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Remedial Action Report Carteret Avenue (AOC CAR-1A) Soil Final

NJDEP Program Interest Number: G000005480

**PPG Garfield Avenue Group
Hudson County Chromate Sites
Jersey City, New Jersey**

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List of Acronyms and Abbreviations

AAC	Acceptable Ambient Concentration
ACO	Administrative Consent Order
AMP	Air Monitoring Plan
AOC	Area of Concern
ASTM	American Society for Testing and Materials
bgs	below ground surface
BOL	bill of lading
CCPW	Chromate Chemical Production Waste
CID	Case Inventory Document
CMAA	Construction Manager as Agent
COC	chain-of-custody
COPR	Chromite Ore Processing Residue
Cr ⁺⁶	hexavalent chromium
CrSCC	Chromium Soil Cleanup Criterion/Criteria
DCP	Dust Control Plan
DGA	dense-graded aggregate
DIGWSSL	Default Impact to Groundwater Soil Screening Level
EDD	electronic data deliverable
EI.	elevation
ENTACT	ENTACT Environmental Services of Latrobe, Pennsylvania
EQ	Environmental Quality Company
ERFS	Environmental Remediation and Financial Services, LLC
FSP-QAPP	Field Sampling Plan – Quality Assurance Project Plan
ft	foot or feet
GA Group	Garfield Avenue Group
GGM	green-gray mud
GPS	global positioning system
HASP	Health and Safety Plan
HCC	Hudson County Chromate
HDPE	high-density polyethylene
IGWSRS-GAG	Impact to Groundwater Soil Remediation Standard - Garfield Avenue Group
JCMUA	Jersey City Municipal Utilities Authority
JCO	Judicial Consent Order
JCRA	Jersey City Redevelopment Agency
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LSRP	Licensed Site Remediation Professional
mg/kg	milligrams per kilogram
MGP	manufactured gas plant
MS	matrix spike
MSD	matrix spike duplicate
NAVD88	North American Vertical Datum of 1988

NJ	New Jersey
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJGIN	New Jersey Geographic Information Network
OSHA	Occupational Safety and Health Administration or Act
PCBs	polychlorinated biphenyls
PDI	pre-design investigation
PI	Program Interest
PM	Project Manager
PPE	personal protective equipment
PSEG	Public Service Electric and Gas Company
PVSC	Passaic Valley Sewerage Commission
QA	quality assurance
QC	quality control
RA	remedial action
RAP	Remedial Action Permit
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan
RDCSRS	Residential Direct Contact Soil Remediation Standard
RE	receptor evaluation
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
RPD	relative percent difference
SESCP	Soil Erosion and Sediment Control Plan
SOP	Standard Operating Procedure
SRP	Site Remediation Program
SRS	Soil Remediation Standard
SSRIR	Supplemental Soil Remedial Investigation Report
SVOC	semi-volatile organic compound
SW	Southwestern
TEP	Technical Execution Plan
TOC	total organic carbon
TRSR	Technical Requirements for Site Remediation
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	volatile organic compound
Weston	Weston Solutions, Inc.

Regulatory Cross Reference Table

**Regulatory Cross Reference Table
Carteret Avenue, Garfield Avenue Group
PPG, Jersey City, New Jersey**

N.J.A.C. 7:26C and 7:26E (last amended August 6, 2018) regulations are the primary source of Remedial Action Report (RAR) requirements. This document is not to be used as a replacement for the Technical Regulations.

Regulation	Description	Document Location	
N.J.A.C. 7:26E-5.7	Remedial Action Report Requirements	Report	Location
5.7(a)	The person responsible for conducting the remediation shall implement the remedial action and submit to the Department a remedial action report, along with a form found on the Department's website at www.nj.gov/dep/srp/srra/forms , pursuant to (b) below, and according to the applicable regulatory timeframe in N.J.A.C. 7:26E-5.8.	Remedial Action Report Carteret Avenue (AOC CAR-1A)	throughout
5.7(b)	The person responsible for conducting the remediation shall present and discuss in the remedial action report all of the information identified or collected pursuant to N.J.A.C. 7:26E-5.1 through 5.6, along with all of the following:	Remedial Action Report Carteret Avenue (AOC CAR-1A)	throughout
5.7(b) 1	The general reporting requirements in N.J.A.C. 7:26E-1.6;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	see below
1.6(a) 1	Submit all documents, forms, spreadsheets and worksheets required in this chapter;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	The Cover/Certification Form is included with the Regulatory Forms. The paper Remedial Action Report form is no longer accepted and is intended for work conducted under the Licensed Site Remediation Professional Program. As this work is being conducted under direct oversight and not being submitted online, no Remedial Action Report form is included.
1.6(a) 2	Certify and have the licensed site remediation professional certify, pursuant to N.J.A.C. 7:26C-1.5, all forms and documents prepared to pursuant to this chapter;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	The Cover/Certification Form is included with the Regulatory Forms. The work is being conducted under direct oversight so it does not require certification by a Licensed Site Remediation Professional.
1.6(a) 3	Submit a completed case inventory document (CID) worksheet available on the Department's website at www.nj.gov/dep/srp/srra/forms at the front of each remedial phase workplan and report required by this chapter, except for a preliminary assessment report where no areas of concern were identified;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Regulatory Forms
1.6(a) 4	Submit a quality assurance project plan (QAPP) prepared pursuant to N.J.A.C. 7:26E-2.2 with each remedial phase workplan and report required by this chapter, except for a preliminary assessment report and remedial action report;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Not Applicable for this Remedial Action Report
1.6(a) 5	Except where a final remediation document for unrestricted use is filed with the Department within one year after the earliest applicable trigger to remediate listed in N.J.A.C. 7:26C-2.2, submit all sampling data electronically in a summary table using the format outlined in the Site Remediation Program's "Electronic Data Interchange Manual," available at www.nj.gov/dep/srp/hazsite/docs/ , in effect as of the date the document is submitted and include items described in subsections 1.6(a) 5.i-iii of Tech Reg.	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Electronic data deliverable provided to NJDEP for data used to document compliance with remedial action goals; receipts of submittal are included in Appendix D-2 - Documentation of EDD Submittal.
1.6(a) 6	Submit a geographic information system (GIS) compatible site plan that includes the site boundaries and the location of all areas of concern as polygons.	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Figure 1-2 - Site Plan for Carteret Avenue
1.6(b) 1	The physical setting of the site that includes a general description of soils, geology, hydrology, hydrogeology, and topography of the site and surroundings;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 2.2 - Physical Setting of the Site
1.6(b) 2	A description of any significant events or seasonal variations that may have influenced sampling procedures or analytical results;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	No significant events or seasonal variations influenced sampling procedures or analytical results. Soil sampling results are discussed in: Section 2.1 - Summary of Soil Remedial Investigation Findings Section 4.2 - Summary of Pre-Design Investigation Activities Section 5.3 - Post-Excavation Soil Sampling

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Regulation	Description	Document Location	
N.J.A.C. 7:26E-5.7	Remedial Action Report Requirements	Report	Location
1.6(b) 3	A description of the results and implications of field measurements or area-specific changes in sampling protocol due to field conditions;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Not Applicable for this Site
1.6(b) 4	A list of: i. All variances from the requirements of this chapter submitted pursuant to N.J.A.C. 7:26E-1.7; and ii. All rationales submitted for deviations from any technical guidance pursuant to N.J.A.C. 7:26C-1.2(a)3;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Not Applicable for this Site
1.6(b) 5	The applicable regulatory timeframe, including: i. Regulatory citation of the regulatory timeframe; and ii. Calendar date of the regulatory timeframe;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Master Schedule, referenced in Section 1.0
1.6(b) 6	A summary table(s), organized by area of concern, of all sampling results, including sample location, medium, sample depth, field and laboratory identification numbers, analytical results, and comparison to remediation standards, and the following: i. Identification of each contaminant concentration exceeding a remediation standard; ii. Identification of each sample with a method detection limit or a practical quantitation level that exceeds a remediation standard, along with an explanation in the table key; and iii. A report of all soils and solids sample results in milligrams per kilogram on a dry weight basis, aqueous sample results in micrograms per liter, and air results in micrograms per cubic meter;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Tables 5-1 through 5-3 - Analytical Results for In-Place Soil
1.6(b) 7	For soil borings, test pits and monitoring wells: i. Stratigraphic logs, which include soil/rock physical descriptions and field instrument readings detected during drilling for each soil boring, test pit and monitoring well; ii. State permit numbers and as-built specifications, if applicable; and iii. Monitoring well certification forms A (the well construction as built certification) and B (the well location certification) available on the Department's website at www.nj.gov/dep/srp/regs/guidance.htm ;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	i. Appendix H - Boring Logs ii and iii. Not Applicable
1.6(b) 8	Maps and figures, with map scale and orientation, including: i. Site location, land use, receptor evaluation, and area of concern maps; ii. Sample location map(s), that include the following: (1) Field identification numbers for all samples; (2) Sample locations, sample depths and contaminant concentrations plotted on the map; and (3) If data for more than 25 samples are presented for an area of concern, soil, ground water and sediment contaminant isopleth maps and cross section diagram(s), including the horizontal and vertical distribution of contaminants in each media, with sample point location numbers and contaminant concentrations; and iii. Ground water elevation contour maps showing the location of all monitoring wells, piezometers, or other ground water sampling points, for each set of static ground water level measurements for each aquifer;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	i. Site Location - Figure 1-1 Areas of Concern - Figure 1-2 Land Use – Regulatory Forms – Receptor Evaluation ii. Sample Location Maps: Figures 5-1A through 5-3B iii. Groundwater maps - Not applicable
1.6(b) 9	A discussion of the usability of laboratory analytical data;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 6.0 - Reliability of Data: Data Validation and Usability
1.6(b) 10	A description of the significance of information generated in the library search of tentatively identified compounds and unknown compounds.	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Not Applicable for this Site
5.7(b) 2	A presentation and discussion of all of the information identified or collected, pursuant to N.J.A.C. 7:26E-1.10 through 1.16 and an updated receptor evaluation on a form found on the Department's website at www.nj.gov/dep/srp/srra/forms ;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Regulatory Forms - Receptor Evaluation and Section 8.0 - Receptor Evaluation Update
5.7(b) 3	A summary of the findings and recommendations for each area of concern from the remedial investigation report prepared pursuant to N.J.A.C. 7:26E-4.9;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 2.3 - Recommended Remedial Action
5.7(b) 4	A description, by area of concern, of each remedial action implemented;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 5.0 - Description of the Remedial Action

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Regulation	Description	Document Location	
N.J.A.C. 7:26E-5.7	Remedial Action Report Requirements	Report	Location
5.7(b) 5	A list, by remedial action, of the remediation standards that apply to each remedial action;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 3.0 - Identification of Applicable Remedial Standards/Criteria and Table 3-1 - Soil Remediation Standards/Criteria
5.7(b) 6	Documentation, by area of concern, that each remedial action is effective in protecting the public health and safety and the environment by: i. Providing an overview of the data to establish the remedial action is operating as designed; or ii. Demonstrating compliance with the applicable remediation standards;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 7.0 - Documentation of the Protectiveness of the Remedial Action
5.7(b) 7	A remedial action permit application prepared pursuant to N.J.A.C. 7:26C-7, if applicable;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	The remedial action permit application will be prepared following NJDEP approval of the Remedial Action Report and finalizing of the Notice in Lieu of Deed Notice.
5.7(b) 8	"As-built" diagrams for any permanent structures associated with the remedial action including, without limitation, caps or other structures associated with the remedial action and engineering controls, if applicable;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 7.0 - Documentation of the Protectiveness of the Remedial Action Appendix F - As-Built Diagrams
5.7(b) 9	A detailed description of site restoration activities, if applicable;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 7.2 - Description of Site Restoration Activities
5.7(b) 10	The total remediation costs through the implementation of the remedial action;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 7.3 - Total Remedial Action Cost
5.7(b) 11	Documentation of all types and quantities of waste generated by the remedial action, including copies of fully executed manifests or bill(s) of lading documenting any off-site transport of waste;	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 7.4 - Documentation of Waste Generation and Disposal Appendix I - Hazardous Waste Disposal Documentation Appendix J - Non-Hazardous Waste Disposal Documentation
5.7(b) 12	Documentation of the source, type, quantities, and location of each alternative fill and clean fill used as part of the remedial action at the site; and	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 7.5 - Documentation of Source, Type, Quantities, and Location of Fill Appendix L - Clean Fill Documentation
5.7(b) 13	A description of each permit required and obtained to implement the remedial action.	Remedial Action Report Carteret Avenue (AOC CAR-1A)	Section 7.6 - Identification of Required Permits and Authorizations Appendix B - Permits and Approvals

Executive Summary

This Remedial Action Report (RAR) has been prepared by AECOM on behalf of PPG to document the remedial action (RA) for Chromate Chemical Production Waste (CCPW)-impacted soil at Carteret Avenue (Area of Concern [AOC] CAR-1A). Carteret Avenue (the Site) is part of the Garfield Avenue Group (GA Group) Sites, which include Sites 114, 132, 133, 135, 137, 143, and 186, and adjacent roadways and properties (**Figure 1-1**). Site 114 is the former location of a chromite ore processing facility previously owned by PPG, and the former Halladay Street Gas Works manufactured gas plant (MGP) previously owned by Public Service Electric and Gas Company (PSEG). Carteret Avenue is tracked under the New Jersey Department of Environmental Protection (NJDEP) Site Remediation Program (SRP) Program Interest (PI) number G000005480 for Site 114.

