DECISION DOCUMENT

Gowanus Canal Northside
Brownfield Cleanup Program
Brooklyn, Kings County
Site No. C224080
April 2022

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

DECLARATION STATEMENT - DECISION DOCUMENT

Gowanus Canal Northside
Brownfield Cleanup Program
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Site No. C224080
April 2022

Statement of Purpose and Basis

This document presents the remedy for the Gowanus Canal Northside 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 the Gowanus Canal Northside 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);
•non-aqueous phase liquids;
•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 above standards; and
•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 (RRSCOs) will be excavated and transported off-site for disposal.

Additionally, soil will be removed from the following "areas of concern" (AOC). Final limits of these areas will be determined during design:

AOC#1 is located along the northern boundary of the site. It is approximately 100 feet long and 50 feet wide. Removal is estimated to be eight feet deep.

AOC#3 is located in the southern half of the site, just south of Sackett Street. It is approximately 40 feet long and 30 feet wide. Removal is estimated to be seven feet deep.

AOC#4 is located near the southern boundary of the site, just north of Union Street. It is and area approximately 70 feet long and 70 feet wide. Removal is estimated to be three feet deep.

Approximately 8,600 cubic yards of petroleum contaminated soil will be removed from the site and trucked off-site for disposal. Any underground storage tanks (USTs), fuel dispensers, underground piping or other structures associated with a source of contamination will also be excavated and removed.

3. Backfill

Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the designed grades at the site. On-site soil which does not exceed the above excavation criteria or the protection of groundwater SCOs for any constituent may also be used anywhere beneath the cover system, including below the water table, to backfill the excavation or re-grade the site.

4. In-situ Treatment Using Activated Carbon

Activated carbon will be added to the subsurface to capture and prevent the migration of petroleum related impacts. In the area of the captured contamination, conditions will be maintained that will allow anaerobic degradation of petroleum impacts to occur. An activated carbon mixture, including an amendment of sodium nitrate/ammonium sulfate (electron acceptor), will be added to the subsurface to treat petroleum source locations. Treatment will be applied to AOC#1 and 4, discussed above. Treatment will also include AOC#2 which is located in the northwest part of the site along Bond Street. AOC#2 extends off-site along the sidewalk. The activated carbon mixture will be applied to the subsurface via a series of temporary injection points and/or through direct application at the base of the excavations. The method and depth of injection will be determined during the remedial design.

5. 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.

6. Coal Tar Recovery

Installation and operation of coal tar recovery wells along the eastern portion of the site, adjacent to Gowanus Canal, to remove potentially mobile coal tar from the subsurface deposited at this site from tar that had historically migrated along the canal from a nearby former manufactured gas plant (MGP) site. The number, depth, type and spacing of the recovery wells will be determined during the design phase of the remedy. Coal tar will be collected periodically from each well; however, if wells are determined by the Department to accumulate large quantities of coal tar over extended time periods, they may be converted to automated collection if site conditions/logistics allow.

7. 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 soil and/or groundwater.

8. 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.

9. Site Management Plan

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

1. 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 discussed in Paragraph 5, the coal tar recovery wells in Paragraph 6 and the sub-slab depressurization system(s) discussed in Paragraph 7 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/or groundwater and/or surface water use restrictions;
•a provision that should a building foundation or building slab be removed in the future, a cover system consistent with that described in Paragraph 5 above will be placed in any areas where the upper two feet of exposed surface soil exceed the applicable soil cleanup objectives (SCOs);
•a provision should redevelopment occur to ensure no soil exceeding protection of groundwater concentrations will remain below storm water retention basin or infiltration structures;
•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.

2. 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, with a provision for additional groundwater treatment if determined necessary by the Department;
•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.

3. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, inspection, and reporting of any mechanical or physical components of the active vapor mitigation system(s) and coal tar recovery wells. The plan includes, but is not limited to:

•procedures for operating and maintaining the system(s) and coal tar recovery wells; and
•compliance inspection of the system(s) to ensure proper O&M as well as providing the data for any necessary reporting.

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.

