REMEDIAL INVESTIGATION REPORT
MARCH 2013

NON-RESIDENTIAL CHROMATE CHEMICAL PRODUCTION WASTE SITE 107
JERSEY CITY, NJ 07302

PREFERRED IDENTIFICATION NUMBER: G000008728

PREPARED FOR:

PPG INDUSTRIES
4325 ROSANNA DRIVE
ALLISON PARK, PA 15101

PREPARED BY:

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DRESDNER ROBIN
Engineering • Environmental • Planning • Surveying • Landscape Architecture

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Case Inventory Document						
I. Area(s) of Concern, Receptor and Emergency Response Tracking	***Impacted Media***	***Contaminants of Concern***	***Exposure Route***	***Receptors***		***Current Status/Outcome***
				Existing	***Potential***	
AOC-1	Soil	CCPW Metals (antimony, nickel, thallium, vanadium) and hexavalent chromium	Soil and Groundwater	n/a	n/a	CCPW (hexavalent chromium, total chromium, antimony, nickel, thallium, vandium) were suspected to have impacted soil at Site 107. Soil borings were advanced and soil samples were collected during seven different mobilizations to the Site (including the Conrail Property to the west of SIte 107 and a stand alone AOC Hotspot located on the northwest corner of the Site 108) between January 2011 and November 2012. The investigations at Site 107 proper, the Conrail Property, and the Site 108 Hotspot and their findings are summarized in the Site 107 Remedial Investigation Report. Hexavalent chromium, antimony, nickel, thallium and vanadium were detected at a concentrations that exceed their respective SRS. Vertical and horizontal delineation of hexavalent chromium and the associated metals has been mostly achieved except along the eastern property line and isolated locations where visible CCPW is present.
AOC-2	Groundwater	CCPW Metals (chromium, nickel, thallium)	Soil and Groundwater	n/a	n/a	CCPW (hexavalent chromium, total chromium, antimony, nickel, thallium, vandium) were suspected to have impacted groundwater at Site 107. Four (4) temporary well points were installed in February 2011. Four (4) groundwater samples were collected from those locations. Groundwater samples indicated chromium, nickel and thallium at concentrations greater than their GWQS. These results are likely biased high due to the presence of suspended particulates in the water column. Therefore, to confirm the presence or absence of chromium, nickel, and thallium at concentrations greater than their GWQS, six (6) permanent monitoring wells are proposed.

New Jersey Department of Environmental Protection
Site Remediation Program

REMEDIAL INVESTIGATION REPORT FORM

Date Stamp
(For Department use only)

SECTION A. SITE NAME AND LOCATION

Site Name: Hudson County Chromate 107

List all AKAs: HCC Site 107

Street Address: 18 Chapel Avenue

Municipality: Jersey City (Township, Borough or City)

County: Hudson Zip Code: 07305

Program Interest (PI) Number(s): G000008728 Case Tracking Number(s):

Date Remediation Initiated Pursuant to N.J.A.C. 7:26C-2: 09/01/2004

State Plane Coordinates for a central location at the site: Easting: 607,011 Northing: 677,537

Municipal Block(s) and Lot(s):

Block #	1505	Lot #	Z 2	Block #		Lot #	
Block #		Lot #		Block #		Lot #	
Block #		Lot #		Block #		Lot #	
Block #		Lot #		Block #		Lot #	

SECTION B. SUBMITTAL STATUS

	Not Applicable	Included in this Submission	Previously Submitted	Date Of Submission	Date of Revised Submission	Date of Document Withdrawal
Public Notification	☐	☐	☒	08/01/2011		
Immediate Environmental Concern Report	☒	☐	☐			
IEC Engineered System Response Action Report	☒	☐	☐			
Vapor Concern Mitigation Report	☒	☐	☐			
LNAPL Interim Remedial Measure Report	☒	☐	☐			
Preliminary Assessment Report	☒	☐	☐			
Receptor Evaluation	☐	☒	☐	03/29/2013		
Site Investigation Report	☒	☐	☐			
Remedial Investigation/Remedial Action Work Plan	☐	☒	☐	03/29/2013		
Remedial Action Report	☒	☐	☐			
Response Action Outcome	☒	☐	☐			
Alternative Soil Remediation Standard and/or Screening level Application Form	☒	☐	☐			
Case Inventory Document	☐	☒	☐	03/29/2013		
Permit Application – list:	☒	☐	☐			
	☐	☐	☐			
	☐	☐	☐			
	☐	☐	☐			
Radionuclide Remedial Investigation Workplan	☒	☐	☐			
Radionuclide Remedial Investigation Report	☒	☐	☐			
Radionuclide Remedial Action Workplan	☒	☐	☐			
Radionuclide Remedial Action Report	☒	☐	☐			