Carteret Avenue is located between Garfield Avenue to the west and Pacific Avenue to the east in Jersey City, New Jersey (NJ) (**Figure 1-2**). Carteret Avenue is bordered to the south by Site 143 (Block 21510, Lot 1), Site 132 (Block 21510, Lot 2), Site 137 North (Block 21510, Lot 3), Site 133 East (Block 21509, Lot 1), and Site 135 (Block 21509, Lot 2) as identified in the Jersey City Parcel Data from the New Jersey Geographic Information Network (NJGIN), last updated December 3, 2020 (available at: https://njgin.state.nj.us/OGIS_IV, last accessed in March 2021), and Halladay Street South (the portion of Halladay Street located between Carteret Avenue and Caven Point Avenue). Carteret Avenue is bordered to the north by Site 114 (specifically Block 21501, Lots 17 and 18.01 as identified in the City of Jersey City Tax Map Viewer, last updated February 2021 [available at: <http://hostedfiles.civilsolutions.biz/jerseycity/taxmaps/index.htm>, last accessed March 2021]), Halladay Street North (the portion of Halladay Street located between Forrest Street and Carteret Avenue), the Former Halsted Corporation property (specifically Block 21502, Lot 12), and Block 21502, Lot 11, as identified in the Jersey City Parcel Data from NJGIN. The total area encompassed by Carteret Avenue is approximately 1.4 acres.

This RAR addresses only the soil impacts for which PPG is responsible under the *Administrative Consent Order* (ACO) (NJDEP, 1990) and the *Partial Consent Judgment Concerning the PPG Sites* (Judicial Consent Order [JCO]) (Superior Court of New Jersey Law Division – Hudson County, 2009). PPG is responsible for CCPW-related impacts in Carteret Avenue emanating from Site 114.

PPG and PSEG are also jointly responsible for the remediation of MGP parameters emanating from Site 114 under the ACO and JCO. PSEG is taking the lead on closing out MGP-related impacts in Carteret Avenue in accordance with the Licensed Site Remediation Professional (LSRP) Program under PI number G000005480, activity number LSR120001, per the July 2019 agreement between PPG and PSEG (PPG and PSEG, 2019). Information required to document the remediation of MGP-related impacts will be presented by PSEG in their forthcoming RAR.

Constituents covered by this Carteret Avenue RAR include:

- Hexavalent chromium (Cr⁶⁺); and
- CCPW metals (antimony, total chromium, nickel, thallium, and vanadium).

Under the ACO and JCO, PPG is not responsible for other constituents exceeding the NJDEP Soil Remediation Standards (SRS) or Default Impact to Groundwater Soil Screening Levels (DIGWSSLs) that may be present at the Site. Remediation of non-CCPW-related constituents and constituents not

emanating from Site 114 is the responsibility of the property owner (i.e., the City of Jersey City [the City]) under the LSRP program.

This RAR presents a summary of the implemented RA for AOC CAR-1A (CCPW-impacted soil in Carteret Avenue), which is presented in the Case Inventory Document (CID). Documentation of the RA for MGP-impacted soil in Carteret Avenue will be provided by PSEG in a separate document. Groundwater impacted by CCPW and/or MGP-related material throughout the GA Group Sites is being tracked under the Site 114 PI number G000005480 and is not included on the CID for the Site; documentation of the RA for groundwater for the GA Group Sites will be provided in a separate document.

Based on the findings of the Remedial Investigation (RI), the recommended RA for soil at the Site included excavation and removal of CCPW-impacted soil as described in the *Final Remedial Action Work Plan (Soil) Rev. 4, Garfield Avenue Group Sites, Jersey City, New Jersey* (GA Group RAWP [RAWP = Remedial Action Work Plan]) (AECOM, 2018b) (see **Section 4.1.1** for the GA Group RAWP submittal history). Implementation of the full remedial excavation in Carteret Avenue was not possible at the time the RA was conducted due to structural concerns associated with the existing 96-inch combined sewer that runs the length of Carteret Avenue and with the adjacent building at Block 21502, Lot 11.

Therefore, the recommended RA for soil at the Site (AOC CAR-1A) included the following, as detailed in the *Final Remedial Action Work Plan (Soil) – Carteret Avenue (Revision 1)* (Carteret RAWP) (AECOM, 2019a) (see **Section 4.1.2** for the Carteret RAWP submittal history):

- Excavation of a clean corridor for utility workers to remove CCPW-related or historic fill-related impacts down to elevation (El.) 3.5 feet (ft) in the North American Vertical Datum of 1988 (NAVD88), where technically feasible, in coordination with the City and the Jersey City Municipal Utilities Authority (JCMUA);
- Excavation below El. 3.5 ft NAVD88, where feasible, to remove soil with concentrations of Cr⁺⁶ greater than the Chromium Soil Cleanup Criterion (CrSCC) down to the spring-line of the 96-inch combined sewer pipe, and deeper than the spring-line of the pipe to remove source material (i.e., CCPW, which is a potential source of Cr⁺⁶ and CCPW metals) and Cr⁺⁶ concentrations in soil greater than 1,000 milligrams per kilogram [mg/kg]), where present (CCPW includes Chromite Ore Processing Residue [COPR] and/or green-gray mud [GGM]); and
- Implementation of engineering controls (High-Density Polyethylene [HDPE] Liner) and institutional controls (notice in lieu of deed notice and implementation of the measures in the *Utility Work Coordination Manual, Final* [AECOM, 2020]) with a corresponding Remedial Action Permit (RAP).

The overall remedial objectives for Carteret Avenue, where implementation of the full remedial excavation was not possible at the time the RA was conducted, were:

- Prevention of potential exposure to Cr⁺⁶ in soil at concentrations greater than the CrSCC and CCPW metals in soil at concentrations greater than the CrSCC or SRS, as relevant, due to direct contact or windborne dust; and
- Reduction of potential exposure of utility workers to Cr⁺⁶ in soil at concentrations greater than the CrSCC and CCPW metals in soil at concentrations greater than the CrSCC or SRS, as relevant, due to direct contact or windborne dust.

For the purposes of planning and implementing the RA, Carteret Avenue was identified as part of GA Group Phase 4, which included roadways within the GA Group area (**Figure 1-2**). Remedial excavation in Carteret Avenue began on June 3, 2019 and was completed on January 15, 2020. Backfilling was completed on February 13, 2020. In AOC CAR-1A, the engineering controls included a HDPE Liner. Backfilling and restoration activities for Carteret Avenue were completed on February 13, 2020 (**Section 7.2**)

Confirmation sampling results presented on figures and tables in this RAR indicate remedial objectives for Carteret Avenue have been achieved as follows:

AOC CAR-1A - CCPW-impacted soil in Carteret Avenue:

- Soil with trace COPR nodules (not analyzed for Cr⁺⁶) remaining in place is being addressed by engineering controls (HDPE Liner) and institutional controls (notice in lieu of deed notice and implementation of the measures in the *Utility Work Coordination Manual, Final* [AECOM, 2020]) with a corresponding RAP.
- For Cr⁺⁶ remaining in soil at concentrations greater than the CrSCC that do not meet the Chromium Policy (NJDEP, 2007) per the Method to Determine Compliance (NJDEP, 2013), compliance averaging was used to attain compliance with the CrSCC, as discussed in **Section 7.0**. Additionally, for areas within Carteret Avenue where compliance with the CrSCC was demonstrated using spatial averaging, institutional controls (notice in lieu of deed notice) are being implemented to restrict use to non-residential use (**Section 7.0**).
- Soil concentrations of CCPW metals are in compliance with the CrSCC or SRS.
- Soil concentrations of CCPW metals in the unsaturated zone are in compliance with the DIGWSSLs and/or the site-specific Impact to Groundwater Soil Remediation Standards - GA Group (IGWSRS-GAGs).

The soil RA for AOC CAR-1A is effective in protecting public health and safety and the environment, and no further soil remediation is warranted at this AOC. This RAR demonstrates compliance with the applicable remediation requirements for the soil at AOC CAR-1A and no further action with regard to this AOC is needed, beyond filing the notice in lieu of deed notice and implementing the RAP. PPG requests the closure of AOC CAR-1A by the NJDEP through the issuance of a Consent Judgment Compliance Letter. Once the Consent Judgment Compliance Letter is granted, PPG will implement the permit conditions under the LSRP program, rather than under the JCO program.

1.0 Introduction

This Remedial Action Report (RAR) has been prepared by AECOM on behalf of PPG to document the remedial action (RA) for Chromate Chemical Production Waste (CCPW)-impacted soil, in Carteret Avenue (Area of Concern [AOC] CAR-1A). Carteret Avenue (the Site) is one of the Garfield Avenue Group (GA Group) Sites, which include Sites 114, 132, 133, 135, 137, 143, and 186, and adjacent roadways and properties (**Figure 1-1**). Site 114 is the former location of a chromite ore processing facility previously owned by PPG, and the former Halladay Street Gas Work manufactured gas plant (MGP) previously owned by Public Service Electric and Gas Company (PSEG). Carteret Avenue is tracked under the New Jersey Department of Environmental Protection (NJDEP) Site Remediation Program (SRP) Program Interest (PI) number G000005480 for Site 114.

Carteret Avenue is located between Garfield Avenue to the west and Pacific Avenue to the east in Jersey City, New Jersey (NJ) (**Figure 1-2**). Carteret Avenue is bordered to the south by Site 143 (Block 21510, Lot 1), Site 132 (Block 21510, Lot 2), Site 137 North (Block 21510, Lot 3), Site 133 East (Block 21509, Lot 1), and Site 135 (Block 21509, Lot 2) as identified in the Jersey City Parcel Data from the New Jersey Geographic Information Network (NJGIN), last updated December 3, 2020 (available at: https://njgin.state.nj.us/OGIS_IV, last accessed in March 2021), and Halladay Street South (the portion of Halladay Street located between Carteret Avenue and Caven Point Avenue). Carteret Avenue is bordered to the north by Site 114 (specifically Block 21501, Lots 17 and 18.01 as identified in the City of Jersey City Tax Map Viewer, last updated February 2021 [available at: <http://hostedfiles.civilsolutions.biz/jerseycity/taxmaps/index.htm>, last accessed March 2021]), Halladay Street North (the portion of Halladay Street located between Forrest Street and Carteret Avenue), the Former Halsted Corporation property (specifically Block 21502, Lot 12), and Block 21502, Lot 11, as identified in the Jersey City Parcel Data from NJGIN. The total area encompassed by Carteret Avenue is approximately 1.4 acres.

In 1990, PPG and the NJDEP entered into an *Administrative Consent Order* (ACO) (NJDEP, 1990) to investigate and remediate locations where CCPW-impacted materials related to former PPG operations may be present. On June 26, 2009, NJDEP, PPG, and the City of Jersey City (the City) entered into a *Partial Consent Judgment Concerning the PPG Sites*, also referred to as the Judicial Consent Order (JCO) (Superior Court of New Jersey Law Division – Hudson County, 2009), with the purpose of remediating soil and sources of contamination at the Hudson County Chromate (HCC) sites. Priority for the remedial activities was given to residential locations where the CCPW-impacted materials were present. The provisions of the original ACO remain in effect with the JCO taking precedence where there are conflicts between the two documents.

As part of the JCO, a judicially enforceable master schedule was created, establishing RA milestone dates for the NJ Chrome Remediation Sites, including Carteret Avenue. Since its establishment in 2009, the master schedule has been revised several times. The most recent revision to the Master Schedule was finalized on July 30, 2021 (Ricchio, 2021).