4/12/2022
Date

Janet Brown, Director
Remedial Bureau C

DECISION DOCUMENT

Gowanus Canal Northside
Brooklyn, Kings County
Site No. C224080
April 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 from January 19th, 2022 to March 5th, 2022, 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/on-line repository
https://www.dec.ny.gov/data/DecDocs/C224080/

Carroll Gardens Branch Library
396 Clinton Street
Brooklyn, NY 11231
Phone: 718-596-6972

Brooklyn Community Board 6
Attn: District Manager: Michael Racioppo
260 Baltic Street
Brooklyn, NY 11201
Phone: 718-643-3027

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 Gowanus Canal Northside site is located in an urban area in the Gowanus section of Brooklyn, NY. The irregularly-shaped site is bounded by DeGraw Street to the north, the Gowanus Canal to the east, Union Street and multiple-story commercial buildings to the south, and Bond Street and multiple-story commercial buildings to the west.

Site Features: The site is approximately 2.27 acres in size and is comprised of four lots transected by Sackett Street. The site buildings were vacant and have been demolished. A new sealed bulkhead is currently being installed along the eastern edge of the site, adjacent to the Gowanus Canal, to support the dredging in the canal.

Current Zoning and Land Use: The site is located in the newly rezoned M1(3)/R7-2 mixed use district. The existing buildings have been demolished and the site is currently inactive. The site is located in an area where rezoning now allows for restricted residential use. The proposed redevelopment project is in the design phase and is anticipated to include two multi-story mixed-use buildings (one on each block) with ground floor commercial spaces and residential units on the upper floors.

Past Use of the Site: The site was formerly occupied by Bayside Fuel Oil Depot Corporation, a registered inactive major oil storage facility (MOSF). An IRM was completed in 2015 to remove storage tanks associated with the MOSF. Other historic uses of the site include a box manufacturer, coal yard, fuel depot, and service garage.

Site Geology and Hydrogeology: Subsurface strata at the site consist of historic fill (sand, gravel, and silt with varying amounts of asphalt, wood, ash, and coal slag) extending to depths ranging from 4 to 14 feet below ground surface (bgs). The fill layer was underlain by fine sand and silt, with varying percentage of clay increasing with proximity to the Gowanus Canal. Bedrock

underlying the site is part of the Hartland Formation, which is comprised of mica schist and quartz-feldspar granulite, with localized intrusions of granite and pegmatite. It is inferred to be approximately 100 feet deep.

Groundwater at the site has been observed at between approximately 2 and 8 feet bgs. In general, shallow groundwater flows to the east, toward the Gowanus Canal. Deep groundwater generally flows toward the south.

A site location map is attached as Figure 1. A site plan is attached as Figure 2.

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

One or more of the Applicants under the Brownfield Cleanup Agreement is a Participant. The Participant(s) has/have an obligation to address on-site and off-site contamination. 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:

- air
- 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 at this site is/are:

1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
benzene, toluene, ethylbenzene and xylenes (BTEX)
acenaphthene
anthracene
benzo(a)anthracene
benzo(a)pyrene
chrysene
arsenic
lead
naphthalene
mercury
benzo(b)fluoranthene
fluoranthene
indeno(1,2,3-cd)pyrene
isopropylbenzene
n-propylbenzene
methyl-tert-butyl ether (MTBE)

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.

Tank Removal IRM

In 2016 and 2017, interim remedial measures were implemented as part of the formal closure of the site's Major Oil Storage Facility (MOSF) in accordance with the 2015 approved IRM work plan.

The primary IRM activities included the removal of five bunkered above ground storage tanks (ASTs) with a capacity of approximately 1.5 million gallons. All associated tank structures and piping were removed. Approximately 4,500 tons of petroleum impacted soil were removed and characterized for off-site disposal.

The IRM also included the decommissioning, removal and off-site disposal of additional tanks associated with the MOSF. These include four underground storage tanks (USTs), with total capacity of approximately 2,800 gallons and seven smaller ASTs, with total capacity of approximately 2,000 gallons.

The IRM activities are summarized in the June 2017 Construction Completion Report.

Bulkhead Barrier Wall IRM

An IRM for the installation of a sealed bulkhead barrier wall was initiated in 2021 and completed in February 2022. This IRM was needed due to the ongoing remediation of the Gowanus Canal Superfund Site.

The work consisted of installation of approximately 475 feet of sealed sheet pile bulkhead, to a minimum depth of -33 feet North American Vertical Datum of 1988 (NAVD88), along the eastern perimeter of the site. To facilitate the work, partial demolition of existing structures was necessary (timber bulkhead, concrete seawall). Petroleum impacted soil was encountered during the work. The soil was stockpiled and disposed of off-site at approved facilities. Petroleum impacted water that was generated as a result of the work was stored in frac tanks for off-site disposal. The bulkhead was surveyed by a licensed surveyor.

