REMEDIAL ACTION REPORT

Greenpoint Landing – Parcel G1
37 Blue Slip
Brooklyn, New York
NYC VCP Project Number # 16CVCP065K
OER Project Number # 15EH-N082K

Hazardous Materials E-Designation (E-138)
CEQR No.: 04DCP003K
Greenpoint Williamsburg Rezoning

Prepared for:

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June 15, 2018

Langan Project No.: 170229010

LANGAN

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LIST OF ACRONYMS

Acronym	Definition
AST	Aboveground Storage Tank
CAMP	Community Air Monitoring Plan
C&D	Construction & Demolition
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
CO	Certificate of Occupancy
CPC	City Planning Commission
DSNY	Department of Sanitation
"E"	E-Designation
EAS	Environmental Assessment Statement
EIS	Environmental Impact Statement
ESA	Environmental Site Assessment
EC/IC	Engineering Control and Institutional Control
ELAP	Environmental Laboratory Approval Program
FDNY	New York City Fire Department
GPR	Ground Penetrating Radar
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations Emergency Response
IDW	Investigation Derived Waste
Notice - NNO	Notice of No Objection
Notice - NTP	Notice to Proceed
Notice - NOS	Notice of Satisfaction
Notice - FNOS	Final Notice of Satisfaction
NYC BSA	New York City Board of Standards and Appeals
NYC DCP	New York City Department of City Planning
NYC DEP	New York City Department of Environmental Protection
NYC DOB	New York City Department of Buildings

NYC DOF	New York City Department of Finance
NYC HPD	New York City Housing Preservation and Development
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DEC PBS	New York State Department of Environmental Conservation Petroleum Bulk Storage
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
OSHA	United States Occupational Health and Safety Administration
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PE	Professional Engineer
PID	Photo Ionization Detector
PM	Particulate Matter
QEP	Qualified Environmental Professional
RA	Register Architect
RAP	Remedial Action Plan
RCA	Recycled Concrete Aggregate
RAR	Remedial Action Report
RD	Restrictive Declaration
RI	Remedial Investigation
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SMDS	Sub-Membrane Depressurization System
SVOCs	Semivolatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List

TCO	Temporary Certificate of Occupancy
USCS	Unified Soil Classification System
USGS	United States Geological Survey
UST	Underground Storage Tank
VB	Vapor Barrier
VOCs	Volatile Organic Compounds

CERTIFICATION

I, Jason J. Hayes, am currently a registered Professional Engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for implementation of the remedial program for Greenpoint Landing - Parcel G1 (OER Project #15EH-N082K, NYC VCP Project Number 16CVCP065K).

I certify to the following:

- I have reviewed this document, to which my signature and seal are affixed.
- Engineering Controls implemented during this remedial action were designed by me or a person under my direct supervision and achieve the goals established in the Remedial Action Work Plan for this site.
- The Engineering Controls constructed during this remedial action were professionally observed by me or by a person under my direct supervision and (1) are consistent with the Engineering Control design established in the Remedial Action Work Plan and (2) are accurately reflected in the text and drawings for as-built design reported in this Remedial Action Report.

The OER-approved Remedial Action Work Plan, dated March 9, 2016, was implemented and all requirements in this document were substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

Name

089491
NYS PE License Number

Jason Hayes
Signature

6/29/18
Date

EXECUTIVE SUMMARY

BOP Greenpoint G, LLC remediated Parcel G1 of the Greenpoint Landing development project at 37 Blue Slip, Brooklyn, New York (the site). Parcel G1 is about 101,140 square feet in area and is the fourth parcel of the Greenpoint Landing development project (referred to herein as the "development property") to be constructed. The final site boundary of Parcel G1 was amended mid-project to include a 12,810-square-foot portion of Parcel F1.[1]

An area-wide remedial investigation (RI) for the development property, a supplemental parcel-specific RI for Parcels G1 and F1, and waste characterization sampling were performed to compile and evaluate data and information necessary to develop a Remedial Action Work Plan (RAWP) implemented to render the site protective of public health and the environment consistent with the contemplated end use. The remedial action described in this document fulfills the remedial objectives defined in the OER-approved RAWP; provides protection of public health and the environment, and complies with applicable environmental standards, criteria guidance and regulations.

Site Location and Prior Usage

Parcel G1, encompasses an area of about 55,920 square feet on Lot 100, about 14,280 square feet on Lot 80, about 20,900 square feet on Lot 50, about 8,540 square feet on Lot 90, and about 1,500 square feet on Lot 45 of Block 2472. The site was vacant and paved before development and is bound by the following:

- Confluence of the East River and Newtown Creek to the north;
- A vacant lot used by a film production vehicle and truck rental company to the east (Parcel H of the development property [Lot 70 of Block 2472]);
- A 6-story affordable housing building (Parcel G2 of the development property [Lot 60 and p/o Lots 50 and 100 of Block 2472]) and Commercial Street to the south; and
- An active construction site (Parcel F1 of the development property [p/o Lots 45 and 50]) and an affordable housing building (Parcel F2 of the development property [Lot 65 and p/o Lot 50 of Block 2472]) to the west.

[1] Parcel G1 and parts of Parcel F1 were remediated and constructed concurrently from a practical constructability perspective. The entirety of Parcel F1B (about 11,100 square feet) and part of Parcel F1A (about 1,710 square feet) were remediated as part of Parcel G1 construction from a practical constructability perspective in accordance with the OER-approved RAWPs for Parcel G1 and F1. The final site boundary of Parcel G1 was amended to include these areas.

The former elevation of Parcel G1 ranged from about el. 12 feet[2] near the East River to about el. 10 feet near Commercial Street. Site elevations were raised as part of construction; new elevations range from about el. 18 feet at the Blue Slip and Bell Slip turnabouts near the East River to about el. 11 feet near Commercial Street. The groundwater elevation is about el. 2.5 feet (about 7.5 feet bgs).

Summary of Development

The development on Parcel G1 includes a 30-story mixed-use residential and commercial building with a cellar footprint of about 26,000 square feet. The aboveground footprint of the building is about 22,000 square feet. The development also includes a waterfront park/esplanade on Lot 80 (about 14,280 square feet), Lot 90 (about 8,540 square feet), Lot 100 (about 2,600 square feet), and part of Lot 45 (about 1,500 square feet); a private roadway on Lot 100 (Bell Slip) (about 26,600 square feet); and a private roadway on part of Lot 50 (Blue Slip) (about 20,900 square feet). The building includes 359 market-rate housing units and three levels of aboveground parking. The cellar is used for parking, storage, amenity space and building systems. The waterfront area consists of a stabilized shoreline with rip-rap revetment outboard of a new steel sheet pile bulkhead and a waterfront esplanade with planted terraces, a secondary walkway, a picnic area (including an asphalt area and planted area), and a lawn. The Bell Slip private roadway is about 24 feet wide by about 300 feet long with two 18-foot wide sidewalks. The Blue Slip private roadway is about 60 feet wide by 300 feet long with two 18-foot wide sidewalks. New site utilities and connections (e.g., water, storm, sanitary, electric, telecommunication) were constructed and installed under the private roadways. The end use of the site is consistent with the property's zoning classification (R6, R8 and C2-4).

The stabilized shoreline and new rip-rap revetment outboard of a new steel sheet pile bulkhead were constructed in Lot 55 of Block 2472 by Phoenix Marine Company under a joint New York State Department of Environmental Conservation (NYSDEC) and U.S Army Corp of Engineers permit[3] and a NYC Small Business Services permit (No. 20151705). These features do not serve any remedial purpose and are not part of the engineered composite cover system. This RAR only accounts for the materials exported (between July 18, 2016 to October 13, 2016) and

[2] North American Vertical Datum of 1988 (NAVD88). Datum refers to the NAVD88, which is approximately 1.1 feet above mean sea level datum at Sandy Hook, New Jersey as defined by the United States Geologic Survey (USGS NGVD 1929).

[3] NYSDEC Tidal Wetlands Permit No. 2-6101-00296-13, Water Quality Certification Permit No. 2-6101-00296-14, Excavation & Fill in Navigable Waters Permit No. 2-6101-00296-15 and its modifications and U.S. Army Corps of Engineers Permit No. NAN-2013-01324.

imported (between September 15, 2016 to May 31, 2018), as part of construction of the stabilized shoreline and new rip-rap revetment, as agreed upon by the OER.

Site development required removal of the existing asphalt pavement and excavations to reach development grade. A total of 25,072.67 tons of excess non-hazardous fill material and 1,003.54 tons of characteristic hazardous lead fill were excavated during the development of Parcel G1. Excavated materials were transported and disposed of off-site in accordance with local, state, and federal laws and regulations. Dewatering was necessary during construction to accommodate excavation of foundation components (including pile caps, grade beams, elevator pits, and parking lift pits) extending below the groundwater table.

Imported materials were used to construct and raise the grade in the utility corridors, shoreline, and waterfront park/esplanade to achieve final development grades. This was performed in accordance with the OER-approved Soil/Materials Management Plan (SMMP), applicable laws and New York State Department of Environmental Conservation (NYSDEC) regulations. Additional imports of planting soil and drainage material will occur in compliance with the SMP over the next several months as the waterfront/esplanade areas are completed.

Summary of the Remedy

The remedial action achieved the remedial action objectives established in the RAWP. The remedial actions are effective in the short-term and long-term; reduced mobility, toxicity and volume of contaminants; used standard methods well established in the industry; and comply with applicable environmental standards, criteria, guidance, and regulations.

The remedial action included:

1. Establishment of site-specific Soil Cleanup Objectives (SCOs);
2. Completion of an in-situ waste characterization of soil/fill material proposed for excavation, as required by disposal facilities;
3. Site mobilization involving site security setup, equipment mobilization, utility mark outs and marking and staking excavation areas;
4. Performance of a Community Air Monitoring Program (CAMP) for particulates and volatile organic compounds;
5. Screening of excavated soil/fill during intrusive work for indications of contamination by visual and olfactory observation and monitoring with a photoionization detector (PID);
6. Removal of the existing asphalt pavement and excavation as follows:

- Excavation to about 8 feet below former site grade (el. 2 feet) to accommodate the foundation slab with deeper excavations to about 16 feet below former site grades (el. -6 feet) to accommodate the building core, elevator pits and parking lift pits;
- Excavation to about 6 feet below former site grades (el. 4 feet) to accommodate most utilities under Blue and Bell Slips with limited deeper excavations to about 12 feet bgs (el. -0.8 feet) for installation of utility structures near Commercial Street;
- Excavation to about 6 feet below former site grades (el. 4 feet) to accommodate associated utilities under the waterfront park/esplanade; and
- Excavation to about 9 feet below former site grades (el. 1 feet) to accommodate hotspot excavations under the waterfront park/esplanade.

7. Transportation and off-site disposal of 1,003.54 tons of hazardous and 25,072.67 tons of non-hazardous soil and fill material at permitted receiving facilities;
8. Off-site recycling and disposal of asphalt and construction and demolition (C&D) debris at registered Part 360-16 solid waste management facilities;
9. Collection and analysis of post-excavation confirmation endpoint samples from hotspots and from within the development excavation and pre-cap confirmation endpoint samples in landscaped areas to document attainment of the site-specific SCOs;
10. Secured a NYSDEC State Pollutant Discharge Elimination System (SPDES) permit (Permit # 2-6101-01361/00001 and SPDES #NY-0276707) for dewatering, pre-treatment of groundwater, and discharge of effluent to the surface waters of Newtown Creek;
11. Importation of the following materials:
    - 3/4-inch recycled concrete aggregate (RCA) for use as temporary fill material for a dewatering system equipment pad;
    - 3/4-inch stone for structural fill below the building foundation;
    - Stone (3/4-inch, 2½-inch, 3-inch), quarry sand, and manufactured quarry sand for structural fill in utility corridors and/or to raise site elevations;
    - Manufactured quarry sand, 3/4-inch stone, bedding stone, and 6-inch stone fill for the new stabilized shoreline;
    - Stone (1/2-inch, 1-inch, 1.5-stone, and 3-inch) and manufactured quarry sand for landscaped areas and roadways; and
    - Drainage and planting soils (S1, S2, and S3 materials) for landscaped areas and terraces and the lawn in the waterfront park and tree planters in pedestrian sidewalks along Blue and Bell Slips
12. Demarcation of residual soil above site-specific SCOs and residual historic fill material outside of the new building footprint using a variety of methods including physical reference

barriers and surveys;

13. Installation of a waterproofing/vapor barrier system beneath the new building slab, elevator pits, and along subsurface sidewalls, as per manufacturer's specifications;
14. Construction and installation of an engineered composite cover system consisting of concrete or asphalt pavement, a concrete building foundation slab, or at least 2 feet of cover soil imported from OER-approved sources;
15. Implementation of stormwater and soil erosion and control measures;
16. Preparation of a Remedial Action Report (RAR) that describes remedial activities, certifies remedial requirements were achieved, describes engineering controls (ECs) and institutional controls (ICs), and describes five OER-approved deviations from the RAWP;
17. Preparation of a Site Management Plan (SMP) to govern the inspection and certification of engineering and institutional controls; and
18. Continuation of the E-Designation and ongoing site management in accordance with the SMP.

REMEDIAL ACTION REPORT

1.0 SITE BACKGROUND

This Remedial Action Report (RAR) was developed for the property at 37 Blue Slip (Parcel G1) in the Greenpoint section of Brooklyn, New York (the site). A site location map is presented as Figure 1. This parcel, also known as Parcel G1, is the fourth parcel of the Greenpoint Landing development project (referred to herein as the "development property") to be constructed. The final site boundary of Parcel G1 was amended mid-project to include a 12,810-square-foot portion of Parcel F1.[4] The development property will eventually cover approximately 19 acres, and includes the construction of residential (affordable and market-rate) buildings, a public elementary/intermediate school, new street infrastructure, new New York City Department of Environmental Protection (NYCDEP) combined sewer overflows (CSO) and outfalls, a public promenade along the East River, public open space, and bulkhead reconstruction and shoreline stabilization. The development property and the location of Parcel G1 are depicted on Figure 2.

Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. (Langan) was retained by BOP Greenpoint G, LLC to oversee the RAWP implementation and develop this RAR. An area-wide remedial investigation (RI) for the development property, a supplemental parcel-specific RI for Parcel G1 and Parcel F1, and waste characterization sampling were performed to compile and evaluate data and information necessary to develop a Remedial Action Work Plan (RAWP) in a manner that renders the site protective of public health and the environment consistent with the contemplated end use. The remedial action described in this document fulfills the remedial objectives defined in the OER-approved RAWP and complies with applicable environmental standards, criteria and guidance and applicable laws and regulations. The project numbers assigned to Parcel G1 by the OER are 16CVCP065K and 15EH-N082K.

This RAR describes the remediation and mitigation activities implemented at the site for the purposes of satisfying the requirements of the Hazardous Materials E-Designation and obtaining a Notice of Satisfaction (NOS). The remedial action described in this document provides for the protection of public health and the environment and complies with applicable

[4] Parcel G1 and parts of Parcel F1 were remediated and constructed concurrently from a practical constructability perspective. The entirety of Parcel F1B (about 11,100 square feet) and part of Parcel F1A (about 1,710 square feet) were remediated as part of Parcel G1 construction from a practical constructability perspective in accordance with the OER-approved RAWPs for Parcel G1 and F1. The final site boundary of Parcel G1 was amended to include these areas.

environmental standards, criteria, guidance, laws and regulations. The site is under the regulatory oversight of the OER pursuant to E-Designations for Hazardous Materials and Noise (E-138) that were placed on the site by the New York City Department of City Planning (DCP) as part of the May 11, 2005 Greenpoint-Williamsburg Rezoning (CEQR 04DCP003K). The remediation and mitigation activities were completed in accordance with the RAWP and the site-specific Construction Health and Safety Plan (CHASP)[5], and in accordance with ASTM and OSHA guidelines.

1.1 Site Location and Prior Usage

Parcel G1, encompasses an area of about 55,920 square feet on Lot 100, about 14,280 square feet on Lot 80, about 20,900 square feet on Lot 50, about 8,540 square feet on Lot 90, and about 1,500 square feet on Lot 45 of Block 2472. The site was vacant and paved before development and is bound by the following:

- Confluence of the East River and Newtown Creek to the north;
- A vacant lot used by a film production vehicle and truck rental company to the east (Parcel H of the development property [Lot 70 of Block 2472]);
- A 6-story affordable housing building (Parcel G2 of the development property [Lot 60 and p/o Lots 50 and 100 of Block 2472]) and Commercial Street to the south; and
- An active construction site (Parcel F1 of the development property [p/o Lots 45 and 50]) and an affordable housing building (Parcel F2 of the development property [Lot 65 and p/o Lot 50 of Block 2472]) to the west.

The former elevation of Parcel G1 ranged from about el. 12 feet near the East River to about el. 10 feet near Commercial Street. Site elevations were raised as part of construction; new elevations range from el. el. 18 feet at the Blue Slip and Bell Slip turnabouts near the East River to about el. 12 feet near Commercial Street. The groundwater elevation is about el. 2.5 feet (about 7.5 feet bgs) at the site.

1.2 Development

The development on Parcel G1 includes a 30-story mixed-use residential and commercial building with a cellar footprint of about 26,000 square feet. The aboveground footprint of the building is about 22,000 square feet. The development also includes a waterfront

[5] The CHASP, dated November 29, 2016, was included as an appendix in the RAWP.

park/esplanade on Lot 80 (about 14,280 square feet), Lot 90 (about 8,540 square feet), Lot 100 (about 2,600 square feet), and part of Lot 45 (about 1,700 square feet), a private roadway on Lot 100 (Bell Slip) (about 26,600 square feet), and a private roadway on part of Lot 50 (Blue Slip) (about 20,900 square feet). The building includes 359 market-rate housing units and three levels of aboveground parking. The cellar is used for parking, storage, amenity space and building systems. The waterfront area consists of a stabilized shoreline with rip-rap revetment outboard of a new steel sheet pile bulkhead and a waterfront esplanade with planted terraces, a secondary walkway, a picnic area (including an asphalt area and planted area), and a lawn. The Bell Slip private roadway is about 24 feet wide by about 300 feet long with two 18-foot wide sidewalks. The Blue Slip private roadway is about 60 feet wide by 300 feet long with two 18-foot wide sidewalks. New site utilities and connections (e.g., water, storm, sanitary, electric, telecommunication) were constructed and installed under the private roadways. The end use of the site is consistent with the property's zoning classification (R6, R8 and C2-4).

The stabilized shoreline and new rip-rap revetment outboard of a new steel sheet pile bulkhead were constructed in Lot 55 of Block 2472 by Phoenix Marine Company under a joint NYSDEC and U.S Army Corp of Engineers permit[6] and a NYC Small Business Services permit (No. 20151705). These features do not serve any remedial purpose and are not part of the engineered composite cover system. This RAR only accounts for the materials exported (between July 18, 2016 to October 13, 2016) and imported (between September 15, 2016 to April 24, 2017) as part of construction of the stabilized shoreline and new rip-rap revetment, as agreed upon by the OER.

Site development required removal of the existing asphalt pavement and excavations to reach development depth:

- Excavation to about 8 feet below former site grade (el. 2 feet) to accommodate the foundation slab with deeper excavations to about 16 feet below former site grades (el. -6 feet) to accommodate the building core, elevator pits and parking lift pits;
- Excavation to about 6 feet below former site grades (el. 4 feet) to accommodate most utilities under Blue and Bell Slips with limited deeper excavations to about 12 feet bgs (el. -0.8 feet) for installation of utility structures near Commercial Street;

[6] NYSDEC Tidal Wetlands Permit No. 2-6101-00296-13, Water Quality Certification Permit No. 2-6101-00296-14, Excavation & Fill in Navigable Waters Permit No. 2-6101-00296-15 and its modifications and U.S. Army Corps of Engineers Permit No. NAN-2013-01324.

- Excavation to about 6 feet below former site grades (el. 4 feet) to accommodate associated utilities under the waterfront park/esplanade; and
- Excavation to about 9 feet below former site grades (el. 1 feet) to accommodate hotspot excavations under the waterfront park/esplanade.

A total of 25,072.67 tons of excess non-hazardous fill material and 1,003.54 tons of characteristic hazardous lead fill were excavated during the development of Parcel G1. Excavated materials were transported and disposed of off-site in accordance with local, state, and federal laws and regulations. Dewatering was necessary during construction to accommodate excavation of foundation components (including pile caps, grade beams, elevator pits, and parking lift pits) extending below the groundwater table.

Imported materials were used to construct and raise the grade in the utility corridors, shoreline, and waterfront park/esplanade to achieve final development grades. This was performed in accordance with the OER-approved Soil/Materials Management Plan (SMMP) and applicable laws and New York State Department of Environmental Conservation (NYSDEC) regulations as follows:

- 93.50 tons of 3/4-inch recycled concrete aggregate (RCA) were used as temporary fill material for a dewatering system equipment pad.
- 1,035.71 tons of 3/4-inch stone were used as structural fill below the building foundation.
- 15,057.41 tons of various quarry aggregate products and quarry sand were used as structural fill within utility corridors and/or to raise site elevations.
- 5,960.17 tons of quarry sand and various quarry aggregate products were used to stabilize the shoreline and within landscaped areas.
- 3,403.56 tons of quarry sand, various quarry aggregate products, drainage soil, and planting soils were used to in the landscaped areas areas and terraces and lawn of the waterfront park and tree planters in pedestrian sidewalks along Blue and Bell Slips.

Additional imports of drainage and planting soils may occur in compliance with the SMP over the next few months as New York City Department of Parks and Recreation completes their final walkthroughs and inspections of the waterfront/esplanade areas.. The new development layout is shown as Figure 3.

1.3 Description of Surrounding Property

The site is located in a dense urban area generally improved with multi-story commercial, residential and industrial buildings in zoning districts designated for commercial, residential and manufacturing uses:

Direction	Adjacent Properties	Surrounding Properties
North	Confluence of the East River and Newtown Creek	
East	Parcel H (Lightnin' Production Rentals)	Metropolitan Transit Authority-Department of Subways-Division of Car Equipment's Office of Emergency Response Motor vehicle storage lot Industrial and manufacturing
South	Parcel G2 (a 6-story mixed-used residential and commercial affordable housing building)	Multi-story mixed-use residential and commercial Industrial and manufacturing Former NuHart plastics manufacturing facility Greenpoint Playground
West	Parcel F1 (a 40-story mixed-used residential and commercial building under construction) Parcel F2 (a 6-story mixed-used residential and commercial affordable housing building)	Newtown Barge Playground (under construction)

The surrounding properties beyond the adjoining properties consist of multi-story residential buildings, some with ground-level retail stores and restaurants; houses of worship; office buildings; television and movie production studios; small-scale industrial and manufacturing facilities; and park land owned and operated by the New York City Department of Parks and Recreation. The former NuHart plastics manufacturing facility, listed as a NYSDEC inactive hazardous waste disposal site, is located to the southeast of the site across Commercial Street at 280 Franklin Street, Brooklyn, NY (Block 2487 Lots 1, 10 and 78). The zoning classifications of the surrounding area include R6, R6A, R6B, R8, M1-1, and M1-2.

The site is located near the confluence of the East River and Newtown Creek, which are the two closest ecological receptors to the site. A search was performed for sensitive receptors, including, but not limited to, schools, daycare facilities, parks, hospitals, and senior care facilities, within an approximate 500-foot radius of the Site boundary. Two sensitive receptors were identified within the search radius, including Greenpoint Playground and Mary D's Senior Housing.

1.4 Summary of Past Uses of Site

The site was historically used for light industrial activities including the transfer and storage of lumber, coal, and construction materials and equipment. Coal and lumber storage were the primary uses for more than 100 years from the late 1800s until approximately 1980. The lumber yard operations were phased out during the 1980s when the former owner (Lumber Exchange Terminal, Inc.) began to lease the site to tenants to use for materials and heavy equipment storage. During the 1980s, the site was leased to the New York City Housing Authority and construction contractors to store materials and heavy equipment as well as trucking companies for materials storage, truck parking, and basic auto repair (e.g. oil changing, truck washing, and tire changing). Most recently, the site was leased to HBO for film/television production.

1.5 Summary of Previous Environmental Documents and Correspondence

The following environmental reports (in chronological order) are associated with the site:

- *Phase I Environmental Site Assessment Report - Greenpoint Lumber Yard, Brooklyn New York*, July 2001, prepared by AKRF, Inc.
- *Phase II Site Investigation Report – Greenpoint Lumber Yard, Brooklyn, New York*, October 2001, prepared by AKRF, Inc.
- *Supplemental Subsurface (Phase II) Investigation Report – Greenpoint Lumber Yard, Brooklyn, New York*, April 2004, prepared by AKRF, Inc.

Copies of the AKRF, Inc. (AKRF) reports are provided in Appendix A. AKRF implemented a supplemental Phase II environmental site investigation (ESI) across the development property in 2003. As part of AKRF's investigation, two soil borings (B5 and B14) were installed and two soil samples were collected for laboratory analysis. The results of the Phase II ESI specific to Parcel G1 are summarized below.

1. The stratigraphy includes a surficial layer of historic fill material overlying native fine- to coarse-grained sandy and silty soil. The historic fill generally extends from ground surface to about ten feet bgs and consists of varying amounts of sand, silt, gravel, and slag, coal, and wood fragments.
2. At soil boring B5, no volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and pesticides exceeded their 6 NYCRR Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (SCOs) in surface soil (2 to 4 feet bgs) and subsurface soil (5 to 7 feet bgs). Two metals (lead and zinc) exceeded their

Unrestricted Use SCO (63 milligrams per kilogram [mg/kg]) and 109 mg/kg, respectively) at concentrations of 291 mg/kg and 129 mg/kg, respectively. The subsurface soil sample collected at B5 was not analyzed for PCBs and pesticides. No constituents exceeded their 6 NYCRR Part 375-6.8(b) Restricted Use Restricted-Residential Use SCOs.

3. At soil boring B14, no VOCs and SVOCs exceeded their 6 NYCRR Part 375-6.8(a) Unrestricted Use SCOs. No polychlorinated biphenyls (PCBs) and pesticides were detected. In the surficial soil sample (2 to 3.5 feet bgs), five metals (barium, copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs. Barium exceeded its Restricted-Residential Use SCO (400 milligrams per kilogram [mg/kg]) at a concentration of 518 mg/kg. Lead also exceeded its Restricted-Residential Use SCO (400 mg/kg) at a concentration of 1,870 mg/kg. No metals were detected above their respective Unrestricted Use SCOs in the deeper soil sample (6 to 8 feet bgs).

1.6 Summary of Area-Wide Remedial Investigation

Langan implemented a remedial investigation (RI) in 2013 for six development parcels (Parcels D1, D2, E3, F, G and H) in accordance with Langan's *Remedial Investigation Work Plan* (RIWP), dated July 24, 2013, which was approved by the OER on August 7, 2013. The area-wide remedial investigation was performed in a two-phased approach starting with the Phase 1 RI (geophysical survey and a soil vapor sampling) and ending with the Phase 2 RI (soil and groundwater sampling).

The following scope of work was performed on Parcel G1:

- Completion of a geophysical survey;
- Installation of 3 soil borings (SB-21, SB-22, and SB-23) and collection of 3 soil samples for laboratory analysis;
- Installation of 3 monitoring wells (MW-21, MW-22, and MW-23) and collection of 3 groundwater samples, as well as the collection of 1 groundwater sample from 1 existing monitoring well (MW-28) for laboratory analysis; and
- Installation of 2 soil vapor sampling points (SV-10 and SV-11) and collection of 2 soil vapor samples for laboratory analysis.

The sampling methodology, field observations and results of Langan's Area-Wide Phase 1 RI and Phase 2 RI are documented in the "*Remedial Investigation Report for Parcels D1, D2, E3, F, G and H of Greenpoint Landing, Brooklyn, New York*," dated May 20, 2014. A copy of this report is provided in Appendix A. The following section summarizes the results of the RI.

1.7 Summary of the RI Results

The environmental findings presented below were derived from Langan's RI only and are specific to Parcel G1 only.