PPG and PSEG are jointly responsible for remediation of MGP parameters including those emanating from Site 114. PSEG is taking the lead on closing out MGP-related impacts in accordance with the Licensed Site Remediation Professional (LSRP) Program under PI number G000005480, activity number LSR120001, per the July 2019 agreement between PPG and PSEG (PPG and PSEG, 2019).

Information required to document the remediation of MGP-related impacts will be presented by PSEG in their forthcoming RAR.

Carteret Avenue is currently vacant land owned by the City. Prior to remediation, the property consisted of a two-lane asphalted roadway underlain by underground water, combined sewer, and gas utility lines.

This RAR presents a summary of the implemented RA for AOC CAR-1A (CCPW-impacted soil in Carteret Avenue), as presented in the Case Inventory Document (CID). The survey limits of AOC CAR-1A are shown on **Figure 1-2**. Documentation of the RA for the MGP-impacted soil in Carteret Avenue will be provided by PSEG in a separate document.

Groundwater impacted by CCPW and/or MGP material throughout the GA Group Sites is being tracked under PI number G000005480 for Site 114 (the location of the former chromite ore processing facility and MGP). Remediation of non-CCPW-related constituents and constituents not associated with the operation of the former Halladay Street Gas Works MGP is the responsibility of the property owner under the LSRP program (i.e., the City).

This RAR was prepared in accordance with the requirements set forth in the *Technical Requirements for Site Remediation* (TRSR), New Jersey Administrative Code (N.J.A.C.), Title 7, Chapter 26E, Subchapter 5.5 (N.J.A.C. 7:26E-5.5) (NJDEP, 1993b), Appendix A of the 1990 ACO (NJDEP, 1990), and the June 26, 2009 JCO (Superior Court of New Jersey Law Division – Hudson County, 2009).

The remainder of this RAR is organized as follows:

- **Section 2** provides the summary of soil remedial investigation (RI) findings and recommendations;
- **Section 3** identifies the applicable remedial standards/criteria;
- **Section 4** presents the summary of pre-remedial action design activities;
- **Section 5** provides the description of the RA implemented;
- **Section 6** discusses the reliability of the data including data validation and usability;
- **Section 7** includes documentation of the protectiveness of the remedy;
- **Section 8** provides the updated receptor evaluation information;
- **Section 9** presents the conclusions and recommendations; and
- **Section 10** lists the references cited in the report.

Supporting information is presented in the appendices.

2.0 Summary of Soil Remedial Investigation Findings and Recommendations

2.1 Summary of Soil Remedial Investigation Findings

RI activities performed at the GA Group Sites were detailed in the following reports, including Remedial Investigation Work Plans (RIWPs) and Remedial Investigation Reports (RIRs), previously submitted to the NJDEP:

- April 2003 *Remedial Investigation Work Plan – Site 114* (ENSR, 2003).
- March 2006 *Remedial Investigation Report – Site 114* (Site 114 RIR) (ENSR, 2006a).
- March 2006 *Remedial Investigation Work Plan – Site 114 (Off Site)* (ENSR, 2006b).
- September 2006 *Remedial Investigation Work Plan – Sites 132, 133, 135, 137 and 143* (ENSR, 2006c).
- December 2007 *Remedial Investigation Report Former Halladay Street Gas Works, Jersey City, New Jersey* (Halladay Street Gas Works RIR) (CMX, 2007).
- July 2008 *Remedial Investigation Report Addendum, Supplemental Offsite Soil Sampling, Former Halladay Street Gas Works, Jersey City, New Jersey* (RIR Addendum) (CMX, 2008).
- December 2009 *Remedial Investigation Report – Non-Residential Chromate Chemical Production Waste Sites, Sites 114, 132, 133, 135, 137, and 143* (AECOM, 2009).
- March 2011 *Soil Remedial Investigation Work Plan – Sites 114, 132, 133, 135, 137, 143 and Site 186* (AECOM, 2011a).
- November 2011 *Draft Remedial Investigation Report – Soil Garfield Avenue Group Non-Residential CCPW Sites 114, 132, 133, 135, 137, 143 and 186* (AECOM, 2011b).
- February 2012 *Remedial Investigation Report – Soil Garfield Avenue Group Non-Residential CCPW Sites 114, 132, 133, 135, 137, 143 and 186* (2012 RIR) (AECOM, 2012a).
- May 2014 *Remedial Investigation Report Former Halladay Street Gas Works Jersey City, New Jersey* (AMEC, 2014).
- August 2018 *Supplemental Soil Remedial Investigation Report, Final Revision 1, PPG Garfield Avenue Group, Hudson County Chromium Sites, Jersey City, New Jersey* (August 2018 SSRIR [SSRIR = Supplemental Soil Remedial Investigation Report]) (AECOM, 2018a), as approved by NJDEP on October 22, 2018 (NJDEP, 2018a).

The 2012 RIR provides a detailed summary of the previous RI work throughout the GA Group Sites, including Carteret Avenue. These initial investigation results were documented in the 2012 RIR (AECOM, 2012a), and the results from additional investigations in Carteret Avenue that occurred after the 2012 RIR were documented in the August 2018 SSRIR (AECOM, 2018a).

RI activities were conducted at Site 114 and the southern GA Group Sites (Sites 132, 133, 135, 137, and 143) between 2005 and 2008. The results of these activities were included in the Site 114 RIR (ENSR, 2006a), and the Halladay Street Gas Works RIR (CMX, 2007) and RIR Addendum (CMX, 2008).

The RI work was designed to delineate the compounds on or potentially emanating from Site 114 related to the former chromite ore processing operations and related to PPG's former ownership of Site 114. The compounds present on Site 114 included volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, and hexavalent chromium (Cr^{+6}), as well as CCPW, which is a potential source of Cr^{+6} and CCPW metals.

Carteret Avenue was initially targeted for RI activities by PPG due to its proximity to former waste stockpile areas located on Site 137 associated with the former chromite ore processing facility. RI activities were also conducted by PSEG for impacts related to the former MGP located in the northeastern portion of Site 114. PPG and PSEG conducted several RI phases throughout the GA Group Sites. The 2012 RIR incorporated the RI work conducted by both PPG and PSEG through 2011.

The RI activities identified the presence of Cr^{+6} in soil at Carteret Avenue at concentrations greater than the NJDEP Chromium Soil Cleanup Criterion (CrSCC). Most of the Cr^{+6} detected at concentrations greater than the CrSCC was found within the fill material that was placed on top of the meadow mat or on top of native materials. Concentrations of Cr^{+6} greater than the CrSCC within Carteret Avenue were limited to depths shallower than 36.5 feet (ft) below ground surface (bgs).

The RI activities identified the presence of CCPW metals in soil at Carteret Avenue at concentrations greater than the most stringent NJDEP Soil Remediation Standards (SRS) and the NJDEP Default Impact to Groundwater Soil Screening Levels (DIGWSSLs). In general, CCPW metals exceedances, particularly antimony and vanadium, were coincident with Cr^{+6} . None of the RI samples had nickel or thallium concentrations that exceeded the NJDEP SRS. Since the completion of the 2012 RIR, the NJDEP has eliminated the SRS for thallium.

2.2 Physical Setting of the Site

The GA Group Sites, including Carteret Avenue, are located in an urban area in Jersey City, Hudson County, NJ between Garfield Avenue, Caven Point Avenue, Pacific Avenue, and the NJ Transit Light Rail. The GA Group Sites consist of former industrial and commercial properties and businesses. The GA Group Sites, including Carteret Avenue, are located within the Canal Crossing Redevelopment Area, which encompasses 111 acres of planned redevelopment space in the southeastern section of Jersey City, NJ (City of Jersey City, 2009, amended October 2020).

There is little topographic relief within and surrounding the GA Group Sites, where the topography ranges from elevation (El.) 9 ft to 16 ft relative to the North American Vertical Datum of 1988 (NAVD88). However, west of Garfield Avenue, the land surface slopes upward and reaches approximately El. 100 ft NAVD88 about one-half mile to the west. The topography east of the GA Group Sites is fairly flat, extending to the Hudson River and Upper New York Bay. Due to highly compacted surface soil and other impervious features, storm water runoff within the GA Group Sites is primarily channeled into the municipal storm sewer system (ENSR, 2006a).

The GA Group Sites are located in a section of Jersey City that experienced significant industrial development in the early 1900s. To create more available land, developers filled the surrounding marshlands and estuarine areas. Research indicates that the fill included construction spoils

consisting of silts and sands, garbage from New York City, ship ballast, coal ash, and incinerator ash. It is unknown what specific fill material was used in which locations. The meadow mat associated with wetland areas was covered with fill materials and/or removed for building foundations or other improvement projects (ENSR, 2006a).

2.2.1 Topography

The United States Geological Survey (USGS) Jersey City, NJ topographic quadrangle map (**Figure 1-1**) presents the regional topography for the GA Group Sites and surrounding area. Carteret Avenue has little topographic relief, with ground surface ranging from El. 10 to 13 ft NAVD88. However, just to the west of Garfield Avenue, the topography rises approximately 30 to 40 ft in elevation within several hundred yards of the GA Group, and to about El. 100 ft NAVD88 about a half-mile west of the GA Group Sites. As of April 2020, the surface elevation of the Site following soil remediation and restoration ranges from El. 10 to 13 ft NAVD88.

2.2.2 Regional Geology

The regional geology includes unconsolidated sediments of Recent and Pleistocene age. According to the New Jersey Geological Survey, these sediments include alluvial, estuarine, eolian (windblown), and glacial lacustrine deposits, as well as glacial till of late Wisconsin age. The Triassic age bedrock of the Newark Group (Lockatong and Stockton formations) throughout the region is comprised of non-marine sedimentary rocks, consisting mainly of sandstone, mudstone, and conglomerate. A diabase sill (i.e., the Palisades Sill) intruded into the Lockatong formation west of Garfield Avenue approximately 200 million years ago.

2.2.3 Carteret Avenue Geology

Carteret Avenue is located on miscellaneous fill material that was used to reclaim the salt marsh for the construction of this portion of Jersey City. The estuarine native soil beneath the fill material includes an organic meadow mat layer and a thick sequence of unconsolidated natural material. The major geologic units in the area of Carteret Avenue from top to bottom include:

- A non-native fill layer (the shallow zone);
- Native soil consisting of sand, silty sand, and clays (the intermediate zone) generally separated from the fill by organic sediments or meadow mat;
- Till directly above the bedrock underlying sand with occasional gravel lenses generally separated from the intermediate zone by a layer of lower hydraulic conductivity silts and clayey silts (the deep zone); and,
- Bedrock of the Lockatong and Stockton Formations (bedrock zone).

The bedrock surface is relatively shallow west of Garfield Avenue, but fairly deep beneath Site 114. Bedrock was observed at depths greater than 10 ft bgs west of Carteret Avenue along Garfield Avenue, at depths exceeding 100 ft bgs below the center of Site 114, and at an approximate depth of 60-70 ft bgs in Carteret Avenue (AECOM, 2012a).

East of the GA Group Sites, the bedrock surface rises to a large bedrock plateau that extends to the shoreline of New York Bay. The bedrock slopes downward again east of Ellis Island (Stanford, 1995).

Estuarine organic-rich deposits (i.e., meadow mat) were identified at a number of boring locations. Observations have indicated that the meadow mat is not continuous. Depths of the meadow mat

range from approximately 10 to 21 ft bgs (AECOM, 2012a). Shallow soil (predominantly fill) extends from the ground surface to the top of the meadow mat, where the meadow mat is present, or to a similar depth where meadow mat is not present.

Below the meadow mat, soils are unconsolidated and are characterized by fine to medium sand and silt with clay and some gravel, typical of the current understanding of the geologic depositional history of the area. The native, unconsolidated soil ranges in thickness from approximately 56 to 77 ft, based on borings that extended to bedrock.

Excavation of the impacted miscellaneous fill at Carteret Avenue took place between June 2019 and January 2020. A summary of the restoration activities, including backfilling, is provided in **Section 7.2** of this RAR.

2.2.4 Hydrogeology

This RAR only addresses the RA of soil at Carteret Avenue AOC CAR-1A. Groundwater impacted by CCPW and/or MGP material throughout the GA Group Sites is being tracked under PI number G000005480 for Site 114 (the location of the former Chromate Chemical Production Facility and MGP). The status of the groundwater investigation throughout the GA Group Sites is documented in the *Groundwater Remedial Investigation Report, Revised Draft*, submitted to the NJDEP on March 24, 2021 (AECOM, 2021b). A separate RAR will be prepared and submitted to document the groundwater RA at the GA Group Sites. This description of hydrogeology is provided herein solely to meet the regulatory requirements of N.J.A.C. 7:26E-5.7(b)1 as specified by N.J.A.C. 7:26E-1.6(b)1.