A construction completion report that summarizes the work will be prepared and submitted to the Department.

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, groundwater and soil vapor samples were collected at the site and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, pesticides and polychlorinated biphenyls (PCBs). Based upon the results of the investigation, the primary contaminants of concern include petroleum related VOCs, SVOCs and metals. Coal tar impacts were also detected which may contribute to the VOCs and SVOCs concentrations at the site.

Soil:

Petroleum impacts were observed across both the northern and southern portions of the site in the vicinity of historic petroleum bulk storage tanks. The contamination was present in the form of odors and staining at various depths ranging from 0 to 24 feet below grade. VOCs detected above their respective soil cleanup objectives (SCOs) include 1,2,4 trimethylbenzene, 1,3,5 trimethylbenzene, benzene, ethylbenzene, and xylene. SVOCs detected above their SCOs include acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-c,d)pyrene, and naphthalene. Some of the greatest soil impacts were observed in SB-03 (northern portion of Lot 1), SB-27 (western portion of Lot 1) and SB-26 (south-eastern part of Lot 17). The highest concentrations observed were 1,2,4 trimethylbenzene detected at a maximum concentration of 810 parts per million (ppm) compared to a protection of groundwater soil cleanup objective (PGWSCO) of 3.6 ppm; 1,3,5 trimethylbenzene detected at 300 ppm compared to a PGWSCO of 8.4 ppm; benzene detected at 5.4 ppm compared to the PGWSCO of 0.06 ppm; ethylbenzene at 180 ppm compared to a PGWSCO of 1 ppm; and xylene detected at 210 ppm compared to a PGWSCO of 1.6ppm. The maximum detections of SVOCs were acenaphthene at a concentration of 1,200 ppm compared to a PGWSCO of 98 pm; anthracene at a concentration of 640 ppm compared to a restricted residential soil cleanup objective (RRSCO) of 100 ppm; benzo(a)anthracene at 410 ppm compared to a PGWSCO of 1 ppm; benzo(a)pyrene at 340 ppm compared to a RRSCO of 1 ppm; benzo(b)fluoranthene at 260 ppm compared to a RRSCO of 1 ppm; chrysene at 370 ppm compared to a PGWSCO of 1 ppm; fluoranthene at 710 ppm compared to a RRSCO of 100 ppm; indeno(1,2,3-c,d)pyrene at 130 ppm compared to a RRSCO of 0.5 ppm and naphthalene at 3,900 ppm compared to a PGWSCO of 12 ppm.

The metals arsenic, lead and mercury were also detected at maximum concentrations of 89 ppm, 2,860 ppm and 12 ppm which exceed their respective RRSCOs of 16 ppm, 400 ppm and 0.73 ppm.

Coal tar contamination was observed in several soil boring locations along the bank of the canal at depths ranging from 15 feet to 54 feet. These impacts are believed to be associated with contamination that migrated along the canal from a former manufacture gas plant site (Fulton Works MGP).

In addition, petroleum impacts were observed along the western portion of Lot 1. This contamination has migrated off-site and is present along the eastern portion of Bond Street.

Groundwater:

Groundwater across the site has been impacted by petroleum related contamination. Light non-aqueous phase liquid was observed in MW-08 and odors and sheens have been observed in the purge water of various monitoring wells. BTEX contaminants and naphthalene were detected in several monitoring wells across the site with the heaviest impacts being in the deeper wells located along the canal which are impacted by coal tar. These wells had maximum concentrations detected of 2,700 parts per billion (ppb) for benzene; 2,200 ppb for ethylbenzene; 540 ppb for toluene and 1,500 ppb for xylene. The ambient groundwater standard for each compound is 5 ppb, except for benzene which has a standard of 1 ppb.

Petroleum contamination observed in on-site groundwater also includes 1,2,4 trimethylbenzene, isopropylbenzene, n-propylbenzene, 1,3,5 trimethylbenzene and MTBE. These contaminants were detected at maximum respective concentrations of 670 ppb, 140 ppb, 110 ppb, 230 ppb and 140 ppb. The ambient groundwater standard for each contaminant is 5 ppb with the exception of MTBE which has a standard of 10 ppb.

Petroleum impacts have been observed in off-site groundwater along the western Lot 1 property boundary. These impacts have been delineated and off-site migration is limited.

