

FINAL REMEDIAL ACTION WORK PLAN

Non-Residential Chromate Chemical Production Waste Sites Former Baldwin Oil Facility, Hudson County Chrome Site 063 And Burma Road Site, Hudson County Chrome Site 065 1 Burma Road Jersey City, New Jersey

Program Interest Number: G000008691 and G000008693

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Plan

LIST OF ACRONYMS

ACO	Administrative Consent Order
bgs	below ground surface
CID	Case Inventory Document
CCPW	Chromate chemical production waste
CEA	Classification Exception Area
COPEC	Contaminants of Potential Environmental Concern
COPR	Chromite ore processing residue
CrSCC	Chromium Soil Cleanup Criteria
EE	Ecological Evaluation
ESC	Ecological Screening Criteria
ESNR	Environmentally Sensitive Natural Resources
GWQS	Ground Water Quality Standard
HASP	Health and Safety Plan
HCC	Hudson County Chrome
HDPE	High Density Polyethylene
HEP SCS	Hudson-Essex-Passaic County Soil Conservation Service
IDW	Investigation derived waste
IGW SSL	Impact to Groundwater Soil Screening Level
IRAR	Interim Remedial Action Report
IRM	Interim Remedial Measures
JCSA	Jersey City Sewerage Authority
JCO	Judicial Consent Order
mg/kg	milligram per kilogram
MS/MSD	Matrix spike and matrix-spike duplicate
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NRDC SRS	Non Residential Direct Contact Soil Remediation Standard
PAMP	Project Air Monitoring Plan
PM-10	Particulate Matter less than 10 micrometers in size
PPG	PPG Industries, Inc.
PVC	Polyvinyl Chloride
RA	Remedial Action
RAWP	Remedial Action Work Plan
RDC SRS	Residential Direct Contact Soil Remediation Standard
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
SPLP	Synthetic Precipitation Leaching Procedure
TS	Treatability Study
µg/L	Microgram per Liter
USEPA	United States Environmental Protection Agency

<u>Case Inventory Document</u> SITE 063/065 1 Burma Road JERSEY CITY, NEW JERSEY PROGRAM INTEREST NOS. G000008691 and G000008693 Page 1

Area of Concern, Receptor and	Impacted	Contaminants	Contaminants	ted Contaminants	Exposure	Contaminants Exposure		ptors	Courses the Status (Outbooks
Emergency Response Tracking	Media	of Concern	Route	Route	Existing	Potential	Current Status/Outcome		
Sites 063 and 065 CCPW Fill	Soil	CCPW Metals (Antimony, Vanadium, Hexavalent Chromium)	Inhalation, Direct Contact	Site Workers	Site Workers, Contractors, General Public	July - August 2011 and December 2012-January 2013. Site investigations identified and delineated the extent of CCPW contamination. Initial investigation: 276 soil samples were collected. Delineation investigation: 52 soil samples were collected. Soil samples were collected. Soil samples contained antimony, vanadium, and hexavalent chromium at concentrations above their respective soil remediation standards (antimony and vanadium) and soil cleanup criteria (hexavalent chromium). The limit of contamination was identified and a volume of soil to be removed and disposed was calculated based on the results of the field investigations.			
Sites 063 and 065 CCPW Fill	Groundwater	CCPW Metals (Chromium, Antimony, Nickel, Vanadium)	Direct Contact - Dermal and Ingestion	None	Groundwater Sampling Staff	August and September 2011 and January and February 2013. Site investigations identified metal contamination. Groundwater samples were collected during two field investigations (2011 and 2013). Chromium, antimony, nickel, and vanadium were present at concentrations above the NJDEP GWQS.			

1.0 INTRODUCTION

This *Remedial Action Work Plan* (RAWP) has been prepared by Shaw Environmental, Inc., a CB&I Company (Shaw), on behalf of PPG Industries, Inc. (PPG) for the remediation of chromium-impacted soils at the former Baldwin Oil facility and Burma Road site (the Site). The former Baldwin Oils facility and Burma Road site are located at 1 Burma Road in Jersey City, New Jersey (Figure 1). Both sites were identified as Non-Residential Hudson County Chrome (HCC) sites by the New Jersey Department of Environmental Protection (NJDEP) and are designated as HCC Sites 063 and 065, respectively, in the July 19, 1990 Administrative Consent Order (ACO) between the NJDEP and PPG.

The NJDEP Site Remediation Program (SRP) Program Interest (PI) number for Site 063 is G000008691 and for Site 065 is G000008693. Site 063 is identified as Block 2154.4, Lot 4 on the most recent Hudson County Tax Map but is also identified as Block 1497, Lot 4 on the most recent Hudson County Tax Parcel database (HCDP, 2007; NJOIT, 2010). Site 065 is the narrow strip of land on the west side of Burma Road between Burma Road and Site 063. Site 065 is part of the 1 Burma Road parcel and has the same block and lot number as Site 063 (Figure 2). The majority of the Site is currently un-used. A portion of the southern end of the Site is used for temporary parking of tractor trailers. An underground natural-gas pipeline was installed by Spectra/Texas Eastern along the western and northern boundary of Site 063 in April and May 2013. A valve station building is also to be installed by Spectra/Texas Eastern. It is expected that soil excavation activities that are part of this RAWP will be completed before the pipeline is functioning.

