WILLETS POINT DEVELOPMENT SCA SCHOOL

QUEENS, COUNTY

QUEENS, NEW YORK

Final Engineering Report

NYSDEC Site Number: C241146D

Prepared for:

Queens Development Group, LLC

QDG Hotel Partners, LLC

QDG 126th Street Partners, LLC

QDG Parking Partners, LLC

QDG Retail Partners, LLC

c/o The Related Companies

30 Hudson Yards, 72nd Floor, New York, New York 10001

Prepared by:

Langan Engineering, Environmental, Surveying,

Landscape Architecture and Geology, D.P.C.

360 West 31st Street, 8th Floor, New York, New York 10001

(212) 479-5400

April 2024

CERTIFICATIONS

I, Jason Hayes, am currently a registered professional engineer licensed by the State of New York, I had primary direct responsibility for implementation of the remedial program activities, and I certify that the Remedial Action Work Plan was implemented and that all construction activities were completed in substantial conformance with the Department-approved Remedial Action Work Plan.

I certify that the data submitted to the Department with this Final Engineering Report demonstrates that the remediation requirements set forth in the Remedial Action Work Plan and in all applicable statutes and regulations have been or will be achieved in accordance with the time frames, if any, established for the remedy.

I certify that all use restrictions, Institutional Controls, Engineering Controls, and/or any operation and maintenance requirements applicable to the Site are contained in an environmental easement created and recorded pursuant ECL 71-3605 and that all affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded.

I certify that a Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, and that such plan has been approved by the Department.

I certify that all documents generated in support of this report have been submitted in accordance with the DER's electronic submission protocols and have been accepted by the Department.

I certify that all data generated in support of this report have been submitted in accordance with the Department's electronic data deliverable and have been accepted by the Department.

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I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Jason Hayes, of Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., am certifying as Owner's Designated Site Representative and I have been authorized and designated by all site owners to sign this certification for the Site.

NYS Professional Engineer #	Date	Signature

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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
Bgs	Below Grade Surface
BOD	Biological Oxygen Demand
Brookside	Brookside Environmental Inc.
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene Compounds
CAMP	Community Air Monitoring Plan
CCR	Construction Completion Report
CEC	Clean Earth of Carteret
CENJ	Clean Earth of North Jersey
CHASP	Construction Health and Safety Plan
CFR	Code of Federal Regulations
COC	Certificate of Completion
CPP	Citizen Participation Plan
CP-51	Commissioner Policy 51
CQAP	Construction Quality Assurance Plan
CVOC	Chlorinated Volatile Organic Compounds
DER	Division of Environmental Remediation
DRO	Diesel Range Organics
DUSR	Data Usability Summary Report
EC	Engineering Control
EE	Environmental Easement
el	Elevation
ELAP	Environmental Laboratory Approval Program
EPH	Extractable Petroleum Hydrocarbons
EROC	Evergreen Recycling of Corona
ESA	Environmental Site Assessment
eV	Electron Volt
EWP	Excavation Work Plan
FDNY	New York City Fire Department
FER	Final Engineering Report
GRO	Gasoline Range Organics
IC	Institutional Control
IRM	Interim Remedial Measures
IRMWP	Interim Remedial Measures Work Plan
MTA	Metropolitan Transit Authority
MIP	Membrane Interphase Probe
µg/m3	Micrograms per cubic meter

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Acronym	Definition
µg/kg	Micrograms per kilograms
µg/L	Micrograms per liter
NAVD88	North American Vertical Datum of 1988
NYCDEP	New York City Department of Environmental Protection
NYCDOF	New York City Department of Finance
NYCDOB	New York City Department of Buildings
NYCEDC	New York City Economic Development Corporation
NYSHPD	New York State Housing Preservation and Development
NYCOER	New York City Office of Environmental Remediation
NYC SCA	New York City School Construction Authority
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYC DOHMH	New York City Department of Health and Mental Hygiene
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PBS	Petroleum Bulk Storage
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PFAS	Per- and Polyfluoroalkyl Substances
PFOS	Perfluorooctane Sulfonic Acid
PGW	Protection of Groundwater
PID	Photoionization Detector
PM10	Particulates with a diameter less than 10 micrometers
Ppm	Parts per million
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QDG	Queens Development Group, LLC
QEP	Qualified Environmental Professional
RAO	Remedial Action Objectives
RAWP	Remedial Action Work Plan
RCA	Recycled Concrete Aggregate
RCRA	Resource Conservation Recovery Act
RE	Remedial Engineer
RI	Remedial Investigation
RR	Restricted Residential
SCA	School Construction Authority
SCL	Soil Cleanup Levels
SCO	Soil Cleanup Objectives
SMMP	Soil/Materials Management Plan
SGV	Standards and Guidance Values
SMP	Site Management Plan

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Acronym	Definition
SOE	Support of Excavation
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-Slab Depressurization System
SVOC	Semivolatile Organic Compound
SWPPP	Stormwater Pollution Prevention Plan
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TCE	Trichloroethene
TOGS	Technical and Operational Guidance Series
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
UST	Underground Storage Tank
USEPA	United States Environmental Protection Agency
UU	Unrestricted Use
VOC	Volatile Organic Compound
6 NYCRR	Title 6 of the New York Codes, Rules, and Regulations

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1.0 BACKGROUND AND SITE DESCRIPTION

Queens Development Group, LLC; QDG URA Corporation, QDG Hotel Partners, LLC; QDG 126th Street Partners, LLC; QDG Parking Partners, LLC; and QDG Retail Partners, LLC entered into a Brownfield Cleanup Agreement (BCA) as volunteer applicants on December 16, 2013 with the New York State Department of Environmental Conservation (NYSDEC) to remediate the Willets Point Development Brownfield Cleanup Program (BCP) Site, which encompassed a total area of approximately 17.900 acres. The Willets Point Development SCA School BCP Site (hereinafter referred to as "the Site") was accepted into the BCP as part of the Willets Point Development BCP Site (Site No. C241146). The BCA for the Willets Point Development BCP Site was amended six times:

1. July 14, 2014 to increase the Willets Point Development BCP Site size by 5.6 acres. The amendment added 14 tax lots and 3 partial roadways and removed 3 tax lots and 2 partial roadways.
2. September 23, 2014 to add the requirement of an Independent Environmental Monitor which was inadvertently omitted from the original BCA.
3. June 10, 2020 to account for the 2015 changes to the BCP legislation.
4. June 1, 2022 to remove QDG URA Corporation as an applicant.
5. September 15, 2023 to update Section, Block, and Lots for the Willets Point Development BCP Site, remove a 0.019-acre encroachment area, correct acreage of the Willets Point Development BCP Site, and add Willets Point Phase I Owner, LLC and Willets Point Phase I LIHTC Owner, L.P. as volunteers under the BCA.
6. October 31, 2023 (together with seven new BCAs of the same date, but each effective as of December 16, 2013 for Site Nos. C241146B through C241146H) to divide the Willets Point Development BCP Site into eight separate BCP sites (BCP Site Nos. C241146 and C241146B though C241146H) and remove future roadway and sliver lot parcels (Block 1833, Lots 111, 112, 141, 151 and 155) from the BCP. In connection with the Amended BCA for the Willets Point Development BCP Site, the Volunteers entered into a BCA for this BCP Site No. C241146D (BCA Index No. C241146D-09-23), effective as of December

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16, 2013.[1]

Queens Development Group, LLC; QDG Hotel Partners, LLC; QDG 126th Street Partners, LLC; QDG Parking Partners, LLC; and QDG Retail Partners, LLC are collectively referenced herein as the "Volunteers" for this Site.

The Willets Point Development BCP Site was remediated as two operable units (OU-1 and OU-2), in accordance with two NYSDEC-approved Remedial Action Work Plans (RAWPs). The Site was remediated in as part of OU-1 to Restricted Residential (RR) use standards and will be redeveloped with a 650-seat public school (anticipated to be PS, IS, or PS/IS). A figure showing the location and boundary of the former Willets Point Development Site, former OU-1, and the Site is provided in **Figure 1**. The boundaries of the Site are more fully described in the metes and bounds site description that is part of the Environmental Easement (EE) provided in **Appendix A**.

The Site is located in a former industrial zone in the County of Queens, New York and is identified as a part of Block 1833, Lot 143. The Site is situated on an approximately 0.857-acre[2] area bounded by the Willets Point L-Parcel BCP Site (Site No. C241146H) and automotive and wrecking facilities to the north; by future roadways to the east; by future roadways followed by the Willets Point Development Phase 1 Senior Housing BCP Site (Site No. C241146B) to the south; and Willets Point Boulevard followed by the Willets Point Development Stadium BCP Site (Site No. C241146C) to the west (see **Figure 1)**.

This Final Engineering Report (FER) documents the remedial actions implemented at the Site, in accordance with the following: NYSDEC-approved May 11, 2021 RAWP Willets Point Development – Operable Unit 1 (Phase 1A); May 21, 2021 Operable Unit Number 01 Decision Document (Decision Document); September 16, 2021 OU-1 RAWP Modification Letter (RAWP Amendment); November 2, 2022 Remedial Design for In-Situ Groundwater Treatment (Remedial Design); and February 13, 2023 Post-Treatment Sampling Plan Addendum (Sampling Plan Addendum).

[1] The Willets Point Development BCP Site Volunteers Willets Point Phase I Owner, LLC and Willets Point Phase I LIHTC Owner, L.P. are not BCA parties and are not Volunteers for this Site (Site No. C241146D).
[2] BCA Index No. C241146D-09-23 lists the Site as 0.856-acres, the actual surveyed area of the Site is 37,320 square feet or 0.8567-acres.

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The December 30, 2020 Construction Completion Report (CCR) documented interim remedial measures completed at OU-1 under the approved IRM Work Plan between October 17, 2019, and February 12, 2020.

The July 5, 2023 CCR documented remedial measures completed at OU-1 from June 7, 2021 through March 18, 2022 and from November 28, 2022 through June 1, 2023.

The Site No. C241146 BCA and amendments, this Site's BCA, Decision Document, OU-1 RAWP, OU-1 RAWP Amendment, Remedial Design, Sampling Plan Addendum, OU-1 RAWP CCR, IRM WP, IRM CCR, and NYSDEC approval letters are included in **Appendix B**. All other documents related to the investigation and remediation of the Site can be found at the document repositories listed in Section 5.1.8 of this FER.

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2.0 REMEDIAL HISTORY

2.1 Previous Environmental Reports

The investigations listed below describe site conditions prior to implementation of the remedy and were performed to characterize the nature and extent of contamination and to confirm environmental conditions and subsurface geology to develop remediation and mitigation strategies. The following environmental investigation reports, work plans, and remedial reports were written prior to the October 31, 2023 BCA amendment that divided the former Willets Point Development BCP Site into eight separate BCP sites. Therefore, the Site represents only a portion of the former Willets Point Development BCP Site covered in the following reports and work plans:

- September 18, 2019 Interim Remedial Measures (IRM) Work Plan, Willets Point – Operable Unit 1 (Phase 1A), prepared by Langan
- December 1, 2020 IRM Construction Completion Report (CCR), Willets Point – Operable Unit 1 (Phase 1A), prepared by Langan
- February 23, 2021 Remedial Investigation Report (RIR), Willets Point – Operable Unit 1 (Phase 1A), prepared by Langan
- May 11, 2021 Remedial Action Work Plan (RAWP), Willets Point – Operable Unit 1 (Phase 1A), prepared by Langan
- September 16, 2021 Willets Point OU-1 RAWP Modification Letter, prepared by Langan
- November 4, 2022 Remedial Design for In-Situ Groundwater Treatment, Willets Point Development – Operable Unit 1 (Phase 1A), prepared by Langan
- February 13, 2023 Post Treatment Sampling Plan Addendum, Willets Point Development Site – OU-1, prepared by Langan
- June 9, 2023 Interim Site Management Plan for OU-1, Willets Point – Operable Unit 1 (Phase 1), prepared by Langan
- July 5, 2023 Construction Completion Report, Willets Point – Operable Unit 1 (Phase 1A), prepared by Langan

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Summaries of the IRMWP, IRM CCR, RIR, OU-1 RAWP, OU-1 RAWP Amendment, Remedial Design, Sampling Plan Addendum, Interim Site Management Plan, and RAWP CCR are provided below.