Soil Vapor:

Data collection was limited to soil vapor and ambient air samples. No sub-slab soil vapor samples were collected.

Petroleum related contaminants such as BTEX; 2,2,4-trimethypentane, cyclohexane, isopropanol, 2-butanone, n-heptane, ethanol and n-hexane were consistently detected in soil vapor samples across the site. The highest detection was observed at SV-03 on the northern portion of Lot 1. Total VOCs were 176,000 micrograms per cubic meter (ug/m3) at this location which is one to two orders of magnitude higher than other soil vapor samples across the site. No significant concentrations of VOCs were detected in either of the two ambient air samples that were collected.

CVOCs were also detected in soil vapor at the site. Both tetrachloroethene and TCE were detected in numerous soil vapor samples collected across the site with the highest concentrations being 538 ug/m3 and 56 ug/m3, respectively. The source of the CVOCs appear to be from an off-site source since they were found in deep off-site groundwater and not in any on-site soil or

groundwater samples. There is the potential for soil vapor intrusion related to the off-site contamination.

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.*

Since the site is fenced and covered by asphalt or concrete, people will not come into contact with site related soil and groundwater contamination unless they dig below the surface. Contaminated groundwater at the site is not used for drinking or other purposes and the site 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 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 vacant, the inhalation of site related contaminants due to soil vapor intrusion does not represent a current concern, however, it could be a concern for future on-site buildings. Environmental sampling indicates soil vapor intrusion from site contamination 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 extent practicable.
- Prevent the discharge of contaminants to surface water.
- 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.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

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 Alternatives 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 use with site-specific soil cleanup objectives remedy.

The selected remedy is referred to as the Soil Removal, In-Situ Treatment, Cover System, and Coal Tar Recovery remedy.

The elements of the selected remedy, as shown in Figure 3, 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);
•non-aqueous phase liquids;
•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 above standards; and
•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 (RRSCOs) will be excavated and transported off-site for disposal.

Additionally, soil will be removed from the following "areas of concern" (AOC). Final limits of these areas will be determined during design:

AOC#1 is located along the northern boundary of the site. It is approximately 100 feet long and 50 feet wide. Removal is estimated to be eight feet deep.

AOC#3 is located in the southern half of the site, just south of Sackett Street. It is approximately 40 feet long and 30 feet wide. Removal is estimated to be seven feet deep.

AOC#4 is located near the southern boundary of the site, just north of Union Street. It is and area approximately 70 feet long and 70 feet wide. Removal is estimated to be three feet deep.

Approximately 8,600 cubic yards of petroleum contaminated soil will be removed from the site and trucked off-site for disposal. Any underground storage tanks (USTs), fuel dispensers, underground piping or other structures associated with a source of contamination will also be excavated and removed.

3. Backfill

Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the designed grades at the site. On-site soil which does not

exceed the above excavation criteria or the protection of groundwater SCOs for any constituent may also be used anywhere beneath the cover system, including below the water table, to backfill the excavation or re-grade the site.

4. In-situ Treatment Using Activated Carbon

Activated carbon will be added to the subsurface to capture and prevent the migration of petroleum related impacts. In the area of the captured contamination, conditions will be maintained that will allow anaerobic degradation of petroleum impacts to occur. An activated carbon mixture, including an amendment of sodium nitrate/ammonium sulfate (electron acceptor), will be added to the subsurface to treat petroleum source locations. Treatment will be applied to AOC#1 and 4, discussed above. Treatment will also include AOC#2 which is located in the northwest part of the site along Bond Street. AOC#2 extends off-site along the sidewalk. The activated carbon mixture will be applied to the subsurface via a series of temporary injection points and/or through direct application at the base of the excavations. The method and depth of injection will be determined during the remedial design.

5. 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.

6. Coal Tar Recovery

Installation and operation of coal tar recovery wells along the eastern portion of the site, adjacent to Gowanus Canal, to remove potentially mobile coal tar from the subsurface deposited at this site from tar that had historically migrated along the canal from a nearby former manufactured gas plant (MGP) site. The number, depth, type and spacing of the recovery wells will be determined during the design phase of the remedy. Coal tar will be collected periodically from each well; however, if wells are determined by the Department to accumulate large quantities of coal tar over extended time periods, they may be converted to automated collection if site conditions/logistics allow.

7. 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 soil and/or groundwater.

8. 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.