In 1990, PPG and the NJDEP entered into an ACO to investigate and remediate locations where chromate chemical production waste (CCPW) or CCPW-impacted materials related to former PPG operations may be present. On June 26, 2009, NJDEP, PPG, and the City of Jersey City entered into a Partial Consent Judgment Concerning the PPG Sites (JCO) with the purpose of remediating the soils and sources of contamination at the Hudson County Chromate sites as expeditiously as possible. The goal of the JCO is to complete the investigation and remediation of the PPG sites within five years, in accordance with a judicially enforceable master schedule. Priority for the remedial activities has been given to residential locations where the CCPW and CCPW-impacted materials are present. The provisions of the original ACO remain in effect with the JCO taking precedence where there are conflicts between the two documents.

This RAWP was prepared in accordance with the requirements set forth in the *Technical Requirements for Site Remediation* New Jersey Administrative Code, Title 7, Chapter 26E, Subchapter 5.5 (N.J.A.C. 7:26E-5.5), Appendix B of the 1990 NJDEP ACO, and the June 26, 2009 JCO.

This RAWP presents a brief discussion of the Site's prior and current use and its regulatory history leading up to the preparation of this RAWP. Summaries of previous environmental investigations, interim remedial measures (IRM), and the Remedial Investigation (RI) are provided, followed by a description of the proposed remedial action and related activities.

2.0 SUMMARY OF THE REMEDIAL INVESTIGATION REPORT

2.1 Summary of Previous Environmental Investigations

A limited environmental investigation was undertaken as part of the Interim Remedial Measures (IRM) work completed in 1999 (IT Corporation, 2000). The City of Jersey City had issued an Order of Condemnation on December 9, 1997 for the Baldwin Oil warehouse, due to the structural instability of the building. In 1998, discussions were initiated with the NJDEP for plans to demolish the building and perform a RI using the following agreed upon approach:

- Demolish the building using technical specifications as a guideline;
- Develop a task-specific HASP for the work;
- Dispose of demolition debris as non-hazardous waste;
- Install several borings through the slab to determine the areal extent of CCPW;
- Cover the slab with an IRM to prevent rainwater seep and slab deterioration prior to removal; and
- Prepare an RIWP using existing data and move ahead with the RI implementation.

The remaining floor slab removal occurred shortly after building demolition. Demolition of the building occurred between November 9, 1998 and December 18, 1998 and floor slab removal occurred between February 15, 1999 and August 5, 1999. The interim remedial measure (IRM) activities included removal of the building's concrete floor slab and loading dock floor slab, removal of the underlying fill materials including most of the CCPW-impacted fill, installation of a high density polyethylene (HDPE) liner, backfilling, and grading (IT Corporation, 2000).

As part of the IRM activities, soil sampling was performed in September 1998 to collect preliminary information for planning the remediation activities. These activities included the removal of the platform beneath the building, limited excavation, and liner installation. Additional sampling was performed following demolition in January 1999. A total of 20 soil borings were advanced, 9 of which were installed during the week of September 21, 1998, and 11 of which were installed during the week of January 4, 1999. Sixteen of the soil borings were drilled through the floor slab and four of the borings were drilled adjacent to it at the northern, western, and southern sides of the floor slab. The depth of these borings ranged from 5 to 15 feet below the ground or platform surface, and soil samples were collected at intervals of approximately 2 feet. One hundred and nine analytical samples were submitted for Total Chromium and Hexavalent Chromium analyses (IT Corporation, 2000).

CCPW was visually identified in all 16 of the borings advanced through the building foundation. CCPW was not identified in the 4 borings surrounding the platform. CCPW was observed as nodules in samples of relatively soft reddish-brown silt or clay from immediately below the floor to a maximum depth of 7.5 feet belowground surface (bgs). The level of concern for Hexavalent Chromium at Sites 063 and 065 was tentatively set at 100 mg/kg pending the development of an alternative NJDEP Cr⁺⁶ remediation standard. Fifteen of the 16 soil borings advanced through the platform had Hexavalent Chromium concentrations exceeding 100 mg/kg. Material exceeding 100 mg/kg Hexavalent Chromium ranged in depth from immediately below the slab to approximately 10 feet bgs. In general, the highest concentrations of Hexavalent Chromium were detected in the middle of the building, toward the northern side of the building. No Hexavalent Chromium exceeding 100 mg/kg was detected in the borings advanced to the north, south, and west of the platform (IT Corporation, 2000).

Post-excavation sampling conducted after the platform excavation was limited because the IRM was not intended to completely remove chromium contamination. Samples collected from the base and sidewalls of the excavation were analyzed for total Cr, Cr^{+6} , Ni, and V, and all but 2 of the 19 samples collected were located within the former loading dock area which bordered the north and west sides of the building. Chromium concentrations were highest beneath the former building (IT Corporation, 2000).