Interim Remedial Measures Work Plan, prepared by Langan, dated September 18, 2019

The IRMWP was developed to initiate interim remedial measures (IRM) on OU-1. The scope of the IRMWP applied to four localized areas of OU-1, two of these IRM areas are applicable to the Site :

- IRM 2 – UST Investigation
    - Investigations of a possible underground storage tank (UST) located in the northern portion of OU-1 – refusal was encountered in multiple locations in this area during the 2019 RI and a UST is suspected. If encountered, decommissioning of the UST will be completed in accordance with applicable local, state, and federal regulations. If discovered, grossly contaminated soil associated with the UST will be excavated to the extent practical.
- IRM 4 – Petroleum-Contaminated Soil Removal Areas – C-SB205 and C-SB206:
    - Removal to the extent practical and additional delineation of petroleum-contaminated soil in the northeastern portion of the Site – Petroleum contamination was partially delineated during the 2019 RI. This IRM called for documentation samples to be collected along the excavation sidewalls and base.

Contamination in OU-1 not addressed by the IRMWP was addressed under the OU-1 RAWP, dated May 11, 2021 and subsequent amendments/modifications.

IRM Construction Completion Report (CCR), prepared by Langan, dated December 1, 2020

The December 2020 CCR describes and documents IRMs performed within OU-1 between October 17, 2019 and February 12, 2020 in accordance with the NYSDEC-approved September 18, 2019 IRMWP. The IRMWP implementation in two IRM areas (IRM 2 and IRM 4) reduced Site contamination and mitigated future contaminant

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migration onto the Site. IRM 2 (UST Investigation) was completed within the northern part of the Site (see Figure 4 of the IRM CCR, Appendix B) and included excavation of two test pits, about 20-foot-long by 5-foot-wide, to a depth of about 5 feet bgs, where groundwater was encountered (no USTs were identified). IRM 4 (Petroleum-Contaminated Soil Removal Areas – C-SB205 and C-SB206) consisted of the following remedial activities for the Site:

- Collection of eight grabs and eight composite soil samples to characterize petroleum-impacted soil prior to remedial excavation
- Excavation of an about 16,650-square-foot area to depths between 4 and 8 feet bgs in the areas surrounding C-SB205, C-SB206, and IRM4_EPB02_6 (see Figure 4 of the IRM CCR, Appendix B)
- Excavation of 21 test pits to depths between 4 and 8 feet bgs (approximate groundwater interface) to delineate residual petroleum contamination
- Off-site disposal of petroleum-contaminated concrete, soil, and soil comingled with debris included former auto parts, concrete, asphalt, wood, brick, and metal scraps
- Collection of 50 documentation soil samples (plus quality assurance/ quality control [QA/QC] samples) from the base and sidewalls of the excavation.

More information on remedial activities performed during the IRM is and provided in Section 4.0 of this SMP.

Remedial Investigation Report, prepared by Langan, dated February 23, 2021

The RI was completed in four mobilizations between October 22 and 23, 2018; March 18 and April 8, 2019; May 14 and June 5, 2019; and October 30 to November 5, 2019 to investigate and to determine, to the extent practical, the nature and extent of contamination in soil, groundwater, and soil vapor throughout OU-1.

Findings from the RI were summarized in the RIR and were based on field observations, instrumental readings, and laboratory analytical results of soil, groundwater, and soil vapor samples collected during the RI. Three areas of concern (AOCs) were initially developed based on historical site review, results of the first RI mobilization (geophysical surveying) and were confirmed through observations and preliminary conclusions made during the second RI mobilization. The three AOCs throughout OU-1 and the findings and conclusions regarding each are as follows:

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Fill Quality: fill contaminants include SVOCs, PCBs, pesticides, and metals, which were detected at concentrations above unrestricted use (UU) and/or RR SCOs, and lead, which was detected at concentrations above the RCRA characteristics of hazardous waste, within this layer. SVOCs, total PCBs, and dissolved metals were also identified in groundwater at concentrations above the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values (SGVs) for Class GA Water.

Petroleum Contamination in Soil, Groundwater, and Soil Vapor: in three localized areas within OU-1, concentrations of petroleum-related VOCs in soil were considered source material that were contributing to the petroleum-related contamination found in groundwater and soil vapor at the Site (two of these areas were within and adjacent to the Site [see Figure 4, RIR]). Petroleum-related conditions, including PID measurements up to 1,859 parts per million (ppm), odors, and staining were observed across OU-1 from 0 to 20 feet bgs. Petroleum-related VOCs (BTEX) were detected at concentrations exceeding UU and/or RR SCOs at, or below the groundwater interface, across OU-1 and the Site. Petroleum-like odors, sheen, and PID headspace readings up to >15,000 ppm were observed during purging and sampling. The concentrations of petroleum-related VOCs in soil in the northern part of OU-1 (the eastern part of the Site and in the future roadway areas adjoining the Site to the east and south) were found to be contributing to the petroleum-related contamination found in groundwater across OU-1. Groundwater may have also been impacted by petroleum sources northeast of the former Willets Point Development BCP Site. BTEX compounds were detected at the highest concentrations in the northern part of the Site and southern parts of OU-1, where the source material was identified. BTEX concentrations ranged from 134.87 to 192,610 micrograms per cubic meter ($\mu g/m^3$). Petroleum-impacted soil and groundwater were found to be the sources of petroleum-impacts to soil vapor. Soil vapor may have also been impacted by off-site petroleum sources within OU-1 and OU-2, and northeast of the former Willets Point Development BCP Site. Petroleum contamination on the Site extended into OU-1 to the east and south and into OU-2 to the north and northwest, and was presumed to extend outside of OU-1 to the northeast.

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CVOC Impacts in Soil, Groundwater, and Soil Vapor: tetrachloroethylene (PCE) in one soil sample collected from the groundwater interface in the northwestern part of OU-1 (outside of the Site) exceeded the UU SCOs. PCE and trichloroethylene (TCE) were detected at concentrations above the NYSDEC SGVs in one groundwater sample located in the Site, within the footprint of a former automotive repair shop. PCE in a soil vapor sample in the southern part of OU-1 (within current Site C241146) was detected at a concentration at which the New York State Department of Health (NYSDOH) Decision Matrix recommends 'no further action' to 'mitigate', depending on indoor concentrations. The identified CVOCs were commonly used as degreasers in the automotive repair industry. An isolated detection of PCE was identified in C-MW201; PCE was not detected in any monitoring wells within OU-1. As such, the source of PCE was presumed to be attributable to the former automotive uses or an off-site source.

Subsurface profiles depicting the geologic conditions documented during the RI are provided as **Figures 2A and 2B**.

Remedial Action Work Plan (RAWP), prepared by Langan, dated May 11, 2021

OU-1 was remediated in accordance with the remedy described in the OU-1 RAWP dated May 11, 2021. The factors considered during the selection of the remedy are those listed in the NYSDEC 6 NYCRR Part 375-1.8. The remedy selected under the RAWP is detailed in Section 3.0, below.

A November 2022 Remedial Design for In-Situ Groundwater Treatment and February 2023 Post-Treatment Sampling Plan Addendum collectively amended the OU-1 RAWP.

RAWP Modification Letter, prepared by Langan, dated September 16, 2021

The September 2021 RAWP Amendment addresses a minor realignment of the groundwater containment cutoff wall due to the presence of two unpermitted structures located on Block 1833, Lot 165 that encroach onto the northern part of the Site by about 5 feet. Installation of the groundwater containment cutoff wall adjacent to the unpermitted structures in Lot 165 was not feasible because of locations of the encroaching structures and safety concerns due to the condition of each structure. To address sheet pile installation considering the structure encroachment, the September 2021 RAWP Amendment proposed the steel sheet piles be installed on-Site within Lot 143, at a 10-foot off-set from the

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unpermitted structures in Lot 165 (total 15-foot off-set south from the Site boundary), and each pair of welded sheet piles be angled by 5 degrees or less (manufacturer-provided tolerance for interlock) near the southeast corner of the structures back to rejoining the northern Site boundary.

Remedial Design for In-Situ Groundwater Treatment, prepared by Langan, dated November 4, 2022

The November 2022 Remedial Design documents the remedial approach and basis for implementation of the in-situ groundwater treatment program conducted at the Site, which was a contingency of the remedy presented in OU-1 RAWP. The purpose of the November 2022 Remedial Design was to address petroleum-related target compounds that were identified in soil at concentrations above PGW SCOs and in groundwater above NYSDEC SGVs in the northeastern part of OU-1 (the eastern part of the Site). The target compounds included 1,2,4-trimethylbenzene, acetone, benzene, ethylbenzene, tert-butyl methyl ether (MTBE), toluene, total xylenes, and naphthalene. The remedial approach documented in the November 2022 Remedial Design included the direct in-situ treatment by mixing chemical reagents into groundwater to a minimum depth of 4 feet into saturated soil, within a targeted 15,000-square foot area. The design called for about 9,200 pounds of PetroFix™ (a water-based suspension fluid of micron-scale activated carbon and biostimulating electron acceptors), 5,920 pounds of Oxygen Release Compound (ORC) Advanced® (an engineered oxygen release compound), and 31 pounds of electron acceptor blend, all supplied by REGENESIS of San Clemente, California. The following sequence for field implementation was proposed:

1. Cordon off treatment area and establish CAMP
2. Temporarily relocate site cap and segregate clean cap material into a separate stockpile
3. Remove demarcation layer
4. Direct mix
5. Replace demarcation layer
6. Backfill / restore 2-foot composite cover

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Post-Treatment Sampling Plan Addendum, prepared by Langan, dated February 13, 2023

The Post-Treatment Sampling Plan Addendum included the following:

- Completion of 12 soil borings within the treatment area, at 10 locations where soil documentation samples were previously collected (EPB214, EPB215, EPB216, EPB217, EPB218, EPB219, EPB220, EPB221, EPB248 and EPB249) and at two new locations (EPB306, and EPB307) to provide adequate sample coverage.
- Collection of 12 soil samples (plus QA/QC samples) for laboratory analysis of the full-suite of NYSDEC Part 375 parameters as detailed by the OU-1 Quality Assurance Project Plan (QAPP). The sample interval was either:
  1. The top of the groundwater treatment zone, if soil is identified, or
  2. The top of the soil interval located directly beneath the ¾-inch quarry stone if stone was encountered at the top of the treatment zone.
- Reinstallation of two groundwater monitoring wells previously located within the in-situ groundwater treatment area, in accordance with the OU-1 RAWP (C-RMW01 and C-MW206).
- Gauging of six groundwater monitoring wells located down gradient, cross gradient, or within the in-situ treatment area (B-MW201, B-MW206, C-MW201, C-MW205, C-MW206, and C-RMW01).
- Collection of six groundwater samples from each of the above-mentioned monitoring wells for laboratory analysis of NYSDEC Part 375 List and target compound list (TCL) VOCs and SVOCs.

The February 2023 Post-Treatment Sampling Plan Addendum was approved by NYSDEC on February 14, 2023. Implementation of the sampling plan was performed on February 16, 2023.

Interim Site Management Plan, prepared by Langan, dated June 9, 2023

The Interim Site Management Plan (Interim SMP) was prepared to manage remaining contamination at OU-1 and govern environmental activities on OU-1 until remediation of the Willets Point Development BCP Site OU-2 was complete and a COC and EE were issued for the Willets Point Development BCP Site. The Interim SMP

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identified ICs and ECs for the entire OU-1 and included operation, maintenance, and inspections of ECs including a composite cover system, groundwater containment cutoff wall, and sub-slab depressurization system (SSDS) for new building developments (or other acceptable measures). The NYSDEC-approved May 2024 SMP supersedes the Interim SMP for the Site.

RAWP CCR, prepared by Langan, dated July 5, 2023

Remediation of OU-1 was performed in advance of redevelopment. The remediation included installing a support of excavation SOE system, excavating OU-1 site-wide soil/fill to between el. -10.10 to el. 25.59 feet in reference to the North American Vertical Datum of 1988 (NAVD88), dewatering the OU-1 area to accommodate SOE and foundation installation, implementation of in-situ groundwater treatment and post-treatment soil and groundwater sampling. The proposed end use of the development is consistent with existing zoning regulations.

The NYSDEC-approved CCR documents the remedial actions implemented at OU-1 in accordance with the NYSDEC-approved September 18, 2019 IRMWP, the NYSDEC-approved May 11, 2021 OU-1 RAWP; the May 21, 2021 Decision Document, the September 16, 2021 OU-1 RAWP Amendment; the NYSDEC-approved November 22, 2022 Remedial Design; and the NYSDEC-approved February 13, 2023 Sampling Plan Addendum. As noted above, a December 1, 2020 CCR documented the interim remedial measures completed at OU-1 between October 17, 2019 and February 12, 2020. Remedial action was completed at OU-1 from June 7, 2021 through March 18, 2022 and from November 28, 2022 through June 1, 2023.

