which varies in depth from 1 to 5 feet. A fine silt, and in some locations clay, is present beneath the fill at a depth of approximately 3 to 5 feet. Crushed rock and coarse sand grading to fine sand and silt is present below the fill and silt and extends to the water table (10 to 15 feet bgs). This is followed by a medium to coarse sand to a depth of 20 feet with cobbles and coarse sand from 20 to 50 feet below grade. According to the USGS topographic map for the area (Brooklyn Quadrangle), the elevation of the property is approximately 20 feet above mean sea level. Depth to groundwater is approximately 13 feet below grade. The topography within the immediate area slopes gradually from south to north.

The site is not located within a designated flood zone area. The nearest moderate risk flood zone is located 800 feet to the northwest and the nearest high risk flood zone is located 950 feet to the northwest.

The groundwater table at the site is generally flat with few anomalies within off-site wells. The groundwater flow direction as determined from on-site and off-site groundwater elevation measurements is east-southeast.

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 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 under the Brownfield Cleanup Agreement is a Participant. The Department has determined that this site poses a significant threat to human health and the environment and there are off-site impacts that require remedial activities. The Applicant has an obligation to address on-site and off-site contamination. 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
-sub-slab vapor
-indoor air

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 at this site is/are:

1,1,2-trichlorethylene
tetrachloroethene (PCE)
cis-1,2-dichloroethene
toluene
1,1,1-Trichloroethane (TCA)

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

- groundwater
- soil
- soil vapor intrusion
- indoor air

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.

There were no IRMs performed at this site during the RI.

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.

Nature and Extent of Contamination:

Soil and groundwater were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), per- and polyfluoroalkyl substances (PFAS), and pesticides. Soil vapor was analyzed for VOCs. Based upon investigations conducted to date, the primary contaminants of concern include chlorinated VOCs, SVOCs and metals in soil, chlorinated VOCs in groundwater, and chlorinated VOCs in soil vapor.

Soil: Chlorinated Volatile Organic Compounds (CVOCs) were detected above Protection of Groundwater Soil Cleanup Objectives (PGSCO) and Restricted Residential Soil Cleanup Objectives (RRSCOs). The highest concentrations of tetrachloroethene (PCE) are 2,600 parts per million (ppm) (PGSCO: 1.3 ppm and RRSCO: 19 ppm), and trichloroethene (TCE) are 480 ppm (PGSCO: 0.47 ppm and RRSCO: 21 ppm). SVOCs and Metals were also detected above RRSCOs. The highest concentrations of arsenic are 22 ppm (RRSCO: 16 ppm), barium are 1,780 ppm (RRSCO: 400 ppm), benzo(a)anthracene are 23 ppm (RRSCO: 1 ppm), benzo(a)pyrene are 19 ppm (RRSCO: 1 ppm), benzo(b)fluoranthene are 16 ppm (RRSCO: 1 ppm), chrysene are 24 ppm (RRSCO: 3.9 ppm) and indeno(1,2,3-c,d)pyrene are 12 ppm (RRSCO: 0.5 ppm). Perfluorooctanoic acid (PFOA) was measured in soil at concentrations ranging from 0. 506 part per billion (ppb) to 0.563 ppb, which is below the guidance value for restricted residential use of 33 ppb. Data does not indicate any off-site impacts in soil related to this site.

Groundwater: Groundwater samples collected at the site exceeded the Ambient Water Quality Standards (AWQSs) for PCE at a maximum concentration of 120,000 ppb (AWQS is 5 ppb), TCE was detected at a maximum concentration of 38,000 ppb (AWQS is 5 ppb), vinyl chloride was detected at a maximum concentration of 7,800 ppb (AWQS is 2 ppb), 1,1,1-TCA at a maximum of 86,000 ppb (AWQS of 5 ppm), cis-1,2-dichlorethene was detected at a maximum concentration of 22,000 ppb (AWQS is 5 ppb) and the non-chlorinated VOC toluene at a maximum of 1,500 ppb (AWQS of 5 ppm). PFOS was detected above the maximum contaminant limit (MCL – drinking water standard) of 10 parts per trillion (ppt) at a maximum concentration of 124 ppt. PFOA was detected above the maximum contaminant limit (MCL – drinking water standard) of 10 parts per trillion (ppt) at a maximum concentration of 124 ppt. Data indicates off-site impacts in groundwater related to this site. Off-site impacts will be monitored post remedy.