2.2 Summary of Previous Interim Remedial Measures

The IRMs implemented at Sites 063 and 065 have included building demolition and slab excavation, aboveground storage tank demolition, installation of fencing, installation of the HDPE liner, and paving areas with surface impacts. IRM details are provided in the January 11, 2000 IT Corporation Draft Interim Remedial Action Report ("IRAR") for these sites. The IRMs were undertaken by PPG to reduce potential exposure to CCPW-impacted soils.

Prior to building demolition in 1998, the IRMs installed at the Site included the following:

- Covering contaminated portions of the south and east building walls with a 30-mil high-density polyethylene (HDPE) liner;
- Covering areas of the ground surface with 30-mil HDPE liner and stone;
- Installing a fence on the south side of the building; and,
- Lining the drainage ditch on the east side with a 20-mil PVC liner and concrete Fabriform ditch liner. The Fabriform structure covers the drainage ditch so it is no longer open. It is, however, tied into a storm sewer to the north of the structure.

Work on these IRMs concluded in May of 1992, when the building was vacant and in disrepair. Regular repair of the IRMs was necessary as the building deteriorated, and in 1997 the building was condemned by the City of Jersey City.

Following the 1997 issuance of an Order of Condemnation for the former Baldwin Oil building, work scope discussions were initiated with the NJDEP to demolish the building and perform a RI (IT Corporation, 2000). As outlined in Section 3.5.1.2, the IRM included excavation of the building foundation and installation of the HDPE liner. There are no building elements remaining on the Site.

Floor slab removal occurred shortly after building demolition. Demolition of the building occurred between November 9, 1998 and December 18, 1998 and floor slab removal occurred between February 15, 1999 and August 5, 1999. IRM activities included removal of the building's concrete floor slab and loading dock floor slab, removal of the underlying fill materials including most of the CCPW-impacted fill, installation of the HDPE liner, backfilling, and grading. According to the Draft 2000 IT Corporation IRAR, a subsurface drainage structure was installed on the western side of the Site along the property line during building and foundation excavation, in addition to the previously installed Fabriform drainage structure on the eastern side of the Site. The purpose of this structure was to intercept surface water run-on to the Site and prevent water accumulation in the excavation. The structure was designed to drain to a storm catch basin previously installed by the NJTA at the southwest of the Site. Prior to installation, IT Corporation determined (using dye tracer tests) that the drainage led to an outlet under the public dock in Liberty State Park. The Jersey City Sewerage Authority (JCSA) approved construction and tie-in of this structure to the sewer system (IT Corporation, 2000).

After an inspection of the condition of the IRMs at the Site in 2012, the northern portion of the Site was covered with a temporary polyethylene liner and additional temporary fencing was installed along the east side of the Site.

The IRMs remaining onsite include the following (Figure 2):

- Fencing and paving along the edge of the property,
- The Fabriform drainage structure on Site 065, and
- The HDPE liner installed following demolition and excavation of the building and building foundation.
- The surface polyethylene liner on the northern portion of the Site.

2.3 Summary of the Remedial Investigation Report

The Remedial Investigation was performed by Tetra Tech, Inc. (Tetra Tech) in accordance with the NJDEPapproved RI Work Plan (RIWP) prepared by AECOM Environmental, Inc. (AECOM)¹. The objective of the RI was to determine the nature and extent of chromate chemical production waste (CCPW) contamination. The CCPW contamination includes Chromate Ore Processing Residue (COPR) and the CCPW-related metals Chromium, Hexavalent Chromium, Antimony, Nickel, Thallium, and Vanadium.

The RI Report (RIR) was prepared by Tetra Tech in March, 2013². The RIR included the installation of sixty-three soil borings, the installation of ten groundwater monitoring wells, and the collection and analysis of three-hundred-twenty-eight soil samples, seventeen groundwater samples, two surface water samples, and two sediment samples.

A summary of the results and conclusions of the RIR is presented here. Tables and Figures from the RIR are presented in Appendix A.

2.3.1 Soils Investigation

The RIR identified areas of the Site where soils contained COPR and where the concentrations of the CCPW-related metals were greater than the NJDEP's Residential Direct Contact Soil Remediation Standards (RDC SRS) or the Chromium Soil Cleanup Criteria (Cr SCC).

COPR was identified in the surface and subsurface soils at the Site. The RIR identified areas of surface and subsurface soils where concentrations of Hexavalent Chromium were above the Cr SCC, and where concentrations of Antimony, and Vanadium were above the RDC SRS.

COPR was detected in twenty-three of the sixty-three soil borings. The depths of the COPR were found at ground surface to four feet below the ground surface, with the extent of COPR presence found throughout the Site (not concentrated in any distinct area of the Site).

Hexavalent Chromium was detected in one-hundred-eight of the three-hundred-twenty-eight soil samples with a range of detection from 0.52 to 9,470 mg/kg. Twelve of the soil samples were above the Cr SCC.

¹ AECOM, Environment, 2011. Remedial Investigation Work Plan, Non-Residential Chromate Chemical Production Waste Sites – Sites 63 and 65, Jersey City, New Jersey. March 2011.

² Tetra Tech, 2013. Remedial Investigation Report, Sites 63 and 65, Jersey City, New Jersey. March 2013

Antimony was detected in sixty-two of the three-hundred-twenty-eight soil samples with a range of detection from 0.38 to 382 mg/kg. One of the soil samples was above the RDC SRS. Eight of the soil samples were above the IGW SSL.