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3.0 SUMMARY OF SITE REMEDY

3.1 Remedial Action Objectives

Based on the results of the Remedial Investigation, the following Remedial Action Objectives (RAOs) were identified for the Willets Point Development BCP Site (including the Site) in the OU-1 RAWP.

3.1.1 Soil RAOs

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

3.1.2 Groundwater RAOs

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Restore ground water aquifer, to the extent practicable, to pre-disposal/pre-release conditions.
- Remove Site source(s) of ground water contamination.

3.1.3 Soil Vapor RAOs

RAOs for Public Health Protection

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- Mitigate the risk of impacts to public health resulting from existing, or the potential for, soil vapor intrusion into building(s) at the Site.

3.2 Description of Selected Remedy

The Site was remediated in accordance with the remedy in the OU-1 RAWP, the Decision Document, OU-1 RAWP Amendment, Remedial Design, and the Sampling Plan Addendum.

The factors considered during the selection of the remedy are those listed in 6NYCRR 375-1.8. Implementation of the selected remedy per the OU-1 RAWP included the elements listed below.

3.2.1 Remedial Design

A remedial program was implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques were 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

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- 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.

3.2.2 Excavation

Excavation and off-site disposal of contaminant source areas including:

- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u);
- 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 (cy) of contaminated soil will be removed from the Site.

3.2.3 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.

3.2.4 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

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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 the Site redevelopment. Such components may include, but are not necessarily limited to pavement, concrete, paved surface parking areas, sidewalks, building foundations and building slabs.

3.2.5 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.

3.2.6 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.

3.2.7 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.

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3.2.8 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.

3.2.9 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.

3.2.10 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 is discussed in Section 5.10.
   - Engineering Controls: The site cover system, groundwater containment cutoff wall, and vapor mitigation discussed in Sections 5.9.1 , 5.9.2, and 5.9.3 of this report.

This plan includes, but may not be limited to:

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- 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:

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- 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.

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4.0 INTERIM REMEDIAL MEASURES

The information and certifications made in the December 2019 IRM CCR were relied on to prepare this report and certify that all the remediation requirements for the Site have been met.

A copy of the final December 2019 IRM CCR is provided in **Appendix B**. The objectives of the OU-1 IRMs were to (1) remove hazardous fill, (2) remove and further delineate petroleum contamination, and (3) investigate and, if encountered, remove a suspected UST.

The following IRM activities were completed in connection with Site remedy;

- IRM 2 – UST Investigation Area (shown on **Figure 5**):
    - Excavation of two test pits, each about 20-foot-long by 5-foot-wide, to a depth of about 5 feet bgs, where groundwater was encountered (no USTs were identified)
- IRM 4 – Petroleum-Contaminated Soil Removal Areas – C-SB205 and C-SB206 (shown on **Figure 5**):
    - Collection of three grab and three composite soil samples on November 6, 2019, to characterize petroleum-impacted soil
    - Collection of four grab and four composite soil samples on December 3, 2019, to characterize petroleum-impacted soil
    - Collection of one grab and one composite soil samples on January 8, 2020, to characterize petroleum-impacted soil
    - Excavation of an about 3,250-square-foot area to about 8 feet bgs in the C-SB205 area
    - Excavation of an about 12,500-square-foot area to depths between 4 and 8 feet bgs in the C-SB206 area
    - Over-excavation of an about 900-square-foot area from 6 to 8 feet bgs around documentation sample IRM4-EPB02_6
    - Excavation of 21 test pits to depths between 4 and 8 feet bgs (approximate groundwater interface) to delineate residual petroleum contamination in

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IRM 4 – odors, staining, and elevated PID readings were not observed in 7 of the 21 test pits excavated

- Off-site disposal of 3,934.03 tons of petroleum-contaminated soil comingled with debris including former auto parts, concrete, asphalt, wood, brick, and metal scraps at the Fairless Landfill in Morrisville, Pennsylvania
- Off-site disposal of 186.72 tons of petroleum-contaminated soil at the CEC facility in Carteret, New Jersey
- Off-site disposal of 237.86 tons of concrete at the EROC facility in Flushing, NY
- Collection of 50 documentation samples (plus QA/QC samples) from the base and sidewalls of the excavation
- Placement of a high-visibility demarcation barrier along each excavation base
- Import of 1,883.54 tons of clean fill material from EROC in Flushing, NY
- Import of 13.23 tons of 3.5-inch stone from the Tilcon facility in Haverstraw, NY
- Backfill and installation of a minimum 2-foot-thick clean cap in each excavation area
- Reinstallation of one monitoring well (C-MW206)

Grossly-impacted soil extended beyond the IRM 4 excavation extents proposed in the IRMWP. Concrete slabs and historic fill material containing high debris content and buried structures were also identified in the IRM 4 excavations. Remediation of the residual petroleum contamination was to be addressed as a part of the OU-1 RAWP. These areas were located within the eastern part of the Site and within the future roadway areas adjacent to east and south of the Site (shown on Figure 2 of IRM CCR and Figure 5 of this FER). The OU-1 RAWP remedial excavations extended deeper than the IRM-4 excavation depth; therefore, the 50 documentation samples collected as part of the IRM do not represent remaining contamination and are not included in this FER.

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5.0 DESCRIPTION OF REMEDIAL ACTIONS PERFORMED

Post-IRM remedial activities completed at the Site were conducted in accordance with the NYSDEC-approved May 11, 2021 OU-1 RAWP; the May 21, 2021 Decision Document; the NYSDEC-approved September 16, 2021 OU-1 RAWP Amendment; the NYSDEC-approved November 2022 Remedial Design; and the NYSDEC-approved February 2023 Post-Treatment Sampling Plan Addendum. All deviations from these NYSDEC-approved work plans are noted in Section 6.0.

5.1 Governing Documents

5.1.1 Site Specific Health & Safety Plan

All remedial work performed under this Remedial Action was in full compliance with governmental requirements, including Site and worker safety requirements mandated by the Federal Occupational Safety and Health Administration (OSHA). Each contractor completing work under the NYSDEC OU-1 RAWP implemented their own HASP that, at minimum, adhered to the CHASP appended to the OU-1 RAWP. The CHASP meets the requirements of 29 Code of Federal Regulations (CFR) 1910 and 29 CFR 1926 (which includes 29 CFR 1910.120 and 29 CFR 1926.65).

The CHASP included, but was not limited to:

- Organization and identification of key personnel
- Training requirements
- Medical surveillance requirements
- List of Site hazards
- Excavation safety
- Work zone descriptions
- Personal safety equipment and protective clothing requirements
- Decontamination requirements
- Standard operating procedures
- Protective measure plan
- CAMP
- Safety Data Sheets

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Each contractor's HASP was complied with for all remedial and invasive work performed at the Site.

5.1.2 Quality Assurance Project Plan

The QAPP was appended to the NYSDEC-approved OU-1 RAWP. The QAPP describes the specific policies, objectives, organization, functional activities, and QA/QC measures designed to achieve the project data quality objectives.

5.1.3 Construction Quality Assurance Plan

The Construction Quality Assurance Plan(s) (CQAPs) managed performance of the Remedial Action tasks through designed and documented QA/QC methodologies applied in the field and in the lab. The CQAP provided a detailed description of the observation and testing activities that were used to monitor construction quality and confirm that remedial construction was in conformance with the remediation objectives and specifications. The CQAP is included in Section 5.1.3 of the OU-1 RAWP.

5.1.4 Soil/Materials Management Plan

The Soil/Materials Management Plan (SMMP) was included in Section 5.4 of the OU-1 RAWP and provided detailed plans for managing soil, fill and liquids that were disturbed during implementation of the remedy, including excavation, handling, storage, transport, and disposal. It also included the controls that were applied to these efforts to promote effective, nuisance-free performance in compliance with applicable federal, state, and local laws and regulations.

5.1.4.1 Soil Screening

Visual, olfactory, and PID soil screening and assessment was performed by Langan field personnel under the direct supervision of a Professional Engineer (PE) or qualified environmental professional (QEP) during all remedial and development excavations into known or potentially contaminated soil/fill and liquids.

5.1.4.2 Soil Stockpiles

Where possible, excavated soil and fill designated for off-site disposal were direct loaded into trucks. Stockpiles were constructed as necessary to separate and stage excavated soil/fill pending loading or characterization sampling. Separate stockpile areas were constructed to avoid comingling soil/fill of differing waste types.

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Stockpile areas met the following minimum requirements:

- Where soil/fill types were different (e.g., petroleum-impacted soil/fill stockpiled in a contaminated soil area), excavated soil/fill was placed onto a minimum thickness of 6 mil low-permeability liner of sufficient strength and thickness to prevent puncture during use
- Equipment and procedures were used to place and remove the soil to minimize the potential to jeopardize the integrity of the liner
- Stockpiles were covered with minimum 6-mil plastic sheeting or tarps, which were securely anchored to the ground
- Stockpile areas were inspected daily, and noted deficiencies were promptly addressed

5.1.4.3 Load Out, Transport, and Off-Site Disposal Plan

The waste types and quantities of waste removed are described in Section 5.3. Remedial excavation extents are presented on **Figure 3**. Nonhazardous non-native fill, and petroleum-impacted soil/fill were removed and transported off-site for disposal. Excavated soil/fill and contaminated liquids were handled, transported, and disposed of in accordance with applicable Part 360 and Part 364 regulations and other applicable local, state, and federal regulations. The waste removal contractors provided the appropriate permits, certifications, and written commitments from disposal facilities accepting the soil/fill and contaminated liquids.

The RE reviewed the contractor's proposed disposal facilities to document permit compliance to accept the soil/fill and contaminated liquids. Nonhazardous contaminated soil/fill were disposed of at facilities licensed to handle the waste. Approval letters were provided on the facility's letterhead, and included OU-1 of the Willets Point Development Site as the originating location, referenced the analytical data provided to and reviewed by the facility, and noted any restrictions on delivery schedules or other non-analytical conditions that may have caused rejection of transported soil/fill and contaminated liquids.

A Langan field engineer, geologist, or scientist under the supervision of the RE observed and documented the excavation and load-out of excavated soil/fill and contaminated liquids. Loaded vehicles leaving the Site were appropriately lined, securely covered, manifested, and placarded in accordance with appropriate federal, state, and local requirements. Soil/fill and contaminated liquids were transported by waste removal

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contractors who possessed a valid New York State Part 364 Waste Transporter Permit, where applicable. A manifest system was used to document and track off-site movement of soil/fill and contaminated liquids.

Crushing and screening of non-contaminated concrete occurred on-site prior to off-site disposal, following NYSDEC approval on July 21, 2021. NYSDEC approval documentation is included in **Appendix F**.

5.1.4.4 Truck Traffic Control

Truck routes were selected by considering the following:

- Limiting transport through residential areas and past sensitive sites
- Use of city mapped truck routes
- Prohibiting off-site queuing of trucks entering the facility
- Limiting total distance to major highways
- Promoting safety in access to highways
- Overall safety in transport
- Egress points for truck and equipment transport from OU-1 were kept clean of dirt and other soil/fill during remediation and development.

To the extent possible, queuing of trucks was performed on-site to minimize off-site disturbance.

Soil/fill transported by trucks exiting OU-1 were secured with tight-fitting covers. Loose-fitting canvas-type truck covers were not used. If loads contained wet soil/fill capable of producing free liquid, truck liners were used.

Before exiting, trucks were required to stop at the truck inspection station and were examined for evidence of contaminated soil on the undercarriage, body, and wheels. If observed, soil and debris were removed. Brooms, shovels, and potable water were utilized for the removal of soil from vehicles and equipment, as necessary. Truck wash waters were collected and disposed of off-site in an appropriate manner.

5.1.4.5 Materials Reuse On-Site

No on-site material excavated as part of the remediation was reused on-site.

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5.1.4.6 Fluids Management

Temporary construction dewatering and groundwater treatment was required to achieve the remedial excavation depth. The system, which was set up onsite on October 21, 2021, included one 18,000-gallon weir tank, two transfer pumps, four 25-micron bag filter units (two per skid), four 3,000-lb virgin carbon units, and a flow meter. Dewatering fluids were pumped from excavation areas into the treatment system for pretreatment prior to discharge to the New York City storm sewer system through an on-site catch basin or was discharged on-site with NYSDEC approval. Temporary dewatering and groundwater treatment was performed in accordance with a NYSDEC State Pollutant Discharge Elimination System (SPDES) permit (SPDES No. NY0277118). The dewatering system operated from February 4 through February 28, 2022, and a total of 287,300 gallons were pumped from the petroleum source area remedial excavations into the treatment system and discharged.