2.2.4.1 Regional Groundwater Flow

Groundwater occurs regionally in the following geologic formations: the fill, the unconsolidated overburden soils/meadow mat, and the bedrock. A summary of groundwater flow in these formations is provided below:

- **Fill (Shallow Water-Bearing Zone):** Groundwater in the fill is unconfined and is typically encountered within 10 ft bgs. In general, the shallow zone groundwater flow patterns represent a subdued version of land surface topography. Variations in these flow patterns can be attributed to heterogeneities in the fill. For instance, tightly compacted dredged sediments would be expected to restrict water flow much more than construction debris. Subsurface infrastructure features (e.g., basements, drains, sewers, etc.) also affect shallow groundwater flow patterns. Groundwater elevations in the shallow fill are also influenced by recharge events.
- **Overburden (Intermediate and Deep Water-Bearing Zones) and Meadow Mat:** Groundwater flow in overburden materials is controlled by permeability or flow through the connected pore spaces in the soil matrix. In this zone, groundwater is mostly unconfined, but may be semi-confined to confined in areas with complex stratigraphy consisting of alternating layers of less- and more-permeable materials. Groundwater generally flows horizontally in these soils but may be influenced by local recharge and discharge zones. The meadow mat is a dense matrix of organic material and fine-grained soils, and this layer generally exhibits permeabilities that are three or more orders-of-magnitude less than surrounding materials.
- **Bedrock (Bedrock Water-Bearing Zone):** Groundwater flow in bedrock formations occurs within interconnected cracks and fractures in the rock. In general, the Palisades Sill has low permeability and is understood to be a no-flow boundary. Well yields from bedrock within the Project Area have been reported to range from several gallons to several hundred gallons per

minute, with yields generally decreasing with depth. Overall, groundwater flow in bedrock is a very small fraction of the total groundwater flux through the Project Area.

2.2.4.2 GA Group Sites Groundwater Flow

Like the regional hydrogeology, groundwater at the GA Group Sites occurs in several hydrogeologic zones:

- The shallow fill zone (shallow water-bearing zone);
- The intermediate sand and silty sand zone including the meadow mat (intermediate water-bearing zone);
- The deep sand, gravel lenses, silts, clays, and glacial till (deep water-bearing zone); and
- Bedrock of the Stockton and Lockatong Formations (bedrock water-bearing zone).

Shallow groundwater flow is complex and is affected by various on- and off-site activities and features, including excavations, placement of clean and/or amended fill, sheet pile, implementation of interim groundwater remedial measures, other subsurface infrastructure, and localized variability in recharge. Groundwater flow patterns within the shallow water-bearing zone are highly variable and no single dominant horizontal groundwater flow direction is discernible. Vertical groundwater flow directions within the shallow water-bearing zone are dominated by downward hydraulic gradients across most of the Site.

The principal direction of groundwater flow in the intermediate and deep water bearing zones is from northwest to southeast. Downward vertical hydraulic gradients provide groundwater influx to the intermediate zone from the overlying shallow water-bearing zone. Groundwater flow into the intermediate water-bearing zone also occurs along upward vertical hydraulic gradients from the underlying deep water-bearing zone, thereby recharging the intermediate zone.

During a May/June 2018 groundwater sampling round, groundwater elevations throughout the GA Group Sites in the shallow, intermediate, and deep overburden, and bedrock groundwater zones ranged from El. 3.25 to 12.78 ft NAVD88 (shallow), El. 6.16 to 9.67 ft NAVD88 (intermediate), El. 6.44 to 8.03 ft NAVD88 (deep), and El. 7.55 to 10.48 ft NAVD88 (bedrock).

The 50th percentile groundwater elevation for Carteret Avenue was estimated to be El. 7.2 ft NAVD88 based on groundwater elevation measurements from 11 monitoring wells located on or adjacent to Carteret Avenue gauged between February 2007 and May 2018. The monitoring well locations and data are included in **Appendix A**.

2.3 Recommended Remedial Action

Based on the findings of the RI, the recommended RA for soil at the Site included excavation and removal of CCPW-impacted soil. It was anticipated that the presence of CCPW metals (antimony, total chromium, nickel, thallium, and vanadium) at concentrations greater than the CrSCC, SRS, DIGWSSLs, or the site-specific IGWSRS-GAGs would be resolved as a result of the excavation being driven by the presence of Cr⁺⁶ at concentrations greater than the CrSCC.

Implementation of the full remedial excavation in Carteret Avenue was not possible at the time the RA was conducted, due to structural concerns associated with the existing 96-inch combined sewer that runs the length of Carteret Avenue and with the adjacent building at Block 21502, Lot 11.

Therefore, the recommended RA for soil at the Site included the following:

- Excavation of a clean corridor for utility workers to remove CCPW-related or historic fill-related impacts down to El. 3.5 ft NAVD88, where technically feasible, in coordination with the City and the Jersey City Municipal Utilities Authority (JCMUA);
- Excavation below El. 3.5 ft NAVD88 to remove soil with concentrations of Cr⁺⁶ greater than the CrSCC down to the spring-line of the 96-inch combined sewer pipe, and deeper than the spring-line of the pipe to remove source material (i.e., CCPW, which is a potential source of Cr⁺⁶ and CCPW metals, and Cr⁺⁶ concentrations in soil greater than 1,000 mg/kg), where present (CCPW includes Chromite Ore Processing Residue [COPR] and/or green-gray mud [GGM]); and
- Implementation of engineering controls (High-Density Polyethylene [HDPE] Liner) and institutional controls (notice in lieu of deed notice and implementation of the measures in the *Utility Work Coordination Manual, Final* [AECOM, 2020]) with a corresponding Remedial Action Permit (RAP).

3.0 Identification of Applicable Remedial Standards/Criteria

3.1 Regulatory Requirements, Guidance, and Alternative/Site-Specific Determinations

The RAs described in the RAWPs relevant to Carteret Avenue were performed in accordance with the following regulatory requirements, NJDEP Guidance, and Site-specific determinations:

- N.J.A.C. 7:9D – *Well Construction and Maintenance; Sealing of Abandoned Wells*, last amended January 2, 2018 (NJDEP, 2001).
- N.J.A.C. 7:26C – *Administrative Requirements for the Remediation of Contaminated Sites*, last amended August 6, 2018 (NJDEP, 1993a).
- N.J.A.C. 7:26D – *Soil Remediation Standards*, last amended September 18, 2017 (NJDEP, 2008a).
- N.J.A.C. 7:26E – *Technical Requirements for Site Remediation*, last amended August 6, 2018 (NJDEP, 1993b).
- NJDEP *Field Sampling Procedures Manual*, dated August 2005, last updated April 2011 (NJDEP, 2005).
- NJDEP *Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria*, dated September 2012 (NJDEP, 2012).
- NJDEP Memorandum from Lisa P. Jackson to Irene Kropp, Subject: *Chromium Moratorium*, February 8, 2007 (the Chromium Policy) (NJDEP, 2007).
- NJDEP *Chromium Soil Cleanup Criteria*, September 2008, revised April 2010 (NJDEP, 2008b).
- NJDEP *Administrative Consent Order*, dated July 19, 1990 (NJDEP, 1990).
- *Partial Consent Judgment Concerning the PPG Sites* (JCO) between NJDEP, PPG, and the City of Jersey City, June 26, 2009 (Superior Court of New Jersey Law Division - Hudson County, 2009).
- Letter from Mr. Thomas Cozzi to W. Michael McCabe, Subject: *Updated Method to Determine Compliance with the Department's Chromium Policy*, Garfield Avenue – Sites 114, 132, 133, 135, 137, and 143, Jersey City, NJ. August 13, 2013 (Method to Determine Compliance) (NJDEP, 2013).
- NJDEP Memorandum from Diane Groth to David Doyle, Subject: *PPG Garfield Avenue Group Sites, Adjacent Streets and Nearby Properties, Jersey City, NJ: Alternative Remediation Standard for Vanadium*, December 28, 2016 (NJDEP, 2016).
- August 2018 *Supplemental Soil Remedial Investigation Report, Final Revision 1, PPG Garfield Avenue Group, Hudson County Chromium Sites, Jersey City, New Jersey* (August 2018 SSRIR) (AECOM, 2018a), which presents the site-specific IGWSRS-GAG for antimony and nickel. The August 2018 SSRIR was approved by NJDEP on October 22, 2018 (NJDEP, 2018a).

3.2 Soil Remediation Standards/Criteria

For soil at Carteret Avenue, under the ACO and JCO, PPG is responsible for CCPW-related impacts present within the Site at concentrations greater than the CrSCC or NJDEP SRS. Additionally, PPG and PSEG are jointly responsible for MGP-related impacts in soil that have emanated from Site 114 onto Carteret Avenue. PPG is not responsible for any other constituents at concentrations exceeding NJDEP SRS, DIGWSSL, or IGWSRS-GAG that may be present at the Site. Remediation of non-CCPW-related constituents and constituents not emanating from Site 114 is the responsibility of the property owner (the City) under the LSRP program. This RAR addresses only CCPW-related impacts in soil. MGP-related impacts in soil will be addressed in a separate submittal by PSEG.

The NJDEP SRS and other criteria relevant to the remediation at Carteret Avenue are presented in **Table 3-1**.

4.0 Summary of Pre-Remedial Action Design Activities

Based on the findings of the RI (as summarized in **Section 2.0**), the recommended RA for soil at the Site included the excavation and removal of CCPW-impacted soil.

Where implementation of the full remedial excavation was not possible at the time the RA was conducted due to structural concerns associated with the existing 96-inch combined sewer that runs the length of Carteret Avenue and with the adjacent building at Block 21502, Lot 11, the recommended RA for soil included source removal, excavation of a clean corridor for utility workers, engineering controls (HDPE Liner), institutional controls (notice in lieu deed notice), and a corresponding RAP.

4.1 Summary of the Remedial Action Work Plan (Soil)

As described in this section, PPG developed a RAWP for the GA Group Sites (GA Group RAWP) (AECOM, 2018b), including Carteret Avenue, to address CCPW-related impacts in soil (**Section 4.1.1**).

Where implementation of the full remedial excavation was not possible at the time the RA was conducted due to structural concerns associated with the existing 96-inch combined sewer that runs the length of Carteret Avenue and with the adjacent building at Block 21502, Lot 11, PPG developed a Site-specific RAWP for Carteret Avenue (Carteret RAWP) as an addendum to the GA Group RAWP (**Section 4.1.2**).

4.1.1 GA Group RAWP

Following the preparation and submittal of the RIR (AECOM, 2012a), PPG prepared a RAWP for the GA Group Sites (GA Group RAWP).

The overall objectives for Cr⁺⁶ in CCPW and CCPW-impacted soil, as stated in the GA Group RAWP were:

- Elimination of potential exposure to Cr⁺⁶ in CCPW and CCPW-impacted soil due to direct contact or windborne dust;
- Removal of accessible impacted soil at depths less than 20 ft bgs and above the meadow mat;
- Removal of CCPW and certain impacted soil to depths greater than 20 ft bgs but to a maximum of 35 ft bgs where: a) the meadow mat is not present; and b) removal is technically prudent and beneficial to the future groundwater remediation; and
- Establishment of site conditions suitable for future uses of the Site.

The selected RA for soils at the GA Group Sites, as described in the GA Group RAWP, is excavation and off-site disposal. Excavation of soil containing Cr⁺⁶ was to meet the Chromium Policy (NJDEP, 2007) by following the Method to Determine Compliance (NJDEP, 2013). Meadow mat, where present, is to be protected to the extent practical since it provides a natural barrier to chromium migration and can reduce Cr⁺⁶ to trivalent chromium. In accordance with the GA Group RAWP, excavation areas are to be backfilled with soil suitable for residential, commercial, or other potential

uses. In areas where deemed necessary, a capillary break is to be installed between groundwater and the ground surface to eliminate the possibility of chromate crystallization from impacted groundwater wicking to the surface.

Carteret Avenue was identified in the GA Group RAWP as an Inaccessible Area, which is defined as an area within the GA Group Sites that is currently inaccessible to excavation for several reasons including the presence of roads, utilities, buildings, and the railroad. For Inaccessible Areas, the GA Group RAWP stated that PPG would work with the property owners to remove CCPW-impacted soil, as utilities are repaired, buildings are removed, and roadways are repaired or realigned. PPG would not initiate work related to these features but would remove chromium-impacted material in the proximity of these features as these areas become accessible on a case-by-case basis. The remedial approach for addressing impacted soil in Inaccessible Areas would be addressed as addenda to the GA Group RAWP or in Technical Execution Plans (TEPs) as these areas become accessible. Additionally, PPG would install and maintain containment measures and controls, such as engineering and institutional controls, as necessary, to address chromium-impacted materials in the Inaccessible Areas.