Nickel was not detected at a concentration above the RDC SRS. Nickel was detected in all of the threehundred-twenty-eight soil samples with a range of detection of 1.5 to 661 mg/kg. Sixty-three soil samples were above IGW SSL.

Vanadium was detected in all of the three-hundred-twenty-eight soil samples with a range of detection of 7.6 to 718 mg/kg. Forty-six soil samples were above the RDC SRS.

Figure 7a in Appendix A shows those soil sampling locations where there were exceedances of either the RDC SRS or the Cr SCC.

2.3.2 Groundwater Investigation

The investigation of groundwater identified areas of the Site where Total Chromium, Nickel, and Vanadium concentrations were above the New Jersey Groundwater Quality Standards (GWQS).

Total Chromium was detected in fourteen of the seventeen groundwater samples collected. Eight samples had concentrations above the GWQS. The range of Total Chromium concentrations in groundwater samples was 5.7 to $51,400 \mu g/l$.

Nickel was detected in thirteen of the seventeen groundwater samples collected. Five samples had a concentration above the GWQS. The range of Nickel concentrations in groundwater samples was 4.4 to 318 μ g/l.

Vanadium was detected in twelve of the seventeen groundwater samples collected. Seven samples had a concentration above the GWQS. The range of Vanadium concentrations in groundwater samples was 3.8 to $1,870 \mu g/l$.

Figure 9 in Appendix A shows those groundwater sampling locations where there were exceedances of the GWQS.

2.3.3 Surface Water and Sediment Investigation

The RIR evaluated surface water and sediments at the Site. Analytical results of sediment and surface water samples were compared to the NJDEP Ecological Screening Criteria (ESC) for freshwater. An evaluation for the presence of Environmentally Sensitive Natural Resources (ESNR) was performed.

Based on the Receptor Evaluation of the RIR, no ESNR were identified at or near the Site. The RIR concluded that there are no ESNR at or near the Site; therefore, a pathway for exposure does not exist. No remedial actions are proposed for surface water or sediments.

3.0 IDENTIFICATION OF THE AREAS WHERE REMEDIAL ACTION WILL OCCUR

3.1 Soils

The areas of the Site requiring remediation are shown on Figures 3 and 4. These Figures present the areal extent requiring remediation and the associated cross-sections give an indication of the vertical extent of the areas requiring remediation. These Figures also detail the presence of COPR and the depths where CCPW-related metals are above the NJDEP's Residential Direct Contact Soil Remediation Standards (RDC SRS) or the Chromium Soil Cleanup Criteria (Cr SCC). Details of the soil boring and soil analytical data used to delineate the area requiring remediation are presented in Appendix A.

The volume of contaminated soil as determined in the Final RIR has been estimated at 10,970 cubic yards. Additional soil borings were advanced and samples collected in March 2013 to complete delineation on the west side of the Site. This information will be used to further define the areas of the Site that require remediation. In addition, design borings will be advanced to further define both the areal and vertical extent of contaminated soils and also to get a better understanding of the potential locations and volumes of those contaminated soils that may be classified as a hazardous waste. This is further discussed in Section 4.0.

3.2 Groundwater

Figure 5 shows the area of the Site where Chromium, Antimony, Nickel, and Vanadium are at concentrations above the GWQS. Groundwater contamination has been found only in shallow (less than 10 feet) groundwater. Deeper groundwater is not impacted. The remediation of groundwater will be further defined in the Remedial Design phase described in Section 4.

4.0 DESCRIPTION OF REMEDIAL MEASURES AND TECHNOLOGIES

This section of the RAWP outlines the scope of work for remediation of the Site. All phases of the remediation will be executed in accordance with applicable regulations including NJDEP's *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E) and applicable permit and plan requirements. Permits and plan approvals required for the remedial effort are identified in Section 8.0.

4.1 Remedial Action for Soils

The remedial action selected by PPG for contaminated soils is excavation and off-site disposal of the excavated materials at landfills permitted to accept the excavated materials. In order to further define the volumes of contaminated soils and contaminated soils that may be classified as a hazardous waste, and therefore, must be segregated and handled separately, Design Borings will be advanced prior to implementation of the remedial action.

4.1.1 Remedial Design Soil Boring Program

The RIR identified areas of COPR and CCPW-related metals that require remediation. As areas of COPR are expected to be classified as a hazardous waste, additional remedial design borings will be advanced in the existing identified areas of COPR to obtain a better estimate of the potential volume of hazardous waste that will require special handling during the Remedial Action. In addition, soil borings will be advanced to provide a better understanding of the deepest exceedance of the RDC SRS or Cr SCC, provide data intended to serve as post excavation data, and provide data to be used for waste characterization purposes suitable to the disposal facilities that receive the waste.

Some samples may be collected in order to calculate a Site-Specific remediation standard for Antimony and Nickel.

This information will allow the excavation activities to be organized so that successive sections of the area to be remediated can be characterized for waste disposal acceptance, the depths required to reach clean soils can be established, and the completeness of remedial action can be documented.