SECTION C. SITE USE

Current Site Use (check all that apply)

- ☒ Industrial
- ☐ Residential
- ☒ Commercial
- ☐ School or child care
- ☐ Other _____
- ☐ Agricultural
- ☐ Park or recreational use
- ☐ Vacant
- ☐ Government

Intended Future Site Use (check all that apply)

- ☒ Industrial
- ☐ Residential
- ☒ Commercial
- ☐ School or child care
- ☐ Park or recreational use
- ☐ Vacant
- ☐ Government
- ☐ Future site use unknown

SECTION D. PUBLIC FUNDS

Did the remediation utilize public funds? ☐ Yes ☒ No

If "Yes," check applicable:

- ☐ UST Grant
- ☐ HDSRF Grant
- ☐ Spill Fund
- ☐ UST Loan
- ☐ HDSRF Loan
- ☐ Schools Development Authority
- ☐ Brownfield Reimbursement Program
- ☐ Landfill Reimbursement Program

SECTION E. SCOPE OF THE REMEDIAL INVESTIGATION REPORT

1. Does the Remedial Investigation address:
   - ☐ Area(s) of Concern (AOCs) Only
   - ☒ Entire Site (based on a completed and submitted Preliminary Assessment/Site Investigation)
2. Total number of contaminated AOCs associated with the case: 2
3. Total number of contaminated AOCs addressed in this submittal: 2
4. Is the Remedial Investigation complete for the contaminated AOCs addressed in this submittal? ☐ Yes ☒ No
5. Is the Remedial Investigation complete for all AOCs associated with this case? ☐ Yes ☒ No

   If "Yes," provide date: _____

SECTION F. SITE CONDITIONS

1. Check each media-type and highest concentration of contamination present above any applicable standards/criteria at the time of remedial investigation:

Soil in ppm						GW = Ground Water in ppb					SW = Surface Water in ppb					Sed = Sediment in ppm				
	Soil ppm	GW ppb	SW ppb	Sed ppm		Soil ppm	GW ppb	SW ppb	Sed ppm		Soil ppm	GW ppb	SW ppb	Sed ppm		Soil ppm	GW ppb	SW ppb	Sed ppm	
*VOCs	☐	☐	☐	☐	<100	☐	☐	☐	☐	100–1,000	☐	☐	☐	☐	>1,000	☐	☐	☐	☐	>1,000
*SVOCs	☐	☐	☐	☐	<100	☐	☐	☐	☐	100–1,000	☐	☐	☐	☐	>1,000	☐	☐	☐	☐	>1,000
*PAHs	☐	☐	☐	☐	<10	☐	☐	☐	☐	10–100	☐	☐	☐	☐	>100	☐	☐	☐	☐	>100
*Metals	☐	☐	☐	☐	<100	☐	☒	☐	☐	100–1,000	☒	☐	☐	☐	>1,000	☒	☐	☐	☐	>1,000
PCBs	☐	☐	☐	☐	<10	☐	☐	☐	☐	10–100	☐	☐	☐	☐	>100	☐	☐	☐	☐	>100
*Pesticides	☐	☐	☐	☐	<1	☐	☐	☐	☐	1-10	☐	☐	☐	☐	>10	☐	☐	☐	☐	>10
Dioxin (ppb)	☐	☐	☐	☐	<1 ppb	☐	☐	☐	☐	1-10 ppb	☐	☐	☐	☐	>10 ppb	☐	☐	☐	☐	>10 ppb
Chromium	☐	☐	☐	☐	<100	☐	☒	☐	☐	100–1,000	☒	☐	☐	☐	>1,000	☒	☐	☐	☐	>1,000
Mercury	☐	☐	☐	☐	<100	☐	☐	☐	☐	100–1,000	☐	☐	☐	☐	>1,000	☐	☐	☐	☐	>1,000
Arsenic	☐	☐	☐	☐	<10	☐	☐	☐	☐	10–100	☐	☐	☐	☐	>100	☐	☐	☐	☐	>100
EPH	☐			☐	<1,700	☐			☐	1,700–5,100	☐			☐	>5,100					

2. For any contaminant group (*) checked above, identify the compound/element with the highest concentration over its applicable remediation standard:

   vanadium, nickel, antimony, thallium (soil) | hexavalent chromium (soil) | nickel, thallium (groundwater) | chromium (groundwater) | _____

3. Were the laboratory reporting minimum detection limits below applicable remediation standards/ criteria required for the site? ☐ Yes ☒ No

4. Are any of the following conditions currently present? (check all that apply)

Ground water:

- ☒ Contaminated ground water in the overburden aquifer
- ☐ Contaminated ground water in a confined aquifer
- ☐ Contaminated ground water in the bedrock aquifer
- ☐ Contaminated ground water in multiple aquifer units
- ☐ Multiple distinct ground water plumes
- ☐ Contaminated ground water migrating off-site
- ☐ Background ground water contamination
- ☐ Contaminated ground water discharging to surface water
- ☐ Residual or free product
- ☐ Radionuclides

Soil:

- ☐ On-site discharge(s) impacting soil off-site
- ☒ Chromate Production Waste
- ☐ Munitions and explosives of concern
- ☐ Contaminated soil in the saturated zone
- ☐ Historic pesticide impacts to soil
- ☐ Residual or free product
- ☐ Radionuclides
- ☐ Historic Fill
- ☐ Soil contamination due to naturally occurring background conditions

SECTION G. APPLICABLE REMEDIATION STANDARDS

1 Were Default Remediation Standards used for all compounds? ☒ Yes ☐ No
(If "Yes," check all that apply)

- ☒ Direct Contact
- ☒ Impact to Ground Water Soil Screening Levels
- ☐ Ecological Screening Levels

2. Has compliance averaging been utilized to determine compliance with the Inhalation Pathway? ☐ Yes ☒ No

3. Has a compliance option been utilized to determine compliance with the Impact to Ground Water Pathway? (If "Yes," check all that apply) ☐ Yes ☒ No

- ☐ Immobile Compounds
- ☐ Data evaluation for metals and semi-volatiles
- ☐ Data evaluation for volatile organics derived from discharges of petroleum mixtures

4. Were Alternate Remediation Standards used for the Ingestion/Dermal Pathway? ☐ Yes ☒ No

5. Were Alternate Remediation Standards used for the Inhalation Pathway? ☐ Yes ☒ No

6. Were Site Specific Standards used for the Impact to Ground Water Pathway? ☐ Yes ☒ No
(If "Yes," check all that apply)

- ☐ Soil-Water Partitioning Equation ☐ SPLP ☐ Sesoil ☐ Sesoil/AT123D
- ☐ DAF Modification ☐ Immobile Chemicals List
- ☐ Soil and Ground Water Analytical Data Evaluation

7. Were site specific Ecological Remediation Goals used? ☐ Yes ☒ No

8. What is the ground water classification for this site as per N.J.A.C. 7:9C? (check all that apply)

- ☐ Class I-A
- ☐ Class I-PL Pinelands Protection Area
- ☐ Class I-PL Pinelands Preservation Area
- ☒ Class II-A
- ☐ Class III-A
- ☐ Class III-B

SECTION H. BACKGROUND CONDITIONS

Did the RI demonstrate via a background investigation, outside the influence of on-site AOCs **and** operational areas, that:

1. all or any part of the ground water contamination is migrating onto this site per N.J.A.C. 7:26E-3.7(g)? ☐ Yes ☒ No ☐ NA

2. soil contamination is naturally occurring per N.J.A.C. 7:26E-3.10 ☐ Yes ☒ No ☐ NA

SECTION I. ALTERNATIVE STANDARD / VARIANCES

Alternative remediation standard

If proposing an alternative remediation standard pursuant to N.J.A.C. 7:26D-7.4, or alternate vapor intrusion screening level, check here ☐ and attach the Alternative Soil Remediation Standard and/or Screening Level Application Form as an addendum.

A site-specific screening level was developed for the evaluation of the VI pathway ..... ☐ Yes ☒ No

Variance from regulations

If the Licensed Site Remediation Professional has varied from the Technical Rules, provide the citation(s) from which the remediation varied and the page(s) in the attached document where the rationale for the variance is provided.

N.J.A.C. 7:26E- _____ Page _____

N.J.A.C. 7:26E- _____ Page _____

N.J.A.C. 7:26E- _____ Page _____

SECTION J. HISTORIC FILL

1. The presence of historic fill is supported by (check all that apply):

   ☒ Boring logs ☐ Test Pits ☐ Trenches ☐ Aerial Photos ☐ NJDEP Mapped Areas

   ☐ No historic fill identified at the site. If none, skip to K. below.