9. Site Management Plan

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

1. 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 discussed in Paragraph 5, the coal tar recovery wells in Paragraph 6 and the sub-slab depressurization system(s) discussed in Paragraph 7 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/or groundwater and/or surface water use restrictions;
•a provision that should a building foundation or building slab be removed in the future, a cover system consistent with that described in Paragraph 5 above will be placed in any areas where the upper two feet of exposed surface soil exceed the applicable soil cleanup objectives (SCOs);
•a provision should redevelopment occur to ensure no soil exceeding protection of groundwater concentrations will remain below storm water retention basin or infiltration structures;
•provisions for the management and inspection of the identified engineering controls;
•maintaining site access controls and Department notification; and

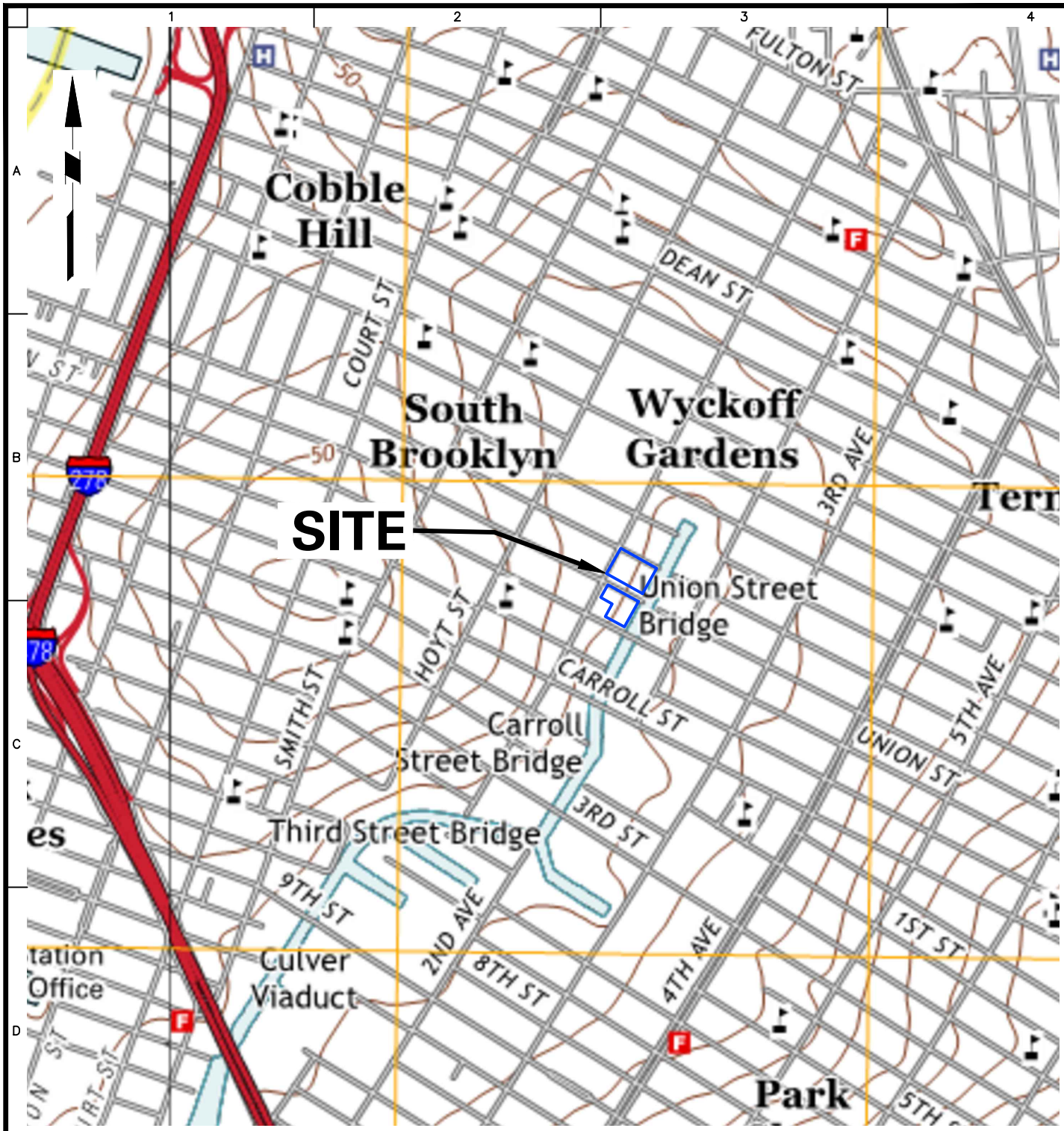
•the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

2. 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, with a provision for additional groundwater treatment if determined necessary by the Department;
•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.

3. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, inspection, and reporting of any mechanical or physical components of the active vapor mitigation system(s) and coal tar recovery wells. The plan includes, but is not limited to:

•procedures for operating and maintaining the system(s) and coal tar recovery wells; and
•compliance inspection of the system(s) to ensure proper O&M as well as providing the data for any necessary reporting.



MAP REFERENCE: USGS 7.5-MINUTE JERSEY CITY, N.J. (2011) AND BROOKLYN, N.Y. (2013) TOPOGRAPHIC QUADRANGLES

1000 0 500 1000

SCALE IN FEET

LEGEND:

SITE BOUNDARY

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Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.

21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001

T: 212.479.5400 F: 212.479.5444 www.langan.com

Project
GOWANUS CANAL NORTHSIDE
BLOCK No. 424, LOT Nos. 1 & 20
BLOCK No. 431, LOT Nos. 12 & 17
BROOKLYN NEW YORK

Figure Title
SITE LOCATION MAP

Project No.	170295301
Date	4/5/2019
Drawn By	CMA
Checked By	SK

Figure No. 1

Sheet 1 of 15

Filename: \\langan.com\data\NY\data3\170295301\Cadd Data - 170295301\SheetFiles\RIR\Figure 1 - Site Location Map.dwg Date: 8/17/2021 Time: 12:48 User: astappenbeck Style Table: Langan.stb Layout: SITE LOCATION MAP

LEGEND:

SITE BOUNDARY

LOT BOUNDARY

NOTES :

1. BASE MAP SOURCE: SURVEY BY CONTROL POINT ASSOCIATES, INC. PC (MARCH 22, 2017).
2. DATUM REFERS TO THE NATIONAL VERTICAL DATUM OF 1988 (NAVD88), WHICH IS APPROXIMATELY 1.1 FEET ABOVE MEAN SEA LEVEL DATUM AT SANDY HOOK, NEW JERSEY AS DEFINED BY THE UNITED STATES GEOLOGICAL SURVEY (USGS NGVD 1929).

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

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Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Project
GOWANUS CANAL NORTHSIDE
BLOCK No. 424, LOT Nos. 1 & 20
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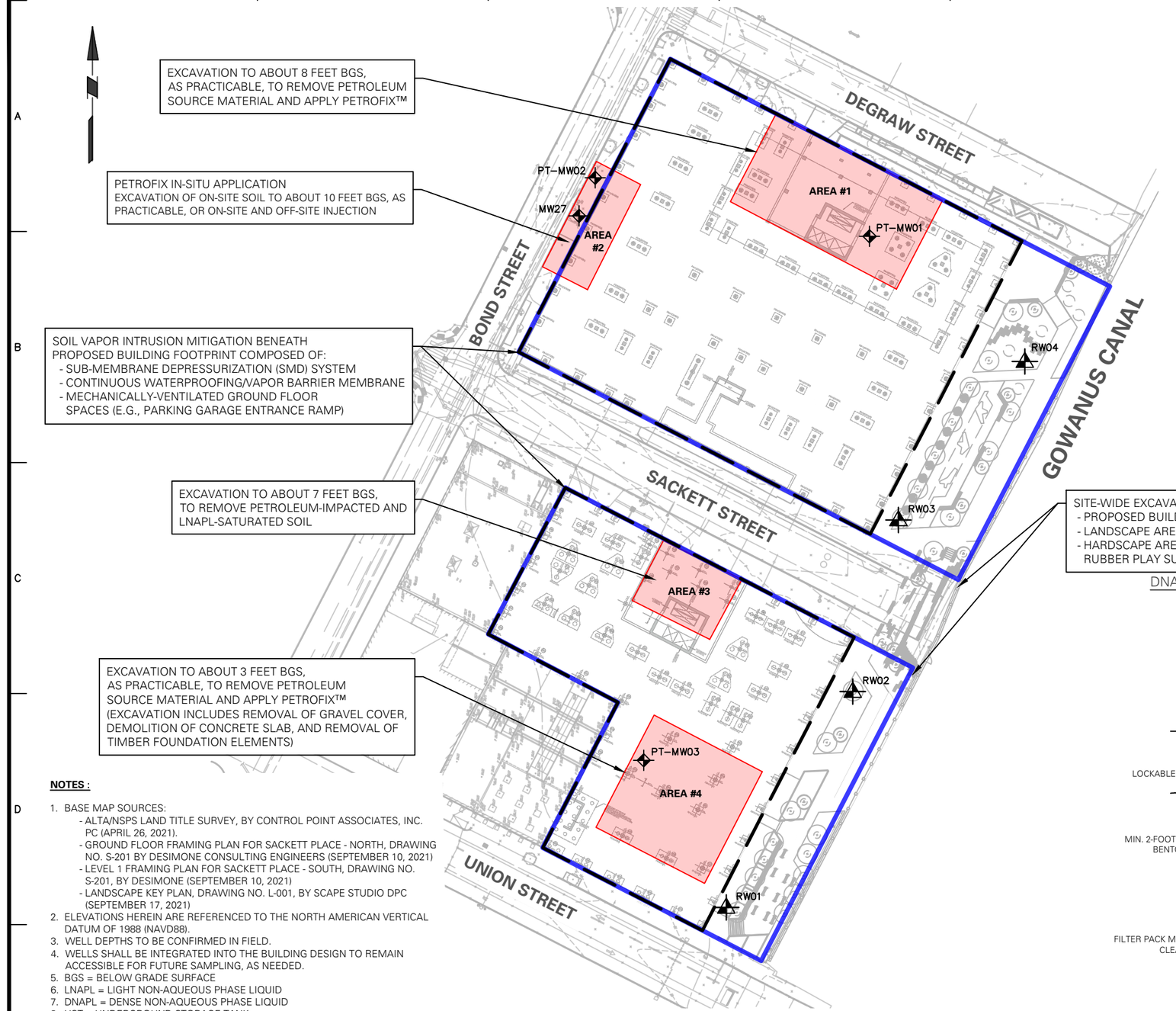
BROOKLYN NEW YORK