Soil Vapor and Indoor Air: Sub-slab vapor containing PCE and TCE have been found beneath the building slab at levels as high as 1.6 million micrograms per cubic meter (ug/m3) and 82,000 ug/m3, respectively. These same compounds have been detected in the indoor air in the building on Lot 21 (prior to demolition), with PCE observed as high as 80 ug/m3 and TCE observed as high as 30.8 ug/m3.

Neighboring lots were analyzed for soil vapor intrusion as part of the remedial investigations. Data indicates that there is potential for additional off-site impacts in soil vapor related to this site.

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.*

Access is restricted by a fence. People may contact contaminants in soil by walking on the site, digging, or otherwise disturbing the soil. People are not drinking the contaminated groundwater because the area is served by a public water supply that obtains water from a different source not affected by this contamination. Volatile organic compounds in soil vapor (air spaces within the soil) may move into overlying 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. The site is currently vacant and redevelopment is planned. The potential exists for the inhalation of site contaminants due to soil vapor intrusion for future on-site buildings. Action is recommended to address potential exposures at an adjacent building. Additional investigation is needed to determine whether actions are needed to address soil vapor intrusion in other off-site structures.

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 extent practicable.

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 2: Restricted use with generic soil cleanup objectives remedy.

The selected remedy is referred to as the Excavation, Groundwater Treatment and Vapor Mitigation 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, including:

- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u); and
- soils which exceed the protection of groundwater soil cleanup objectives (PGSCOs), as defined by 6 NYCRR Part 375-6.8 for those contaminants found in site groundwater above standards.

All soils in the upper four feet which exceed the restricted residential SCOs will be excavated and transported off-site for disposal. Source material in the former solvent pit area exceeding Protection of Groundwater SCOs will be excavated to nineteen feet and transported off-site for disposal. Source material along the eastern boundary of the site exceeding Protection of Groundwater SCOs will be excavated to twelve feet and transported off-site for disposal.

If a Track 2 restricted residential cleanup is achieved, a Cover System will not be a required element of the remedy.

Approximately 3,600 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 complete the backfilling of the excavation and establish the designed grades at the site.

4. Cover System

If a Track 2 restricted residential cleanup is not achieved, a site cover will be required in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs), to allow for restricted residential use of the site. 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 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. Groundwater Remedies

In-Situ Chemical Reduction

In-situ chemical oxidation (ISCO) and in-situ chemical reduction (ISCR) will be implemented to treat chlorinated volatile organic compounds (CVOCs) in groundwater.

A chemical oxidizing agent will be injected into the shallow subsurface to 3,000 square foot area located in the central portion of the site where CVOC compounds were elevated in the groundwater. A chemical reducing agent will be injected into the intermediate and deep subsurface to destroy the contaminants in an approximately 3,000 square foot area located in the central portion of the site where CVOC compounds were elevated in the groundwater. Injection wells will be screened from approximately 15 to 55 feet below ground surface (bgs). It is estimated that ISCO and ISCR will be injected during multiple events. A secant wall will be installed downgradient of the injection area to limit t agents from migrating to brownfield sites downgradient of 11 Spencer Street.

Prior to the full implementation of this technology, laboratory and on-site pilot scale studies will be conducted to more clearly define design.

Monitoring will be required up-gradient, down-gradient, and within the treatment zone.

Permeable Reactive Barrier

A permeable reactive barrier will be installed on the upgradient side of the site consistent with groundwater contours to mitigate contamination entering the site. The barriers will be installed to a terminal depth of 34 feet bgs.

A secant wall will be installed on the downgradient side of the site consistent with groundwater contours to mitigate contamination migrating from the site and to limit the on-site remedy from effecting neighboring remedial elements. The secant wall will be installed to a terminal depth of 25 feet bgs.

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Monitoring will be required up-gradient, down-gradient, and within the treatment zone.

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A soil vapor intrusion assessment will be completed at off-site buildings as part of this remedy. Continued attempts to access and assess off-site buildings identified must be performed. Any on-site buildings and off-site buildings impacted by the site will be required to have a sub-slab depressurization system, or other acceptable measures, to mitigate the migration of vapors into the building from soil and/or groundwater.

Engineering and Institutional Controls

Imposition of an institutional control in the form of an environmental easement and a Site Management Plan, as described below, will be required. The remedy will achieve a Track 4 restricted residential cleanup at a minimum and will include imposition of a site cover.

7. 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 NYCDOH; and
- require compliance with the Department approved Site Management Plan.