2. How was the historic fill characterized pursuant to N.J.A.C. 7:26E-4.6? (check all that apply)

   ☒ Samples were collected outside areas potentially impacted by on-site operations (i.e., AOC(s))

   ☐ Contaminant levels in Table 4.2 at N.J.A.C. 7:26E-4.6

3. Are any other AOCs (i.e., location of discharge and any contaminants that may have migrated from that area) located within the defined boundaries of the historic fill? ..... ☐ Yes ☒ No

   If "No," skip to K. below

4. Have the same contaminant type(s) (e.g., lead, arsenic, and/or benzo(a)pyrene, etc.) characterized as being present in the historic fill been **sampled for** as a contaminant of concern at these co-located AOCs? ..... ☐ Yes ☐ No

SECTION K. GROUND WATER TRIGGER

1. Was a ground water investigation conducted at all AOCs where a ground water investigation was triggered pursuant to N.J.A.C. 7:26E-3.7 and 4.4(a)? ..... ☒ Yes ☐ No ☐ NA
2. Is contamination in soils fully delineated? ..... ☐ Yes ☒ No

SECTION L. GROUND WATER REMEDIAL INVESTIGATION INFORMATION

1. Are contaminants present with a specific gravity less than that of water? ..... ☐ Yes ☒ No
   a. If "Yes," were any monitor wells installed in unconfined aquifers in which the water table is higher than the top of the well screen? ..... ☐ Yes ☐ No

   If "Yes" to 1a, identify the affected wells. _____
2. Are contaminants present with a specific gravity greater than that of water? ..... ☒ Yes ☐ No
   a. If "Yes," were multiple depth discrete ground water samples collected in a vertical profile at each ground water sampling location where dense contaminants were suspected? ..... ☐ Yes ☒ No
3. Is ground water in the bedrock aquifer contaminated? ..... ☐ Yes ☒ No

   If "Yes," answer questions 3a and 3b.

   a. Were bedrock cores collected? ..... ☐ Yes ☐ No
   b. Were geophysical logging methods conducted to characterize the bedrock aquifer pursuant to N.J.A.C. 7:26E-4.4(g)5? ..... ☐ Yes ☐ No
4. Is contamination in ground water fully delineated? ..... ☐ Yes ☒ No

SECTION M. ECOLOGICAL RECEPTORS

1. Have soil, sediment, and/or surface water data been collected from Environmentally Sensitive Natural Resources (ESNR)? ☐ Yes ☐ No ☒ NA
   a. If "Yes," do contaminant concentrations at the ESNR exceed ecological screening criteria or the aquatic chronic NJSWQS [N.J.A.C.7:9B]? ☐ Yes ☐ No
   b. If "Yes," have soil and sediment data been collected from both surface and subsurface intervals in the ESNR? ☐ Yes ☐ No
   c. If No for 1b, provide explanation _____
2. Have contaminant migration pathways from the site/AOC to the ESNR been identified? ☐ Yes ☐ No
3. Do the results of the Ecological Evaluation require a remedial investigation of ecological receptors? ☐ Yes ☐ No

   If No, provide explanation _____
4. Has an Ecological Risk Assessment been conducted [N.J.A.C.7:26E-4.7]? ☐ Yes ☐ No
5. Is remediation required in an ESNR? ☐ Yes ☐ No

SECTION N. LABORATORY DATA

1. Were all data submitted in the appropriate full and/or reduced formats according to the deliverables defined in N.J.A.C. 7:26E-2? ☒ Yes ☐ No
2. Do all data submitted meet the quality assurance/quality control (QA/QC) requirements incorporated by reference in N.J.A.C. 7:26E-2 for:
   sampling ☒ Yes ☐ No
   analysis ☒ Yes ☐ No
3. How was it determined that the data complied with the QA/QC requirements?
   ☐ Laboratory non-conformance summary/narrative
   ☐ Laboratory correspondence
   ☐ LSRP review
   ☒ Independent contractor review
   ☐ Other: _____
4. Has any data been qualified and used? ☒ Yes ☐ No
5. Has any data been rejected and used? ☐ Yes ☒ No
6. Comments:

SECTION O. MISCELLANEOUS

1. Were any regulated USTs identified during the course of the RI that were not previously known? ☐ Yes ☒ No

   If "Yes," list tank size, contents and registration number(s). _____

   _____

1a. If "Yes," to item N.1. above and if these USTs were Federally Regulated, was the source/cause of release identified on a Confirmed Discharge Notification form? ☐ Yes ☐ No

   If "No," complete and submit a revised Confirmed Discharge Notification form.
2. Were additional Areas of Concern identified during the RI? ☐ Yes ☒ No

   If "Yes," identify AOC: _____

3. Identify Remedial Measures (RMs) conducted during the RI (check all that apply):

- ☐ Soil excavation
- ☐ Potable water supply treatment or replacement
- ☐ Hydraulic containment of source area
- ☐ Soil vapor extraction
- ☐ Enhanced fluid recovery (EFR)
- ☐ Other(s), specify: _____
- ☐ UST closure
- ☐ Free product recovery
- ☐ Vapor intrusion mitigation
- ☒ No RMs were conducted during the RI