1. The geophysical survey did not identify subsurface anomalies with reflections or signatures consistent with underground storage tanks (USTs).
2. The stratigraphy underlying Parcel G1 consists of a surficial layer of historic fill material overlying native fine- to coarse-grained sandy soil and silty soil. The surficial historic fill material generally extends from ground surface to about 10 feet bgs (about el. 2 feet) and is composed of varying amounts of sand, silt, gravel, coal, coal ash, cinders, slag, and brick, wood, concrete, and asphalt fragments. Depth to bedrock is expected to be more than 50 feet below existing site grade.
3. Groundwater elevation ranges from about el 0.5 feet near the East River to about el. 1.5 feet near the southern perimeter of the site, based on measurements recorded during the RI. Depth to groundwater is about 8 feet below existing grade. Groundwater elevation data across the development property indicate the direction of groundwater flow is to the north and west towards the East River.
4. At soil boring SB-21, no VOCs, PCBs or herbicides were detected in soil above their Unrestricted Use SCOs. One SVOC (indeno(1,2,3-c,d)pyrene) exceeded its Unrestricted Use SCO in surface soil (0 to 2 feet bgs). Two pesticides (4,4'-DDD and 4,4'-DDE) exceeded their Unrestricted Use SCOs (0.0033 mg/kg) in surface soil only. Three metals (copper, lead, and zinc) exceeded their Unrestricted Use SCO in the surface soil. Lead also exceeded its Restricted-Residential SCO (400 mg/kg) in surface soil at a concentration of 770 mg/kg. Four metals (copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in subsurface soil (3.5 to 5.5 feet bgs). Mercury also exceeded its Restricted-Residential SCO (0.81 mg/kg) in subsurface soil at a concentration of 1.4 mg/kg.
5. At soil boring SB-22, three soil samples were collected from the intervals of 0 to 2 feet bgs, 3.5 to 5.5 feet bgs and 6 to 8 feet bgs. No PCBs were detected above the Unrestricted Use SCO and no herbicides were detected. One VOC, trichloroethene (TCE), was detected slightly above its Unrestricted Use SCO, but below its Restricted-Residential Use SCO, in the intermediate soil sample. Eight SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, and indeno(1,2,3-c,d)pyrene, were detected above

their Unrestricted Use SCOs in surface soil. Seven of these PAHs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene, also slightly exceeded their Restricted-Residential Use SCOs in surface soil. The total SVOC concentration detected in surface soil was 306.38 mg/kg. Seven PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene, exceeded their Restricted-Residential Use SCOs in intermediate soil. Total SVOCs in intermediate soil were detected at a concentration of 178.49 mg/kg. No SVOCs were detected above their Unrestricted Use SCOs in subsurface soil (6 to 8 feet bgs). This interval was collected from native soil. One pesticide (4,4-DDT) was detected above its Unrestricted Use SCO (0.0033 mg/kg), but below its Restricted-Residential Use SCO (7.9 mg/kg), at a concentration of 0.00705 mg/kg in surface soil only. Ten metals (arsenic, barium, beryllium, cadmium, trivalent chromium, copper, lead, mercury, nickel and zinc) were detected above their Unrestricted Use SCOs in surface soil, intermediate soil, and/or subsurface soil. Eight metals also exceeded their Restricted-Residential Use SCOs in subsurface soil, and are summarized below (Restricted Residential SCO is presented in parentheses):

- Arsenic concentrations ranging from 17 to 33 mg/kg in surface, intermediate and subsurface soil (16 mg/kg).
- Barium concentration of 550 mg/kg in surface soil only (400 mg/kg).
- Cadmium concentration of 22 mg/kg in intermediate soil (4.3 mg/kg).
- Copper concentration of 2,500 mg/kg in surface soil only (270 mg/kg).
- Lead concentrations ranging from 460 to 3,300 mg/kg in surface, intermediate and subsurface soil. The highest lead concentration was in surface soil (400 mg/kg).
- Mercury concentration of 2.2 mg/kg in intermediate soil (0.81 mg/kg).
- Nickel concentration of 320 mg/kg in surface soil only (310 mg/kg).
- Zinc concentrations ranging from 14,000 to 19,000 mg/kg in surface and intermediate soil (10,000 mg/kg).

6. At soil boring SB-23, herbicides were not detected in soil. VOCs and PCBs were not detected in soil at concentrations above their Unrestricted Use SCOs. Four SVOCs, all PAHs including benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene, exceeded their Unrestricted Use SCOs in surface soil (0 to 2 feet bgs); benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene also exceeded their Restricted-Residential Use SCOs. Seven SVOCs, all PAHs including benzo(a)anthracene,

benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene, exceeded their Unrestricted Use SCOs in subsurface soil (6.5 to 8.5 feet bgs); benzo(k)fluoranthene and chrysene also exceeded their Restricted-Residential Use SCOs. The total SVOC concentration detected in surface and subsurface soil was 12.27 mg/kg and 42.39 mg/kg, respectively. The pesticide 4,4-DDD was detected above its Unrestricted Use SCO in surface soil only. Five metals (arsenic, copper, lead, mercury, and zinc) were detected above their Unrestricted Use SCOs in surface and subsurface soil. Mercury also exceeded its Restricted-Residential Use SCO (0.81 mg/kg) in subsurface soil at a concentration of 1.4 mg/kg.

7. At monitoring well MW-21, one VOC, p-isopropyltoluene, was detected in groundwater above its Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values (SGVs) for Class GA waters (5 micrograms per liter [µg/L]) at a concentration of 27 µg/L. No PCBs, pesticides, or herbicides were detected. Five PAHs, including benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene, were detected at concentrations exceeding their TOGS SGVs. Benzo(a)pyrene was detected at a total concentration of 0.32 µg/L. Benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene exceeded their TOGS SGV (0.002 µg/L) at total concentrations of 0.3 µg/L, 0.18 µg/L, 0.33 µg/L, and 0.21 µg/L, respectively. Bis(2-ethylhexyl)phthalate also slightly exceeded its TOGS SGV (5 µg/L) at a concentration of 5.2 µg/L. Four metals (iron, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs, including:

    - Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 11,100 µg/L.
    - Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 53,900 µg/L.
    - Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 987.8 µg/L.
    - Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 304,000 µg/L.

    Four metals (antimony, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs, including:

    - Antimony exceeded its TOGS SGV (3 µg/L) at a dissolved concentration of 11.99.
    - Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 69,800 µg/L.

- Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 1,208 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 427,000 µg/L.

8. At monitoring well MW-22, no VOCs, PCBs, pesticides, or herbicides were detected in groundwater. Five PAHs, including benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene, were detected at concentrations exceeding their TOGS SGVs. Benzo(a)pyrene was detected at a total concentration of 0.2 µg/L. Benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene exceeded their TOGS SGV (0.002 µg/L) at total concentrations of 0.13 µg/L, 0.11 µg/L, 0.12 µg/L, and 0.15 µg/L, respectively. Bis(2-ethylhexyl)phthalate was detected at a concentration also slightly exceeding its TOGS SGV (5 µg/L) at a concentration of 5.6 µg/L. Four metals (iron, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs, including:

   - Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 1,970 µg/L.
   - Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 43,400 µg/L.
   - Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 1,023 µg/L.
   - Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 310,000 µg/L.

   Four metals (antimony, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs, including:

   - Antimony exceeded its TOGS SGV (3 µg/L) at a dissolved concentration of 7.28.
   - Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 46,900 µg/L.
   - Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 1,037 µg/L.
   - Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 237,000 µg/L.

9. At MW-23, no VOCs, PCBs, pesticides, or herbicides were detected in groundwater. Two PAHs, including benzo(a)pyrene and benzo(k)fluoranthene, slightly exceeded their TOGS SGVs. Benzo(a)pyrene exceeded its TOGS SGV (0 µg/L) at a concentration of 0.13 µg/L. Benzo(k)fluoranthene exceeded its TOGS SVG (0.002 µg/L) at a concentration of 0.07 µg/L.

Five metals (iron, lead, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs.

- Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 30,400 µg/L.
- Lead exceeded its TOGS SGV (25 µg/L) at a total concentration of 58.18 µg/L.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 143,000 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 902.2 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 285,000 µg/L.

Four metals (iron, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs.

- Iron exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 12,200 µg/L.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 134,000 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 747 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 268,000 µg/L.

10. At monitoring well MW-28, no VOCs were detected in groundwater at concentrations above their TOGS SGVs. No PCBs, pesticides, or herbicides were detected. Five PAHs, including benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene, were detected at concentrations exceeding their TOGS SGVs. Benzo(a)pyrene was detected at a total concentration of 0.15 µg/L. Benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene exceeded their TOGS SGV (0.002 µg/L) at total concentrations of 0.09 µg/L, 0.08 µg/L, 0.07 µg/L, and 0.12 µg/L, respectively. Four metals (iron, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs, including:

    - Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 33,500 µg/L.
    - Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 117,000 µg/L.
    - Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 902 µg/L.
    - Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 352,000 µg/L.

Four metals (iron, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs, including:

- Iron exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 16,000.
- Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 104,000 µg/L.
- Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 788.2 µg/L.
- Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 318,000 µg/L.

11. No VOCs exceeded their New York State Department of Health (NYSDOH) Air Guidance Values (AGV) in SV-10. TCE exceeded its NYSDOH (AGV of 5 µg/m^3) at a concentration of 338 micrograms per cubic (µg/m^3) at SV-11.

1.8 Summary of Supplemental Remedial Investigation for Parcel G1

Langan implemented a supplemental parcel-specific RI for Parcel G1 to satisfy the OER requirements in accordance with Langan's *Supplemental Remedial Investigation Work Plan for Parcel G1*, dated August 13, 2014, which was approved by the OER on August 13, 2014. Concurrently, Langan implemented a supplemental parcel-specific RI for the former area described as Parcel F1 (together with Parcel F2) to satisfy the OER requirements in accordance with Langan's *Supplemental Remedial Investigation Work Plan for Parcels F1 and F2* dated August 13, 2014, which was also approved by the OER on August 13, 2014. A copy of this report is provided in Appendix A. The supplemental parcel-specific remedial investigation for Parcel F1 was used to develop the Parcel G1 RAWP because the construction activity planned for Parcel G1 will also disturb soil/fill material on Parcel F1.[7]

Langan's supplemental remedial investigations consisted of the following scope of work in areas addressed by this RAWP:

- Installation of 7 soil borings (SB-33 through SB-38 and SB-44), and collection of 14 soil samples, and associated QA/QC samples for laboratory analysis;

[7] The Department of Buildings filing for Parcel G1 includes a portion of the area formerly described as Parcel F1. Parcel G1 as described in the Supplemental RIR for Parcel G1, included a portion of Lot 90, which is described in the RAWP for Parcel F1 as area F1B. Parcel F1 as described in the Supplemental RIR for Parcel F1 included portions of Lots 50 and Lot 80, which are described in the RAWP for Parcel G1.

- Installation of one monitoring well (MW-34) and collection of a groundwater sample, as well as the collection of one groundwater sample from one existing monitoring well (MW-23), and associated QA/QC samples for laboratory analysis; and
- Installation of 6 soil vapor sampling points (SV-19 to SV-23, and SV-32) and collection of 6 soil vapor samples.

The sampling methodology, field observations and results of Langan's supplemental RI for Parcel G1 are documented in the "*Supplemental Remedial Investigation Report for Parcels G1, Brooklyn, New York*," dated December 5, 2015. Additionally, the sampling methodology, field observations and results of Langan's supplemental RI for Parcels F1 and F2 are documented in the "*Supplemental Remedial Investigation Report for Parcels F1 and F2, Brooklyn, New York*," dated January 9, 2015. The following section summarizes the results of the supplemental RI.

1.9 Summary of Supplemental RI Results

The environmental findings presented below were derived from Langan's supplemental remedial investigations and are specific to Parcel G1 only:

1. The soil vapor sampling points and soil borings were completed at a depth of 5 feet bgs within the surficial layer of historic fill. The historic fill is composed of varying amounts of sand, gravel, brick, coal, wood, ash, and brick, ceramic, and asphalt fragments.

2. At soil boring SB-33, no VOCs, PCBs, pesticides or herbicides exceeded their Unrestricted Use SCOs. Eight SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, and indeno(1,2,3-cd)pyrene) exceeded their Unrestricted Use SCOs in both surface and subsurface soil. Seven of these compounds (all except dibenzofuran in the subsurface sample) also exceeded their Restricted-Residential Use SCOs. Total SVOCs were detected in surface soil at a concentration of 457.75 mg/kg and at a concentration of 306.44 mg/kg in subsurface soil. Seven metals (arsenic, trivalent chromium, copper, lead, mercury, nickel, and zinc) exceeded their Unrestricted Use SCOs in surface soil. Three metals (copper, lead, and mercury) also exceeded their Restricted-Residential Use SCOs (270 mg/kg, 400 mg/kg, and 0.81 mg/kg, respectively) in surface soil at concentrations of 430 mg/kg, 640 mg/kg, and 2.6 mg/kg, respectively. Four metals (copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in subsurface soil. No metals exceeded their Restricted-Residential Use SCOs in subsurface soil.

3. At soil boring SB-34, no PCBs and herbicides were detected and no VOCs and pesticides exceeded their Unrestricted Use SCOs. Five VOCs, including acetone, m/p-xylene, toluene,

trichloroethene, and total xylenes, were detected at concentrations below their Unrestricted Use SCOs in surface soil. Five VOCs, including ethylbenzene, m/p-xylene, toluene, trichloroethene, total xylenes, were detected at concentrations below their Unrestricted Use SCOs in subsurface soil. Five SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene) exceeded their Unrestricted Use SCOs in both surface and subsurface samples. Four of these compounds (all except chrysene) also exceeded their Restricted-Residential Use SCOs in both sample intervals. Total SVOCs were detected in surface soil at a concentration of 20.95 mg/kg and at a concentration of 22.86 mg/kg in subsurface soil. Five metals (copper, lead, mercury, nickel, and zinc) exceeded above their Unrestricted Use SCOs in surface soil. Lead also exceeded its Restricted-Residential Use SCO (400 mg/kg) in surface soil at a concentration of 600 mg/kg. Three metals (lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in subsurface soil. No metals exceeded their Restricted-Residential Use SCOs in subsurface soil.