8. Site Management Plan

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

d. 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 above.
   - Engineering Controls: The soil cover system discussed in Paragraph 4, the ISCR and permeable reactive barrier in Paragraph 5 and the sub-slab depressurization system discussed in Paragraph 6 above.

   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, and groundwater use restrictions;
   - provisions for the management and inspection of the identified engineering controls;
   - a provision for evaluation of the potential for soil vapor intrusion for any occupied buildings off-site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
   - maintaining site access controls and Department notification; and
   - the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

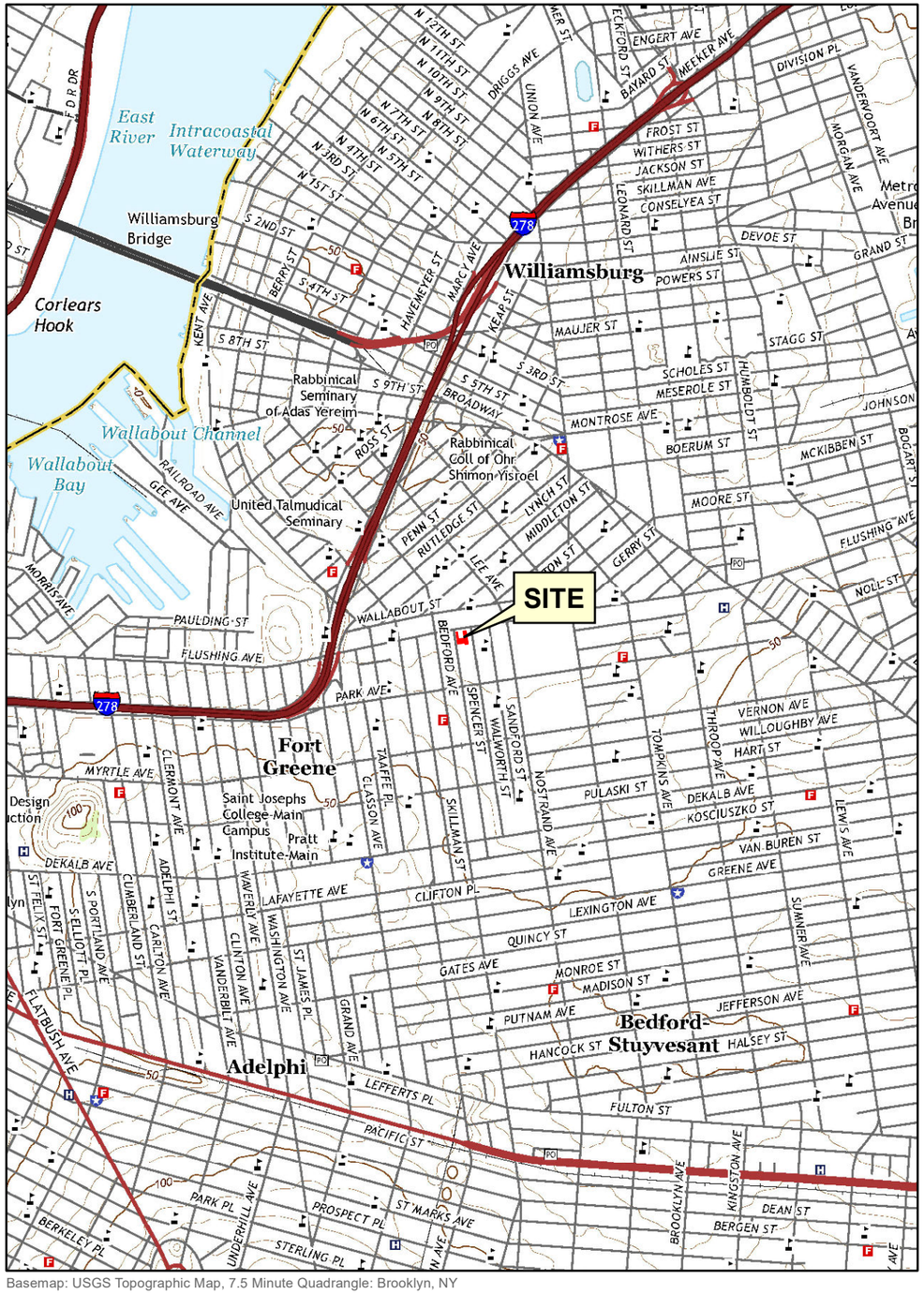
e. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan

includes, but may not be limited to:

- monitoring of groundwater and vapor 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 and off-site, as may be required by the Institutional and Engineering Control Plan discussed above.

f. 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:

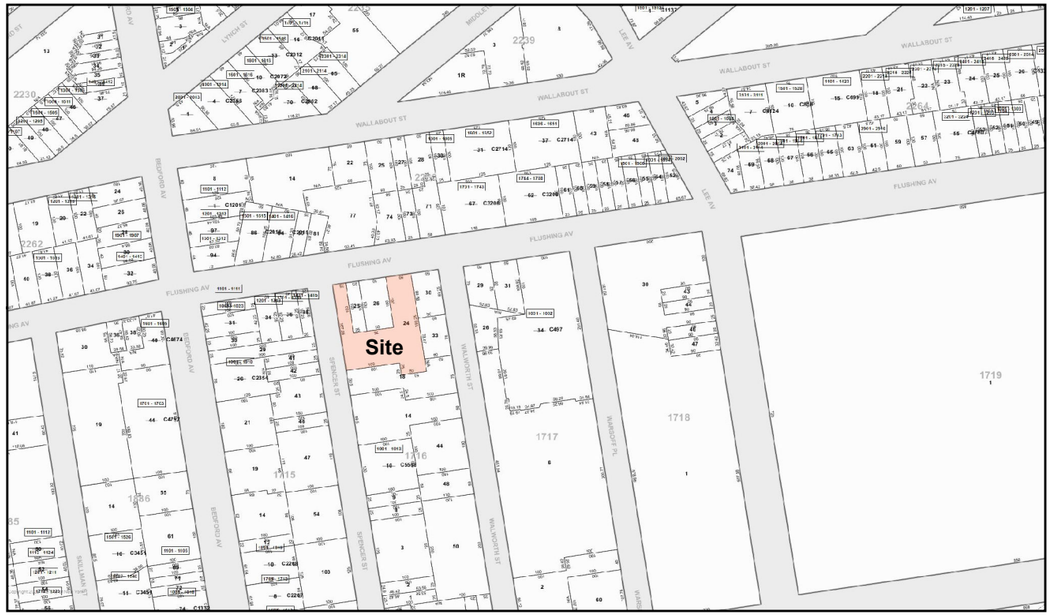
- procedures for operating and maintaining the remedy;
- compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
- maintaining site access controls and Department notification; and
- providing the Department access to the site and O&M records.



Basemap: USGS Topographic Map, 7.5 Minute Quadrangle: Brooklyn, NY

Site Location

0 1,000 2,000 4,000 Feet



http://gis.nyc.gov/taxmap/map.htm

Department of Finance Digital Tax Map

0 150 300 600 Feet

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NYC Department of City Planning, Information Technology Division

Department of City Planning MapPLUTO - 2022 v2

0 150 300 600 Feet

Site

11 Spencer Street
Brooklyn, New York
Block 1716, Lot 24

TENEN ENVIRONMENTAL
Tenen Environmental, LLC
121 West 27th Street
Suite 702
New York, NY 10001
O: (646) 606-2332
F: (646) 606-2379

Drawn By	LM
Checked By	AP
Date	November 2022
Scale	As Noted
Drawing Title	**Site Location Map**
Drawing No	**Figure 1**