4. Did the remedial investigation include sampling to characterize any on-site contaminated media for either on-site or off-site reuse? ☐ Yes ☒ No

5. Has clean fill has been brought onto the site? ☒ Yes ☐ No

   If yes, has it been analyzed? ☒ Yes ☐ No

6. Has new information (material facts, data or other information) been generated during the RI that corrects or contradicts information, or changes conclusions from, previously submitted reports or information? ☐ Yes ☒ No

   If "Yes," explain: _____

7. Have past deficiencies/notice of deficiencies been addressed in this submittal? ☐ Yes ☒ No

SECTION P. PERSON RESPONSIBLE FOR CONDUCTING THE REMEDIATION INFORMATION AND CERTIFICATION

Full Legal Name of the Person Responsible for Conducting the Remediation: PPG

Representative First Name: Mark Representative Last Name: Terril

Title: Corporate Director, Environmental Affairs

Phone Number: (412) 434-2078 Ext: Fax:

Mailing Address: One PPG Place

City/Town: Pittsburgh State: PA Zip Code: 15272

Email Address: terril@ppg.com

This certification shall be signed by the person responsible for conducting the remediation who is submitting this notification in accordance with Administrative Requirements for the Remediation of Contaminated Sites rule at N.J.A.C. 7:26C-1.5(a).

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Signature: Mark Terril Date: September 26, 2018

Name/Title: Mark Terril/Director, Environmental Affairs **No Changes Since Last Submittal** ☒

SECTION Q. LICENSED SITE REMEDIATION PROFESSIONAL INFORMATION AND STATEMENT

LSRP ID Number: _____

First Name: _____ Last Name: _____

Phone Number: _____ Ext: _____ Fax: _____

Mailing Address: _____

City/Town: _____ State: _____ Zip Code: _____

Email Address: _____

This statement shall be signed by the LSRP who is submitting this notification in accordance with SRRA Section 16 d. and Section 30 b.2.

I certify that I am a Licensed Site Remediation Professional authorized pursuant to N.J.S.A. 58:10C to conduct business in New Jersey. As the Licensed Site Remediation Professional of record for this remediation, I:

[SELECT ONE OR BOTH OF THE FOLLOWING AS APPLICABLE]:

☐ *directly oversaw and supervised all of the referenced remediation, and\or*

☐ *personally reviewed and accepted all of the referenced remediation presented herein.*

I believe that the information contained herein, and including all attached documents, is true, accurate and complete.

It is my independent professional judgment and opinion that the remediation conducted at this site, as reflected in this submission to the Department, conforms to, and is consistent with, the remediation requirements in N.J.S.A. 58:10C-14.

My conduct and decisions in this matter were made upon the exercise of reasonable care and diligence, and by applying the knowledge and skill ordinarily exercised by licensed site remediation professionals practicing in good standing, in accordance with N.J.S.A. 58:10C-16, in the State of New Jersey at the time I performed these professional services.

I am aware pursuant to N.J.S.A. 58:10C-17 that for purposely, knowingly or recklessly submitting false statement, representation or certification in any document or information submitted to the board or Department, etc., that there are significant civil, administrative and criminal penalties, including license revocation or suspension, fines and being punished by imprisonment for conviction of a crime of the third degree.

LSRP Signature: _____ Date: _____

LSRP Name/Title: _____ **No Changes Since Last Submittal** ☐

Company Name: _____

Completed forms should be sent to:

Bureau of Case Assignment & Initial Notice
Site Remediation Program
NJ Department of Environmental Protection
401-05H
PO Box 420
Trenton, NJ 08625-0420

1.0 INTRODUCTION

On behalf of the PPG Industries (PPG) this Remedial Investigation Report (RIR) has been prepared by Dresdner Robin to present the findings of the soil and groundwater remedial investigations conducted at Non-Residential Chromate Chemical Production Site 107 (the Site). The Site is located at 18 Chapel Avenue Block 1505, Lot Z^2 in Hudson County, Jersey City, New Jersey. The Preferred Identification number for the Site is G000008728.

The primary objective of the investigations was to delineate the horizontal and vertical extent of Chromium Chemical Production Waste (CCPW) and the CCPW impacts to soil and groundwater at the Site. Remedial investigations were conducted in accordance with scope of work outlined in AECOM's October 2010 *Remedial Investigation Workplan for Non-Residential Chromate Chemical Production Sites 107 and 108*. We draw to your attention that findings presented in this RIR are limited to Site 107; a separate RIR for Site 108 was submitted.