Following NYSDEC approval via email on June 10, 2021, the contractor pumped excess rainwater and snowmelt to other parts of the Site without treatment. The discharged water did not exhibit a petroleum-like sheen, odor, or other impacts.

NYSDEC approval documentation related to on-site discharge of treated groundwater and untreated rainwater and snowmelt is included in **Appendix E**. The SPDES permit is included in **Appendix F**. The dewatering treatment system design drawings and the operations and maintenance manual are included in **Appendix S**.

5.1.4.7 Demarcation

After completion of soil/fill removal and any other invasive remedial activities, and prior to backfilling, a land survey was performed by a New York State licensed surveyor. The survey defined the top elevation of residual contaminated soils. A physical demarcation layer, consisting of orange snow fence, was placed on this surface to provide a visual reference. This demarcation layer constitutes the top of the 'Residuals Management Zone,' the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the SMP. The survey measured the grade covered by the demarcation layer before the placement of cover soils, pavement, structures, or other materials. This survey and the demarcation layer placed on this grade surface constitute the physical and written record of the upper surface of the 'Residuals Management Zone'

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in the SMP. A copy of the survey of the Residual Management Zone is provided in **Appendix N**.

5.1.4.8 Backfill from Off-Site Sources

Fill proposed for import onto the Site was approved by the NYSDEC project manager and RE and complied with the provisions in the OU-1 RAWP, except for the deviation noted in Section 6.1. Imported soil for backfill met the lower of PGW and Residential SCOs, or other acceptable fill such as virgin, native stone from a quarry. Fill from industrial sites, spill sites, other environmental remediation sites, or other potentially contaminated sites was not imported. Solid waste was not imported onto the Site.

Imported soil (i.e., clean fill) met the lower of PGW and Residential SCOs. Non-compliant soils were not imported. Clean fill was segregated at a Part 360-permitted source/facility that is free of environmental contaminants. Samples were collected at a frequency consistent with DER-10, Table 5.4(e)10 and were analyzed for Part 375 VOCs, SVOCs, pesticides/herbicides, PCBs, cyanide, metals including trivalent and hexavalent chromium, and emerging contaminants including per- and polyfluoroalkyl substances (PFAS) by a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. Following NYSDEC approval, the certified-clean fill was transported to the Site and segregated from impacted soil/fill, on plastic sheeting until it was used as backfill.

Soils imported onto the Site all met the 'general fill' requirements under 6 NYCRR § 360.13, and the backfill or cover soil objectives for this Site, as set forth in the OU-1 RAWP and the Decision Document.

Backfill areas cover the entire Site, as shown on **Figure 4**. Requests to import material and NYSDEC import approval notifications are included in **Appendix G**. Imported material transportation documentation is included in **Appendix H**.

5.1.5 Storm-Water Pollution Prevention Plan (SWPPP)

The erosion and sediment controls for all remedial construction were performed in conformance with requirements presented in the New York State Standards and Specifications for Erosion and Sediment Control and the site-specific SWPPP, dated July 6, 2021; SPDES General Permit Number: GP-0-20-001; Form Submission Number: HP5-3G47-0XMFH and NYC DEP MS4 SWPPP Application S400421.

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The SWPPP described practices and procedures required to prevent pollutants from entering the waters of the United States via stormwater runoff. The stormwater management design and erosion control plan for the project were prepared using criteria established in the New York State Standards and Specifications for Erosion and Sediment Control (November 2016).

The SWPPP was developed in accordance with the New York State Stormwater Management Design Manual, erosion, and sediment control standards, and accepted engineering practices, and:

- Offered protective measures to minimize sediment transport during construction activities
- Described the implementation of control measures that are to be used to reduce pollutant loadings from stormwater runoff during construction activities
- Identified potential sources of stormwater pollution from the construction site

The SWPPP outlined soil erosion and sediment control practices, dewatering, a maintenance program, inspection procedures during construction, post-construction stormwater controls, water quality requirements and controls, and non-stormwater discharge controls. The SWPPP is included in **Appendix I**.

5.1.6 Community Air Monitoring Plan

Community air monitoring was conducted in accordance with the CAMP described in OU-1's CHASP, which is in accordance with the requirements of NYSDEC DER-10 – Technical Guidance for Site Investigation and Remediation and with the provisions of the NYSDOH Generic CAMP included as Appendix 1A in DER-10. The CAMP was implemented to prevent off-site receptors, including residences and businesses, from exposure to potential airborne contaminant releases during intrusive field activities.

The CAMP included real-time monitoring for VOCs and particulates at the downwind perimeter of each designated work area when ground-intrusive work was in progress. One upwind and one or two downwind stations were selected daily based on a local weather station to reflect the dominant wind direction. Each monitoring station included a TSI DustTrak II aerosol monitor for measuring particulates with a diameter less than 10 micrometers (PM10), and a MiniRAE 3000 PID for measuring total VOCs. A portable PID was used to monitor the work zone. The CAMP was not implemented during rain events or non-intrusive work activities. The work zone and site perimeters were

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visually monitored for fugitive dust emissions. Continuous monitoring was required for all ground-intrusive work. Ground-intrusive work includes, but is not limited to, soil/fill excavation (e.g., utility trenching, grading, foundation cuts) and handling. Periodic monitoring for VOCs occurred during non-intrusive work such as the collection of soil samples.

Action levels used for PM10 and VOCs were established in the CAMP, included as Appendix I of the OU-1 RAWP. Per the CAMP, the action level for particulates was set at 150 µg/m^3 above background for a 15-minute average. The alert level (to assess perimeter site conditions and apply dust suppression as necessary) for particulates was set at 100 µg/m^3 above background for a 15-minute average. Action levels for VOCs were set at 25 ppm for instantaneous readings above background and 5 ppm above background for a 15-minute average.

Field personnel observed ambient air conditions to check for visible dust emissions and/or odors; if observed, the construction team was alerted and mitigation measures were implemented, which included wetting fill and soil, construction of an engineered gravel tracking pad, covering stockpiles with polyethylene sheeting, and limiting vehicle speeds to five miles per hour.

Odor and vapor mitigation methods included limiting the time that the excavations remained open, minimizing stockpiling of contaminated-source soil, minimizing the handling of contaminated soil and fill, application of polyethylene sheeting over the odor or VOC source area and direct load-out of soil to trucks for off-site disposal whenever feasible. CAMP results are discussed in Section 5.2.5. and CAMP air monitoring data logs are included in **Appendix J**.

5.1.7 Contractors Site Operations Plans

The Remediation Engineer (RE) reviewed all plans and submittals for this remedial project (i.e., those listed above plus contractor and subcontractor submittals) and confirmed that they were in compliance with the OU-1 RAWP. All remedial documents were submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

5.1.8 Citizen Participation Plan (CPP)

The CPP lends transparency to remediation projects by providing the public with information on the proposed plans and an outlet to voice concerns to limit the impact a remediation project may have on the surrounding community. The CPP established a

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protocol for citizen participation, including creating a document repository to contain a copy of applicable project documents. A certification of mailing was sent to the NYSDEC project manager following the distribution of Fact Sheets and notices that included: (1) certification that the Fact Sheets were mailed; (2) the date they were mailed; (3) a copy of the Fact Sheets; (4) and a list of recipients (contact list). No changes were made to Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC.

Document repositories have been established at the following locations and contain all applicable project documents. Note that the addresses for the document repositories changed during implementation of the remedial action, both the original and current (as indicated by asterisk) repository locations are provided below.

Queens Community Board 7
133-32 41st Road – Room 3B
Flushing, NY 11355
Phone: 718-359-2800
Email: qn07@cb.nyc.gov
Website: www.nyc.gov/queenscb7

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

Queens Community Board 7*
30-50 Whitestone Expressway, Suite 205
Flushing, NY 11354
Phone: 718-359-2800
Email: qn07@cb.nyc.gov
Website: www.nyc.gov/queenscb7
* Indicates a current Site repository

Queens Public Library at Central*
89-11 Merrick Boulevard
Flushing, New York, 11432
Phone: (718) 990 - 0700

Access to projects documents is available through the DECinfo Locator at:

https://www.dec.ny.gov/data/DecDocs/C241146D/

5.2 Remedial Program Elements

5.2.1 Contractors and Consultants

Contractor	Responsibility
QDG, LLC	Developer/BCP Volunteers
Triumph Construction Corp.	General Contractor
Keller North America (Keller Management Services, LLC)	Dewatering
Grid Logistics, LLC	Materials Management

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Contractor	Responsibility
Soil Solutions, Inc.	SOE Installation
Mirmax Engineering, P.C.	Survey and Structural Monitoring
American Secured Fence Corp.	Construction Fence Installation
Peak Security Plus Inc.	Site Security
Twin Peaks, Inc.	Waste Characterization Sampling
Lakewood Environmental Services, Corp.	Driller and Monitoring Well Installer
Alpha Analytical, Inc.	Laboratory
Langan Engineering and Environmental: Jason Hayes, P.E.	Remedial Engineer (RE)
Langan Engineering and Environmental: Gerald Nicholls, P.E., CHMM	Qualified Environmental Professional (QEP)
Langan Engineering and Environmental: Joe Conboy	DUSR Preparer
Langan Engineering and Environmental: Elizabeth Burgess, P.E.	Project Manager
Langan Engineering and Environmental: William Bohrer	Site Safety Officer
Langan Engineering and Environmental: Luke McCartney	Field Team Leader

The RE is a registered professional engineer licensed by the State of New York and responsible for the inspection of remedial work.

5.2.2 Site Preparation

A pre-construction meeting was held with NYSDEC and all contractors on June 2, 2021. This meeting was held to introduce the remediation team, discuss NYSDEC expectations, and identify the expected construction schedule for the BCP project.

Mobilization for remedial work under the RAWP occurred on June 7, 2021, and remedial activities were completed at the Site from June 7, 2021 through March 8, 2022, November 28, 2022 through February 16, 2023, and April 27 through June 1, 2023. Daily and monthly reports were provided to the NYSDEC throughout remediation and are provided in **Appendix C**. A remedial action photograph log is included in **Appendix D**.

Documentation of agency approvals required by the OU-1 RAWP is included in **Appendix B**. Other non-agency permits relating to the remediation project are provided in **Appendix F**.

No SEQRA or applicable natural resource approvals or other permits were needed to perform the Site remediation. To the best of the RE's knowledge, all SEQRA

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requirements and all substantive compliance requirements for attainment of applicable natural resource or other permits were achieved during this Remedial Action.

5.2.3 General Site Controls

5.2.3.1 Site Security

The Site was secured during implementation of the remedy as follows:

- Perimeter security fencing and access gates with locks were installed along the OU-1 boundary to prevent access by unauthorized persons (NYCDOB-approved construction fence design drawings are included in **Appendix F**)
- A security guard was present for weekday nights and weekends
- Unauthorized personnel were not permitted to access the work areas
- Safe work practices were implemented, which included:
- Maintaining an organized work area, including the proper storage of tools, equipment, materials, and fuels
- Warning tape and/or barricades placed around open excavations
- Maintaining and covering stockpiles

No problems were encountered with regard to Site security during remediation.

5.2.3.2 Job Site Record Keeping

Daily observations were recorded in a logbook and documented in daily field reports, which are discussed in greater detail in Section 5.2.6. Monthly reports were also issued to NYSDEC. Langan personnel and its subcontractors reviewed and signed the HASP when visiting the Site for the first time. The Contractor was responsible for maintaining the health and safety of its workers and subcontractors.

5.2.3.3 Erosion and Sedimentation Controls

In accordance with the January 29, 2021 (revised July 6, 2021) SWPPP, erosion and sedimentation controls were installed during implementation of the remedy. These controls included 1) silt/filter socks, 2) stabilized construction entrances, 3) low points to temporarily capture stormwater, and/or 4) silt fence, as needed. A copy of the SWPPP is provided in **Appendix I**.

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5.2.3.4 Stockpile Methods

Soil stockpiles were constructed as necessary when excavated material could not be directly loaded into trucks for off-site transport. Detailed stockpiling procedures are presented in Section 5.1.4.2 of this FER.

5.2.3.5 Equipment Decontamination

Equipment used during field activities was properly washed prior to exiting the decontamination zone. When feasible, monitoring instruments were either wrapped in plastic or carried by personnel not involved in handling contaminated materials, to reduce the need for decontamination. All instruments were wet wiped prior to removal from the work zone. Dedicated and/or disposable sampling equipment was used to the extent possible to minimize decontamination requirements and the possibility of cross contamination.