Figure Title
SITE PLAN

Project No. 170295301
Date 4/5/2019
Drawn By CMA
Checked By SK

Figure No. 2
Sheet 2 of 15

Filename: \\langan.com\data\NY\data3\170295301\Cadd Data - 170295301\SheetFiles\RIR\Figure 4 - Soil, GW, AOC, etc.dwg Date: 8/17/2021 Time: 12:35 User: astappenbeck Style Table: Langan.stb Layout: SITE PLAN



LEGEND:

- SITE BOUNDARY
- APPROXIMATE EXTENT OF PROPOSED BUILDING FOUNDATION
- APPROXIMATE EXTENT OF REMEDIATION OF PETROLEUM IMPACTS

AREA #1 - REMEDIATION OF PETROLEUM IMPACTS ASSOCIATED WITH FORMER 14 550-GALLON DIESEL AND KEROSENE USTs AND FORMER TWO PUMP ISLANDS (EXCAVATION TO ABOUT 8 FEET BGS):
- SOURCE MATERIAL EXCAVATION TO THE GROUNDWATER TABLE TO THE EXTENT PRACTICABLE
- IN-SITU APPLICATION OF PETROFIX™ (MANUFACTURED BY REGENESIS)

AREA #2 - REMEDIATION OF PETROLEUM IMPACTS IN GROUNDWATER DOCUMENTED BY GROUNDWATER MONITORING WELL MW02:
- IN-SITU APPLICATION OF PETROFIX™ (MANUFACTURED BY REGENESIS)

AREA #3 - REMEDIATION OF PETROLEUM IMPACTS EVIDENCED BY THE PRESENCE OF LNAPL IN GROUNDWATER MONITORING WELL MW08 (EXCAVATION TO ABOUT 7 FEET BGS):
- REMOVAL OF RECOVERABLE LNAPL TO THE EXTENT PRACTICABLE

AREA #4: REMEDIATION OF PETROLEUM IMPACTS ASSOCIATED WITH FORMER BUNKERED ASTs (EXCAVATION TO ABOUT 3 FEET BGS):
- SOURCE MATERIAL EXCAVATION TO THE GROUNDWATER TABLE TO THE EXTENT PRACTICABLE
- IN-SITU APPLICATION OF PETROFIX™ (MANUFACTURED BY REGENESIS)

RW01 — PROPOSED DNAPL RECOVERY WELL
- FOR POTENTIAL RECOVERY OF DNAPL DURING SITE MANAGEMENT, IF RECOVERABLE DNAPL IS ENCOUNTERED