4. At soil boring SB-35, no herbicides were detected and no VOCs, SVOC, PCBs, or pesticides exceeded their Unrestricted Use SCOs. Total SVOCs were detected in surface soil at an estimated concentration of 4.664 mg/kg and 2.384 mg/kg in subsurface soil. Three metals (copper, lead, and zinc) exceeded their Unrestricted Use SCOs in surface soil. Lead also exceeded its Restricted-Residential Use SCO (400 mg/kg) in surface soil at a concentration of 440 mg/kg. Five metals (barium, cadmium, lead, mercury, and zinc) were detected above their Unrestricted Use SCOs in subsurface soil. Lead and mercury also exceeded their Restricted-Residential Use SCOs (400 mg/kg and 0.81 mg/kg) in subsurface soil at concentrations of 3,400 mg/kg and 5.5 mg/kg, respectively.

5. At soil boring SB-36, no herbicides were detected and no VOCs, PCBs, or pesticides exceeded their Unrestricted Use SCOs. Six VOCs, including 1,2-dichloroethane, acetone, methylcyclohexane, m/p-xylene, toluene, and total xylenes, were detected at concentrations below their Unrestricted Use SCOs in surface soil. Six VOCs, including acetone, ethylbenzene, o-xylene, m/p-xylene, toluene, total xylenes, were detected at concentrations below their Unrestricted Use SCOs in subsurface soil. One SVOC (indeno[1,2,3-cd]pyrene) exceeded its Restricted-Residential Use SCO in surface and subsurface soil. Total SVOCs were detected in surface soil at a concentration of 9.124 mg/kg and at a concentration of 8.91 mg/kg in subsurface soil. Four metals (copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in surface soil. Three metals (lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in subsurface soil. No metals exceeded their Restricted-Residential Use SCOs in surface or subsurface soil.

6. At soil boring SB-37, no PCBs, pesticides and herbicides were detected and no VOCs exceeded their Unrestricted Use SCOs. Six VOCs, including 2-butanone, acetone, methyl cyclohexane, m/p-xylene, toluene, and total xylenes, were detected at concentrations below their Unrestricted Use SCOs in surface soil. Five VOCs, including 2-butanone, acetone, m/p-xylene, toluene, and total xylenes, were detected at concentrations below their Unrestricted Use SCOs in subsurface soil Seven SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene) exceeded their Unrestricted Use SCOs in both surface and subsurface samples. Six of these compounds (all except benzo(k)fluoranthene) also exceeded their Restricted-Residential Use SCOs in both samples. Total SVOCs were detected in surface soil at a concentration of 61.444 mg/kg and at a concentration of 134.71 mg/kg in subsurface soil. Four metals (copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in surface soil. Lead exceeded its Unrestricted Use SCOs in subsurface soil. No metals exceeded their Restricted-Residential Use SCOs in surface or subsurface soil.

7. At soil boring SB-38, no pesticides and herbicides exceeded their Unrestricted Use SCOs. Two VOCs (benzene and toluene) exceeded their Unrestricted Use SCOs in surface soil (0-2 feet bgs). Benzene also exceeded its Unrestricted Use SCO in subsurface soil (3-5 feet bgs). No VOCs exceeded their Restricted-Residential SCOs. Seven SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, exceeded their Unrestricted Use SCOs in surface soil only. Six of these compounds (all except benzo(k)fluoranthene) also exceeded their Restricted-Residential Use SCOs in surface soil. Total SVOCs were detected in surface soil at a concentration of 52.81 mg/kg and at a concentration of 6.07 mg/kg in subsurface soil. Total PCBs exceeded their Unrestricted Use SCO in surface soil only. Four metals (copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in surface soil. Lead also exceeded its Restricted-Residential Use SCO (400 mg/kg) in surface soil at a concentration of 570 mg/kg. Five metals (trivalent chromium, copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in subsurface soil. No metals exceeded their Restricted-Residential Use SCOs in subsurface soil.

8. At soil boring SB-44, no PCBs and herbicides exceeded their Unrestricted Use SCOs. TCE exceeded its Unrestricted Use SCO (0.47 mg/kg) at a concentration of 1.1 mg/kg in surface soil (0 to 2 feet bgs) only. No SVOCs exceeded their Unrestricted Use SCOs in surface soil. Six SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene, exceeded their Unrestricted

Use SCOs in subsurface soil (3 to 5 feet bgs). Four SVOCs (all except benzo(k)fluoranthene and chrysene) also exceeded their Restricted-Residential Use SCOs in subsurface soil. Total SVOCs were detected in surface soil at a concentration of 7.63 mg/kg and at a concentration of 21.24 mg/kg in subsurface soil. One pesticide (4,4'-DDE) slightly exceeded its Unrestricted Use SCO in surface soil. Two metals (lead and zinc) exceeded their Unrestricted Use SCOs in surface soil. Four metals (copper, lead, mercury, and zinc) exceeded their Unrestricted Use SCOs in subsurface soil. Lead and mercury also exceeded their Restricted-Residential Use SCOs (400 mg/kg and 0.81 mg/kg, respectively) in subsurface soil at concentrations of 1,000 mg/kg and 1.6 mg/kg, respectively.

9. At monitoring well MW-23, no PCBs, pesticides, or herbicides were detected. The VOC trans-1,2-dichloroethene (trans-1,2-DCE) exceeded its TOGS SGV (5 micrograms per liter [µg/L]) at a concentration of 7.4 µg/L. Three PAHs (benzo(b)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene) exceeded their TOGS SGVs. Benzo(b)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene exceeded their TOGS SVG (0.002 µg/L) at concentrations of 0.09 µg/L, 0.06 µg/L, and 0.15 µg/L, respectively. Five metals (iron, lead, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs.

    - Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 25,400 µg/L.
    - Lead exceeded its TOGS SGV (25 µg/L) at a total concentration of 69.01 µg/L.
    - Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 134,000 µg/L.
    - Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 979.2 µg/L.
    - Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 312,000 µg/L.

    Four metals (iron, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs.

    - Iron exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 16,200 µg/L.
    - Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 118,000 µg/L.
    - Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 818.2 µg/L.
    - Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 31,300 µg/L.

10. At MW-34, no SVOCs, PCBs, pesticides, or herbicides were detected. The VOC trans-1,2-DCE exceeded its TOGS SGV (5 µg/L) at a concentration of 16 µg/L. Five metals (arsenic, iron, magnesium, manganese, and sodium) were detected in total concentrations above their TOGS SGVs.

    - Arsenic exceeded its TOGS SGV (25 µg/L) at a total concentration of 58.5 µg/L.
    - Iron exceeded its TOGS SGV (300 µg/L) at a total concentration of 15,100 µg/L.
    - Magnesium exceeded its TOGS SGV (35,000 µg/L) at a total concentration of 48,900 µg/L.
    - Manganese exceeded its TOGS SGV (300 µg/L) at a total concentration of 1,637 µg/L.
    - Sodium exceeded its TOGS SGV (20,000 µg/L) at a total concentration of 357,000 µg/L.

    Four metals (iron, magnesium, manganese, and sodium) were detected in dissolved concentrations above their TOGS SGVs in the parent sample.

    - Iron exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 2,030 µg/L.
    - Magnesium exceeded its TOGS SGV (35,000 µg/L) at a dissolved concentration of 46,800 µg/L.
    - Manganese exceeded its TOGS SGV (300 µg/L) at a dissolved concentration of 1,613 µg/L.
    - Sodium exceeded its TOGS SGV (20,000 µg/L) at a dissolved concentration of 318,000 µg/L.
    - Arsenic was detected at a dissolved concentration in the parent sample (17.35 µg/L), but not at a concentration above its TOGS SGV; arsenic was, however, detected above its TOGS AGV in the duplicate sample. Arsenic exceeded its TOGS SGV (25 µg/L) at a dissolved concentration of 28.15 µg/L.

11. No VOCs exceeded their NYSDOH AGVs at SV-19 and SV-20. TCE exceeded its AGV of 5 micrograms per cubic meter (µg/m^3) at four soil vapor points (SV-21, SV-22, SV-23, and SV-32) at concentrations of: 109 µg/m^3 at sampling location SV-21, 207 µg/m^3 at sampling location SV-22, 118 µg/m^3 at sampling location SV-23, and 19.6 µg/m^3 at sampling location SV-32. No other detected soil vapor concentrations exceeded established AGVs.

1.10 Summary of Waste Characterization and Results

A waste characterization was completed for the area of the building footprint of Parcel G1 in September 2013. The waste characterization investigation included soil and groundwater sampling. The purpose of the waste characterization investigation was to:

- Perform in-situ characterization to avoid characterizing stockpiles of excavated soil;
- Provide sufficient information to help evaluate construction costs related to management and re-use or disposal of excess soil and groundwater during the planned redevelopment of a sub-area of Parcel G1; and
- Evaluate potential dewatering options (e.g. discharge to a NYCDEP sewer or the East River).

The building footprint of Parcel G1 was divided into 10 approximately 2,700-square-foot waste characterization cells. About 10,000 cubic yards of soil/fill material within the excavation area (about 26,000 square feet) was characterized in-situ at a frequency of one sample for every 500 cubic yards (CY). Waste characterization cells were composed of shallow intervals representing approximately 0 to 5 feet bgs and approximately 500 CY of subsurface material, and one deep interval (in the southern portion of the proposed excavation) representing approximately 5 to 10 feet bgs and approximately 500 CY of subsurface material. Twenty soil borings were completed within the excavation area, with two soil borings within each cell. A sample set was collected from each shallow and deep grid cell, consisting of one grab sample and one composite sample. Twenty sample sets and one duplicate sample were collected and submitted for analysis and associated QA/QC samples. Grab soil samples were analyzed for VOCs only, by United States Environmental Protection Agency (USEPA) Method 8260C. Composite soil samples were analyzed for the following parameters:

- SVOCs (USEPA Method 8270D)
- PCBs (USEPA Method 8082A)
- Organochlorine pesticides (USEPA Method 8081B)
- Herbicides (USEPA Method 8151A)
- Target analyte list [TAL] metals (USEPA Method 6010C/7471B)
- Hexavalent chromium (USEPA Method 7196A)
- Cyanide (USEPA Method 9010C/9012A)
- Toxicity characteristic leaching procedure (TCLP) Resource Conservation and Recovery Act (RCRA) 8 metals (USEPA Method 1311)
- Ignitability (USEPA Method 1030)
- Corrosivity (USEPA Method 9045D)
- Cyanide Reactivity (SW846 Chapter 7.3)
- Sulfide Reactivity (SW846 Chapter 7.3)
- Total petroleum hydrocarbons gasoline-range organics (TPH-GRO) (USEPA Method 8015C)

- Total petroleum hydrocarbons diesel-range organics (TPH-DRO) (USEPA Method 8015C)
- Paint filter (USEPA Method 9095A)

One groundwater sample was collected and analyzed for New York City Department of Environmental Protection (NYCDEP) sewer discharge parameters[8] and NYSDEC State Pollutant Discharge Elimination System (SPDES) parameters[9] to evaluate potential dewatering options (e.g. discharge to a NYCDEP sewer or Newtown Creek/East River).

The sampling methodology, field observations and results of the waste characterization investigation are presented in the *Waste Characterization Technical Letter Report for Building G1 and Proposed CSO,* dated November 11, 2013, which can be found in Appendix A.

The environmental findings presented below were derived from Langan's waste characterization only and are specific to Parcel G1. A review of the analytical soil and groundwater results indicated:

- Seven VOCs, including 1,2-dichloroethane, acetone, benzene, methylene chloride, naphthalene, toluene, and total xylenes, were detected above their Unrestricted Use SCOs in one or more grab soil samples. The VOCs 1,2-dichloroethane and acetone exceeded their Unrestricted Use SCOs in sample G1_SB-03B_4-4.5. Methylene chloride exceeded its Unrestricted Use SCO in sample G1_SB-04A_2-2.5. Benzene and total xylenes exceeded their Unrestricted Use SCOs in sample G1_SB-05B_3-3.5. Naphthalene exceeded its Unrestricted Use SCO in sample G1_SB-06A_3-3.5. Toluene exceeded its Unrestricted Use SCO in sample G1_SB-06A_7-7.5. None of the VOCs detected in the soil samples exceeded their Restricted-Residential Use SCOs.
- Fourteen SVOCs, including 3-methylphenol, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene exceeded their Unrestricted Use SCOs in one composite soil sample, G1_COMP-10D_5-10. Ten SVOCs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene,

[8] NYCDEP sewer discharge parameters include non-polar material, pH, temperature, flash point, cadmium, hexavalent chromium, copper, lead, mercury, nickel, zinc, benzene, carbon tetrachloride, chloroform, 1,4-dichlorobenzene, ethylbenzene, MTBE, naphthalene, phenol, tetrachloroethylene, toluene, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, total xylenes, total PCBs, total suspended solids, carbonaceous biochemical oxygen demand (CBOD), chloride, total nitrogen, and total solids.

[9] NYSDEC SPDES parameters include pH, temperature, oil and grease, total suspended solids, settable solids, BTEX, MTBE, halogenated VOCs, aromatic VOCs, nitrate and nitrite, and metals.

dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, and pyrene also exceeded their Restricted-Residential Use SCOs in composite soil sample, G1_COMP-10D_5-10.