Following use, all other equipment was decontaminated utilizing potable water and power washing methodologies. No equipment was left on-site without prior approval of the field personnel under the supervision of the RE.

5.2.4 Nuisance Controls

Nuisances related to the remediation included odors, dust, and truck traffic. Odors generated by the remedial excavation were minimal and were managed by covering petroleum-impacted stockpiles with plastic sheeting until removed. Dust suppression was conducted by covering stockpiles with plastic sheeting and spraying water on exposed soil/fill and concrete prior to and during excavation. During soil transport for off-site disposal, truck tires were washed with a hose prior to leaving and runoff was contained within the Site. Sidewalks and roadways surrounding OU-1 were swept, as necessary. Equipment decontamination was performed prior to handling new waste streams, in accordance with the OU-1 RAWP and CHASP.

With the exception of the CAMP exceedances detailed in Section 5.2.5, below, no problems were recorded with regard to odors, dust, stockpile management, and truck traffic. No known complaints related to odors, dust, or waste transport were filed during remediation.

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5.2.5 CAMP Results

Air monitoring for particulates and VOCs was performed during ground-intrusive activities from June 16, 2021 through March 8, 2022, November 28, 2022 through February 16, 2023, and April 27 through June 1, 2023. The CAMP was performed at one upwind and two downwind air monitoring stations using TSI Model 8530 DustTraks to monitor particulates and MiniRAE 3000 PIDs to monitor VOCs. Fifteen-minute time-weighted averages were calculated from the data recorded at each station, and averages were compared to the action levels established in the CAMP.

The CAMP action levels were exceeded on 13 occasions over the course of remedy implementation within OU-1. These occurrences were attributed to close-proximity equipment movement, equipment exhaust in close proximity to the downwind station, and equipment malfunctions (i.e., moisture trapped in units). During instances when particulate concentrations exceeded the CAMP action levels, dust mitigation was accomplished by applying dust mitigation (i.e., water to work areas) and/or pausing work. Copies of all field data sheets relating to the CAMP for OU-1 are provided in electronic format in **Appendix J**. The CAMP exceedances and the corrective actions taken are described **in Table 1** below:

CAMP Exceedances and Corrective Action Summary

Type of Exceedance	Date of Exceedance	Corrective Action
Particulate	June 30, 2021	Particulate exceedance caused by concrete demolition. Demolition was paused and water was used for dust suppression.
Particulate	July 15, 2021	Particulate exceedance caused by concrete demolition. Demolition was paused and water was used for dust suppression.
Particulate	July 19, 2021	Particulate exceedance caused by concrete demolition. Demolition was paused and water was used for dust suppression.
VOC	August 30, 2021	VOC exceedance was not associated with field work. Device was recalibrated.
VOC	October 14, 2021	VOC exceedance was not associated with field work. Device was recalibrated.
Particulate	November 17, 2021	Particulate exceedance was not associated with field work. Device was recalibrated.
Particulate	December 10, 2021	Welding activities near CAMP station. Particulate exceedance was not associated with soil or concrete dust.

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CAMP Exceedances and Corrective Action Summary		
Type of Exceedance	Date of Exceedance	Corrective Action
VOC	December 11, 2021	VOC exceedance was not associated with field work. Device was recalibrated.
VOC	December 30, 2021	VOC exceedance was not associated with field work. Device was recalibrated.
Particulate	January 13, 2022	Particulate exceedance was not associated with field work. Device was recalibrated.
VOC	February 2, 2022	VOC exceedance was not associated with field work. Device was recalibrated.
Particulate	February 12, 2022	Particulate exceedance caused by stone placement and high wind speed. Dust was not observed leaving the Site.
Particulate	March 1, 2022	Particulate exceedance caused by stone placement and high wind speed. Dust was not observed leaving the Site.
Particulate	January 26, 2023	Particulate exceedance caused by stone placement and high wind speed. Dust was not observed leaving the Site.

5.2.6 Reporting

The RE recorded on-site personnel and equipment, a summary of work completed, a CAMP data summary, and the anticipated schedule of upcoming work in field books and daily reports. This data was used to track remediation progress, monitor compliance with the OU-1 RAWP, and summarize completed remedial actions in monthly BCP reports for submission to the NYSDEC. Daily and monthly reports were sent to the NYSDEC via email.

All daily and monthly reports are included in electronic format in **Appendix C**.

The digital photo log required by the OU-1 RAWP is included in electronic format in **Appendix D**.

5.3 Contaminated Soil, Fill, and Fluids Removal

The former Willets Point Development BCP Site was remediated as two operable units (OU-1 and OU-2). In accordance with the OU-1 RAWP, the total quantity of soil/fill exported for OU-1 was tracked, confirmed, and documented in the NYSDEC-approved July 5, 2023 OU-1 CCR. Disposal quantities tabulated and provided in this FER for the

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Site are approximate and based on an apportionment of about 19.9% of the total OU-1 disposal quantities documented in the July 5, 2023 OU-1 CCR, including the disposal of soil/fill generated during the November 2022 Remedial Design implementation. The Site apportionment percentage of 19.9% is based on a software generated analysis of the Site remedial excavation volume and the total OU-1 excavation volume, using the pre-remediation Site elevation data from the October 14, 2021 Boundary, Topographic and Utility Survey prepared by Langan and bottom of excavation elevation data from the March 21, 2023 Bottom of Excavation As-Built Survey prepared by Mirmax Engineering PC **(Appendix N**). The remedial excavations completed for the Site remedy include the following:

- Site-wide excavation to at least 2 feet bgs (el. 8.5 to el. 7) to remove soil/fill exceeding RR SCOs and to prepare the Site for installation of the site cover system (shown as the blue area on **Figure 3**),
- Excavation to about 4 to 15 feet bgs (el. 6 to e. -3) to remove petroleum source material and prevent groundwater contamination from migrating to Site groundwater (shown as the red area on **Figure 3**)
- Excavation to about 8 to 11 feet bgs (el. 2) to facilitate the implementation of in-situ groundwater treatment and remove nuisance conditions, petroleum impacted soil/fill, metal car parts, and other large-diameter debris (shown as the orange area on **Figure 3**).

Contaminated soil/fill, including petroleum-impacted soil, and large-diameter debris were transported for off-site disposal. A Track 4 RR remediation was achieved utilizing the Track 4 RR SCOs summarized in **Table 1.** Remedial excavation extents are presented on **Figure 3**. A Track 4 RR remediation was achieved utilizing the Track 4 RR SCOs summarized in **Table 2.** Remedial excavation extents are presented on **Figure 3**. The following contaminated wastes were removed during the remedial action (quantities are summarized in Section 5.3.6):

- Nonhazardous non-native fill and petroleum-impacted soil/fill
- Petroleum-impacted groundwater

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5.3.1 Waste Characterization Soil Sampling

Twin Peaks collected pre-excavation waste characterization samples from August 10 through 20, 2021 to characterize soil/fill requiring off-site disposal. The pre-excavation waste characterization was conducted across the entire OU-1 area and included the collection of 63 composite and 63 grab soil samples from 63 waste characterization grids. Samples were analyzed for TCL VOCs, SVOCs, PCBs, pesticides, herbicides, TAL metals, hexavalent chromium, EPH, reactivity, ignitability, pH, and TCLP RCRA 8 metals by an NYSDOH ELAP-certified laboratory.

Triumph Construction collected waste characterization soil samples from stockpiled non-native fill, generated during implementation of the November 2022 Remedial Design, on January 12, January 16, February 2, March 9, and May 16, 2023. Six composite soil samples were collected and analyzed for TCL SVOCs, PCBs, pesticides, herbicides, TAL metals, hexavalent chromium, reactivity, ignitability, pH, and TCLP RCRA 8 metals, TCLP SVOCs, TCLP pesticides, and TCLP herbicides by an NYSDOH ELAP-certified laboratory. Three grab soil samples were collected and analyzed for TCL VOCs and TCLP VOCs. Langan provided third-party oversight during the waste characterization sampling activities.

The soil/fill waste characterization sampling results, including a sample location map, data summary tables, and laboratory reports, are included in **Appendix K**.

5.3.2 Nonhazardous Non-Native Fill and Petroleum-Impacted Soil/Fill from Remedial Excavation

Contaminated nonhazardous soil/fill removed from OU-1 included nonhazardous soil/fill impacted by VOCs, SVOCs, PCBs, and metals. The remedial excavation included the removal of soil/fill from surface grade to 2 feet bgs across the Site and excavation beyond 2 feet in three localized petroleum sources areas. The petroleum source areas were remediated beyond the limited proposed in the OU-1 RAWP. Remediation of the petroleum source areas was accomplished through excavation and removal to prevent contaminant migration to Site groundwater. The petroleum source areas were remediated beyond the limits proposed in the OU-1 RAWP, which was necessary to prevent recontamination of the Site from the upgradient source. Langan personnel delineated the extents of the petroleum source areas during remedial excavation based on visual, olfactory, and PID soil screening and assessment.

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During implementation of the November 2022 Remedial Design, excavated petroleum-impacted soil/fill from the in-situ groundwater treatment area was encountered, which was not suitable for replacement or mixing because of the presence of metal car parts, large-diameter debris, nuisance conditions, and petroleum impacts. This material was stockpiled separately for off-site disposal. The petroleum source area and in-situ groundwater treatment area are identified on **Figure 3**.

Grid Logistics, Inc. transported a total of 22,856.88 tons (13,852.66 cy) of nonhazardous soil/fill and petroleum-impacted soil/fill for off-site disposal as a part of the Site remedy. Of the 22,856.88 tons (13,852.66 cy), about 8,360.19 tons (5,078.90 cy) of nonhazardous petroleum-impacted soil/fill was removed for off-site disposal from petroleum source areas contaminating the Site, and about 4,281.53 tons (2,594.87 cy) of petroleum-impacted soil/fill was removed from the in-situ groundwater treatment area. Off-site disposal quantities and disposal facilities are summarized in Section 5.3.6.

5.3.3 Underground Storage Tanks

No USTs were discovered during remedial activities at the Site.

5.3.4 Petroleum-Impacted Groundwater

A total of 287,300 gallons of petroleum-impacted groundwater was pumped from petroleum source area excavations in northeastern part of OU-1 and through the dewatering treatment system between February 4 and 28, 2022. The treated water was discharged either on-site with NYSDEC approval or to the NYC stormwater sewer system through an on-site catch basin in accordance with NYCDEP SPDES Permit No. 926995.

5.3.5 In-Situ Groundwater Treatment

An in-situ groundwater treatment program was implemented in the northeastern part of OU-1, to address petroleum-related target compounds that were identified in soil above PGW SCOs and in groundwater above NYSDEC SGVs. The target compounds were identified based on the results of documentation soil samples and August 2022 groundwater sampling (discussed in Section 5.4.3.1) and consisted of 1,2,4-trimethylbenzene, acetone, benzene, ethylbenzene, tert-butyl methyl ether (MTBE), toluene, total xylenes, and naphthalene. Stimulation of biodegradation was accomplished via direct in-situ mixing of chemical reagents within a 15,100-square-foot area within the Site (shown on **Figure 3**). The reagents selected for mixing included PetroFix™ (a water-based suspension fluid of micron-scale activated carbon and biostimulating electron

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acceptors), Oxygen Release Compound (ORC) Advanced® (an engineered oxygen release compound), and an electron acceptor blend supplied by REGENESIS of San Clemente, California. The in-situ groundwater treatment program was a contingency of the OU_1 RAWP and implemented in accordance with the NYSDEC-approved November 2022 Remedial Design. NYSDEC correspondence documenting approval of the in-situ groundwater treatment program is provided in **Appendix B**. A summary of the field implementation is presented below.

5.3.5.1 Field Implementation

Field implementation began on November 28, 2022, and was completed January 17, 2023. The following sequence of construction occurred within five separate areas comprising the groundwater treatment area:

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- Mark-out of in-situ groundwater treatment area extents using GPS
- Cordoned off treatment area and establish CAMP
- Temporary relocation of clean site cap to stockpiles for future replacement within the treatment area.
- Removal of demarcation layer
- Excavation and temporary stockpiling of non-native fill to groundwater to the observed groundwater table (approximately el. 2).
- Direct mixing of PetroFix™, ORC Advanced®, and electron acceptor blend to a minimum depth of 4 feet into saturated soil (approximately el.-2 to el. 2).
- Backfilling of the treatment area with about 2,448 cubic yards NYSDEC-approved ¾-inch quarry stone at the water table (about el. 2 to el. 4.5) throughout the treatment area, to offset material that was not suitable for mixing or backfill.
- Backfilling of the treatment area with non-native fill material previously excavated from the corresponding backfill location, to about 2 feet below adjacent grade.
- Replacement of the demarcation layer
- Restoration of the 2-foot composite cover system by backfilling with approximately 1,928 cubic yards of NYSDEC approved clean fill and 882 cubic yards of NYSDEC-approved ¾-inch quarry stone, to a final grade of about el. 6 to el. 12.