Investigations conducted at the Site are subject to the 1990 Administrative Consent Order (ACO) between PPG and the New Jersey Department of Environmental Protection (NJDEP) as well as the 2009 Judicial Consent Order (JCO) between the PPG, the NJDEP and the City of Jersey City. Investigations presented within this report were conducted in accordance with the NJDEP Technical Requirements for Site Remediation ("TRSR"), N.J.A.C. 7:26E (adopted on November 4, 2009, last amended October 3, 2011) and the NJDEP Field Sampling Procedures Manual (dated August 2005, last updated April 11, 2011).

2.0 ENVIRONMENTAL SETTING

A description of the Site, surrounding land use, topography, soils, surface water, geology and hydrogeology for the Site and surrounding area is summarized below.

2.1 Site Location and Description

The Site is identified on the New Jersey tax map as Block 1505, Lot Z^2 with a street address of 18 Chapel Avenue in Jersey City, Hudson County, New Jersey. The Site is approximately five (5) acres and contains one (1) building that is used for warehousing and light manufacturing. The Site is located within a residential, commercial and light industrial area of Jersey City, New Jersey. A United States Geological Survey (USGS) map presenting the regional location of the project is presented as **Figure 1**; an aerial photograph identifying the Site is presented as **Figure 2.**

2.2 Surrounding Land Use

This area of Jersey City is generally characterized by residential, commercial and light industrial uses. The limits of Site are broadly defined by the Conrail Right of Way to the northwest, Non-Residential Chromate Chemical Production Site 108 to the southwest, Hudson County Chromate Site 67 to the southeast beyond a small portion of a Conrail Right-of-Way, and an empty lot (identified as Block 1505, Lot Z^1) beyond which is Chapel Avenue to northeast. Please note, Site 67 is not a PPG related chromate waste site and is shown on **Figure 2**.

2.3 Topography

The USGS Topographic Map **(Figure 1)** presents the regional topography in the area. The Site is generally flat with little topographic relief and an average ground surface elevation of approximately twenty (20) above mean sea level ("msl").

2.4 Surface Water

There are no surface water bodies on or adjacent to the Site. The nearest surface water body is the Upper New York Bay, which is located approximately 2,000 feet to the east of the Site.

2.5 Wetlands

The Site is not designated as wetlands and none were identified on or adjacent to the Site. According to NJDEP's i-Map wetlands database, the nearest wetlands are located approximately 1,500 feet to the southeast of the Site.

2.6 Regional Geology

The Project Area is located in the Piedmont Physiographic Province of New Jersey along the eastern edge of the Newark Basin. The Piedmont is described as a rolling plain which extends south and east from the southeastern edge of the New Jersey Highlands to the Hudson River, in the northern portion of New Jersey. The Newark Basin was formed during the Late Triassic and Early Jurassic periods and extends locally from the west of the first Watchung Mountain in northern central New Jersey to the Hudson River.

The Triassic Newark Supergroup consists of non-marine sedimentary rocks and diabase intrusions. The Newark Supergroup is divided into three (3) formations on the basis of distinctive lithology: (1) the lower unit - the Stockton Formation, (2) the middle unit - Lockatong Formation, and (3) the upper unit - the Passaic Formation.

The Bedrock Geology Map of Northern New Jersey, USGS 1996, indicates the bedrock at the Site is comprised of the Lockatong Formation. The Stockton Formation is found east of the Site, and Diabase to the west of the Site. The Lockatong Formation is composed of light to dark gray, greenish-gray and black dolomitic or silty argillite, mudstone, sandstone, siltstone and minor silty limestone.

2.7 Regional Soil

Generally the subsurface conditions at the Project Area consist of the following strata listed in order of increasing depth:

- Fill Material: The thickness and composition of the fill material is variable. The fill material generally rest on top of marine deposits, glacial deposits and bedrock. The fill material is composed by a mixture of cinders, sand and gravel with a trace of silt and clay, construction demolition debris (concrete, brick, glass, metal, etc.), wood, slag and miscellaneous debris. Additionally, it is believed some areas of fill may include CCPW and or CCPW impacted material. The fill was often placed to raise surface elevations above the existing water level in an effort to reclaim wetlands and flood prone areas for development and can range from 10 feet to 20 feet in the general project area. Deeply occurring subsurface fill is common in Jersey City.

- Natural Marine and Estuarine Marsh Deposits: Generally, these deposits are composed of organic silt and clay (clayey silt), fine sand, traces of shells, traces of wood and peat. These deposits can range in thickness from 20 to 40 feet and thickness varies regionally. Organic sediments at the Site are not expected to be greater than 5 feet thick.