- Seven SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene exceeded their Unrestricted Use SCOs in sixteen composite soil samples (G1_COMP-01S_0-5, G1_COMP-01D_5-10, G1_COMP-02S_0-5, G1_COMP-02D_5-10, G1_COMP-03S_0-5, G1_COMP-03D_5-10, G1_COMP-04S_0-5, G1_COMP-04D_5-10, G1_COMP-05S_0-5, G1_COMP-05D_5-10, G1_COMP-06D_5-10, G1_COMP-07S_0-5, G1_COMP-07D_5-10, G1_COMP-08S_0-5, G1_COMP-09S_0-5, and G1_COMP-09D_5-10). Seven PAHs also exceeded their Restricted-Residential Use SCOs in G1_COMP-08S_0-5 and G1_COMP-09D_5-10. Six PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene also exceeded their Restricted-Residential SCOs in seven composite soil samples (G1_COMP-01D_5-10, G1_COMP-02S_0-5, G1_COMP-03S_0-5, G1_COMP-04D_5-10, G1_COMP-05S_0-5, G1_COMP-06D_5-10, and G1_COMP-09S_0-5). Five PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene also exceeded their Restricted-Residential Use SCOs in six composite soil samples (G1_COMP-01S_0-5, G1_COMP-02D_5-10, G1_COMP-03D_5-10, G1_COMP-04S_0-5, G1_COMP-05D_5-10, and G1_COMP-07S_0-5)
- Six SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene exceeded their Unrestricted Use SCOs in one composite soil sample, G1_COMP-06S_0-5. Four PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene also exceeded their Restricted-Residential SCOs.
- Five SVOCs, all PAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3-c,d)pyrene exceeded their Unrestricted Use SCOs in one composite soil sample, G1_COMP-10S_0-5. Four PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene also exceeded their Restricted-Residential SCOs.
- Two SVOCs, both PAHs, including benzo(b)fluoranthene and indeno(1,2,3-c,d)pyrene exceeded their Unrestricted Use and Restricted-Residential Use SCOs in one composite soil sample, G1_COMP-08D_5-10.
- Total SVOC concentrations ranged from 12.265 mg/kg (G1_COMP-08D_5-10) to 134.71

mg/kg (G1_COMP-10D_5-10).

- No PCBs were detected above their Unrestricted Use SCOs.
- No herbicides were detected.
- One pesticide (4,4-DDT) was detected above its Unrestricted Use SCO, but below its Restricted-Residential Use SCO, in four composite soil samples (G1_COMP-02S_0-5, G1_COMP-07D_5-10, G1_COMP-09S_0-5, and G1_COMP-10S_0-5).
- Ten metals (arsenic, barium, beryllium, trivalent chromium, copper, lead, mercury, nickel, selenium and zinc) exceeded their Unrestricted Use SCOs in one or more composite soil samples. Four metals (arsenic, barium, copper, and lead) also exceeded their Restricted-Residential Use SCOs in one or more composite samples. Arsenic concentrations above its Restricted-Residential Use SCO ranged from 17 mg/kg (G1_COMP-04S_0-5) to 54 mg/kg (G1_COMP-01D_5-10). Barium exceeded its Restricted-Residential Use SCO at 420 mg/kg in one composite soil sample, G1_COMP-09D_5-10. Copper concentrations above its Restricted-Residential Use SCO ranged from 300 mg/kg (G1_COMP-04S_0-5) to 2,900 mg/kg (G1_COMP-09D_5-10). Lead concentrations above its Restricted-Residential Use SCO ranged from 410 mg/kg (G1_COMP-03S_0-5) to 1,600 mg/kg (G1_COMP-02S_5-10).
- Based on the TCLP analytical results, lead was found to exceed its maximum concentration for the toxicity characteristic (5.0 mg/L) at a concentration of 5.4 mg/L in one composite soil sample, G1_COMP-05S_0-5.
- A review of the groundwater analytical results indicated no parameters exceeded their NYCDEP limitations for effluent to sanitary or combined sewers and no parameters exceeded their TOGS SGVs for Class I waters with the exception of total lead. Total lead exceeded its TOGS Class I SGV (8 µg/L) at a concentration of 18 µg/L.

1.11 Summary of Areas of Concern

The environmental data generated by previous environmental investigations, including Langan's Area-Wide RI, Parcel-Specific Supplemental RI, and Waste Characterization, are sufficient to delineate the distribution of contaminants in soil, groundwater, and soil vapor. Based on the environmental data and information presented in previous studies, 20 hotspot areas with elevated concentrations of total metals (e.g., arsenic, cadmium, copper, lead, mercury, and zinc) and total SVOCs (see following table) were identified in historic fill material and were considered hotspots. One area, represented by two boring locations also exhibited characteristic hazardous lead waste.

Hotspot Summary			
Boring Location(s)	**Contaminant**	**Depth (feet bgs)**	**Concentration (mg/kg)**
SB-1A / SB-1B	Arsenic Copper	5-10 0-5	54 810
SB-2A / SB-2B	Arsenic Copper Lead	5-10 0-5 0-5	46 480 1,600
SB-3A / SB-3B	Arsenic Copper	5-10 0-5	34 500
SB-5A / SB-5B*	Copper Lead	0-5 0-5	620 5.4 mg/L by TCLP lead
SB-7A / SB-7B	Copper	0-5	920
SB-8A / SB-8B	Arsenic Copper	5-10 0-5	30 440
SB-9A / SB-9B	Copper	0-5 5-10	680 2,900
SB-10A / SB-10B	Total SVOCs	5-10	1,246.17
SB-22	Arsenic Cadmium Copper Lead Zinc	3.5-5.5 3.5-5.5 0-2 0-2 0-2	33 22 2,500 3,300 19,000
SB-33	Total SVOCs	0-2 3-5	457.75 306.44
SB-35	Lead Mercury	3-5	3,400 5.5
B14	Lead	2-3.5	1,870
* - Area with characteristic hazardous lead waste			

2.0 SUMMARY OF REMEDIAL ACTIONS

The site was remediated in accordance with the procedures set forth in the RAWP. Remedial action objectives established in the RAWP were fulfilled and completed in accordance with applicable laws and regulations and the site-specific CHASP. The remedial actions are effective in the short-term and long-term; reduced mobility, toxicity and volume of contaminants; used standard methods well established in the industry; and comply with applicable environmental standards, criteria, guidance and regulations.

The remedial actions completed during site redevelopment included:

1. Establishment of site-specific Soil Cleanup Objectives (SCOs);
2. Completion of an in-situ waste characterization of soil/fill material proposed for excavation, as required by disposal facilities;
3. Site mobilization involving site security setup, equipment mobilization, utility mark outs and marking and staking excavation areas;
4. Performance of a Community Air Monitoring Program (CAMP) for particulates and volatile organic compounds;
5. Screening of excavated soil/fill during intrusive work for indications of contamination by visual and olfactory observation and monitoring with a photoionization detector (PID);
6. Removal of the existing asphalt pavement and excavation as follows:
    - Excavation to about 8 feet below former site grade (el. 2 feet) to accommodate the foundation slab with deeper excavations to about 16 feet below former site grades (el. -6 feet) to accommodate the building core, elevator pits and parking lift pits;
    - Excavation to about 6 feet below former site grades (el. 4 feet) to accommodate most utilities under Blue and Bell Slips with limited deeper excavations to about 12 feet bgs (el. -0.8 feet) for installation of utility structures near Commercial Street;
    - Excavation to about 6 feet below former site grades (el. 4 feet) to accommodate associated utilities under the waterfront park/esplanade; and
    - Excavation to about 9 feet below former site grades (el. 1 feet) to accommodate hotspot excavations under the waterfront park/esplanade.
7. Transportation and off-site disposal of 1,003.54 tons of hazardous and 25,072.67 tons of non-hazardous soil and fill material at permitted receiving;
8. Off-site recycling and disposal of asphalt and construction and demolition (C&D) debris at registered Part 360-16 solid waste management facilities;

9. Collection and analysis of post-excavation confirmation endpoint samples from hotspots and from within the development excavation and pre-cap confirmation endpoint samples in landscapes areas to document attainment of the site-specific SCOs;
10. Secured a NYSDEC State Pollutant Discharge Elimination System (SPDES) permit (Permit # 2-6101-01361/00001 and SPDES #NY-0276707) for dewatering, pre-treatment of groundwater, and discharge of effluent to the surface waters of Newtown Creek;
11. Importation of the following materials:
    - 3/4-inch recycled concrete aggregate (RCA) for use as temporary fill material for a dewatering system equipment pad;
    - 3/4-inch stone for structural fill below the building foundation;
    - Stone (3/4-inch, 2½-inch, 3-inch), quarry sand, and manufactured quarry sand) for structural fill in utility corridors and/or to raise site elevations;
    - Manufactured quarry sand, 3/4-inch stone, bedding stone, and 6-inch stone fill for the new stabilized shoreline;
    - Stone (1/2-inch, 1-inch, 1.5-stone, and 3-inch) and manufactured quarry sand for landscaped areas and roadways; and
    - Drainage and planting soils (S1, S2, and S3 materials) for landscaped areas and terraces and the lawn in the waterfront park and tree planters in pedestrian sidewalks along Blue and Bell Slips
12. Demarcation of residual soil above site-specific SCOs and residual historic fill material outside of the new building footprint using a variety of methods including physical reference barriers and surveys;
13. Installation of a waterproofing/vapor barrier system beneath the new building slab, elevator pits, and along subsurface sidewalls, as per manufacturer's specifications;
14. Construction and installation of an engineered composite cover system consisting of 6-inch thick concrete and/or 4-inch thick asphalt pavement, a 20-inch thick concrete building foundation slab, and at least 2 feet of cover soil imported from OER-approved sources;
15. Implementation of stormwater and soil erosion and control measures;
16. Preparation of a Remedial Action Report (RAR) that describes remedial activities, certifies remedial requirements were achieved, describes engineering controls (ECs) and institutional controls (ICs), and describes five OER-approved deviations from the RAWP;
17. Preparation of a Site Management Plan (SMP) to govern the inspection and certification of engineering and institutional controls; and

18. Continuation of the E-Designation and ongoing site management in accordance with the SMP.

2.1 Compliance with Remedial Action Plan

2.1.1 Construction Health and Safety Plan

The remedial construction activities performed during redevelopment complied with the site-specific CHASP. The Site Safety Coordinator was William Bohrer.

2.1.2 Community Air Monitoring Program

The CAMP consisted of real-time air monitoring for total VOCs and respirable particulate matter at the upwind and downwind perimeter of the work area during intrusive soil disturbance activities to evaluate the need for odor and dust control measures to mitigate off-site impacts to the surrounding neighborhood. The real-time air monitoring was performed in accordance with the provisions of the community air monitoring plan set forth in the CHASP.

Particulate matter was monitored using TSI DustTRAK® aerosol monitors and total VOCs were monitored using MiniRAE® 3000 photoionization detector (PID) instruments. In addition, total VOCs were monitored with a PID adjacent to areas of soil disturbance during excavation, post-excavation endpoint sampling, and soil export activities. Dust management measures were implemented during construction, including the use of dedicated water sprays for roads, excavation areas and stockpiles; anchored tarps to cover stockpiles; and use of gravel at egress points. No community nuisance odor or dust complaints were received during remedial construction. Particulate matter and VOCs concentrations in excess of action levels were recorded over isolated periods during remedial construction. A daily summary of the community air monitoring results are included in daily and weekly field reports (Appendix B).

2.1.3 Soil/Material Management Plan

The SMMP in the RAWP established requirements and guidelines for managing soil/fill material disturbed during construction activities, including excavation, handling, stockpiling, importing, storage, and off-site transport and disposal. It included a series of controls for effective, nuisance-free remedial activity in compliance with applicable laws and regulations. Remedial construction activities were performed in compliance with the SMMP.

2.1.4 Reporting

Qualified Langan field staff documented remedial construction activities, including excavation/earthwork, hotspot removals and endpoint sampling, community air monitoring,

stockpile management, material import/export, waste characterization sampling, post-excavation confirmation endpoint sampling, and installation of engineering controls, in daily and weekly field reports with photographs and a summary of the air monitoring results. The daily and weekly field reports were submitted to the OER for the agency's records. Copies of the daily and weekly field reports are included as Appendix B.

2.1.5 Deviations from the Remedial Action Work Plan

There were five deviations from the RAWP, all of which were discussed with and approved by the OER:

1. The entirety of Parcel F1B (about 11,100 square feet) and part of Parcel F1A (about 1,710 square feet) were remediated as part of Parcel G1 construction from a practical constructability perspective in accordance with the OER-approved RAWPs for Parcel G1 and F1. The final site boundary of Parcel G1 was amended to include these areas.
2. The RAWP proposed removing soil exceeding the site-specific SCOs to the extent practical. The following post-excavation confirmation endpoint samples exhibited concentrations of contaminants above site-specific SCOs:
    - EP-09_EL_2.0 exhibited total arsenic above the site-specific SCO (23 mg/kg)
    - EP-13_EL-4.2 exhibited total copper and mercury above the site-specific SCOs (300 and 2.8 mg/kg, respectively).
    - Endpoint samples collected from 0 to 4 feet bgs on the north, east, and west sidewalls of the SB-22 hotspot excavation had total copper and/or lead concentrations greater than the site-specific SCO. Endpoint samples collected from 4 to 8 feet bgs from the north and east sidewalls at this hotspot excavation also contained total arsenic concentrations greater than the site specific SCO.
    - Endpoint samples collected from 0 to 4 feet bgs on the east and south sidewalls of the SB-33 hotspot excavation had total SVOC concentrations greater than the site-specific SCO.
    - Endpoint samples collected from 0 to 4 and 4 to 8 feet bgs depth interval on the south sidewall of the SB-35 hotspot excavation had total lead concentrations greater than the site-specific SCO.

    The residual concentrations above the site-specific SCOs were evaluated to assess the potential for environmental and human health impact. The OER agreed with the conclusion that no exposure risk would exist with engineering and institutional controls

in place and allowed for soil characterized by these results to remain on site. Refer to Sections 3.14.5 and 3.16 for detail on the hotspot delineation program and post-excavation confirmation endpoint sampling program, respectively.

3. The RAWP proposed using shallow soil samples (representing 0 to 2 feet below grade surface) from previous soil borings B5, SB-36, SB-37, and SB-38 as pre-cap confirmation endpoints. These areas were excavated as part of utility structure installations and therefore could no longer serve as the pre-cap confirmation endpoints. Post-excavation endpoint samples (EP-14, EP-13, EP-11, and EP-11 [from former Parcel F1], respectively), were collected nearby to replace the former samples.

4. National Grid's contractor (Hallen Construction Company of Flushing, NY) imported and used fill material from a Part 360 registered facility (Allocco Recycling Ltd. of Brooklyn, NY, Part 360 #24WA3) as backfill for the gas line trench under Bell Slip that did not meet the imported material criteria (Restricted-Residential Use SCOs) specified in the RAWP. One SVOC (benzo(a)anthracene) and one pesticide (aldrin) exceeded the Restricted-Residential Use SCO. No other parameters exceeded the Restricted-Residential Use SCOs. The OER was informed of this deviation via email on February 28, 2018 (see Appendix C).