The location of the design borings are shown on Figure 6. These borings are spaced in thirty-foot grids in accordance with the NJDEP Technical Guidance for Remedial Action Verification Sampling for Soil to allow sufficient data for establishing the clean zones beneath the contamination and can serve as post-excavation sampling points and documentation of the completeness of remedial action. It is expected that additional post-excavation samples, particularly sidewall samples, will be required to meet the NJDEP requirements for frequency of post-excavation sampling.

All field sampling and laboratory analytical activities will be performed in accordance with the existing Field Sampling and Analysis Plan and Quality Assurance Control Plan (Appendix B). The following methods will be used in analyzing soil samples collected during the Remedial Design phase.

Analysis for Hexavalent Chromium will be performed using 3060 SW 846 digestion and 7196A SW 846 analysis as modified by NJDEP.

Analysis for Total Chromium, Antimony, Nickel, Thallium, and Vanadium will be performed using USEPA methods 6020B, 3050B.

4.1.2 **Pre-Construction Activities**

Pre-construction activities include obtaining approval of all permit applications and plans submitted to the state and local agencies (discussed in Section 8.0); obtaining access agreements from affected property owners; development and implementation of an Erosion and Sedimentation Control Plan, development of an Air Monitoring Plan, development of a Health and Safety Plan, and Site clearing activities.

An Erosion and Sediment Control Plan is provided in Appendix C. A soil erosion and sediment control permit is required from the Hudson-Essex-Passaic (HEP) Soil Conservation Service for the remedial construction activities. This permit includes requirements for drainage control and control of soil erosion during the remedial activities. Requirements of the plan will be implemented as part of the site preparation activities. Implementation of these requirements will be performed independently as an initial site preparation activity. The Erosion and Sediment Control Plan provided contains all the elements of what is expected to be required. Confirmation with the HEP Soil Conservation Service will be required once the final area of remediation has been delineated.

A utility survey, which will include invert depths, will be conducted.

A Site-Specific Health and Safety Plan (HASP) developed in accordance with OSHA 1910.120 will be developed for the remedial action at the Site. The HASP documents policies and procedures to be followed to protect workers and the public from potential hazards posed at this Site. The HASP will include training program protocols, medical surveillance program, equipment maintenance programs, personal hygiene practices, project air monitoring plan, dust control plan and other information. An example site HASP is provided in Appendix D.

A Project Air Monitoring Plan is presented in Section 7.0.

4.1.3 Remedial Action

Remedial Action activities will start with the implementation of the Erosion and Sedimentation Control Plan. This will include the construction of a truck decontamination pad and establishment of work zones.

Any excess vegetation at the Site will be cleared and disposed. Vegetation removal will be performed using standard landscaping equipment such as a brush cutter.

Portions of the Site will be excavated by Spectra during their installation of a buried natural-gas pipeline that will traverse the western section of the Site. Spectra will segregate the top four feet of soil that they excavate and place these soils on a PVC liner. These soils will then be characterized and transported from the Site by PPG. The Spectra pipeline will be constructed in an eleven foot wide excavation that is part of a fifty-foot easement. The pipeline is expected to be completed prior to initiation of remedial action.

Spectra has determined that PPG can safely conduct future remedial activities within 5.5 feet of the center line, and 3 feet from the edge, of the installed pipe. These activities can include excavation and sheet pile driving. Spectra's transmission division will provide oversight and guidance during PPG's anticipated remedial activities in proximity to the pipeline. It is expected that soil excavation activities associated with this RAWP will be completed before the pipeline becomes functional.

Spectra has informed PPG that equipment can be staged over the pipeline for future remedial work. Spectra has specific requirements for driving heavy equipment over its pipelines, including the use of mats and other

weight-spreading techniques. Spectra's transmission division will provide oversight and guidance during any such activities. The Spectra Excavation Management Plan is included as Appendix E.

The existing polyethylene liner at the north end of the Site will be removed. The gravel covering the HDPE Liner in the center of the Site will be stockpiled and/or used to construct elements of the Erosion and Sedimentation Control Plan. The HDPE liner under the gravel will then be removed and disposed. The temporary liner on the north portion of the Site will also be removed and disposed.

Certain areas of the northern portion of the Site and extending to the west onto the New Jersey Turnpike Authority property have visible CCPW at the surface. These surface areas will be removed and segregated as a potential hazardous waste.

Soil excavation activities are expected to proceed from the north of the Site to the south, however, the constructability of the project will be evaluated during bid specifications development. Soils will be excavated in increments that have been pre-characterized for waste classification and acceptance at the appropriate facility. The excavated soils can either then be directly loaded onto trucks for transport to the disposal facility or stockpiled for later transport. As excavation activities continue southward, the excavated areas will be backfilled as described below.

Shaw will use the soil analytical results from the design soil boring program and the analytical results from the RI soil boring program to pre-determine the depths of the excavation. These sampling results will serve as the post-excavation samples used to document the effectiveness and completeness of the soil remediation.

During soil remediation activities, areas where CCPW is identified will be excavated and removed from the Site. This will include areas where the presence of CCPW was unanticipated.