4.1.2 Carteret RAWP

PPG prepared a site-specific RAWP for Carteret Avenue entitled, *Final Remedial Action Work Plan (Soil) – Carteret Avenue, Addendum to the Final Remedial Action Work Plan (Soil) Rev. 4, Garfield Avenue Group Sites, Jersey City, Hudson County, New Jersey* (Carteret RAWP) (AECOM, 2019a).

The overall remedial objectives for inaccessible soil in Carteret Avenue with CCPW-impacts as proposed by the Carteret RAWP were:

- Prevention of potential exposure to CCPW-impacted soil due to direct contact or windborne dust; and
- Reduction of potential exposure for utility workers to CCPW-impacted soil due to direct contact or windborne dust.

The selected RA for CCPW-impacted soil in Carteret Avenue consisted of the following:

- Excavation of a clean corridor for utility workers to remove CCPW-related or historic fill-related impacts down to El. 3.5 feet ft NAVD88, where technically feasible, in coordination with the City and the JCMUA;
- Excavation below El. 3.5 ft NAVD88, where feasible, to remove soil with concentrations of Cr⁺⁶ greater than the CrSCC down to the spring-line of the 96-inch combined sewer pipe, and deeper than the spring-line of the pipe to remove source material; and
- Implementation of engineering controls (HDPE Liner) and institutional controls (notice in lieu of deed notice and implementation of the measures in the *Utility Work Coordination Manual, Final* [AECOM, 2020]) with a corresponding RAP.

Based on the site conditions within Carteret Avenue and the criteria established as part of the *Capillary Break Design Final Report (Revision 2)* (AECOM, 2017e) and the *Capillary Break Design Final Report (Revision 2) Addendum (Revision 1)* (AECOM, 2021a), a capillary break is required in portions of Carteret Avenue where remediation of soil adjacent to the Block 21502, Lot 11 building was not completed due to a structural offset, and where trace COPR nodules were observed in the excavation sidewall, since COPR is a potential source of Cr⁺⁶ and CCPW metals.

4.2 Summary of Pre-Design Investigation Activities

As part of the pre-RA activities, and in an effort to better define the excavation limits and planned excavation, Pre-Design Investigation (PDI) activities were implemented. These activities included advancing soil borings; conducting test pits, utility surveys, geotechnical assessments, and sampling; and obtaining permits, where required. The goals of these activities were to define the limits of excavation and the locations of underground utilities under adjacent roadways, and to obtain geotechnical data to support the design of excavation.

The results of the PDI activities and proposed excavation limits were presented in the Carteret RAWP (AECOM, 2019a).

5.0 Description of the Remedial Action

The RA at AOC CAR-1A (CCPW-impacted soil in Carteret Avenue) included two parts. The first part included excavation of CCPW-impacted soil, off-site transport and disposal of affected soil, backfilling of the excavations, and restoration of the affected areas. It was anticipated that the presence of CCPW metals (antimony, total chromium, nickel, thallium, and vanadium) at concentrations greater than the CrSCC, SRS, and DIGWSSLs, as relevant, would be resolved as a result of the excavation being driven by the presence of Cr⁺⁶ at concentrations greater than the CrSCC. The second part included placement of engineering controls (HDPE Liner), a notice in lieu of deed notice, and a corresponding RAP to mitigate exposure to soil with trace COPR nodules, which are a potential source of Cr⁺⁶ and CCPW metals, that remain in place in AOC CAR-1A. The HDPE liner is also intended to function as a capillary break between groundwater and the ground surface to eliminate the possibility of chromate crystallization from impacted groundwater wicking to the surface.

The RA was performed in accordance with the Carteret RAWP (AECOM, 2019a), as described in **Section 4.1**.

Preparatory activities for the remediation of the GA Group Sites, overall, began in 2010 with obtaining regulatory permits and/or approvals to facilitate implementation of RA. Mobilization and preparation for RA of the GA Group Sites began in June 2010.

AECOM served as the remediation engineer. Mueser Rutledge Consulting Engineers served as the geotechnical/structural engineer.

ENTACT Environmental Services of Latrobe, Pennsylvania (ENTACT) served as Construction Manager as Agent (CMAA) to manage and coordinate the work of multiple contractors hired by PPG to perform the required remedial construction and support work.

AECOM performed the air monitoring at the Site during excavation and restoration activities, in accordance with the December 2010 *Revision of the Air Monitoring Workplan for Ground Intrusive Activities at the Garfield Avenue Site in Jersey City, New Jersey* (AECOM, 2010b) and the *Air Monitoring Plan Amendment 35* (AECOM, 2018c).

ENTACT performed the remedial construction activities at the Site. These services consisted of coordination and disconnection of utilities, excavation and backfilling, decontamination, demolition, dewatering, and Site restoration.

ENTACT coordinated transportation and disposal of the waste streams generated from the RA activities.

The following sections summarize the RA activities as implemented.

5.1 Pre-Construction Activities

The following activities were conducted prior to starting excavation of CCPW-impacted soil:

- Approval of permit applications and plans submitted to the state and local agencies.

- Implementation of a Soil Erosion and Sediment Control Plan (SESCP).
- Implementation of the Air Monitoring Plan (AMP).
- Development of a site-specific Health and Safety Plan (HASP).
- Site utility clearance.
- Abandonment of monitoring wells located within the extent of excavation.
- Mobilization of equipment and set up of temporary facilities.
- Establishment of work zones.

The necessary permits were obtained from and approved by the state, local, and county agencies prior to initiation of activities covered by the permits as detailed in **Section 7.6**. Necessary permits and approvals are documented in **Appendix B**.

Coordination meetings were held among PPG, AECOM, JCMUA, ERFs, Jersey City Redevelopment Agency (JCRA), and the Site Administrator project manager (PM) during the pre-planning phase.

Pre-construction activities including mobilization and placement of jersey barriers and temporary fencing, implementation of the SESCO, establishment of work zones, and utility clearance were performed. Prior to excavation work, electric and natural gas utilities were disconnected by PSEG and sewer and potable water service was cut and capped under the supervision of JCMUA.

The AMP was developed to provide specific procedures for measuring, documenting, and responding to potential airborne impacts during remedial activities at the Site. The AMP was approved by NJDEP prior to the initiation of work.

A HASP was developed for the RA at the GA Group Sites (including Carteret Avenue) in accordance with the Occupational Safety and Health Act (OSHA) 1910.120. The HASP documents policies and procedures to be followed to protect workers and the public from potential hazards posed at the GA Group Sites. The HASP includes training program protocols, a medical surveillance program, equipment maintenance programs, personal hygiene practices, a project air monitoring plan, a dust control plan, and other information.

In addition to contacting the New Jersey One-Call system, a utility survey was conducted prior to intrusive Site activities to mark underground utilities (gas, sewer, water, phone, cable, electrical, etc.) that exist within the proposed excavation area. The underground water, 48-inch sewer, and gas lines were abandoned prior to excavation and were removed during excavation. The 96-inch sewer was protected in place during remediation.

Monitoring wells 114-MW22A (permit number 2600081172), 114-MW22B (permit number 2600081173), 114-P2B3-MW2 (permit number E201409187), 114-P2B4-MW1 (permit number E201409188), 132-P3A-MW1 (permit number E201410048), 132-P3A-MW5 (permit number E201410052), 137-P3B-MW1 (permit number E201413188), and MW-34 (permit number E201211015), MW-35 (permit number E201211016) were properly abandoned by New Jersey-licensed well drillers in accordance with the NJDEP's *Well Construction and Maintenance; Sealing of Abandoned Wells* (N.J.A.C. 7:9D) (NJDEP, 2001). Well abandonment documentation is included in **Appendix C**. Per the Carteret RAWP (AECOM, 2019a), monitoring well 114-P2B3-MW1 (permit number E201409186) was scheduled to be abandoned but could not be located.

Equipment was delivered during the initial mobilization phase for the RA activities at the GA Group Sites and on an as-needed basis as work progressed. Temporary facilities including field office

trailers, sanitary facilities, and Conex/intermodal boxes for equipment storage were mobilized onto Site 114 and set up for use during the RAs. As remediation progressed, some support trailers were relocated to Site 133 East and Site 135 to improve logistics.

Work zones were established to exclude unauthorized personnel from entering the Site and to prevent contamination from being tracked off Site or into clean work zones. The following work zones were established:

- A Secure Zone was established to exclude unauthorized personnel from entering the Site. The Secure Zone consisted of a steel chain link fence and locking gates. Warning signs were placed on the fence to prevent unauthorized entry into work areas.
- A Support Zone was established to stage office trailers, sanitary facilities, Conex/intermodal storage boxes, and vehicle parking.
- An Exclusion Zone encompassed areas associated with impacted material and/or heavy equipment hazards. Temporary fencing was installed to isolate the exclusion zones and modified Level D personal protective equipment (PPE), including Tyvek, was required when working in the exclusion zone.
- A Contamination Reduction Zone and a truck decontamination pad were constructed for transition from the Exclusion Zone. The Contamination Reduction Zone prevented the track-out of sediment onto off-Site streets other paved areas, and onto sidewalks from vehicles and personnel exiting the Site.

Existing shoring present along much of Carteret Avenue was used to support excavation at the Site. Excavation shoring consisted of steel sheet pile. The excavation shoring along the boundary of Carteret Avenue and Site 114 (specifically Phase 1B) was installed in February 2012 (**Figures 5-1A and 5-1B**). The excavation shoring along the Site 114 boundary between Carteret Avenue, Halladay Street North (the portion of Halladay Street between Carteret Avenue and Forrest Street), and Forrest Street was installed between May 2013 and July 2014. The excavation shoring along Carteret Avenue and Site 132 was installed between March and September 2014. The excavation shoring along Carteret Avenue and Site 137A was installed between July and December 2014.

5.2 Excavation

In accordance with the Carteret RAWP (AECOM, 2019a), excavation was conducted in Carteret Avenue to create a clean corridor with no CCPW-related or historic fill-related impacts down to El. 3.5 ft NAVD88, where technically feasible. To facilitate excavation of a clean corridor in Carteret Avenue, removal of non-chrome fill (i.e., historic fill material that did not contain CCPW- or MGP-related impacts) was required. Excavation continued below El. 3.5 ft NAVD88 to remove soil with concentrations of Cr⁺⁶ greater than 20 mg/kg down to the spring-line of the 96-inch sewer pipe, and deeper than the spring-line of the pipe to remove source material, where present.

Soil analytical results from the RI soil boring program and the PDI soil boring program were used to in developing the excavation limits. See **Section 2.0** for further information regarding the RI and **Section 4.0** for further information regarding PDI activities.

Excavation of Carteret Avenue began on June 3, 2019 and was completed on January 15, 2020. Excavation was performed by ENTACT utilizing an excavator.

AECOM implemented dust control measures at the Site, in accordance with the March 2011 Revision of the Dust Control Plan (DCP) and applicable DCP Amendments, during excavation, stockpiling,

transportation, backfilling, and associated activities during the RA. Results of the air monitoring and sampling during the Carteret Avenue activities were documented as part of the activities associated with the larger scale GA Group Sites, available on the Chromium Cleanup Website (<http://www.chromiumcleanup.com>, last accessed in March 2021) in the form of Weekly Reports and Annual Reports and Event Documentation Reports. The concentrations and the short-duration metrics demonstrated that the dust control measures were effective at maintaining Cr⁺⁶ in dust at concentrations less than the Acceptable Ambient Concentration (AAC).

ENTACT verified excavation extents using global positioning system (GPS) survey equipment to document that proposed excavation limits were achieved. Before placement of backfill, the excavation was visually inspected by a representative from the Site Administrator's independent technical consultant, Weston Solutions, Inc. (Weston), and an AECOM geologist for the presence of CCPW, as it is a potential source of Cr⁺⁶ and CCPW metals. If no evidence of CCPW was observed through visual inspection, a survey of the inspected area was conducted by a surveyor licensed in the State of New Jersey, post-excavation samples were collected (if required), and the inspected area was backfilled upon review and approval of the survey data by AECOM. **Figures 5-1A** through **5-3B** depict the final excavation as-built conditions.