5. Submittal packages for imported materials were prepared by the contractor and reviewed by Langan before import to the site. The OER was not notified of all imported materials and the lack of notification is considered a deviation. All imported materials, with the exception of fill material from Allocco Recycling Ltd for the Bell Slip underground gas line (discussed above), were derived from virgin sources, did not require additional environmental testing, and met the requirements of the RAWP and SMMP. Available OER approvals for imported materials are included in Appendix C.

3.0 DESCRIPTION OF REMEDIAL PROGRAM

3.1 Project Organization and Oversight

The remedial action was performed concurrently with redevelopment of the site. Turner Construction Company of New York, hereafter referred to as "the Construction Manager", provided construction management services for the project. Multiple contractors were involved with the remedial action and are listed and their scope is described in the following table:

Contractor Name	Scope of Work
Urban Foundation/Engineering, LLC (Urban)	Excavation/earthwork, foundation construction, dewatering/pre-treatment
MFM Contracting Corp. (MFM)	Site utility installation and general site work
Phoenix Marine Company (Phoenix Marine)	Bulkhead reconstruction and shoreline stabilization
BrightView Landscapes LLC (BrightView)	Landscaping and general site work

Langan provided environmental engineering services, including documenting compliance with the RAWP, implementing the CAMP, coordinating with OER, and observing and documenting the installation of engineering controls.

The New York State Professional Engineer responsible for overseeing implementation of the RAWP is Jason J. Hayes, PE, Principal/Vice President with Langan. Langan field staff under the direction of Mr. Hayes documented that the remedial actions were implemented in accordance with the RAWP, SMMP, and site-specific CHASP. Gregory Wyka, PG, of Langan served as the project manager during environmental oversight. Luke McCartney, PG and Kimberly Nagotko served as Langan's primary on-site field representatives.

3.2 Site Preparation

The Notice to Proceed (NTP) is dated March 26, 2015. A copy of the NTP is included in Appendix C. The pre-construction meeting was held at the site with parties involved in the remedial process on April 6, 2016 before the start of construction and remediation. Mobilization was conducted as necessary for each phase of work and included both Langan field personnel orientation and equipment mobilization. The Contractor mobilized construction equipment and began excavation and earthwork in May 2016.

3.3 Security

Site access was controlled by 24-hour guarded entrances at the intersections of Commercial Street with Blue Slip and Bell Slip. Exterior and interior gates and doors were locked and secured by the Contractor at the end of each work day.

3.4 Utility Layouts

Existing utilities within Commercial Street were investigated, demarcated, protected, and maintained by the Contractor during remedial construction. Utilities constructed as part of the Parcel G1 development were also protected and maintained by the Construction Manager and contractors during construction and remediation. Invasive activities were performed in compliance with applicable laws and regulations.

3.5 Easements

The following easements exist and will remain following construction:

- Combined Sewer – filed with NYCDEP
- Access
- Construction
- Light and Air

3.6 Construction Dewatering and Fluids Management

The discharge of dewatering fluids to the surface waters of Newtown Creek was authorized by a SPDES permit (NYSDEC Permit #2-6101-01361/00001 and SPDES #NY-0276707). Construction dewatering was conducted between July and December 2016 using localized sump pump systems during foundation and utility construction. The dewatering fluid collection and treatment systems were installed, operated and maintained by Urban and their subcontractor, Groundwater Treatment Technologies, LLC (GWTT), before the startup of dewatering operations to treat and discharge groundwater during construction. The pretreatment system included a settling/weir tank, an oil/water separator, bag filters, carbon filtration, polishing cartridges, and ion exchange units. Post-treatment effluent samples were collected by Langan on a monthly basis during dewatering, and results were submitted to NYSDEC in accordance with the SPDES permit. Dewatering fluids were discharged to the NYCDEP-owned 24-inch combined sewer overflow (CSO) pipe under Blue Slip that was constructed in 2015. The dewatering fluids entered Newtown Creek via Outfall #23 (Permit ID #NY0026204). About 815,100 gallons of groundwater were pumped, treated, and discharged to Newtown Creek during construction.

3.7 Equipment and Material Staging

Equipment and materials were stored and staged within the secure site using measures described in the SMMP.

3.8 Soil Screening

Throughout construction, remediation and site development activities, soil was inspected through visual and olfactory means for evidence of staining or odors representative of a chemical or petroleum release. Soil was also screened using a handheld RAE MiniRAE 3000 PID.

3.9 Stockpile Management

Excavated soil/fill material was staged in stockpiles on and covered during off-hours with polyethylene sheeting, pending off-site disposal. Stockpiles were only used when necessary, were generally centrally located (about 25 feet from the property boundary), were removed as soon as possible and were routinely inspected. Stockpiles were appropriately graded to control run-off in accordance with applicable laws and regulations.

3.10 Truck Inspection/Wash Station

Outbound-truck inspection/wash stations were erected at the Blue and Bell Slip egresses. Outbound trucks were required to stop at the inspection stations for examination by the contractors for evidence of soil and debris on the undercarriage, body, and wheels before exiting the site. Soil and debris observed on outbound trucks was removed by the contractors using brooms, shovels, and pressurized potable water, as necessary. Soil observed on sidewalks and streets outside of the construction egresses was routinely cleaned by the contractors.

3.11 Traffic Control

The contractors were provided with truck route maps showing designated NYC truck and commercial vehicle routes for use by vehicles arriving at and leaving the site.

3.12 Nuisance Controls

Continuous air monitoring was performed at the upwind and downwind perimeter of the site during earthwork to evaluate the need for vapor and dust control in accordance with the RAWP and CHASP. The perimeter of the site was screened for odors periodically by Langan staff. Dust, vapor and/or odor management during invasive on-site work included the following:

- Usage of water spray methodology for roads, excavation areas and stockpiles

- Proper usage of anchored tarps to cover stockpiles
- Limiting the area of open excavations
- Placement of clean aggregate on egresses and other roadways to provide a clean road surface free of nuisance dust

The vapor, odor and dust control plans were effective in controlling emissions; there were no community complaints and no instances of halting work because of nuisances.

3.13 Agency Approvals and Reporting

Permits and government approvals required for remediation and construction were obtained by the contractors before start of remediation and before each phase of construction. Langan generated daily and weekly reports to provide a general summary of activities for each day/week of active remedial work; these reports were uploaded to OER's Environmental Project Information Center (EPIC) by the end of the following day/week. Daily and weekly field reports are included as Appendix B. The reports generally included the following information:

- Project number
- Statement of the activities and locations of work performed
- An update of progress made toward completion of site remediation
- Quantities of material imported and exported from the site
- Status of on-site soil/fill stockpiles
- A summary of CAMP exceedances
- A summary of sampling activities
- Photographs of notable site conditions and activities

3.14 Materials Characterization

3.14.1 Additional In-Situ Waste Characterization – Building Foundation

Urban excavated a test pit to development depth and Langan collected one grab and one composite sample for laboratory analysis to characterize subsurface material not previously sampled during the initial waste characterization of the building footprint. Samples G1_GRAB01_12-14 and G1_COMP01_10-17 were containerized in laboratory-supplied glassware and submitted to a NYSDOH ELAP-certified laboratory (Alpha Analytical Laboratories, Inc., of Westborough, MA [ELAP ID # ID #11148]) via courier service under standard chain-of-custody protocol. The grab soil sample was analyzed for VOCs by USEPA Method 8260C and Extractable Petroleum Hydrocarbons (EPH) by USEPA Method 3546. The composite soil sample was analyzed for the following parameters:

- SVOCs by USEPA Method 8270D
- PCBs by USEPA Method 8082A
- Organochlorine pesticides by USEPA Method 8081B
- TAL metals by USEPA Method 6010C/7471B
- Hexavalent and trivalent chromium by USEPA Method 6010C
- Cyanide by USEPA Method 9010C/9012A
- Toxicity characteristic leaching procedure [TCLP] Resource Conservation and Recovery Act (RCRA) 8 metals by USEPA Method 6010C/1311
- Paint filter/free liquids by USEPA Method 9095B

A review of the analytical soil results indicated no VOCs, SVOCs, PCBs, pesticides, or metals exceeded the Part 375 Unrestricted Use SCOs or site-specific SCOs, EPH was not detected and the paint filter test was negative. In addition, no metals exceeded the maximum concentration for the toxicity characteristic. Excavated material from 10 to 17 feet bgs was classified as non-hazardous waste and managed accordingly during construction. Grab and composite sample summary results are presented in Table 1. A copy of the laboratory data report is included in Appendix D.

3.14.2 Additional In-Situ Waste Characterization – Utility Corridors

An in-situ waste characterization investigation was completed by MFM and their subcontractor, Long Island Analytical Laboratories, Inc. (LIAL), in June 2016 for the Blue and Bell Slip utility corridors to collect additional data to facilitate disposal of excavated site material and obtain facility approvals. The sampling methodology, field observations and results of the waste characterization are presented in the *Waste Characterization Report* for Greenpoint Landing Building G1, prepared by MFM and dated June 24, 2016. A copy of the report is included in Appendix D. A summary of the investigation and analytical results is provided below.

Blue Slip and Bell Slip were divided into waste characterization grids (Grids A, B, C, and D and E, F and G, respectively); about 7,000 tons of soil/fill material within the corridor areas were characterized. Two test pits were excavated within each grid. One test pit was excavated to about 8 feet bgs and a grab sample was collected from the 1-foot, 4-foot, and 8-foot depth intervals. The second test pit was excavated to about 6 feet bgs and a grab sample was collected from the 2-foot and 6-foot depth intervals. These five grab samples were mixed and homogenized to create the composite soil sample for each grid. In addition, one grab sample for VOC analysis was collected from each grid; the sample was either collected from the interval exhibiting the greatest degree of chemical and/or petroleum impacts based on field observations, or from the bottom of the test pit excavation, if impacts were not encountered.

Test pits were located and completed by MFM with an excavator under the supervision of Langan field staff. LIAL field staff classified and sampled the excavated material. Excavated soil/fill material was also inspected by a Langan field staff using PID, visual, and olfactory methods.

Samples were containerized in laboratory-supplied glassware and submitted to a NYSDOH ELAP-certified laboratory (LIAL, Inc. of Holbrook, NY [ELAP ID #11693]) under standard chain-of-custody protocol for analysis. Grab soil samples were analyzed for VOCs by USEPA Method 8260C and EPH by USEPA Method 8015C. Composite soil samples were analyzed for the following parameters:

- SVOCs by USEPA Method 8270D
- PCBs by USEPA Method 8082A
- Organochlorine pesticides by USEPA Method 8081B
- TAL metals (including boron and tin) by USEPA Method 6010C
- Hexavalent chromium by USEPA Method 7196A
- Mercury by EPA Method 7471B
- Cyanide by USEPA Method 9014
- TCLP RCRA 8 metals by USEPA Method 200.7 Rev. 4.4 (USEPA Method 245.1 for mercury)
- Ignitability by USEPA Method 1010A
- Corrosivity by USEPA Method 9045C
- Cyanide Reactivity by SW846 Chapter 7 Section 7.3
- Sulfide Reactivity by SW846 Chapter 7 Section 7.3

The stratigraphy underlying the utility corridors was generally comprised of sand, silt, gravel, and trace amounts of asphalt, concrete, brick, and wood fragments. No visual or olfactory (i.e., staining, free product, odors, etc.) indicators of a chemical or petroleum release were identified.

A review of the analytical soil results specific to the Parcel G1 utility corridors on Blue and Bell Slip indicated the following:

- VOCs, SVOCs, pesticides, and metals exceeded Part 375 Unrestricted Use SCOs in one or more of the soil samples
- No PCBs were detected above Unrestricted Use SCOs.
- No TCLP metals exceeded the maximum concentration of toxicity characteristic.

Based on the analytical results, the soil/fill in utility corridors was classified as non-hazardous waste and managed accordingly during construction.

3.14.3 Additional In-Situ Waste Characterization – SB-22 and EP-15

The waste characterization was completed by MFM and their subcontractor, LIAL, in January 2017 to facilitate off-site disposal of excavated hotspot material. The sampling methodology, field observations and results of the waste characterization are presented in the *Waste Characterization Report for the Four Hotspot Locations*, prepared by MFM and dated January 31, 2017. A copy of this report is included in Appendix D. A summary of the investigation and analytical results is provided below.

The hotspots at SB-22 and EP-15 were excavated by MFM with Langan oversight in January 2017. Excavated material was stockpiled separately on and covered with poly sheeting. A grab and composite sample were collected from each stockpile, containerized in laboratory-supplied glassware and submitted to LIAL under standard chain-of-custody protocol for analysis. Grab soil samples were analyzed for VOCs by USEPA Method 8260C. Composite soil samples were analyzed for the following parameters:

- SVOCs by USEPA Method 8270D
- PCBs by USEPA Method 8082A
- Pesticides by USEPA Method 8081A/8151A
- Herbicides by USEPA Method 8051
- TAL metals (including hexavalent chromium, mercury, boron and tin) by USEPA Method 6000
- Cyanide by USEPA Method 9014
- TCLP RCRA 8 metals by USEPA Method 1311/6010
- Ignitability by USEPA Method 1010A
- Corrosivity by USEPA Method 9045C
- Cyanide Reactivity by SW846 Chapter 7 Section 7.3
- Sulfide Reactivity by SW846 Chapter 7 Section 7.3

Summary of Waste Characterization Results

A review of the analytical soil results indicated no VOCs, PCBs, or pesticides exceeded Part 375 Unrestricted Use SCOs. SVOCs and metals exceeded Part 375 Unrestricted Use SCOs. No TCLP metals exceeded the maximum concentration of toxicity characteristic. Based on the analytical results, the material excavated from hotspot SB-22 was classified as non-hazardous waste and managed accordingly during construction.

3.14.4 Delineation of Characteristic Hazardous Lead Waste

The waste characterization investigation completed in September 2013 identified soil with characteristic hazardous concentrations of lead. Lead exceeded the maximum concentration for the toxicity characteristic (5.0 mg/L) at a concentration of 5.4 mg/L in one composite soil sample, G1_COMP-05S_0-5. This composite sample was derived from five grab samples collected from two soil borings (SB-5A and SB-5B).