Groundwater encountered in the excavations will be pumped to a storage tank. The collected water will be sampled to determine waste disposal options. In the event that the groundwater from the excavation contains light, non-aqueous phase liquids, these liquids will be separated and disposed of appropriately.

Prior to backfilling the excavated areas with certified clean fill, orange plastic construction fencing will be placed at the bottom and sidewalls of the excavation to demarcate the areas remediated by PPG. This is proposed as additional soil remedial activities may be performed by the Site owner due to the petroleum-related soil contamination at the Site.

4.2 Remedial Action for Groundwater

Analysis of groundwater samples at the Site during the RI has identified concentrations of Chromium, Antimony, Nickel, and Vanadium at levels above the GWQS. Remedial action efforts for groundwater will be evaluated after the completion of soil remediation.

5.0 IDENTIFICATION OF APPLICABLE REMEDIAL STANDARDS/CRITERIA

5.1 Remediation Standards/Criteria

The remedial actions described in this RAWP will be performed in accordance with the following regulatory requirements and NJDEP Guidance.

- N.J.A.C. 7:26E Technical Requirements for Site Remediation, dated May 7, 2012.
- N.J.A.C. 7:26C Administrative Requirements for the Remediation of Contaminated Sites, dated May 7, 2012.
- NJDEP Field Sampling Procedures Manual, dated August, 2005.
- NJDEP Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria, dated September, 2012.
- N.J.A.C. 7:9C Ground Water Quality Standards, dated July 22, 2010.
- NJDEP Final Guidance on Designation of Classification Exception Areas, dated November, 1998.
- NJDEP Administrative Consent Order, Dated July 19, 1990.
- Judicial Consent Order (JCO) between NJDEP, PPG, and the City of Jersey City, June 26, 2009.

5.2 Soil Remediation Standards/Criteria

Soil Remediation Standards for acceptance of post-excavation results for CCPW-related metals for the Site are based on the May 2012 NJDEP Residential Direct Contact Soil Remediation Standards (RDC SRS)³, the NJDEP's Letter of February 8, 2007 related to the lifting of the Chromium Moratorium⁴, and the NJDEP's September 2008 Chromium Soil Cleanup Criteria document⁵.

The 2007 and 2008 Soil Cleanup Criteria were used only for Trivalent Chromium and Hexavalent Chromium. The May 2012 NJDEP Residential Direct Contact Soil Remediation Standards were used for Antimony, Nickel, Thallium, and Vanadium. The NJDEP Impact to Groundwater Site Screening Levels (IGW SSLs) are additional criteria for Antimony, Nickel, and Thallium.

Metals	RDC SRS (mg/kg)	CrSCC (mg/kg)	IGW SSLs
Trivalent chromium	NA	120,000 mg/kg	NA
Hexavalent chromium	NA	20 mg/kg	NA
Antimony	31 mg/kg	NA	6
Nickel	1,600 mg/kg	NA	31
Thallium	5 mg/kg	NA	3
Vanadium	78 mg/kg	NA	NA

The soil remediation standards/criteria include the following values.

mg/kg = milligrams per kilogram. NA = Not Applicable.

PPG is not legally responsible for any other chemicals exceeding NJDEP Soil Remediation Standards that may be present at the Site. This RAWP addresses only chromium and CCPW-related constituents. Other

³ N.J.A.C. 7:26D, Remediation Standards, Date last amended May 7, 2012.

 ⁴ NJDEP Memorandum from Lisa P. Jackson to Irene Kropp. Subject: Chromium Moratorium. February 8, 2007.
 ⁵ NJDEP Chromium Soil Cleanup Criteria, September 2008, revised April 2010.

chemicals above NJDEP Residential Soil Remediation Standards will be managed if co-located and comingled with chromium and CCPW-related constituents, but the RAWP will not pursue excavation of these chemicals to achieve current NJDEP Residential Soil Remediation Standards.

5.3 Groundwater Remediation Standards

The RAWP will apply the New Jersey Groundwater Quality Standards (GWQS) as of July 2010 (N.J.A.C. 7:9C) as the remediation criteria for chromium and CCPW-related metals. The groundwater remediation standards include the following values.

Metals	GWQS (µg/l)
Total chromium	70 μg/l
Antimony	6 μg/l
Nickel	100 µg/l
Thallium	2 µg/l
Vanadium	60 µg/l

 $\mu g/l = micrograms per liter.$

6.0 EVALUATION OF THE EFFECTIVENESS OF THE REMEDIAL ACTION

Shaw will use the soil analytical results from the remedial design soil boring program and the analytical results from the RI soil boring program to pre-determine the depths of the excavation. These sampling results will serve as the post-excavation samples used to document the effectiveness and completeness of the soil remediation.

The locations of the remedial design soil borings and the RI soil boring programs are shown on Figure 6. Cross-sections that show the depths where clean soils have been encountered are provided in Figures 3 and 4. Analytical data from the remedial design borings in conjunction with the existing RI soil analytical database will be used to pre-determine depths where the analysis of soil samples have indicated that all contaminated soils have been removed.

During soil remediation activities, areas where CCPW is identified will be excavated and removed from the Site to the extent practicable. This will include areas where the presence of CCPW was unanticipated.