Excavated CCPW-impacted materials were live-loaded into lined dump trucks where possible. During times when excavation was progressing, but trucks were not on site, day piles were created adjacent to or within the excavation in areas that had not yet been remediated. The ground surface was pitched so that liquid that may have drained out of the soil returned into the excavation prior to its transport for off-site disposal (see **Section 7.4** for details related to waste generation and disposal).

Concrete was stockpiled to be sized prior to load out in accordance with the Soil and Stockpile Management Plan for the GA Group Sites included in the GA Group RAWP (AECOM, 2012c). The stockpiles were located on un-remediated portions of the Site. Since the stockpile locations were to undergo excavation as part of a subsequent phase of work, post-removal soil samples were not collected from below the stockpiles.

Non-chrome fill was temporarily stockpiled on Site 143 adjacent to the Carteret Avenue excavation in accordance with the memorandum entitled, *Carteret Avenue Non-Chrome Fill Soil Re-Use Plan (Revision 2)* (AECOM, 2019b) included in the Carteret RAWP, the Soil and Stockpile Management Plan for the GA Group Sites included in the GA Group RAWP, and site policies and procedures as outlined in Field Change Notification SWTEP 3 – Relocation of Stockpile Area, and with the Flood Hazard Area Permit requirements.

Surface water runoff, storm water, groundwater entering the excavation, and decontamination wastewater were transferred by pump to the GA Group Sites groundwater treatment plant located on Site 137.

5.2.1 Sewer Bedding Investigation

In Spring 2018, an investigation was attempted within Carteret Avenue to determine the location and elevation of the top of the 96-inch combined sewer line, to verify the elevation of the sewer spring-line, and to visually and analytically assess the nature of the sewer pipe bedding material, as described in the Carteret RAWP (AECOM, 2019a). Due to the unexpected depth of the pipe, the presence of timber shoring at the side of the pipe, and the soil conditions encountered, the investigation was not able to be completed (Carteret RAWP) (AECOM, 2019a). Since the 2018 investigation could not be completed, the sewer pipe bedding was to be investigated for the presence of CCPW material during remedial excavation at locations that exhibited the highest pre-remediation concentrations of Cr⁺⁶ in soil (AECOM, 2019a). However, due to the presence of timber shoring located on either side of the

96-inch sewer, the bedding material beneath the pipe could not be evaluated without a risk to the pipe. Excavation exposed the pipe to the spring-line, and no evidence that CCPW was used as bedding material was observed in the materials located at the spring-line of the pipe. No CCPW was observed in the bedding material for the 48-inch sewer, which was accessible to observation during removal of that pipe.

5.3 Post-Excavation Soil Sampling

During the course of RA activities, post-excavation pit bottom samples were collected, if required, consistent with the requirements set forth in the Method to Determine Compliance (NJDEP, 2013), the August 10, 2015 email from Weston to AECOM, Subject: *RE: Sidewall Sampling Exceedance Procedure* (Weston, 2015), and the GA Group RAWP (AECOM, 2018b) to document post-excavation conditions.

Where the excavation sidewalls varied by more than two feet vertically, sidewall samples were collected every 30 linear ft and at two-ft depth intervals. Where excavation sidewalls were enclosed by shoring, or where the excavation sidewalls varied by less than two ft vertically, sidewall sampling was not conducted.

The post-excavation/confirmation samples were analyzed for:

- Cr⁺⁶ using United States Environmental Protection Agency (USEPA) SW-846 Method 3060A digestion and USEPA SW-846 Method 7196A, as modified by NJDEP;
- pH using USEPA SW-846 Method 9045C, D;
- Redox Potential using American Society for Testing and Materials (ASTM) International Method D1498-76M; and
- Total chromium, antimony, nickel, thallium, and vanadium using USEPA SW-846 Method 6010C (in 10% of selected samples only per the GA Group RAWP [see **Section 4.1** for the GA Group RAWP submittal history] and Field Change Notification SWTEP 1 discussed in **Section 5.5**).

The other constituents for which PPG was responsible (select SVOCs and VOCs identified as parameters emanating from Site 114) were analyzed for in the post-excavation/confirmation samples as follows:

- VOCs using USEPA SW-846 Method SW8260 (in 10% of selected samples only); and
- SVOCs using USEPA SW-846 Method SW8270 (in 10% of selected samples only).

Analytical results for VOCs and SVOCs will be presented by PSEG in their forthcoming RAR for MGP-related impacts.

In accordance with the Carteret RAWP, additional excavation (re-dig) was not completed where Cr⁺⁶ concentrations associated with post-excavation soil samples exceeded the CrSCC but were less than 1,000 mg/kg (see **Section 3.0**).

Figures 5-1A through **5-3B** and **Tables 5-1** through **5-3** present data for locations within the Carteret Avenue boundary that have samples remaining in place. In addition, locations from outside the Carteret Avenue boundary and/or removed samples may be shown to demonstrate compliance with the RA objectives. Laboratory analytical reports and data validation reports for the data presented in

Tables 5-1 through **5-3** are included in **Appendices D** and **E**, respectively. The laboratory electronic data deliverables (EDDs) have been submitted to the NJDEP database, as documented in **Appendix D-2**.

5.3.1 Non-Chrome Fill Characterization Sampling

Characterization samples were collected from the non-chrome fill material stockpiles in accordance with the *Carteret Avenue Non-Chrome Fill Soil Re-Use Plan (Revision 2)* (AECOM, 2019b), which was included in the Carteret RAWP (AECOM, 2019a). Samples were collected consistent with the requirements of N.J.A.C. 7:26E and as specified in Table 1 of the *New Jersey Department of Environmental Protection, Site Remediation Program, Fill Material Guidance for SRP Sites, Version 3.0* (NJDEP, 2015) (NJDEP's Fill Material Guidance for SRP Sites).

The non-chrome fill characterization samples were analyzed for:

- Cr⁺⁶ using USEPA SW-846 Method 3060A digestion and USEPA SW-846 Method 7196A, as modified by NJDEP;
- pH using USEPA SW-846 Method 9045C, D;
- Redox Potential using ASTM International Method D1498-76M;
- Total chromium, antimony, nickel, thallium, and vanadium using USEPA SW-846 Method 6010C; and
- MGP-related impacts that have emanated from Site 114 into Carteret Avenue (2-methylnaphthalene, benzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and naphthalene) using USEPA SW-846 Method SW8270.

Additional samples were collected from non-chrome fill material stockpiles for waste characterization purposes, if required, to confirm that the material was non-hazardous. Samples collected for waste characterization purposes were collected per waste disposal facility requirements in accordance with the *Carteret Avenue Non-Chrome Fill Soil Re-Use Plan (Revision 2)* (AECOM, 2019b). The data associated with samples collected for waste characterization purposes did not require data validation. See **Section 7.5.1** for additional details.

5.4 Engineering and Institutional Controls

5.4.1 HDPE Liner Engineering Control

As described in the Carteret RAWP, a 15-ft excavation offset (support-of-excavation offset for Pacific Avenue buildings) was established adjacent to the Block 21502, Lot 11 building due to structural concerns. As shown in **Figure 5-1B**, trace COPR nodules remain in the excavation sidewall adjacent to the Block 21502, Lot 11 building as a result having to maintain this excavation offset. The soil containing trace COPR nodules observed in this area was not analyzed for Cr⁺⁶. The engineering control for soil with trace COPR nodules, which are a potential source of Cr⁺⁶ and CCPW metals, remaining in this area consists of an HDPE liner.

Following remediation of soil in Carteret Avenue, dense-graded aggregate (DGA) backfill material was placed at the bottom of the excavation in this area and compacted to final backfill subgrades. In a portion of the support-of-excavation offset for the Pacific Avenue buildings (**Figure 5-1B**), the existing asphalt was removed and underlying soil was excavated to approximately 18 inches bgs to approximately El. 8.5 ft NAVD88. A 40-mil HDPE Liner was placed on top of the prepared surface in this area. Along the northern boundary of Carteret Avenue, the liner was placed to abut the Block

21502, Lot 11 building. Eight inches of DGA was then placed on top of the HDPE liner. The DGA on top of the HDPE liner does not serve as an engineering control.

The horizontal extent of the HDPE Liner engineering control is depicted on the as-built diagrams in **Appendix F**. The northwestern extent of the HDPE Liner is the property boundary and the remaining extents are based on the limits of soil with trace COPR nodules remaining in place in this area (as shown on **Figure 5-1B**).

Within the restricted area, the HDPE Liner serves as an engineering control for a portion of AOC CAR-1A to restrict access to soil with trace COPR nodules, which are a potential source of Cr⁺⁶ and CCPW metals. This HDPE liner also serves as a capillary break, as described in **Section 7.2**.

5.4.2 Institutional Controls

The draft notice in lieu of deed notice for CCPW-related impacts in Carteret Avenue is provided in **Appendix G**. The notice in lieu of deed notice restricts the use to non-residential use within areas of Carteret Avenue where compliance with the CrSCC is demonstrated through spatial averaging (see **Section 7.0**). Once NJDEP approves the RAR, the notice in lieu of deed notice will be filed with the following entities: 1) each road department of each municipality in which the property is located; 2) each road department of each county in which the property is located; 3) the New Jersey Department of Transportation; and 4) each utility company with an easement on the roadway, pursuant to N.J.A.C. 7:26C-7.2. Once the notice in lieu of deed notice is filed, a RAP application will be submitted for the remaining soil impacts, along with the final RAR, to NJDEP for approval.

5.5 Field Change Notifications

Field changes made during implementation of the RA at the GA Groups Sites were documented in Field Change Notification forms. Field Change Notifications submitted relevant to the RA activities at Carteret Avenue are listed in **Table 5-4**.

6.0 Reliability of Data: Data Validation and Usability

6.1 Data Validation

Data validation was performed by AECOM to evaluate whether the analytical data collected to demonstrate compliance with the Carteret Avenue RAR objectives were scientifically defensible, properly documented, of known quality, and met RAR objectives. Data validation included the review of analytical procedures, quality control (QC) results, calibration procedures, data reduction, and completeness of the laboratory data packages as specified in the soil RIWP (AECOM, 2011a) and Field Sampling Plan – Quality Assurance Project Plan (FSP-QAPP) (AECOM, 2010a). Deficiencies noted were communicated to the laboratory and resolutions were documented in the data validation reports. If appropriate, data were qualified for use as described later in this section.

Note that for the Carteret Avenue RAR data set, 8 Cr⁺⁶ (1.67% of the data) data points and 81 CCPW metals (15.8% of the data) data points were not validated. The unvalidated data was not evaluated as part of this usability section, because it is not being used for decision-making purposes.

The laboratory analytical data packages (**Appendix D-1**) were reviewed in accordance with the FSP-QAPP (AECOM, 2010a), the NJDEP validation Standard Operating Procedures (SOPs) for Cr⁺⁶ and inorganic data, and USEPA Region 2 metals validation guidelines. The following NJDEP validation guidelines served as the basis for the actions taken during validation:

- NJDEP Office of Data Quality *SOP 5.A.10, Rev 3 (September 2009), SOP for Analytical Data Validation of Hexavalent Chromium – for USEPA SW-846 Method 3060A, USEPA SW-846 Method 7196A and USEPA SW-846 Method 7199* (NJDEP, 2009); and
- NJDEP Office of Data Quality *SOP 5.A.16, Rev 1 (May 2002), Quality Assurance Data Validation of Analytical Deliverables for Inorganics (based on USEPA SW-846 Methods)* (NJDEP, 2002).

Where USEPA Region 2 inorganic validation guidelines were also used in assessing metals, the most current guidance in effect at the time of validation was used; the specific revision used is listed in each data validation report provided in **Appendix E**. The link to Region 2 validation guidance on the USEPA website is shown below:

- <https://www.epa.gov/quality/region-2-quality-assurance-guidance-and-standard-operating-procedures> (last accessed in March 2021).

The level of validation ranged from a comprehensive validation according to the NJDEP guidelines to a limited validation based on QC summary information or completeness reviews, depending on the analyte and matrix. The validation procedures for the Cr⁺⁶ data included full validation, which involved a comprehensive review of both summary forms and raw data, whereas the metals data received limited validation. Limited validation for metals data was based on information provided by the laboratory on its QC summary forms and did not include raw data review. At a minimum, limited validation included validation of the following data elements:

- Agreement of analyses conducted with chain-of-custody (COC) requests;
- Holding times and sample preservation;

- Method blanks/field equipment blanks/trip blanks;
- Surrogate spike recoveries;
- Laboratory control samples (LCS) or equivalent results;
- Matrix spike (MS)/matrix spike duplicate (MSD) results;
- Laboratory duplicate results;
- Field duplicate results; and
- Quantitation limits and sample results (limited to evaluating dilutions and re-analyses).