In May 2016, before the start of general construction, Urban completed the initial excavation and removal of the hazardous lead waste area measuring about 40-feet by 60-feet to a depth of 5 feet bgs and then assisted Langan with a post-excavation confirmation end-point sampling program. The hazardous waste was disposed of at Clean Earth of North Jersey (CENJ) as described in Section 3.15. The hazardous waste in Grid 5 was delineated concurrently with hazardous waste removal. Historic fill within the hotspot area was characterized by greater amounts of coal, slag, and fly ash relative to the rest of the site.

The hazardous lead excavation area encompassed about 3,420 square feet and terminated at about 5 feet bgs. The extents of the completed excavation are presented in a topographical survey by Munoz Engineering P.C., dated June 21, 2016, which is provided in Appendix E. The locations of all delineation samples are presented on Figure 4. The tabulated analytical results for the delineation samples are presented in Table 2. The laboratory data reports are included in Appendix E. The OER was informed of the status of the delineation efforts on a timely basis. Analytical results, observations and each step towards remediation of hazardous waste were presented to the OER via email. Copies of these emails are included in Appendix C.

3.14.5 Hotspot Delineation and Removals

The RAWP identified 20 hotspot areas with total metals (arsenic, cadmium, copper, lead, mercury, and/or zinc) and/or total SVOCs concentrations that exceed Track 4 site-specific SCOs. One area exhibited characteristic hazardous lead waste. An additional hotspot was identified during the pre-cap endpoint sampling program completed during construction. The 21 hotspots are summarized in the following table:

Hotspot Summary				
Boring/Sampling Location(s)	**Contaminant**	**Depth (feet bgs)**	**Concentration (mg/kg)**	**Classification**
SB-1A / SB-1B	Arsenic Copper	5-10 0-5	54 810	Hotspot
SB-2A / SB-2B	Arsenic Copper	5-10 0-5	46 480	Hotspot

Hotspot Summary				
Boring/Sampling Location(s)	**Contaminant**	**Depth (feet bgs)**	**Concentration (mg/kg)**	**Classification**
	Lead	0-5	1,600	
SB-3A / SB-3B	Arsenic Copper	5-10 0-5	34 500	Hotspot
SB-5A / SB-5B	Copper Lead	0-5	620 5.4 mg/L	Hotspot Hazardous Waste
SB-7A / SB-7B	Copper	0-5	920	Hotspot
SB-8A / SB-8B	Arsenic Copper	5-10 0-5	30 440	Hotspot
SB-9A / SB-9B	Copper	0-5 5-10	680 2,900	Hotspot
SB-10A / SB-10B	Total SVOCs	5-10	1,246.17	Hotspot
SB-22	Arsenic Cadmium Copper Lead Zinc	3.5-5.5 3.5-5.5 0-2 0-2 0-2	33 22 2,500 3,300 19,000	Hotspot
B14	Lead	2-3.5	1,870	Hotspot
SB-33	Total SVOCs	0-2 3-5	457.75 306.44	Hotspot
SB-35	Lead Mercury	3-5	3,400 5.5	Hotspot
EP-15	Mercury	1-2	9.6	Hotspot

Hotspot areas, with the exception of SB-22, SB-33, SB-35, were removed as part of the mass excavation for the new building's foundation. Post-excavation confirmation endpoint samples were collected at development grade within the building footprint to confirm attainment of the site-specific SCOs. Hotspot excavations at SB-5A/SB-5B are discussed in Section 3.14.5.

The hotspot excavations at SB-22, SB-33, SB-35, and EP-15 and post-excavation confirmation endpoint sampling were completed in January 2017. Post-excavation confirmation endpoint samples were analyzed for hotspot-specific constituents of concern. The extents of the hotspot excavations were delineated horizontally and vertically with a survey (see Section 3.18). The excavations were backfilled to grade using manufactured quarry sand from ECM Hamburg Quarry via New York Sand and Stone (NYSS) after receiving permission from the OER on January 26 and 31, 2017. The excavations and confirmation endpoint sampling methodology and results are fully described in the technical letter report *Hotspot Endpoint Sampling and*

Construction Plan/Remedy, prepared by Langan and dated March 24, 2017, which is included in Appendix E. This report was provided to the OER in March 2017. The extents of the hotspot excavation areas and confirmation endpoint sampling results are presented in Figures 5 and 6.

3.15 Materials Excavation and Disposal

This section contains a summary of exported materials from each phase of Parcel G1 construction (foundation, utilities, and shoreline stabilization), including material types, export quantities, and disposal facilities. A tabulated summary of exported materials is provided in the table below. In accordance with the RAWP, real-time air monitoring for VOCs and particulates was performed during active load-out of soil/fill material. Excavated soil/fill was screened during intrusive work for indications of contamination using PID, visual, and olfactory methods. Excavated materials were appropriately segregated on-site prior to off-site disposal.

Exported Materials Summary Table							
Area of Site	**Disposal Facility Name and Address**	**Material Type**	**Quantity Exported**	**Date Range of Disposal**	**Permit/Registration and ID Number**	**Refer to Table**	**List of Supporting Documentation in Appendix F**
G1 Foundation	Evergreen Recycling of Corona (EROC) 12750 Northern Boulevard Flushing, New York 11368	Asphalt	284 cubic yards	5/5/16-5/9/16	NYSDEC Part 360 Registration #41W93	3	Part 360 Registration Manifests/Weight tickets
	Clean Earth of North Jersey (CENJ) 115 Jacobus Avenue Kearny, New Jersey 07032	Characteristic Hazardous Lead Waste (D008)	1,003.54 tons	5/6/16-5/25/16	NJDEP Permit No. HWP040002	4	Pre-approval request letter Waste profile/application RCRA Subtitle C Site Identification Form Facility permit Facility permit renewal Approval letter Waste transporter permits Manifests/Weight tickets Soil Disposal Notification
	Phase III Environmental, LLC 1120 Mauch Chunk Road Palmerton, PA 18071	Non-hazardous soil/fill material	4,614.76 tons	5/23/16-8/3/16	PADEP Permit #WMGR096NE003	5	Pre-approval request letter Waste profile/application Facility permit renewal Approval letter Manifests/Weight tickets Soil Disposal Notification
	Bayshore Recycling Corporation 75 Crows Mill Road Keasbey, New Jersey 08832	Non-hazardous soil/fill material	12,310.11 tons	5/24/16-9/30/16	NJDEP Permit #CBG110004	5	Pre-approval request letter Waste profile/application Facility permit Approval letter Manifests/Weight tickets Soil Disposal Notification

Exported Materials Summary Table							
Area of Site	**Disposal Facility Name and Address**	**Material Type**	**Quantity Exported**	**Date Range of Disposal**	**Permit/Registration and ID Number**	**Refer to Table**	**List of Supporting Documentation in Appendix F**
	110 Sand & Gravel via City Wide Recycling 170 Cabot Street West Babylon, New York 11704	Excavated treated timbers	100 cubic yards	5/26/16-6/10/16	NYSDEC Part 360 Permit #1-4726-00490/00010	7	Facility Permit Facility Permit Renewal Manifests/Weight tickets
Blue Slip, Bell Slip, and Utility Corridors	Allocco Recycling Ltd. 540 Kingsland Avenue Brooklyn, New York 11222	Asphalt	40 cubic yards	7/11/16-7/16/16	NYSDEC Part 360 Registration #24WA3	3	Part 360 Registration Manifests/Weight tickets
	Clean Earth of Carteret (CEC) 24 Middlesex Avenue Carteret, New Jersey 07008	Non-hazardous soil/fill material	4,307.27 tons	7/12/16-2/3/17	NJDEP Permit #CBG080002	5	Pre-approval request letter Waste profile/application Facility permit renewal Approval letter Manifests/Weight tickets Soil Disposal Notification
	Bayshore Recycling Corporation 75 Crows Mill Road Keasbey, New Jersey 08832	Non-hazardous soil/fill material	3,886.86 tons	7/15/16-4/12/17	NJDEP Permit #CBG110004	5	Pre-approval request letter Waste profile/application Facility Permit Approval letter Manifests/Weight tickets Soil Disposal Notification
	Allocco Recycling Ltd. 540 Kingsland Avenue Brooklyn, New York 11222	C&D debris	25 cubic yards	7/18/16	NYSDEC Part 360 Registration #24WA3	6	Part 360 Registration Manifests/Weight tickets
Shoreline (Lot 55)	EROC 12750 Northern Boulevard Flushing, New York 11368	C&D debris	468 cubic yards	7/18/16-10/13/16	NYSDEC Part 360 Registration #41W93	6	Part 360 Registration Manifests/Weight tickets

3.16 Confirmation Endpoint Sampling

Sixteen post-excavation confirmation endpoint samples and nine pre-cap confirmation endpoint samples were collected on Parcel G1 (see Figure 7):

- Post-excavation confirmation endpoint samples, EP-01 through EP-10 were collected from the final depth of the Parcel G1 building footprint excavation (about el. 2 feet to el. -4 feet).
- Post-excavation confirmation endpoint samples, EP-11 through EP-14 and EP-11 and EP-12 from former Parcel F1 were collected from the final depth of the Blue and Bell Slip utility corridor excavations (about el. 0.0 to el. 4.3).
- Pre-cap confirmation endpoint samples, EP-15 and EP-16 and EP-13, EP-14, EP-15 from former Parcel F1 were collected along the waterfront park/esplanade (about el. 10). In addition, shallow soil samples (from 0 to 2 feet below grade surface) collected from previous soil borings SB-21, SB-23, SB-34, and SB-44 completed as part of the Supplemental Remedial Investigations, serve as pre-cap confirmation endpoints.

Soil samples were analyzed for VOCs, SVOCs, PCBs, pesticides, herbicides and metals (including hexavalent and trivalent chromium) and cyanide. The soil analytical results are presented in Tables 8 and 9. The analytical results from EP-01 through EP-16 (all from the original Parcel G1 site) were presented to the OER via email on June 14, 2016, September 16, 2016, and October 6, 2016. Copies of these emails and the laboratory data reports are included in Appendix G. The confirmation endpoint samples collected from the former Parcel F1 were not presented to the OER in advance of this RAR.

The analytical results show that two of sixteen post-excavation confirmation endpoint samples (EP-09 and EP-13) and one of ten pre-cap confirmation endpoint samples (EP-15) did not meet the site-specific SCOs established in the RAWP. Residual soil/fill at all three locations will be managed with engineering and institutional controls (including a composite cover system) in accordance with the SMP.

3.16.1 Confirmation Endpoint Data Usability Summary

The requirement for an End Point Data Usability Summary is not included in the OER-approved RAWP. The following is an evaluation of quality assurance/quality control for confirmation endpoint sample analysis. A total of 16 confirmation samples and one duplicate sample were collected for laboratory analysis. Samples were collected using dedicated, disposable sampling equipment and submitted to a NYSDOH ELAP-certified laboratory (Alpha Analytical, Inc. of Westborough, MA [ELAP ID #11148]) via courier service under standard chain-of-custody

protocol. Endpoint samples comprised three 5-gram EnCore® samplers, one plastic 2-ounce unpreserved jar, and two 8-ounce unpreserved glass jars. Samples met National Environmental Laboratory Accreditation Program (NELAP) requirements for NELAP accredited parameters with no significant deviations encountered during preparation or analysis. Sample-specific quality control data for each individual sample and laboratory batch quality control for each parameter are summarized in the laboratory data packages.

3.17 Materials Import

Imported materials were screened during import for indications of contamination using instrumental (PID), visual, and olfactory methods. Imported materials were appropriately segregated on-site before use. Submittal packages for imported materials were prepared by the contractor and reviewed by Langan before import to the site. The OER was not notified of all imported materials; however, all imported materials, with the exception of fill material from Allocco Recycling Ltd for the Bell Slip underground gas line, were derived from virgin sources, did not require additional environmental testing, and met the requirements of the RAWP and SMMP. Available OER approvals for imported materials are included in Appendix C. Maps showing the placement areas of imported materials are provided as Figures 8 and 9. An imported materials as-built survey showing total depth to underlying, residual material is shown on Figure 10. The following table summarizes imported material types, volumes, and placement and import facilities.

Imported Materials Summary Table								
Area of Site	**Import Facility and Address**	**Material Type**	**Quantity Imported**	**Date Range of Import**	**Placement Location/Use**	**Permit/Registration and ID Number**	**Refer to Table**	**List of Supporting Documentation in Appendix H**
G1 Foundation	Vanbro Corporation 1900 South Avenue Staten Island, NY	3/4-inch RCA	93.50 tons	6/16/16	Temporary fill material for dewatering system equipment pad	NYSDEC Part 360 Registration No. 43W12R	10	Part 360 Registration Fill Transfer Station Permit Sieve analysis Weight ticket
	Liberty Stone & Aggregate LLC 50 Craven Point Avenue Jersey City, NJ	3/4-inch stone	84.78 tons	8/2/16-8/3/2016	Structural fill beneath building footprint	NJ Mine Registration No. 004201	10	Mine Registration Certificate Sieve analysis Weight Tickets
	Stavola Construction Materials Inc. 810 Thompson Ave, Bound Brook, NJ	3/4-inch stone	950.93 tons	7/14/16 – 9/22/16	Structural fill beneath building footprint	NJ Mine Registration No. 004231	10	Mine Registration Certificate Sieve analysis Weight Tickets
Blue Slip, Bell Slip, and Utility Corridors	Tilcon New Jersey – Pompton Lakes, NJ Quarry 1 Broad Street Pompton Lakes, NJ	3/4-inch stone	156.03 tons	7/20/16 – 9/6/16	Structural fill for Blue and Bell Slip utility corridors below cradles	NJ Mine Registration No. 004259	11	Mine Registration Certificate Sieve analysis Weight Tickets
	Lafarge Ravena Plant via NYSS 1916 US Route 9W Ravena, NY	3-inch stone	1,319.43 tons	9/6/16-4/12/17	General cover fill for Blue and Bell Slips Slip	NYSDEC Permit 4-0124-00001	11	NYSDEC Permit Sieve Analyses Weight Tickets
		3/4-inch stone	465.72 tons	9/8/16-1/25/17	Structural fill for Blue and Bell Slip utility corridors below cradles			