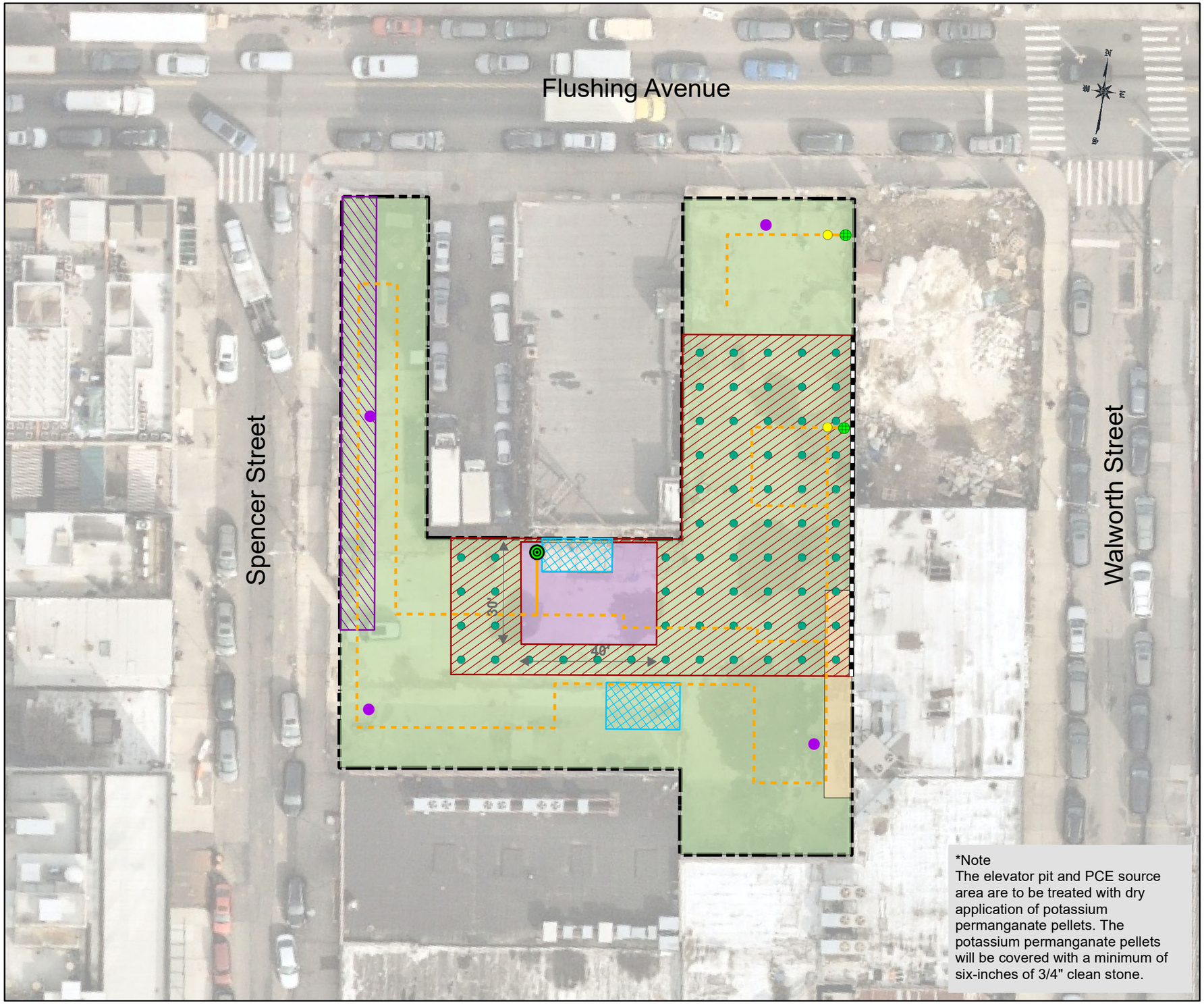
Basemap: NYC Department of City Planning, Information Technology Division
Nearmap Image 3/10/2021

0 15 30 60 Feet

Legend

Property/Site Boundary

Drawing Title: **Site Plan**	Drawn By: LM	Tenen Environmental, LLC 121 West 27th Street Suite 702 New York, NY 10001 O: (646) 606-2332 F: (646) 606-2379	Site: **11 Spencer Street Brooklyn, New York Block 1716, Lot 24**
	Checked By: AP		
Drawing No: **Figure 2**	Date: November 2022		
	Scale: As Noted		



Legend

- Conceptual Injection Well Locations
- Secant Wall
- Extent of Proposed ZVI Wall
- Elevator Pit*
- ISCO Injection Area
- Remedial Excavation of soil exceeding Protection of Groundwater SCOs to 12 ft-bsg (Approx. 486 SF)
- Remedial Excavation of Soil Exceeding Protection of Groundwater and/or Restricted-Residential Use SCOs to 4 ft-bsg (Approx. 17,151 SF)
- Remedial Excavation of PCE Source Area/Concrete Pit to 19 ft-bsg (Approx. 1,200 SF)*
- Property Boundary

SSDS System

- Transition Over Footing to Riser
- Vertical Transition in Solid PVC SSDS Pipe to Parking Area in Cellar
- Riser to Roof
- Pressure Monitoring Point
- Four-inch Solid PVC SSDS Pipe
- Four-inch Slotted PVC SSDS Pipe

Note: bsg = feet below sidewalk grade

0 15 30 60 Feet

*Note
The elevator pit and PCE source area are to be treated with dry application of potassium permanganate pellets. The potassium permanganate pellets will be covered with a minimum of six-inches of 3/4" clean stone.

Basemap: NYC Department of City Planning, Information Technology Division
Nearmap Image 3/10/2021

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Drawn By	Checked By	Date	Scale
LM	AP	November 2022	As Noted

Drawing Title: **Elements of Remedy**

Drawing No: **Figure 3**