Full validation was conducted on the Cr⁺⁶ data. Full validation included each of the data elements listed for limited validation along with review of calibration data and raw data and spot checks for verification of calculations.

Validation reports were prepared for each data package that was validated. The validation reports are provided in **Appendix E**. The reports summarize the samples reviewed, parameters reviewed, nonconformance with the established criteria, and validation actions (including application of data qualifiers) presented in accordance with the NJDEP “hit list” format. Validation data qualifiers were based on the USEPA Region 2 validation guidelines for organic data and the NJDEP validation SOPs for the Cr⁺⁶ and inorganic data. The following qualifiers are used in data validation:

- J Indicates the result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample. J+ or J- is used when the direction of bias can be determined.
- U Indicates the analyte was not detected in the sample above the sample reporting limit.
- UJ Indicates the analyte was not detected above the reporting limit and the reporting limit was approximate.
- UB The analyte concentration is less than or equal to three (3) times the concentration in the associated method/preparation blank. The presence of the analyte in the sample is negated due to laboratory blank contamination.
- JB The analyte concentration is greater than three (3) times, but less than or equal to ten (10) times the concentration in the associated method/preparation blank. The presence of that analyte in the sample is considered “real” but the concentration is quantitatively estimated due to method blank contamination.
- R The sample result was rejected due to serious deficiencies; the presence or absence of the analyte could not be confirmed.
- RA The sample result was rejected due to NJ-specific data validation QC requirements; however, the result is usable for project objectives. Refer to the Data Quality and Usability section of the data validation report for further information.

In addition, some of the data validation performed 2004-2006 included the following qualifiers:

- B The presence of the analyte in the sample is negated (B) due to laboratory blank contamination since the analyte concentration in the sample was less than three (3) times the maximum blank contamination.

- JF Overall qualification of “JF” since the analyte concentration is greater than three (3) times, but less than or equal to ten (10) times the concentration in the associated field blank.

6.2 Data Usability Assessment

Soil samples collected to demonstrate compliance with the RAR objectives were sent to Test America Laboratories (formerly Severn-Trent Laboratories) in Edison, NJ (NJ certification 12028) or SGS-Accutest Laboratories in Dayton, NJ (NJ Certification 12129). The analyses were performed in accordance with USEPA- and NJDEP-approved analytical protocols in place at the time the analyses were performed. Quality assurance analytical measures were implemented in accordance with the NJDEP TRSR (N.J.A.C. 7:26E) (NJDEP, 1993b) and complied with the requirements for a NJDEP-certified laboratory specified in *Regulations Governing the Certification of Laboratories and Environmental Measurements* (NJDEP, 1981). Specific quality control issues identified during validation are documented in the individual data validation reports provided in **Appendix E**. Results of the data validation indicated that, in general, the analytical data were of adequate quality to meet the project objectives. However, there were some quality assurance (QA)/QC issues identified during data validation that resulted in rejection of data or qualification of data as estimated.

Data usability was evaluated using the data quality indicators of precision, accuracy, representativeness, comparability, completeness, and sensitivity. Data that were not rejected during validation are regarded as usable.

Certain Cr⁺⁶ results that were rejected due to failure of the matrix spikes to meet the NJDEP-specified control limits of 50-150% were qualified “RA” to indicate that the result may have value for information purposes. This qualifier is typically used for Cr⁺⁶ where the spiked sample matrix appears to be reducing and would not be expected to support the presence of Cr⁺⁶. The presence of other indicators of a reducing environment such as total organic carbon (TOC), sulfide, or ferrous iron is a factor in the decision to utilize the “RA” qualifier for Cr⁺⁶ data.

No CCPW metals results were rejected.

6.2.1 Precision

Precision is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions and includes both field and analytical components. The information used to evaluate precision included results for field duplicates, matrix duplicates, and laboratory duplicates. For the Carteret Avenue RAR data set, relative percent difference (RPD) non-conformances were observed for field and laboratory duplicates associated with Cr⁺⁶.

Field precision was assessed through the collection and analysis of field duplicates and expressed as the RPD of the sample and field duplicate pair results. Approximately 17.8% of the Cr⁺⁶ results included field duplicate precision as a reason for qualification.

Laboratory precision was assessed through the RPD results for MS/MSDs, LCS/laboratory control sample duplicate (LCSD) pairs, and duplicate sample analyses. MS/MSDs and duplicate sample analyses do not reflect laboratory precision as purely as LCS/LCSDs since sample homogeneity, which can be a significant issue for soil samples, can impact the precision of sample and matrix spike duplicates. However, no differentiation of the applied reason code is made between LCS/LCSDs and

MS/MSDs or sample duplicates. Overall, 8.3% of the Carteret Avenue RAR validated data (primarily Cr⁺⁶ results) were qualified on the basis of laboratory precision; for the CCPW metals, 5.3% of the data were qualified on the basis of laboratory precision. Two Cr⁺⁶ results were also qualified for failure to meet the 20% RPD criteria between duplicate injection results associated with the ion chromatography analysis used in Method 7199.

6.2.2 Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference or true value. The results of LCS data, surrogate recoveries, method blanks, and MS/MSDs were used as the primary indicators of accuracy; information such as sample container type, preservation, and holding time was also considered as impacting to analytical accuracy. Some of this information was assessed by the laboratory at the time of receipt (container type and preservation); other parameters were evaluated during the validation process.

Approximately 8.4% of the Cr⁺⁶ results reported for the Carteret Avenue RAR were qualified “RA” to indicate the results were rejected since both initial and reanalysis spike recoveries fell outside of the control limits of 50-150%, but the sample matrix appeared to be reducing and, therefore, unable to support the presence of Cr⁺⁶; these results may provide further information for project decisions, but should be used with an understanding of the QC issues identified. None of the CCPW metals results associated with the RAR sampling were rejected on the basis of accuracy.

Qualification of data as estimated (J/J-UJ) for accuracy was related to issues such as field or laboratory blank contamination, LCS results, MS results, and percent solids. A summary of the validation findings is presented by QC parameter type below.

The presence of target analytes in laboratory blanks and blanks related to field activities (i.e., field blanks) was cited as a reason for qualification of selected CCPW metals results (approximately 1.2% of reported values). For those blanks in which contaminants were detected, action levels were established per the NJDEP or USEPA Region 2 validation guidance documents. Associated sample results were qualified accordingly. Approximately 2% of the Cr⁺⁶ results were qualified for field blank contamination.

In the CCPW metals fraction, 5.3% of the results (antimony and chromium) were qualified based on MS and/or MSD recoveries. Approximately 73% of the Cr⁺⁶ results were flagged as estimated based on the results of soluble and/or insoluble spike recoveries outside the range of 75-125% but within the limits of 50-150%. Data points impacted by MS and/or MSD recoveries within this range were flagged as J/J- or UJ; individual validation reports address the potential for high or low bias to sample results based on matrix interferences.

Moisture content greater than 50% resulted in selected data points being qualified. Approximately 8.1% of the metals results and 15.5% of the Cr⁺⁶ results were qualified on the basis of low percent solids.

Approximately 1.7% of the Cr⁺⁶ results were qualified because the laboratory storage exceeded the acceptable holding temperature of 6°Celsius for a period of approximately 18 hours.

6.2.3 Representativeness

The representativeness of any field program is a function of the planning and procedures used to collect the samples and the locations and density of samples collected. Sampling and preservation methods were based on established methods and SOPs outlined in the soil RIWP (AECOM, 2011a)

and FSP-QAPP (AECOM, 2010a), which are known to minimize error associated with the disturbance of environmental samples from their natural setting.

Factors to be considered in evaluating representativeness are the use of standard analytical procedures, sample preservation, and the use of the appropriate sample container. The analytical methods, preservation procedures, and containers used in this program were as specified in the FSP-QAPP.

Environmental samples are generally shipped so that the samples are maintained at a temperature of approximately 4°Celsius. Eight Cr⁺⁶ results (1.7% of Cr⁺⁶ data) were flagged as estimated based on the sample receipt temperature being over 4°Celsius.

The moisture content of samples is also a factor in the representativeness of the data. In accordance with USEPA Region 2 validation guidance, samples containing more than 50% moisture were qualified as estimated. As noted previously, this requirement resulted in the qualification of approximately 8.1% of the metals results and 15.5% of the Cr⁺⁶ results.

6.2.4 Comparability

Comparability of the data in the Carteret Avenue RAR data set was maximized by using standard methods for sampling, analysis, and data validation.

6.2.5 Completeness

Completeness is the measure of the amount of valid data obtained from a measurement system; valid data are defined as those data judged to be usable (i.e., not rejected as a result of the validation process). For the RAR, 904 individual data points were generated. Of those data points, 49 Cr⁺⁶ results (5.4% of the total results generated) were qualified as “RA” to indicate that although QC exceedances were identified, the results still had value for understanding Site conditions. There was one rejected non-detect Cr⁺⁶ result qualified as “R” to indicate that the data point is not usable for Site decisions due to serious nonconformances. Since only one Cr⁺⁶ result was qualified as R, over 99.8% of the results are considered usable for Site decisions with an understanding of the quality issues identified during validation.

No CCPW metals results were qualified R or RA.

6.2.6 Sensitivity

Analytical dilutions can be necessary due to the sample matrix or elevated concentrations of target or non-target analytes. The detection limits reported by the laboratory were adjusted to reflect dilution factors. Limitations in analytical methodologies and/or low percent solids content for some soil samples can result in detection limits that exceed either the Residential Direct Contact Soil Remediation Standard (RDCSRS), DIGWSSL, or the IGWSRS-GAGs. One thallium detection limit in the Carteret Avenue RAR data set exceeded the DIGWSSL.

6.2.7 Data Quality/Data Usability Conclusions

The findings of this Data Quality Assessment and Data Usability Evaluation indicate that the data used to demonstrate compliance with the RAR objectives are sufficiently representative of actual conditions and may be used to support decisions with the exceptions identified below:

- Cr⁺⁶ results qualified “RA” due to matrix spike recoveries outside the range of 50-150% may provide useful information for Site decisions based on the apparent reducing nature of the matrix but should be used with an understanding of the data limitations.
- The non-detected Cr⁺⁶ result qualified “R” due to not being re-digested and reanalyzed for low matrix spike recoveries is not usable for site decisions.

Data qualifiers and reason codes were applied by the data validator to identify data limitations found in the validation process. Specific details regarding analytes and samples can be found in the individual data validation reports in **Appendix E**.

7.0 Documentation of the Protectiveness of the Remedial Action

Soil analytical results from the RI and PDI soil boring programs were used in developing the excavation limits. These sampling results, in combination with the post-excavation sampling results, were used to document the effectiveness and completeness of the soil remediation.

As summarized in **Section 5.3**, the locations of samples used to demonstrate compliance with the remediation goals are depicted on **Figures 5-1A** through **5-3B**. **Tables 5-1** through **5-3** present the analytical results for samples used to demonstrate compliance with the remediation goals. Laboratory analytical reports and data validation reports for the data presented in these tables are included in **Appendices D** and **E**, respectively. As discussed in **Section 6**, the laboratory analytical data for the collected samples were found to be usable for the purposes of defining the extents of the remedial excavation. **Appendix H** presents the available boring logs from the locations of samples that were used to demonstrate compliance with the remediation goals.

AOC CAR-1A has been remediated as follows:

- Soil with trace COPR nodules (not analyzed for Cr⁺⁶), which are a potential source of Cr⁺⁶ and CCPW metals, remaining in place is addressed by an engineering controls (HDPE Liner) and institutional controls (notice in lieu of deed notice).
- Soil concentrations of CCPW metals are in compliance with the CrSCC or SRS.
- Soil concentrations of CCPW metals in the unsaturated zone are in compliance with the DIGWSSLs and/or the Site-specific IGWSRS-GAGs.
- For Cr⁺⁶ remaining in soil at concentrations greater than the CrSCC that do not meet the Chromium Policy (NJDEP, 2007) per the Method to Determine Compliance (NJDEP, 2013), compliance averaging was used to attain compliance with the CrSCC. For areas within Carteret Avenue where compliance with the CrSCC was demonstrated using spatial averaging, institutional controls (notice in lieu of deed notice) are being implemented to restrict use to non-residential use (**Figures 5-1A** through **5-3B**).

Waste manifests for soil and other materials that were loaded for off-site disposal are presented in **Appendices I** and **J**. The compliance averaging evaluation used to attain compliance with the CrSCC is included in **Appendix K**.

Clean fill documentation is provided in **Appendix L**.