Metals	RDC SRS (mg/kg)	CrSCC (mg/kg)	IGW SSLs
Trivalent chromium	NA	120,000 mg/kg	NA
Hexavalent chromium	NA	20 mg/kg	NA
Antimony	31 mg/kg	NA	6
Nickel	1,600 mg/kg	NA	31
Thallium	5 mg/kg	NA	3
Vanadium	78 mg/kg	NA	NA

The soil remediation standards/criteria include the following values.

mg/kg = milligrams per kilogram. NA = Not Applicable.

7.0 AIR MONITORING PLAN AND DUST CONTROL PLAN

A Project Air Monitoring Plan (PAMP) will be developed as part of the Remedial Design process.

8.0 IDENTIFICATION OF REQUIRED PERMITS AND AUTHORIZATIONS

The permits and approvals needed for the proposed remedial action are listed below.

- A Soil Erosion and Sediment Control Permit from Hudson-Essex-Passaic (HEP) County Soil Conservation District.
- Jersey City Temporary Construction Trailer Permit, City of Jersey City.
- Jersey City Traffic Control Permit, City of Jersey City.
- Plan Review for potential impact to city storm water infrastructure on site, Jersey City Municipal Utility Authority,
- Electrical Service Permit Field Trailer, City of Jersey City.
- Review of RAWP for potential impact to utility poles, PSE&G.
- Well Abandonment, NJDEP.
- Construction dewatering permit.
- New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Groundwater Permit by Rule, NJDEP.
- Groundwater CEA, NJDEP.
- NJPDES Discharge to Surface Water General Permit for Construction Activity Stormwater.

All necessary permits will be obtained prior to initiation of activities covered by the permits. Permit copies will be provided to the NJDEP as part of design submittals.

8.1 Local Agencies

City of Jersey City Construction Office

The Construction Office has no additional permitting or plan approval requirements for this project other than those listed.

• Contractor registration with the Construction Official (unless state licensed)

City of Jersey City Planning and Zoning Office

The City of Jersey City Planning and Zoning Office has no permitting requirements applicable to the project.

City of Jersey City Engineering Department

The City of Jersey City Engineering Department has no additional permitting or plan approval requirements; however, they do require notification for all excavations for which they charge a registration fee.

8.2 County Agencies

Hudson County Public Health Department – Environmental Health Division

The County Health Department, Environmental Health Division does not require any permits or plan approvals for this project.

Hudson County Planning Department

The Hudson County Planning Department has no applicable permitting or plan requirements since the project does not involve construction of new facilities or impacts to Site drainage.

Hudson County Engineering Department

No permit or plan approvals are required from the Engineering Department for this project.

8.3 State Agencies

<u>NJDEP – Site Remediation Program</u>

No other permitting requirements from State agencies were identified for this project.

9.0 FILL USE PLAN

This Fill Use Plan has been prepared in accordance with N.J.A.C. 7:26E-5.2.

9.1.1 Characterization of Backfill

Backfilling of the excavations will be performed using soil from off-site sources or using on-site materials approved for re-use through a NJDEP Soil Reuse Plan, if appropriate for this Site. The off-site backfill will be verified as meeting NJDEP Residential Soil Cleanup Standards and IGW SSLs by laboratory analysis before being accepted for transport to the Site. Backfill will be installed in lifts of no greater than eight (8) inches and compacted to non-movement. Soil backfill will be installed to elevations required to support the final restoration.

Backfill may include material from virgin sources, recycled soil, or other types of material. Minimal requirements for all backfill are as follows:

- The source of the backfill must be clearly established;
- Certification of the source is required;
- An initial sample for laboratory analysis will be collected;
- Subsequent laboratory analysis will be conducted at a specified frequency; and
- Visual inspections will be conducted on the material as it is received on-site at a frequency of at least one inspection per 2,000 tons.

All material must be free of trash. Stones or other material in excess of 6 inches in size is not acceptable. The upper allowable limit for root matter, brick fragments, glass and concrete is 0.5% total. Frozen lumps or other materials that would affect the performance of the fill are not allowed.

All applicable requirements of the Alternative and Clean Fill Guidance for SRP Sites (Version 2.0, December 29, 2011) will be followed for fill imported to the Site.

For both soil from a virgin source and a non-virgin source, initial and routine samples will be analyzed for the following:

- Volatile Organic Compound TCL Target Compound List (SW846 8260B/5035)
- Acid / Base Neutral Extractable Compounds (SW846 8270C/3550B)
- NJDEP Extractable Petroleum Hydrocarbons (SW846 3545)
- Herbicides (SW846 8151/3550B)
- Pesticides (SW846 8081A/3545)
- Polychlorinated Biphenyls (SW846 8082/3545)
- Target Analyte List (TAL) Metals (SW846 6010B, 6020, 6020B, 7471A)
- Hexavalent Chromium (SW846 3060A/7196A)
- Redox Potential (Eh)
- Percent Solids
- pH

Final analytical data will be compared the NJDEP SRS. In addition to the SRS, analytical results will also be compared to Default Impact to Groundwater Soil Standards for Class II Groundwater for which health-based ground water quality criterion has already been developed by the NJDEP (Ground Water Quality Standards, N.J.A.C. 7:9C). Each final data package will be sent via email to NJDEP after the evaluation has been completed. A statement regarding the evaluation will be included in the transmittal. A summary spreadsheet of all analytical samples pertaining to the backfill will also be included, which will highlight exceedances of residential and impact-to groundwater remedial standards.