- Glacial Deposits (undifferentiated): The glacial deposits generally consist of a thin layer of glacial till deposited on top of the bedrock or beneath the fill or organic sediments. The glacial till comprises either brown or gray-brown coarse through fine sand and gravel with some silt and/or clayey silt with gravel and sand. The glacial deposits beneath the Project Area and its vicinity may not be continuous.

2.8 Regional Hydrogeology

Groundwater in the Project Area occurs in three (3) general stratigraphic zones:

1. Non-native fill;
2. Unconsolidated native deposits including glacial silt, sand, gravel; and
3. Bedrock.

2.9 Regional Groundwater in Fill Deposits

Groundwater in the fill is typically encountered within five (5) to (10) feet below ground surface (bgs). In general, shallow groundwater flow pattern mimics land surface topography. Variations from this can be attributed to factors such as heterogeneities in the fill, subsurface structures, exfiltration from and infiltration to subsurface utilities and spatially variable recharge due to the presence of impervious surfaces.

2.10 Regional Groundwater in Native Unconsolidated Deposits

While there are some more permeable zones of sand and gravel in the intermediate zone, the aquifer below the meadow mat can be characterized as low to moderately permeable because of the high silt content. Observations of clay also support a lower permeability below the meadow mat.

Groundwater flow in the deep zone glacial deposits is controlled by primary permeability or flow through the interconnected pore spaces in the soil matrix. Groundwater moves most readily through the glacial deposits. Conceptually, in this stratum, groundwater flows horizontally but is influenced strongly by local recharge and

discharge zones (i.e., drainage divides and surface water bodies, respectively). Regionally, glacial deposits can support water supply wells yielding up to 1,500 gpm (Geraghty, 1959).

2.11 Regional Groundwater in the Lockatong Formation (Bedrock)

The unconsolidated native deposits and the bedrock are part of a regional aquifer serving most of the industrialized sections of northern New Jersey. Hydrogeologic properties of the Lockatong Formation is not well-documented, but is expected to be similar to the Passaic Formation which is well documented. The hydraulic properties of the bedrock aquifer (i.e., storage capacity and transmissivity) are due to secondary permeability, characterized by flow within fractures. The thickness of water-bearing zones is small, with estimates ranging from a few inches to 20 feet. Groundwater occurrence and flow is controlled either by the numerous vertical or near-vertical fractures (Herpers and Barksdale, 1951), or by major bedding partings and/or intensely fractured seams (Michalski, 1990). These formations exhibit an anisotropic flow pattern with preferential flow along the strike of the beds. Well yields range from several gallons to several hundred gallons per minute ("gpm"), with yields generally decreasing with depth. Groundwater in these formations occurs under both unconfined and confined conditions.

3.0 REMEDIAL INVESTIGATION PROCEDURES

The objective of the Remedial Investigation was to horizontally and vertically delineate CCPW, visual CCPW, and CCPW-impacted materials at, and potentially emanating from the Site. The delineation was proposed through the advancement of soil borings, installation of temporary well points and through the laboratory analysis of soil and groundwater samples.

The initial soil and groundwater investigation consistent with AECOM's October 2010 Remedial Investigation Workplan (RIWP) was conducted in January and February 2011. Additional mobilizations were required to delineate hexavalent chromium and metals potentially associated with CCPW and are outlined below. The methods used for each round of sampling are detailed in Sections 3.6 and 3.8.

The following is a chronological summary of the individual mobilizations conducted during the Site 107 RI:

- January and February 2011 – consisted of a soil and groundwater investigation at Site 107 as outlined in AECOM's October 2010 Remediation Investigation Workplan. All soil borings and temporary well points were advanced along a predetermined, surveyed grid.

- June 2011 – consisted of an additional soil investigation at Site 107 to delineate hexavalent chromium and metals potentially associated with CCPW detected at concentrations greater than their SRS during the January and February 2011 mobilization.

  In addition, soil was excavated and post-excavation samples were collected at Site 108, at the soil boring location 108_M018 (Site 108 hotspot). Due to the proximity of soil boring location 108_M018 to Site 107, and because this area identified as the "Site 108 Hotspot" is the only area to contain hexavalent chromium exceedances at Site 108, this area of concern was documented in this report.

- July 2011 – consisted of additional soil excavation and collection of post-excavation soil samples at Site 108 hotspot, at the boring location 108_M018 due to the results of June 2011 sampling.

- August 2011 – consisted of an additional soil investigation at Site 107 to delineate hexavalent chromium and metals potentially associated with CCPW detected at concentrations greater than their SRS during the June 2011 mobilization.