Non-native fill that was not suitable for replacement or mixing because of the presence of metal car parts, large-diameter debris, nuisance conditions, and petroleum impacts was stockpiled separately and removed from the Site for off-site disposal (4,281.53 tons). The in-situ groundwater reagent mixing was completed on January 17, 2023. Transportation and off-site disposal of non-native fill from the in-situ groundwater treatment area was completed June 1, 2023.

5.3.5.2 Quantities of PetroFix™, ORC Advanced™ and Electron Acceptor Blend

The following total quantities of reagents were mixed within saturated soil across the 15,100-square foot in-situ groundwater treatment area:

- PetroFix™ - 9,200 pounds
- ORC Advanced™ - 5,920 pounds
- Electron Acceptor Blend™ - 460 pounds

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REGENESIS dosing calculations and excavation application guidance, and Safety Data Sheets (SDS) for PetroFix™, the electron acceptor blend, and ORC Advanced® are provided in **Appendix R**.

5.3.6 Disposal Quantities

The following table provides a summary of excavated material removed and transported for off-site disposal as a part of the Site remedy.

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Material Type	Quantity Removed	Volume Removed	Disposal Timeframe	Disposal Facility
Nonhazardous and Petroleum-Impacted Soil/Fill	18,575.35 tons	11,257.79 cy	November 11, 2021, through March 7, 2022	Hazleton Creek Associates Inc., 282 South Church Street, Hazleton, PA
Petroleum-Impacted Soil/Fill from In-Situ Groundwater Treatment Area	3,708.41 tons	2,247.52 cy	April 27 through May 5, 2023	WM Fairless Landfill 1000 Bordentown Road, Morrisville, PA
	573.12 tons	347.35 cy	June 1, 2023	Bayshore Soil Management, Inc., 75 Crows Mill Road, Keasbey, NJ
Non-impacted Concrete	366.18 tons	228.86 cy	June 28, 2021, through February 24, 2022	Evergreen Recycling of Corona, Inc., 12708 Willets Point Boulevard, Corona, NY
Non-impacted Concrete	1,776.04 tons	1,110.02 cy	July 6 through December 28, 2021	Durante Bros. Construction Corp., 31-40 123rd Street, Flushing, NY
Non-impacted Concrete & Asphalt	771.58 tons	482.23 cy	July 15, 2021, through January 28, 2022	E. Tetz and Sons, 63 Cemetery Road Middletown, NY
Dewatering System Groundwater	-	287,300 gallons[3]	February 4 through 28, 2022	Discharged either on-site with NYSDEC approval or to the NYC stormwater sewer system through an on-site catch basin
Total Soil/Fill	**22,856.88 tons**	**13,852.66 cy**		
Total Concrete & Asphalt	**2,913.79 tons**	**1,821.12 cy**		
Total Groundwater	**-**	**287,300 gallons**		

Remedial excavation extents are presented on **Figure 3**. Each regulated waste stream was transported for off-site disposal using NYCRR Part 364-permitted transporters in accordance with federal, state, and local regulations. Regulated waste removed for disposal was tracked using a manifesting system. **Tables 3A and 3B** show the total quantities of each category of material removed as a part of the Site remediation, and the

[3] The quantity of groundwater disposed represents the total gallons of groundwater removed, treated, and discharged to the storm sewer for remediation of OU-1.

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disposal locations for the excavated material. A summary of the samples collected to characterize the waste, and associated analytical results are summarized on **Tables 4 and 5**. Letters from Applicants to disposal facility owners, acceptance letters from disposal facilities, disposal facility operating permits, and waste transporter permits are attached in **Appendix L**. Waste disposal manifests, bills of lading, and scale tickets are included in **Appendix M**.

5.4 Remedial Performance/Documentation Sampling

Documentation soil samples were collected from the excavation base and excavation sidewalls in accordance with the OU-1 RAWP. Documentation sampling was completed to document subsurface conditions following remedial excavation and to evaluate the performance of the remedy relative to the RAOs. Tables and figures summarizing all documentation sampling are included as **Tables 4 and 5** and **Figures 6A through 6D** respectively, and all exceedances of SCOs are highlighted.

Data Usability Summary Reports (DUSRs) were prepared for all data generated in this remedial performance evaluation program. These DUSRs are included in **Appendix O**.

5.4.1 Documentation Soil Sampling

Per the OU-1 RAWP and NYSDEC DER-10 guidance, documentation soil samples were collected to document subsurface conditions following remedial excavation and to evaluate the performance of the remedy relative to the RAOs. Documentation samples were collected at a reduced sampling frequency of one sample per 2,000 square feet of excavation base, and one sample per 50 linear feet of sidewall. In petroleum source soil/fill removal areas, documentation samples were collected at a frequency of one sample per 900 square feet of excavation base, and one sample per 30 linear feet of sidewall. Sidewall samples were not collected in areas where the SOE or the contaminant cutoff wall obstructs access to sidewall soil, sidewall soil is off-site, or in areas where the slope of the excavation cut was 1:1 or less. Sidewall samples were not collected along the OU-1 perimeter because excavations would only extend to about 2 feet and remaining soil would be outside the OU-1 boundary. A total of 38 documentation samples, including QA/QC, were collected during OU-1 RAWP and Remedial Design implementation for this Site (excluding the 26 documentation samples collected as part of the IRMWP implementation from soil that was removed during RAWP implementation). Eleven documentation soil samples represent

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soil/fill that was removed during excavation for implementation of the November 2022 Remedial Design. A total of 27 documentation samples represent soil remaining in place.

Documentation samples were analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides, cyanide, metals (including hexavalent and trivalent chromium), 1,4-dioxane, and PFAS compounds by an NYSDOH ELAP-certified laboratory. Results were compared to the RR and PGW SCOs and are discussed in Section 5.6.

A documentation sample location map is included as **Figure 5**. A documentation sample collection summary is included as **Table 4**. Documentation sample results (including QA/QC samples) are summarized in **Table 5** and **Figures 6A through 6D**. Analytical laboratory reports are included in **Appendix P**.

5.4.2 Post-Treatment Documentation Soil Sampling

The February 2023 Post-Treatment Sampling Plan Addendum was prepared to supplement the NYSDEC-approved November 2022 Remedial Design and establish post-treatment soil documentation sampling and groundwater monitoring. Implementation of the sampling plan was performed on February 16, 2023, 30-days after the in-situ groundwater mixing completion date.

The post-treatment sampling plan implementation included the completion of 12 soil borings within the treatment area, at 10 locations where soil documentation samples were previously collected and at two new locations (EPB306 and EPB307) to provide adequate sample coverage. Twelve soil samples from the treatment zone (between el. -2 to 2), plus QA/QC samples, were collected for laboratory analysis of the full-suite of NYSDEC Part 375 parameters as detailed by the OU-1 QAPP.

The post-treatment soil documentation endpoint soil sample locations are presented on **Figure 5**. A sample collection summary is included in **Table 4**. Soil documentation sampling results are summarized in **Table 5** and **Figures 6A through 6D**. Analytical laboratory reports are included in **Appendix P**.

5.4.3 Post-Remediation Groundwater Sampling

Groundwater remediation at the Site was accomplished through excavation of source soil/fill within the Site boundary and implementation of in-situ groundwater treatment. Three groundwater monitoring wells (C-MW201, C-MW206, and C-RMW01) remain within the Site to assess the performance of the groundwater remedy. Monitoring

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well C-MW206 was reinstalled in accordance with the February 13, 2023 Sampling Plan Addendum.

Once the remedy was completed, a network of monitoring wells was sampled to monitor upgradient, on-site, and downgradient groundwater conditions. The monitoring well network includes a total of 15 monitoring wells across the former Willets Point Development BCP Site; 10 of which remain within the former OU-1 boundary. Three of the 15 monitoring wells are located within the Site (C-MW201, C-MW206, and C-RMW01). The on-site and surrounding OU-1 monitoring well locations are identified in **Figure 8**.

After the initial post-remediation groundwater sampling in August 2022, four groundwater sampling events were completed in February, May, August, and December 2023. Depth to groundwater was measured using a Solinst® oil/water interface probe and the wells were gauged for potential free product. Head space readings were measured for organic vapors with a PID. Each monitoring well that could be sampled was purged using a peristaltic pump and dedicated, disposable polyethylene tubing. During purging, the turbidity, pH, temperature, conductivity, redox potential, and dissolved oxygen of the groundwater were monitored using a Horiba U-52 Water Quality meter with a flow-through cell. The wells were purged until water quality parameters stabilized.

Groundwater samples were collected into laboratory-prepared containers, tightly sealed, uniquely labeled, and stored on ice for transport to Alpha Analytical, Inc., a NYSDOH ELAP-certified laboratory in Westborough, Massachusetts (ELAP No. 11148), under standard chain-of-custody procedures. Field blanks, trip blanks, and duplicate samples were collected for QA/QC purposes. Samples were analyzed for NYSDEC Part 375 List and TCL VOCs and SVOCs. The trip blank was analyzed for VOCs only. A summary of each sampling event is provided below.

5.4.3.1 August 2022 Groundwater Sampling (OU-1)

The OU-1 August 2022 groundwater sampling event was completed in accordance with the first draft Interim SMP for OU-1, prepared by Langan and submitted to NYSDEC on August 30, 2022. August 2022 groundwater sampling was completed prior to implementation of in-situ groundwater treatment and is considered baseline. Eight of eleven existing OU-1 groundwater monitoring wells were sampled and gauged on August 3, 4, and 5, 2022. Langan was unable to collect groundwater samples from three

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monitoring wells: A-MW112, A-MW204, and C-MW206. A-MW112 and C-MW206 contained a blockage and could not be gauged or sampled. A-MW204 ran dry during well purging and could not be sampled. A-MW204R was relocated outside of the proposed building footprint to facilitate foundation construction. C-MW206 was reinstalled in accordance with the February 13, 2023 Sampling Plan Addendum.

5.4.3.2 February 2023 Post-Treatment Groundwater Sampling (OU-1)

Groundwater sampling was conducted on February 16, 2023, in accordance with the NYSDEC-approved February 13, 2023 Sampling Plan Addendum. The sampling event consisted of gauging six groundwater monitoring wells located down gradient, cross gradient, or within the in-situ treatment area (B-MW201, B-MW206, C-MW201, C-MW205, C-MW206, and C-RMW01).

Six groundwater samples plus QA/QC samples were collected from each of the above-mentioned monitoring wells for laboratory analysis of NYSDEC Part 375 List and TCL VOCs and SVOCs.

The groundwater monitoring well network is presented on **Figure 8**. Groundwater sample results are summarized in **Table 6** and **Figure 9**. Analytical laboratory reports are included in **Appendix P**.

5.4.3.3 May 2023 Groundwater Sampling (OU-1)

The OU-1 May 2023 Groundwater Sampling event was completed in accordance with the NYSDEC-approved November 2022 Remedial Design and February 13, 2023 Sampling Plan Addendum. Ten of eleven existing OU-1 groundwater monitoring wells were sampled and gauged May 22 and 23, 2023. Langan was unable to collect groundwater samples from one monitoring well: A-MW112. A-MW112 contained a blockage and could not be gauged or sampled. The decommissioning of A-MW112 was presented in the Interim SMP for OU-1 and was decommissioned by Lakewood environmental on August 29, 2023 following the NYSDEC June 9 approval.

5.4.3.4 August 2023 Groundwater Sampling (OU-1)

The OU-1 August 2023 Groundwater Sampling event was completed in accordance with the NYSDEC-approved June 9, 2023 Interim SMP for OU-1, prepared by Langan. Ten OU-1 groundwater monitoring wells were sampled and gauged August 29 and 30, 2023. Langan was unable to collect groundwater samples from one monitoring well:

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A-MW112. A-MW112 contained a blockage and could not be gauged or sampled. Well A-MW112 was decommissioned on August 29, 2023 in accordance with the Interim SMP, due to its location within the proposed building footprint.