9.1.2 Placement of Backfill

Backfill will be placed in accordance with Bid Specifications that will be prepared after receipt of the analytical results from the design boring program.

10.0 SITE RESTORATION PLAN

A Site Restoration Plan will be developed for implementation following confirmation of completion of the remedial action at the Site.

At a minimum, surface restoration will return the disturbed areas to the pre-excavation use. The intent is to restore the Site in kind.

The excavation activities are not expected to result in the removal of any subsurface storm water catch basins and collector piping or any subsurface electrical utilities. The surface Fabriform drainage structure that is covering the surface drainage ditch at the east end of the Site will be removed. A lined storm water drainage ditch will be constructed in its place.

In the event that any subsurface storm water catch basins and collector piping or any subsurface electrical utilities are encountered during excavation activities, they will be replaced in kind. Restored underground utilities will be inspected by appropriate local jurisdictions and be approved prior to placing them back in service. Reconstruction may either be performed concurrent with backfilling or following backfilling operations.

11.0 REMEDIAL ACTION SCHEDULE AND PROPOSED COMPLETION DATE

The project schedule is provided below. The project schedule will be based upon NJDEP approval of this RAWP. To provide a clear step-by-step schedule for both remediation of soils and groundwater, a separate schedule has been provided for the Soil Remedial Action process and one for the Groundwater Remedial Action process. Note that both Soil and Groundwater Remedial Action tasks will proceed concurrently.

Task	Completion Date
Submittal of Draft Remedial Action Work Plan to NJDEP	4/23/2013
Subcontracting for Remedial Design Borings and Analysis	7/3/2013
Completion of Remedial Design Borings	8/13/2013
Receipt of NJDEP Comments to the Draft RAWP	6/12/2013
Submittal of Revised RAWP to NJDEP	6/26/2013
Finalize the Draft Remedial Action Work Plan	8/1/2013
Obtain Approval of the RAWP from the NJDEP	7/11/2013
Submittal of Final RAWP to NJDEP	8/1/2013
Submittal of Remedial Design Report to NJDEP	9/11/2013
Subcontracting for Remedial Contractors	12/13/2013
Implementation of RAWP	4/29/2014
Site Restoration	5/20/2014
Submit Draft Remedial Action Report to the NJDEP	7/17/2014
Submit Soil Remedial Action Permit to NJDEP	7/17/2014
Receive Soil Remedial Action Permit approval from NJDEP	9/18/2014
RAR Conditions for Approval	9/18/2014

SOIL REMEDIAL ACTION SCHEDULE

GROUNDWATER REMEDIAL ACTION SCHEDULE

Task	Completion Date
Completion of Groundwater TS	To be determined.
Submit Draft GW RAWP Addendum to NJDEP ¹	To be determined.
Receipt of NJDEP Comments to the Draft GW RAWP Addendum	To be determined.
Finalize the Draft GW RAWP Addendum	To be determined.
Obtain Approval of the RAWP from the NJDEP	To be determined.
Subcontracting for Remedial Contractors	To be determined.
Implementation of RAWP	To be determined.
Submit GW Remedial Action Permit to NJDEP	To be determined.
Receive GW Remedial Action Permit approval from NJDEP	To be determined.
Completion of CEA	To be determined.

1 – Draft GW RAWP Addendum will include the NJPDES Discharge to GW Proposal and the Groundwater CEA Proposal.

12.0 REMEDIAL ACTION REPORT

12.1 Remedial Action Progress Reports

In the event that the Remedial Action is not completed within three months, then in accordance with NJAC 7:26E-5.7, Remedial Action Progress Reports will be submitted to the NJDEP and other interested parties on a quarterly basis. The Remedial Action Progress Reports will include the information specified in N.J.A.C. 7:26E-5.7.

12.2 Remedial Action Report

In accordance with N.J.A.C. 7:26E-5.7, a Remedial Action Report (RAR) will be submitted to the NJDEP and other interested parties. The RAR will include the information specified in N.J.A.C. 7:26E-5.7. The RAR will describe the remedial actions implemented at the Site and provide all necessary supporting data to demonstrate that the remedial action is complete. The format of the RAR will be as follows.

- Remedial Action Report Form.
- Updated Case Inventory Document.
- Updated Receptor Evaluation Form.
- Summary of the RIR Findings and Recommendations.
- Description of the Remedial Actions Performed.
- List of Applicable Remedial Standards.
- Documentation that the Remedial Action is Effective in Protecting Public Health and Safety and the Environment.
- Remedial Action Permit Application.
- Applicable As-Built Documents.
- Description of Site Restoration Activities.
- Documentation of the Types and Quantities of Wastes Generated.
- Documentation of the Source, Type, Quantities and Locations of Fill.
- Description of Each Permit Required and Obtained.