PT-MW01 — PROPOSED POST-TREATMENT GROUNDWATER MONITORING WELL

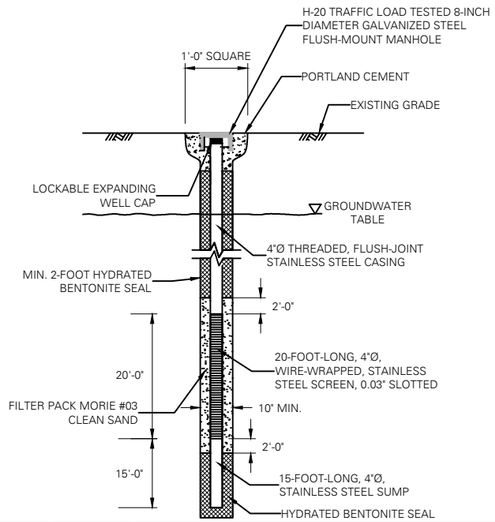
MW27 — EXISTING/PROPOSED POST-TREATMENT GROUNDWATER MONITORING WELL

NOTES :

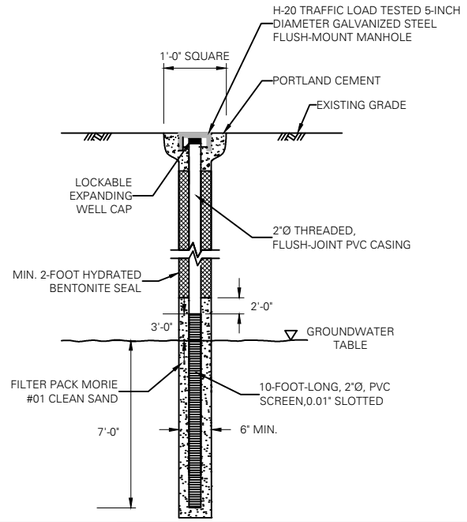
1. BASE MAP SOURCES:
   - ALTA/NSPS LAND TITLE SURVEY, BY CONTROL POINT ASSOCIATES, INC. PC (APRIL 26, 2021).
   - GROUND FLOOR FRAMING PLAN FOR SACKETT PLACE - NORTH, DRAWING NO. S-201 BY DESIMONE CONSULTING ENGINEERS (SEPTEMBER 10, 2021)
   - LEVEL 1 FRAMING PLAN FOR SACKETT PLACE - SOUTH, DRAWING NO. S-201, BY DESIMONE (SEPTEMBER 10, 2021)
   - LANDSCAPE KEY PLAN, DRAWING NO. L-001, BY SCAPE STUDIO DPC (SEPTEMBER 17, 2021)
2. ELEVATIONS HEREIN ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. WELL DEPTHS TO BE CONFIRMED IN FIELD.
4. WELLS SHALL BE INTEGRATED INTO THE BUILDING DESIGN TO REMAIN ACCESSIBLE FOR FUTURE SAMPLING, AS NEEDED.
5. BGS = BELOW GRADE SURFACE
6. LNAPL = LIGHT NON-AQUEOUS PHASE LIQUID
7. DNAPL = DENSE NON-AQUEOUS PHASE LIQUID
8. UST = UNDERGROUND STORAGE TANK
9. AST = ABOVEGROUND STORAGE TANK

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

DNAPL RECOVERY WELL DETAIL
(NOT TO SCALE)



POST-TREATMENT GROUNDWATER MONITORING WELL DETAIL
(NOT TO SCALE)



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21 Penn Plaza, 360 West 31st Street, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Project: **GOWANUS CANAL NORTHSIDE**
BLOCK No. 424, LOT No. 1
BLOCK No. 431, LOT No. 12
BROOKLYN NEW YORK

Figure Title: **ALTERNATIVE II: TRACK 4 REMEDY**
REMEDIAL ACTION WORK PLAN

Project No.	170295301
Date	3/18/2022
Drawn By	AMS
Checked By	VDP

Figure No. 9
Sheet 12 of 15

Filename: \\langan.com\data\NY\data3\170295301\Cadd Data - 170295301\SheetFiles\RAWP\Figure 9 - Track 4 Remedy.dwg Date: 3/21/2022 Time: 18:00 User: dstammers Style Table: Langan.stb Layout: SITE PLAN