7.1 As-Built Diagrams

The following as-built diagrams are included in **Appendix F**:

- An as-built diagram depicting the final extents of the excavation in Carteret Avenue;
- As-built diagrams depicting the horizontal extent and typical section of the HDPE Liner Engineering Control to address soil with trace COPR nodules remaining in place; and
- An as-built diagram of the final Site grades following restoration of Carteret Avenue.

7.2 Description of Site Restoration Activities

After completion of the excavation activities, the backfill was amended with FerroBlack®-H by ENTACT in accordance with the plans and specifications. The placement of FerroBlack®-H serves as a phase of groundwater remediation as documented in the *Progress Report for Groundwater Pilot Study and FerroBlack®-H Amended Backfill Permits-By-Rule - 2016 Fourth Quarter (October to December)* (AECOM, 2017a). Backfilling of Carteret Avenue was completed in stages, keeping pace with the excavation. Backfilling of Carteret Avenue began on June 18, 2019 and was completed on February 13, 2020.

Clean fill for site restoration consisted of DGA backfill material supplied by Tilcon. Information regarding the source and quality of the backfill material is provided in **Section 7.5**. Based on the compaction goal of 90% standard proctor, specified in the Carteret RAWP (AECOM, 2019a), ENTACT satisfactorily completed compaction of the backfill placed within the limits of Carteret Avenue. Final compaction results ranged from 93.5% to 111.9%, exceeding the 90% compaction goal.

Carteret Avenue was backfilled and restored in accordance with the *Restoration Technical Execution Plan, Garfield Avenue Group (Revision 1)* (Restoration TEP), dated August 2017 (AECOM, 2017b), the PPG/AECOM memorandum entitled *Response to NJDEP/Weston's 08/31/17 Comments and the City of Jersey City/ERFS's 09/12/17 Comments on the Restoration Technical Execution Plan, Garfield Avenue Group (Revision 1)*, dated October 16, 2017 (AECOM, 2017d), and the Carteret RAWP (AECOM, 2019a).

Per the Restoration TEP (AECOM, 2017c) and the Carteret RAWP (AECOM, 2019a), PPG committed to restoring the final surface finish in Carteret Avenue to match the pre-construction finish, consistent with the City standard construction details and storm drains that were removed during the remediation of Carteret Avenue. Restoration of the final surface finish and storm drains is being addressed as part of the infrastructure restoration agreement between PPG and the City and, therefore, is not documented in this RAR.

For the purposes of this RAR, restoration activities are considered to be physically complete as of February 13, 2020, which corresponds to the backfilling completion date, and administratively complete as of December 16, 2020, which is the date that the NJDEP accepted the capillary break determination for Carteret Avenue as presented in the *Capillary Break Design Final Report (Revision 2) Addendum (Revision 1)* (AECOM, 2021a) (See **Section 4.1.2**).

Sheet pile that is in place at the time of the preparation of this RAR will remain in place at least until soil remediation of the adjacent area, Phase 3B South, is implemented. Prior to demobilization from Phase 3B South, the sheet pile on the southern side of Carteret Avenue will be removed. Sheet pile on the northern side of Carteret Avenue along Site 114 will remain in place until no longer needed to satisfy remedial objectives for groundwater, as specified in the forthcoming RAWP for groundwater at the GA Group Sites, or to satisfy PSEG's remedial objectives for MGP impacted material, as specified in the *Public Service Electric and Gas Company (PSEG) Remedial Action Work Plan Addendum for On-Site Soils, Former Halladay Street Gas Works, Jersey City, New Jersey* (PSEG, 2012).

7.3 Total Remedial Action Cost

PPG's total remediation cost for implementation of the RA at Carteret Avenue AOC CAR-1A was approximately \$23 million. This includes the costs for RI, engineering, excavation and backfilling, air monitoring, construction management, groundwater management and treatment, waste transportation and disposal, and overall project management and reporting.

7.4 Documentation of Waste Generation and Disposal

The approximate in-place volume of soil that was excavated from the Carteret Avenue AOC CAR-1A and disposed of off site is approximately 47,000 tons.

Waste manifests and bills of lading (BOLs) for the time period during which Carteret Avenue was excavated (June 3, 2019 to January 15, 2020) are included in **Appendix I** (Hazardous Waste Disposal Documentation) and **Appendix J** (Non-Hazardous Waste Disposal Documentation).

Other materials generated as a result of the RA activities at Carteret Avenue included contaminated debris and groundwater treatment plant sludge.

The following facilities were used for the off-site disposal of waste materials generated during RA activities at Carteret Avenue:

Hazardous Waste Materials

- Stablex, Canada Inc., Blainville, Québec, Canada;
- Environmental Quality (EQ) Company - Michigan Disposal Waste Treatment Plant, Belleville, Michigan;
- EQ Envirite of Pennsylvania, Inc., York, Pennsylvania;
- EQ Envirite OHIO - Envirite of Ohio, Inc. in Canton, Ohio; and/or
- Clean Earth of New Jersey, Kearny, NJ.

Non-Hazardous Waste Materials

- Cumberland County Improvements Authority Landfill, Deerfield Township, New Jersey;
- EQ - Michigan Disposal Waste Treatment Plant, Belleville, Michigan; and/or
- BayShore Recycling Corp. in Keasbey, New Jersey.

Water

- Pre-treatment through the on-site treatment plant located on Sites 137A and 137B followed by discharge to the public sewer system (conveyed via JCMUA system) to the Passaic Valley Sewerage Commission (PVSC) Wastewater Treatment Plant, Newark, NJ (under the PVSC Sewer Use Permit #31630035, included in **Appendix B**) for final treatment and discharge.

Copies of fully executed manifests, BOLs, and certificates of disposal documenting the off-site transport of waste material are presented in the following appendices:

- **Appendix I** – Hazardous Waste Disposal Documentation. This appendix includes fully executed manifests and certificates of disposal (if provided) documenting the off-site transport of hazardous soil, concrete, sludge, and other debris, such as scrap metal.
- **Appendix J** – Non-Hazardous Waste Disposal Documentation. This appendix includes BOLs documenting the off-site transport of non-hazardous soil.

7.5 Documentation of Source, Type, Quantities, and Location of Fill

Licensed quarry material was utilized for backfill and restoration and consisted of ¾-inch open grade stone and DGA supplied by Tilcon from their mine facilities at 625 Mt. Hope Road, Wharton, NJ and

Broad Street, Pompton Lakes, NJ, licensed quarry facilities permitted to operate as commercial quarries by NJDEP.

To meet the minimum requirements of the NJDEP TRSR (NJDEP, 1993b) at the time of the Carteret Avenue remedial activities, the sources of imported fill were certified by the supplier as clean from a virgin source, based on their knowledge of the place of origin and history.

In accordance with Field Change Notification #16A dated July 24, 2015, each quarry was required to submit, on an annual basis, its license (mining certificate) and annual certification that the imported material was from a clean, virgin source along with analytical results provided by the quarry/mine in accordance with NJDEP's Fill Material Guidance for SRP Sites (NJDEP, 2015).

The concentrations of the analytes in samples collected from the quarry material were less than the NJDEP RDCSRS and the quarry material did not pose a potential impact to groundwater (per NJDEP's Fill Material Guidance for SRP Sites [NJDEP, 2015]), indicating that the material was acceptable for on-site use.

In addition, AECOM implemented a stringent visual inspection process, conducted by on-site AECOM personnel, to verify the quality of the backfill. Visual inspection criteria included size of the individual stones, presence of foreign debris, ratio of fines in the material, and significant differences in color.

A list of the quarry material load reports is provided in **Appendix L-1** and the analytical reports, mine certificates, and annual certifications are provided in **Appendix L-2**.

7.5.1 Non-Chrome Fill Reuse

In accordance with *Carteret Avenue Non-Chrome Fill Soil Re-Use Plan (Revision 2)* (AECOM, 2019b) included as part of the Carteret RAWP (AECOM, 2019a), and the procedures presented in the NJDEP's *Fill Material Guidance for SRP Sites Version 3.0* (NJDEP, 2015), non-chrome fill excavated for the purpose of creating a clean corridor in Carteret Avenue (for utility workers) was reused to backfill below the clean corridor. The non-chrome fill reused as backfill was determined to be non-hazardous and free of CCPW- or MGP-related impacts based on the results of characterization sampling (see **Section 5.3.1**) and was confirmed visually clean. The non-chrome fill reuse location as-built diagram and analytical data are provided in **Appendix L-3**. Laboratory analytical reports and data validation reports are included in **Appendix L-4**. Data associated with samples collected for waste characterization purposes did not require data validation; therefore, no data validation reports for waste characterization data exist.

Non-chrome fill that remains within Carteret Avenue at concentrations greater than the unrestricted standards is the responsibility of the property owner (i.e., the City of Jersey City) under the LSRP program.

7.6 Identification of Required Permits and Authorizations

The permits and approvals needed for the RA at Carteret Avenue are listed below.

- SESCO approvals from Hudson-Essex-Passaic County Soil Conservation District.
- Notice of Non-Applicability, Discharge to Surface Water General Permit for Construction Activity - Stormwater (5G3), NJDEP, Division of Water Quality.
- Flood Hazard Area Individual Permit for GA Group, NJDEP, Division of Land Use Regulation.
- Water Use Registration, NJDEP, Division of Water Supply.

- Permit-By-Rule Discharge Authorization for Site-wide FerroBlack®-H Backfill Amendment, NJDEP, Site Remediation Program.
- Community Right-to-Know Survey for 2020, NJDEP.
- PVSC Sewer Use Permit #31630035 (groundwater treatment plant – Sites 137A and 137B).

The necessary permits were obtained from and approved by the state, local, and county agencies prior to initiation of the activities covered by the permits. Necessary permits and approvals are documented in **Appendix B**.

Local permits that are not included in **Appendix B** include local road closure and street opening permits (which were renewed approximately every 6 months).

8.0 Receptor Evaluation Update

The purpose of a receptor evaluation (RE) is to document the existence of human or ecological receptors, and the actions taken to protect those receptors, at contaminated sites. Pursuant to N.J.A.C. 7:25E-1.12, REs must include general site information, an evaluation of surrounding land use, a description of contamination, a discussion of groundwater use in the area, an evaluation of vapor intrusion potential, and an ecological evaluation.

The Receptor Evaluation Report, Rev. 3, Non-Residential Chromate Chemical Production Waste Sites 114, 132, 133, 135, 137, 143 and 186 Jersey City, New Jersey (AECOM, 2012b), dated March 20, 2012, was submitted to the NJDEP on March 23, 2012. The Final Garfield Avenue Group RE/Ground Water RE/Baseline Ecological Evaluation Reports were submitted to the NJDEP on July 22, 2013. The updated RE form and required attachments are provided with this RAR.

9.0 Conclusions and Recommendations

This RAR documents that the soil RA for Carteret RAR AOC CAR-1A is effective in protecting public health and safety and the environment and remedial objectives have been achieved as follows:

- Soil with trace COPR nodules (not analyzed for Cr⁺⁶), which are a potential source of Cr⁺⁶ and CCPW metals, remaining in place is addressed by an engineering control (HDPE Liner) and institutional controls (notice in lieu of deed notice).
- Soil concentrations of CCPW metals are in compliance with the CrSCC or SRS.
- Soil concentrations of CCPW metals in the unsaturated zone are in compliance with the DIGWSSLs and/or the site-specific IGWSRS-GAGs.

For Cr⁺⁶ remaining in soil at concentrations greater than the CrSCC that do not meet the Chromium Policy (NJDEP, 2007) per the Method to Determine Compliance (NJDEP, 2013), compliance averaging was used to attain compliance with the CrSCC, as presented in **Appendix K**. Additionally, for areas within Carteret Avenue where compliance with the CrSCC was demonstrated using spatial averaging, institutional controls (notice in lieu of deed notice) are being implemented to restrict use to non-residential use (**Figures 5-1A** through **5-3B**).

On this basis, PPG, the responsible party has demonstrated compliance with the applicable remediation requirements for the soil in Carteret Avenue AOC CAR-1A, and no further action with regard to AOC CAR-1A soil is needed (other than filing the notice in lieu of deed notice and implementing the RAP). PPG requests the closure of AOC CAR-1A by the NJDEP through the issuance of a Consent Judgment Compliance Letter.

MGP-related impacts in Carteret Avenue are being addressed in accordance with the LSRP Program under PI number G000005480, activity number LSR120001, per the July 2019 agreement between PPG and PSEG (PPG and PSEG, 2019). Information required to document remediation of MGP-related impacts will be presented by PSEG in their forthcoming RAR.

10.0 References

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