Imported Materials Summary Table								
Area of Site	**Import Facility and Address**	**Material Type**	**Quantity Imported**	**Date Range of Import**	**Placement Location/Use**	**Permit/Registration and ID Number**	**Refer to Table**	**List of Supporting Documentation in Appendix H**
	ECM – Hamburg Quarry via NYSS	2½-inch stone	24.93 tons	11/21/16	Structural fill below concrete utility cradles	NYSDEC Mine Registration No. 004034	11	Mine Registration Certificate Source Certification Sieve analyses Weight Tickets
		Manufactured quarry sand	12,974.66 tons	8/3/16 – 4/14/17	Structural fill for Blue and Bell Slip utility corridors and backfill for hotspot excavations in waterfront park areas			
Blue Slip, Bell Slip, and Utility Corridors	Sparrow Mining of Suffolk Mine (d/b/a Ranco Sand & Stone) 151 South Street Manorville, NY	Manufactured quarry sand	116.64 tons	8/3/16 – 12/28/16	Structural fill for Blue and Bell Slip utility corridors	NYSDEC Permit 1-4722-00218	11	NYSDEC Permit Sieve Analysis Weight Tickets
	Allocco Recycling Ltd 540 Kingsland Avenue Brooklyn, New York 11222	Fill material	18 cubic yards	2/20/2017	Structural fill for underground gas line (Bell Slip)	NYSDEC Part 360 Registration #24WA3	11	Part 360 Registration Analytical Data Sieve Analysis Truck Ticket
Shoreline (Lot 55)	Lafarge Ravena Plant via NYSS 1916 US Route 9W Ravena, NY	3/4-inch stone	207.48 tons	1/13/17-4/8/17	Structural fill for bulkhead reconstruction and shoreline stabilization	NYSDEC Permit 4-0124-00001	12	NYSDEC Permit Sieve Analyses Source Certification Weight Tickets
		4-inch stone	320.22 tons	9/27/16 – 10/7/16	Riprap Revetment			
		6-inch stone	2,135.29 tons	9/28/16 –	Riprap Revetment			

Imported Materials Summary Table								
Area of Site	**Import Facility and Address**	**Material Type**	**Quantity Imported**	**Date Range of Import**	**Placement Location/Use**	**Permit/Registration and ID Number**	**Refer to Table**	**List of Supporting Documentation in Appendix H**
				1/1/17				
	ECM – Hamburg Quarry via NYSS	Manufactured quarry sand	2,146.34 tons	9/15/16 – 4/24/17	Structural fill for bulkhead reconstruction and shoreline stabilization	NJ Mine Registration No. 004034	12	Mine Registration Source Certification Sieve Analysis Weight Tickets
Landscaped Areas	NYSS – Colarusso/Greenpoint Quarry via NYSS	1/2-inch Stone	9.56 tons	9/7/17	Drainage layer on Lot 80	NYSDEC Permit 4-1040-00011	13	NYSDEC Permit Sieve Analyses Weight Tickets
		1.5-inch stone	383.49 tons	11/3/2017 – 5/17/18	Blue Slip and Bell Slip Roadway Pavement Sub-Base			
		1-inch Stone	494.93 tons	7/28/17-5/31/18	General fill material for Lots 45 and 80			
		0.75-inch Stone	60.85 tons	11/14/17-4/24/18	Blue Slip and Bell Slip Roadway Pavement Sub-Base			
	Lafarge Ravena Plant via NYSS 1916 US Route 9W Ravena, NY	3-inch Stone	384.56 tons	7/26/17-8/30/17	Cover fill material for Lots 45 and 80	NYSDEC Permit 4-0124-00001		
	Tilcon New Jersey – Pompton Lakes, NJ Quarry 1 Broad Street Pompton Lakes, NJ	3/4-inch stone	4.12 tons	5/18/18	Blue Slip and Bell Slip Roadway Pavement Sub-Base	NJ Mine Registration No. 004259	13	Mine Registration Certificate Sieve analysis Weight Tickets
	ECM – Hamburg	Manufactured	728.88 tons	7/21/17-	General fill	NJ Mine Registration	13	Mine Registration

Imported Materials Summary Table								
Area of Site	**Import Facility and Address**	**Material Type**	**Quantity Imported**	**Date Range of Import**	**Placement Location/Use**	**Permit/Registration and ID Number**	**Refer to Table**	**List of Supporting Documentation in Appendix H**
	Quarry via NYSS	quarry sand		7/25/17	material for Lots 45 and 80	No. 004034		Source Certification Sieve Analysis Weight Tickets
	Sparrow Mining of Suffolk Mine (d/b/a Ranco Sand & Stone) 151 South Street Manorville, NY	Coarse sand for drainage layer (S3)	60 tons	5/17/18-5/23/18	Landscaped terraces, lawn, and tree planters in Blue Slip and Bell Slip	NYSDEC Permit 1-4722-00218	13	NYSDEC Permit Sieve Analysis Weight Tickets Field Sampling Report prepared by Roux Associates, Inc.
	Sparrow Mining of Suffolk Mine (d/b/a Ranco Sand & Stone) 151 South Street Manorville, NY	Planting soil blend of sand and loam (S2)	1,920 tons	4/26/18-5/31/18	Landscaped terraces, lawn, and tree planters in Blue Slip and Bell Slip	NYSDEC Permit 1-4722-00218	13	NYSDEC Permit Sieve Analysis Weight Tickets Field Sampling Report prepared by Roux Associates, Inc.
	Sparrow Mining of Suffolk Mine (d/b/a Ranco Sand & Stone) 151 South Street Manorville, NY	Planting soil blend of sand, loam and compost (S1)	360 tons	4/26/18 – 5/31/18	Landscaped terraces, lawn, and tree planters in Blue Slip and Bell Slip	NYSDEC Permit 1-4722-00218	13	NYSDEC Permit Sieve Analysis Weight Tickets Field Sampling Report prepared by Roux Associates, Inc.

Notes: 1. NYSS – New York Sand and Stone. NYSS is a commercial supplier of construction materials with distribution facilities at Pier J at the Brooklyn Navy Yard in Brooklyn, NY and at 75 25th Street, Brooklyn, NY

3.18 Demarcation

High visibility demarcation barriers and field surveys were used to demarcate residual historic fill material and are summarized in the following table:

Location	Method of Demarcation	Purpose	Reference
EP-13	Highly-visible physical barrier (orange geosynthetic fencing)	Demarcate residual historic fill material with parameters exceeding the Track 4 SCOs	Figure 11 Daily field report for December 22, 2016 (Appendix B)
SB-22, SB-33 and SB-35	Field survey	Demarcate residual historic fill material with parameters exceeding the Track 4 SCOs	Figure 11 Hotspot Endpoint Sampling and Construction Plan/Remedy letter report (Appendix E)
Utility corridors in Blue Slip and Bell Slip	Concrete utility cradles and clean corridors	Demarcate residual historic fill underneath and outside of the utility corridors	Figure 11 and Appendix I
Waterfront park, Blue Slip, Bell Slip	Pre-Construction Survey	Demarcate top of remaining historic fill underlying the imported fill material in the waterfront park, Blue Slip and Bell Slip	Figure 11 and Appendix I

4.0 ENGINEERING CONTROLS

Engineering controls were employed as part of the remedial action to address residual contamination remaining at the site. The site has two engineering controls:

1. A composite cover system
2. A waterproofing/vapor barrier membrane system

4.1 Composite Cover System

The site was capped with an engineered composite cover system to prevent exposure to residual historic fill material and areas where the historic fill material exceeds the site-specific SCOs, including subsurface material represented by two post-excavation confirmation endpoint samples (EP-09 and EP-13) and three hotspots (SB-22, SB-33, and SB-35) that were not excavated in their entirety. The composite cover system consists of the following components:

- A 20-inch thick concrete foundation slab at Building G1;
- At least 2 feet and up to 9 feet of imported manufactured quarry sand above the historic fill layer across Blue Slip, Bell Slip, and the waterfront park/esplanade areas;
- Reinforced concrete slab (6-inches thick) and/or temporary asphalt pavement (4-inches thick) above coarse aggregate at Blue Slip and Bell Slip; except tree planters in pedestrian sidewalks containing imported drainage and planting soils;
- Concrete pavers (3-inch thick) above reinforced structural slab (6-inches thick) above coarse aggregate at pedestrian sidewalks along Blue Slip and Bell Slip;
- Concrete pavers (4-inch thick) and cast-in-place concrete (4-inches thick) above an 8-inch reinforced structural slab above coarse aggregate at the waterfront esplanade;
- Cast-in-place concrete (4-inches thick) above coarse aggregate at walkways within the waterfront park areas; and
- Drainage and planting soils (S1, S2, and S3 materials) above the imported manufactured quarry sand above for landscaped areas and terraces and the lawn in the waterfront park and tree planters in pedestrian sidewalks along Blue and Bell Slips.

An imported materials as-built survey showing total depth to underlying, residual material is shown on Figure 10. At this time, the waterfront park/esplanade areas are covered with at least 2 feet or more of cover soil (imported manufactured quarry sand) and are substantially complete with respect to final hardscape and landscaped finishes. Most of the drainage and planting soils (S1, S2 and S3 materials) required for landscaped areas was imported and placed in the waterfront park/esplanade areas, Blue Slip, and Bell Slip. Some additional imports of planting soil and drainage material may occur in compliance with the SMP over the next few

months as New York City Department of Parks and Recreation completes their final walkthroughs and inspections of the waterfront park/esplanade areas. These materials will be derived from virgin sources. Field sampling packages received from BrightView indicate the planting soil meets the cover soil quality criteria (lower of the 6 NYCRR Part 375 Restricted-Residential and Protection of Groundwater SCOs). The as-built composite cover system layout and details are presented in Figures 12, 13, and 14.

4.2 Waterproofing/Vapor Barrier Membrane System

A waterproofing/vapor barrier membrane system was installed by Urban beneath the concrete slab (including the elevator pits and footings) and along the subsurface sidewalls of the foundation to mitigate against potential soil vapor intrusion into the new building. The waterproofing/vapor barrier system is composed of Grace Preprufe® 300R (46 mils) (installed under the horizontal slab), and Grace Preprufe® 160R (21 mils), Bituthene® 4000, and Hydroduct® 220 for vertical applications. The waterproofing/vapor barrier system was installed in accordance with the manufacturer's specifications. The installed waterproofing/vapor barrier system was inspected by Surface Design, Inc. Langan documented the waterproofing/vapor barrier membrane installation. Photographs of the installation process can be found in daily reports from July 19, 2016 to October 21, 2016 (Appendix B). The following documents associated with the waterproofing/vapor barrier membrane system are included in Appendix J:

- As-built drawings and details
- A letter from the contractor responsible for the installation
- An Registered Architect-certified letter from the third-party responsible for field inspections (Surface Design Group)
- The installer's certificate of warranty
- The manufacturer's certificate of warranty
- The installer certification letter from W.R. Grace
- Product specifications

5.0 SITE MANAGEMENT PLAN

An SMP was prepared as a companion document to the RAR. Site management is the last phase of the remedial process and begins after the approval of the RAR and issuance of the NOS by the OER. The SMP provides a detailed description of procedures required to manage residual material at the site following the completion of remedial construction in accordance with the OER's E-Designation requirements and to govern long-term performance of engineering controls (ECs) and institutional controls (ICs). ECs and ICs were incorporated into the remedial action to ensure that the site remains protective of human health and the environment. In general, ECs provide physical protective measures and ICs provide restrictions on site usage and establish remedial operation, maintenance, inspection and certification measures. The SMP describes the procedure for the operation and maintenance of ECs, maintenance of ICs, inspection of ECs and ICs, and certification of performance of ECs and ICs. It is the responsibility of the property owner to ensure that site management obligations are fulfilled as failure to implement the SMP may result in revocation of the NOS.

6.0 SUSTAINABILITY REPORT

6.1 Reuse of Clean, Recycleable Materials and Conservation of Natural Resources

Reuse of clean, recyclable materials reduced consumption of non-renewable virgin resources and provided energy savings and greenhouse gas reduction since these materials were locally derived. No excavated on-site material was reused on-site.

6.2 Reduced Energy Consumption and Promotion of Greater Energy Efficiency

Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, and can lower traffic congestion and provide substantial cost savings. Because no excavated on-site material was reused on-site, reduced energy consumption through fewer truck trips was not realized during construction.

6.3 Conversion to Clean Fuels

Use of clean fuel improves NYC's air quality by reducing harmful emissions. Natural gas is utilized as the principal fuel in the new building, instead of fuel oil.

6.4 Recontamination Control

Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later that could impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of existing contamination from off-site. The vapor barrier/waterproofing, composite cover system, consisting of a 20-inch thick concrete hydrostatic building slab, up to 9 feet of imported manufactured quarry sand above the historic fill layer across Blue Slip, Bell Slip, and the waterfront park/esplanade areas, and concrete and/or temporary asphalt pavement on Blue Slip, Bell Slip, and the waterfront park/esplanade areas, and reinforced soil/cement mixed support of excavation (SOE) wall will prevent underlying soil contamination from any future leaks and spills, and migration of vapors into the structure in the future. Therefore, the entire site footprint contains recontamination controls.

6.5 Stormwater Management

Stormwater management improves water quality by lowering the peak rate of combined storm-water and sewer discharges to the NYC's sewage treatment plants during periods of precipitation.

Stormwater at Parcel G1 will be collected and discharged via storm sewers on Blue Slip and Bell Slips that directly discharge to Newtown Creek at new outfalls. No stormwater from Parcel G1 will be conveyed to the municipal sewer network.

6.6 Paperless Brownfield Cleanup Program

BOP Greenpoint G, LLC participated in OER's paperless Voluntary Cleanup Program. Under this program, submission of electronic documents replaced submission of hard copies for the review of project documents, communications and milestone reports. An estimate of the mass (pounds) of paper saved under this plan is 30 pounds.

6.7 Trees and Plantings

Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance. About 60 trees and 80 shrubs (a mix of native and adaptive species), a multitude of perennial and meadow species, and grassy lawn areas (collectively covering about 12,000 square feet, or about 12% of the total site area) will be planted as a part of the Parcel G1 development.

7.0 CONCLUSION

This report documents that the remedial action completed at the site meets the remedial objectives set forth in the RAWP. Based on attainment of the remedial objectives, a Notice of Satisfaction is requested.