5.4.3.5 December 2023 Groundwater Sampling (Former OU-1)

The former OU-1 December 2023 Groundwater Sampling event was completed in accordance with the NYSDEC-approved June 9, 2023 Interim SMP for OU-1, prepared by Langan. Ten of ten existing OU-1 groundwater monitoring wells were sampled and gauged on November 28 and 29, 2023 and December 27, 2023.

5.5 Imported Backfill and Cover Material

The former Willets Point Development BCP Site was remediated as two operable units (OU-1 and OU-2). In accordance with the OU-1 RAWP, the total quantity of imported material for OU-1 was tracked, confirmed, and documented in the July 5, 2023 OU-1 CCR. Import quantities for the Site are estimated and based on apportionment of about 37% of the total OU-1 import quantities documented in the July 5, 2023 Construction Completion Report, excluding RCA and SCA Clean Fill which was specific to an off-site area. The Site apportionment percentage of 37% is based on a software-generated fill volume analysis using the pre-remediation Site elevation data from the October 14, 2021 Boundary, Topographic and Utility Survey prepared by Langan and post-remediation Site elevation data from the March 21, 2023 Finish Grade As-Built Survey prepared by Mirmax Engineering PC (**Appendix N**).

All fill imported onto the Site met the import criteria of the OU-1 RAWP. The imported fill was approved by the RE and NYSDEC project manager prior to import to the Site, except for the deviation noted in Section 6.0.

The following table provides a summary of material imported onto the Site and the areas to the south and east of the Site that comprised source areas for Site contamination for use as backfill to bring remedial excavations to grade and/or as part of the site cover system:

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Material Type	Quantity Imported	Volume Imported	Site Usage	Origin Facility
3/4-inch quarry stone (ASTM 57)	2,980.54 tons	1,806.39 cy	Site Cover System and General Fill	Braen Royalties, 400-402 Central Ave, Haledon, NJ 07508, supplied by EROC, 12708 Willets Point Boulevard, Corona, NY 11368
3/4-inch quarry stone (ASTM 57)	4,448.66 tons	2,696.16 cy	Site Cover System and General Fill	Callanan Industries, 8 Southwoods Blvd, 4th Floor Albany, NY 12211
3/4-inch quarry stone (ASTM 57)	63.76 tons	38.64 cy	Site Cover System and General Fill	E. Tetz and Sons (Chester Site), 66 Tetz Road, Chester, NY 10918
3/4-inch quarry stone (ASTM 57)	1,351.17 tons	818.89 cy	Site Cover System and General Fill	E. Tetz and Sons (Monqaup Valley Quarry), 130 Crotty Road, Middletown, NY 10941
Clean Fill	8,312.45 tons	5,937.46 cy	Site Cover System and General Fill	Durante Bros. Construction Corp., 31-40 123rd Street, Flushing, NY 11354
Clean Fill	2,914.86 tons	1,979.15 cy	Site Cover System and General Fill	EROC, 12708 Willets Point Boulevard, Corona, NY 11368
SCA Clean Sand	4,272.85 tons	3,052.04 cy	Cover System and General Fill, including in SCA Area	EROC, 12708 Willets Point Boulevard, Corona, NY 11368
SCA Clean Fill	532.55 tons	380.39 cy	Site Cover System and General Fill	NYCDEP Valhalla 15 Walker Road Valhalla, NY 10595
Total ¾-inch Quarry Stone:	**8,844.14 tons**	**5,360.09 cy**		
Total Clean Fill:	**11,759.86 tons**	**8,297.01 cy**		
Total SCA Clean Sand:	**4,272.85 tons**	**3,052.04 cy**		

A summary of all shipments of imported backfill with quantities for each is presented in **Tables 7A and 7B**. A figure showing where backfill was placed at the Site is shown in **Figure 4**. Requests to import material and NYSDEC import approval notifications are included in **Appendix G**. Imported soil/fill and stone transportation documentation is included in **Appendix H**.

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5.6 Contamination Remaining at the Site

5.6.1 Soil

During implementation of the May 11, 2021 NYSDEC-approved OU-1 RAWP and the September 19, 2019 Interim Remedial Measures Work Plan, contaminated soil/fill was removed from the Site. Soil/fill that was not removed during remedial excavation remains beneath the demarcation layer that underlies the composite cover system. A total of 27 documentation soil samples from the Site, including two duplicate samples, represent soil remaining in-place (11 documentation soil samples represent soil that was removed during excavation for implementation of the November 2022 Remedial Design). Documentation sample locations are shown on **Figure 5**. Documentation soil sample analytical results (including QA/QC samples) are summarized in **Figures 6A through 6D** and **Table 5**.

The Site documentation soil samples indicate that remaining contamination exceeds the lower of PGW and/or Track 4 RR SCOs at 20 of the 27 documentation soil samples. Documentation soil samples collected detected 11 VOCs, 8 SVOCs, total PCBs, 10 metals, and one PFAS compound, perfluorooctanesulfonic acid (PFOS), above the lower of PGW and RR SCOs in at least one documentation sample. The lower of PGW and RR SCO exceedances in the Site documentation samples are summarized in the table below.

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Documentation Endpoint Soil Samples							
Analyte	**PGW SCO**	**RR SCO**	**Unit**	**Minimum Detected Concentration above SCOs**		**Maximum Detected Concentration above SCOs**	
VOCs							
1,2,4-Trimethylbenzene	3.6	52	mg/kg	3.9	EPB187_EL6	64	EPB306A_EL0.5
1,2-Dichloroethane	0.02	3.1	mg/kg	0.026	EPB216A_EL0	0.026	EPB216A_EL0
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	mg/kg	16	EPB306A_EL0.5	16	EPB306A_EL0.5
Acetone	0.05	100	mg/kg	0.054	EPB215A_EL0	1	EPB221A_EL-0.5
Benzene	0.06	4.8	mg/kg	0.45	EPB222_EL3	2.3	EPB306A_EL0.5
Ethylbenzene	1	41	mg/kg	1.3	EPB187_EL6	15	EPB306A_EL0.5
Naphthalene	12	100	mg/kg	14	EPB307A_EL1	14	EPB307A_EL1
n-Propylbenzene	3.9	100	mg/kg	4.7	EPB185_EL3	9.1	EPB306A_EL0.5
Tert-Butyl Methyl Ether	0.93	100	mg/kg	1.3	EPB307A_EL1	4.3	EPB219A_EL1.5
Toluene	0.7	100	mg/kg	1.2	EPB186_EL3	29	EPB306A_EL0.5
Total Xylenes	1.6	100	mg/kg	4.9	EPB187_EL6	71	EPB306A_EL0.5
SVOCs							
3 & 4 Methylphenol (m&p Cresol)	0.33	100	mg/kg	0.34	EPB214A_EL1.5	4.6	SODUP01_021623*
Benzo(a)anthracene	1	1	mg/kg	1.4	EPB186_EL3	4	EPB221A_EL-0.5
Benzo(a)pyrene	22	1	mg/kg	1.2	EPB186_EL3 EPB220A_EL1	3.4	EPB221A_EL-0.5
Benzo(b)fluoranthene	1.7	1	mg/kg	1.1	EPB148_EL7 EPB149_EL8 EPB214A_EL1.5	4.3	EPB221A_EL-0.5
Chrysene	1	3.9	mg/kg	1.3	EPB186_EL3	3.8	EPB221A_EL-0.5
Dibenz(a,h)anthracene	1000	0.33	mg/kg	0.49	EPB221A_EL-0.5	0.49	EPB221A_EL-0.5
Indeno(1,2,3-cd)pyrene	8.2	0.5	mg/kg	0.52	EPB149_EL8	2.1	EPB221A_EL-0.5
Phenol	0.33	100	mg/kg	0.35	EPB219A_EL1.5	0.56	SODUP01_021623
PCBs							
Total PCBs	3.2	1	mg/kg	1.02	EPB218A_EL-1	7.3	EPB219A_EL1.5
Metals							
Arsenic	16	16	mg/kg	16.6	SODUP01_021623	32.8	EPB214A_EL1.5
Barium	820	400	mg/kg	448	EPB214A_EL1.5	1050	EPB307A_EL1
Cadmium	7.5	4.3	mg/kg	4.9	EPB151_EL7	24	EPB219A_EL1.5
Chromium, Total	19	110	mg/kg	19.5	EPB150_EL7	83.1	EPB219A_EL1.5
Copper	1720	270	mg/kg	279	EPB218A_EL-1	4110	EPB214A_EL1.5
Lead	450	400	mg/kg	524	EPB185_EL3	3910	EPB307A_EL1
Mercury	0.73	0.81	mg/kg	0.761	EPB217A_EL-1	7.05	EPB214A_EL1.5
Nickel	130	310	mg/kg	132	EPB214A_EL1.5	142	EPB222_EL3
Silver	8.3	180	mg/kg	14.9	EPB219A_EL1.5	14.9	EPB219A_EL1.5
Zinc	2480	10000	mg/kg	3,100	EPB186_EL3	28100	EPB214A_EL1.5
PFAS							
Perfluorooctanesulfonic Acid (PFOS)	0.001^	0.044^	mg/kg	0.00105	EPB186_EL3	0.002	EPB151_EL7

*SODUP01_021623 is a duplicate sample of EPB219A_EL1.5
^ - Guidance Value
mg/kg = milligrams per kilogram

Twelve documentation soil samples contained VOCs (excluding acetone) exceeding the NYSDEC PGW SCO: EPB185, EPB186, EPB187, EPB214A, EPB216A, EPB217A, EPB219A, EPB220A, EPB221A, EPB222, EPB306A, and EPB307A. The remaining contamination at the twelve locations will continue to decline from the introduction of PetroFix and ORC Advanced during In-Situ Groundwater Treatment Implementation creating conditions conductive to biodegradation. Groundwater monitoring is ongoing at the Site and across former OU-1, sampling results confirm the efficacy of the In-Situ Groundwater Treatment Implementation and are discussed in the following subsection of this report.

A demarcation layer was placed at base of excavation depths across the Site. Due to varying elevations, a demarcation layer will not be encountered at a common elevation across the Site. The elevation recorded at the bottom of remedial excavations constitutes the elevation of the demarcation layer throughout the Site is shown on the P.E.-certified as-built survey drawings of OU-1, provided as **Appendix N**.

Since contaminated soil remains beneath the Site after completion of the Remedial Action, EC/IC are required to protect human health and the environment. These ECs/ICs are described in Sections 5.9 and 5.10. Long-term management of remaining contamination will be performed under the SMP.

5.6.2 Groundwater

Three monitoring wells (C-MW201, C-MW206, and C-RMW01) are located on the Site as part of a network of monitoring wells being used to assess petroleum contamination across the former OU-1 area. Remaining groundwater contamination on the Site was documented during the post-remediation groundwater monitoring events conducted on August 5, 2022, February 16, 2023, May 22, 2023, August 30, 2023, and November 28 and 29, 2023 and December 27, 2023 (**Figure 9**). The groundwater samples collected from the Site were analyzed for target compound list (TCL) VOCs, SVOCs, and 1,4-dioxane. Groundwater sampling results from the August 2023 sampling event indicate that 12 VOC and 8 SVOCs exceeded the NYSDEC SGVs in groundwater samples collected, as summarized below:

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Post-Remediation Groundwater Samples					
Analyte	**Unit**	**NYSDEC SGVs**	**Detected Concentration above SCOs**		
			C-MW201	**C-MW206**	**C-RMW01**
VOCs					
1,2,4,5-Tetramethylbenzene	µg/L	5	ND*	22	1.0 J**
1,2,4-Trimethylbenzene	µg/L	5	ND	370	11
1,3,5-Trimethylbenzene (Mesitylene)	µg/L	5	ND	83	3.6
Benzene	µg/L	1	ND	160	15
Ethylbenzene	µg/L	5	ND	180	5.2
Isopropylbenzene (Cumene)	µg/L	5	ND	13	0.75 J
M,P-Xylene	µg/L	5	ND	380	13
n-Propylbenzene	µg/L	5	ND	38	0.98 J
o-Xylene (1,2-Dimethylbenzene)	µg/L	5	ND	88	0.87 J
Tert-Butyl Methyl Ether	µg/L	10	31	580	130
Total Xylenes	µg/L	5	ND	470	14 J
Toluene	µg/L	5	ND	130	0.91 J
SVOCs					
1,4-Dioxane (P-Dioxane)	µg/L	0.35	0.876	4.19	2.54
2,4-Dimethylphenol	µg/L	1	ND	9	ND
Benzo(a)anthracene	µg/L	0.002	ND	ND	ND
Benzo(a)pyrene	µg/L	0	ND	0.04 J	0.02 J
Benzo(b)fluoranthene	µg/L	0.002	0.03 J	ND	0.02 J
Chrysene	µg/L	0.002	0.03 J	ND	ND
Naphthalene	µg/L	10	1.4	59	1
Phenol	µg/L	1	ND	58	ND

*ND denotes the analyte was not detected
**J denotes the analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample
µg/L = micrograms per liter

Analysis of post-remedial groundwater data and previous groundwater data collected prior to the remedial action indicates that target contaminant concentrations in groundwater are declining. While petroleum-related VOC and SVOC concentrations within the in-situ treatment area still exceed NYSDEC SGVs, concentrations have reduced relative to baseline concentrations. Total BTEX and MTBE concentrations at monitoring wells within the in-situ groundwater treatment area (C-RMW01 and C-MW206) have declined since the August 2022 Baseline Sampling Event and the February 2023 Post-

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Treatment Sampling Event. The plume geometry around the in-situ treatment area is stable and shrinking and there is no indication of off-site migration of target compounds as demonstrated by the data collected from downgradient monitoring wells at the Site (C-MW201) and the adjacent BCP Site No. C241146B (B-MW201, C-MW205, and B-MW206). Groundwater data for the entire former OU-1 monitoring well network is documented in the quarterly groundwater monitoring reports for former OU-1 (BCP Site Nos. C241146, C241146B, C241146D, and p/o C241146E).

Based on data obtained during the remedial investigation and post-remediation groundwater sampling at the surrounding Willets Point Development BCP Site, the overall flow direction of groundwater is from east to west (see the Groundwater Contour Map presented on Figure 3 of the SMP). Because of the lack of drainage systems, groundwater elevations are presumed to heavily depend on precipitation and infiltration.

Table 6 and **Figure 9** summarize the results of all groundwater sampling performed after implementation of the RAWP.

5.6.3 Soil Vapor (Pre-Remediation Conditions)

Soil vapor sampling results from environmental investigations performed prior to implementation of the RAWP indicate the presence of several VOCs, including CVOCs and petroleum-related VOCs. A direct comparison standard has not been established for soil vapor in New York State.

During the 2019 RI conducted for the former OU-1 area, six soil vapor samples and one outdoor ambient air sample were collected and submitted for laboratory analysis for VOCs by United States Environmental Protection Agency (USEPA) Method TO-15. Of these six soil vapor and one outdoor ambient samples collected, one of the soil vapor samples was located within the Site boundary. Soil vapor concentrations from this soil vapor sample are listed below:

- 2,2,4-trimethylpentane was detected at a concentration of 603,000 µg/m^3
- Benzene was detected at a concentration of 175,000 µg/m^3
- Cyclohexane was detected at a concentration of 81,200 µg/m^3
- Ethylbenzene was detected at a concentration of 7,380 µg/m^3
- M,P-xylene was detected at a concentration of 5,780 µg/m^3

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- n-heptane was detected at a concentration of 184,000 µg/m^3
- n-hexane was detected at a concentration of 359,000 µg/m^3
- Tert-butyl alcohol was detected at a concentration of 33,000 µg/m^3
- Toluene was detected at a concentration of 4,450 µg/m^3
- Total VOCs were detected at a concentration of 1,450,000 µg/m^3

5.7 Monitoring Well Reinstallation

Groundwater monitoring wells installed prior to the OU-1 remedial work were replaced during OU-1 RAWP implementation. The three groundwater monitoring wells being monitored as part of the Site (C-MW201, C-MW206, and C-RMW01) were damaged during excavation and were replaced with new 2-inch-diameter monitoring wells following installation of the OU-1 cap. Well reinstallation was performed by AARCO Environmental Services, Corp. and well construction was logged by Langan field personnel. Monitoring well construction reports are included in **Appendix Q** and monitoring well locations are shown on **Figure 8**.

5.8 Support-of-Excavation Installation

For remedial excavations that extended beyond four feet in depth, such as the petroleum source area excavation shown on **Figure 3**, support of excavation was accomplished via sloping or installation of sheet piles. The remedial contractor (Triumph Construction) completed the SOE for the western, and southern perimeter of the petroleum source area excavation via sloping. SOE for the northern and eastern perimeter of the petroleum source area excavation was accomplished via the sheet piling installed by Soil Solutions, Inc. for the groundwater containment cutoff wall. The NYCDOB-approved drawings are included in **Appendix T**.

5.9 Engineering Controls

Since remaining contaminated soil, groundwater, and soil vapor exists beneath the Site, Engineering Controls (EC) are required to protect human health and the environment. The site has the following primary Engineering Controls, as described in the following subsections.

ECs include a site cover system to eliminate exposure to remaining contaminated soil and potential new building development ECs, including but not limited to vapor

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barriers, concrete foundation slabs for buildings or roadway/utility platforms, and/or mechanically ventilated parking garages to mitigate the potential for soil vapor intrusion in future new building developments. Details regarding these ECs are summarized in Sections 5.9.1, 5.9.2, and 5.9.3. The extents of the site cover system are shown on **Figure 10**.

5.9.1 Site Cover System

Exposure to remaining contamination in soil/fill within the Site is prevented by an engineered site-wide cover system placed over the Site. The site cover system will be modified in accordance with the SMP during infrastructure and building construction. As of the date of this FER, the site cover system is comprised of a minimum of 2 feet of clean fill or gravel imported from an approved facility/source and asphalt pavement. In areas of soil cover, the top 4 inches, minimum, consists of virgin ¾-inch crushed stone to serve as dust and vegetation suppression and mitigate erosion. Imported soil (*i.e.*, clean fill) meets the lower of PGW and Residential SCOs. Imported stone and fill documentation is included in **Appendix H**. The extent of the site cover system is shown on **Figure 10**. An as-built survey showing the final grade elevation is included in **Appendix N**.

The SMP and associated Excavation Work Plan (EWP) outline the procedures required to be implemented in the event the cover system is breached, penetrated, or temporarily removed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of the SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a CHASP and associated CAMP prepared for the Site and provided in **Appendix F** of the SMP. Any breech of the site cover system must be overseen by a PE who is licensed and registered in New York State.

If additional import of fill is required for new building and infrastructure development, a request form will be submitted to the NYSDEC using the form included in Appendix E of the SMP.

Active permits relevant to the Site's new building and infrastructure development are included in Appendix G of the SMP.

The site cover system will be maintained to allow for RR, commercial, or industrial use of the Site. Any future Site redevelopment must maintain, repair, or replace the existing cover system. The existing clean fill/gravel comprising the site cover system may be

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replaced with a building foundation slab. Any on-site buildings constructed below groundwater will require a waterproofing barrier incorporated into concrete foundation slabs, to prevent groundwater intrusion into the building and exposure to remaining contamination in groundwater.

Procedures for monitoring, operating, and maintaining the cover system are provided in the SMP. The Monitoring Plan also addresses inspection procedures that must occur after any severe weather condition has taken place that may affect on-site ECs. An EWP, which outlines the procedures required in the event the cover system and/or underlying residual contamination are disturbed, is provided in Appendix D of the SMP.

5.9.2 Groundwater Containment Cutoff Wall

Recontamination of the Site from presumed sources to the north and east of the former Willets Point Development BCP Site boundary will be prevented by a groundwater containment cutoff wall that was installed from about 2 feet above the highest observed groundwater elevation (resulting in a top of wall el. 11) to about 1 foot into the confining organic material layer (el. -14) that exists across the former Willets Point Development BCP Site. The wall consists of a 435-foot-long sheet pile wall, consisting of 25-foot ArcelorMittal AZ14-770-DOUBLE sheet piles, with sealed seams (Adeka P-120A waterstop) installed along the northern and eastern OU-1 boundaries. The 300-foot-long portion of the groundwater containment cutoff wall located along the northern perimeter of OU-1 is a component of the Site remedy and necessary to prevent recontamination of the Site by sources outside of the former OU-1 (**Figure 10**). The remainder of the groundwater containment cutoff wall is a component of the remedy for BCP Site No. C241146B. The final sheet pile was installed on November 16, 2023.

The location of the groundwater containment cutoff wall for the Site and the segment applicable to BCP Site No. C241146B is shown on **Figure 10** and an as-built survey is provided in **Appendix N**.

The containment cutoff wall will be a permanent EC. The Interim, and then the final SMP, will outline maintenance requirements and the procedures to be followed if the containment cutoff wall is disturbed after the remedial action is complete. As part of future infrastructure and redevelopment work, modifications to the containment cutoff wall are anticipated (e.g., penetrations to allow of utility connections). Proposed modifications will

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undergo review by the RE and NYSDEC prior to implementation to confirm that the modifications will not alter the design intent or performance of the containment cutoff wall.

5.9.3 Vapor Mitigation

While remedial construction has been completed at the Site, building and infrastructure construction has not begun. ECs to be incorporated into new buildings constructed on the Site will include vapor barriers, concrete foundation slabs, a sub-slab depressurization system, or other applicable measures to mitigate the potential for soil vapor intrusion into buildings constructed on the Site.

The planned building will include a sub-slab depressurization system and vapor barriers incorporated into the concrete foundation slabs.

5.10 Institutional Controls

The Site remedy requires that an EE be placed on the property to (1) implement, maintain, and monitor the Engineering Control systems; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and (3) limit the use and development of the Site to RR, commercial and industrial uses only (subject to applicable zoning). Adherence to these ICs on the Site is required by the EE and will be implemented under the Site SMP. ICs identified in the EE may not be discontinued without an amendment to or extinguishment of the EE. The IC boundaries are shown on the NYSDEC easement survey; a copy of the EE is included in **Appendix A**. The ICs to be implemented pursuant to the SMP for the Site are:

- The Site may be used for restricted residential use (appropriate for use as a school), commercial, or industrial use as defined in Part 375-1.8(g), subject to applicable zoning[4];
- The Site owner must complete and submit the NYSDEC a periodic certification of institutional and engineering (IC and ECs) in accordance with Part 375-1.8(h)3;
- All ECs must be operated and maintained as specified in the SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP;

[4] Restricted-Residential is the appropriate remedial standard for a school site.

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- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the NYC Department of Health and Mental Hygiene (DOHMH) to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;
- Compliance with the Department-approved SMP and EE;
- Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in the SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with the SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in the SMP;
- Access to the Site must be provided to agents, employees, or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the EE;
- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on the NYSDEC easement survey, and any potential impacts that are identified must be monitored or mitigated;
- Vegetable gardens and farming on the Site are prohibited and
- An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible.[5]

The EE for the Site was executed by the Department on [date] and recorded with the NYC Office of the City Register on [date]. The City Register File Number for this

[5] This IC does not apply to the redevelopment ongoing as of the date of the SMP.

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filing is [number]. A copy of the easement and proof of recording is provided in **Appendix A**.

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6.0 DEVIATIONS FROM THE REMEDIAL ACTION WORK PLAN

6.1 Backfill Material Import Prior to Approval

Triumph imported approximately 3,290 cy of clean fill and 8,208 cubic yards of SCA clean sand from EROC during OU-1 RAWP implementation. All imported soil met the lower of PGW and RR SCOs. During the clean soil import process, sample analysis of some of the imported soil was delayed and Triumph imported a total of 9,600 cubic yards over the initially NYSDEC-approved quantity of 1,000 cubic yards. Despite the deviation from the approved OU-1 RAWP, the placement of this fill was documented and analytical data demonstrating all the imported material's compliance with the OU-1 RAWP was provided to the NYSDEC on April 13, 2022. On June 2, 2022, the NYSDEC issued a Notice of Violation regarding the import of unapproved material (*i.e.,* in excess of the approved quantity). Based on documentation provided and corrective measures implemented by the Volunteers, the NYSDEC determined the violations were corrected in a letter dated June 17, 2022. NYSDEC correspondence regarding the Violation is included in **Appendix E**. Requests to import material are included in **Appendix G**. Imported material documentation is included in **Appendix H**.

6.2 Containment Cutoff Wall Realignment

The containment cutoff wall was realigned per the NYSDEC-approved RAWP Amendment, dated September 16, 2021. Two unpermitted structures on Block 1833, Lot 165 encroach onto the northern part of the Site by about 5 feet. To accomplish sheet pile installation in close proximity to the neighboring structure encroachment, the steel sheet piles were installed at a 10-foot off-set from the unpermitted structures in Block 1833, Lot 165 (total 15-foot off-set south from the Lot 143 property line), and each pair of welded sheet piles was angled by 5 degrees or less (manufacturer-provided tolerance interlock) near the southeast corner of the dilapidated brick structure back to rejoining the Site boundary. The RAWP Amendment and NYSDEC approval are included in **Appendix B**.

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