- December 2011 - consisted of an additional soil investigation along the northwestern property line and the property adjacent to the Site to the northwest (hereinafter the Conrail Property) to delineate hexavalent chromium detected (at concentrations greater than their NRDCSRS and RDCSRS) at Site 107.

- July 2012 – consisted of an additional soil investigation at the Conrail Property to delineate hexavalent chromium (detected at concentrations greater than its NRDCSRS and RDCSRS) impacts during the December 2011 investigation.

- November 2012 – consisted of an additional soil investigation at the Conrail Property to delineate hexavalent chromium (detected at concentrations greater than its NRDCSRS and RDCSRS) impacts during the July 2012 investigation.

It should be noted PPG implemented an Interim Remedial Measure (IRM) at Site 107 in 1992 to prevent worker exposure to potential CCPW-related contamination. The IRM included the installation of polyethylene plastic and plywood coverings over contaminated interior building areas. The coverings were placed over interior building walls in the northwest loading dock and the eastern wall of the building. Warning placards explaining the hazard were placed over the protective coverings. Asphalt pavement was installed at exterior locations on the south side and northwest corner of the Site 107 building. PPG implemented additional IRMs at the Site from March 18 to August 26, 1999 to repair and/or replace portions of the concrete floor slab and

concrete block walls at thirteen (13) interior building locations. Subfloor material was excavated to a specified depth below the bottom of the slab. The bottom and sides of the excavation were lined with a clean polyethylene liner, and the excavation was backfilled with certified clean fill to just below the base of the adjacent concrete slab. A polyethylene liner was placed above the clean fill, and a new concrete was poured to a thickness equal to the adjacent slab. Additional IRM activities included asbestos floor tile removal, removal and replacement of an eastern wall, and removal and replacement of an interior double block wall. The repair and replacement work conducted by PPG remediated the areas capped and sealed during the initial IRM work allowing the removal of the initial IRMs. A figure depicted the IRM locations is provided as **Figure 3**.

The following sections 3.1 through 3.6 outline the general procedures used for each mobilization.

3.1 Land Survey

A boundary survey was developed for Site 107 to identify the limits of the Site including deed boundaries and existing physical features and is included as **Figure 4**. Proposed sample locations were located and flagged by the surveyor along a 60-foot by 60-foot grid. As such, all soil boring locations are identified based on site location and grid location. For example, 107_I038 indicates the sample was collected from Site 107 and at grid location I38. Any suffix (i.e., 107_I038_7.0) designates the beginning depth of a six (6) inch discrete soil sample location and (i.e., 107_M018E2_N) designates the direction in which the delineation boring was advanced.

3.2 Geophysical Investigation

Prior to conducting any intrusive investigations at Site 107 or at the Conrail Property, a geophysical investigation including Ground Penetrating Radar (GPR) and Electro-Magnetic (EM) surveys were conducted by Enviroprobe Services, Inc. of Moorestown, New Jersey. All boring locations were cleared prior to drilling in order to identify utilities and any subsurface anomalies.

3.3 Visual Classification of Soil

Visual classification of soil samples was performed using the Burmeister Soil Classification System. Sample descriptions included a geologic description of the soil and visual observations (e.g., staining, oily sheens, mottling, discoloration, etc.). Soil boring logs are provided in **Attachment A.**

3.4 Field Screening of Samples

Each soil core was field-screened with a properly calibrated photo ionization detector (PID). Samples were field-screened within each acetate macro-core liner immediately upon opening the soil core. Field-screening results were recorded on the soil boring logs and in a dedicated field book. The PID was only used for health and safety purposes and not used for assistance in sample collection as VO compounds were not included in the sampling suite.

3.5 Sample Collection and Laboratory Analyses

Sampling was performed in accordance with the *NJDEP Field Sampling Procedures Manual.* Analytical samples were placed in pre-cleaned containers provided by Test America Laboratories and IAL Laboratories (July 2012 and November 2012 only), both New Jersey licensed analytical laboratories. The containers were clearly labeled with the sample identification, depth, date of collection, preservation, and analyses to be performed. All samples were transported to the laboratory under chain-of-custody procedures.

3.6 Soil Investigation Procedures

All drilling was performed by EMC, Inc. of Randolph, New Jersey using direct-push methods with a dual tube setup. The dual tube setup used two sets of probe rods to collect continuous soil cores. One set of drill rods was driven into the ground as an outer casing. These rods received the driving force from the hammer and provided a sealed hole from which soil samples could be recovered without the threat of cross contamination. The second, smaller set of rods was placed inside the outer casing. The smaller rods held a sample liner in place as the outer casing was driven the length of sampling interval. The small rods were then retracted to retrieve the filled liner. The macro-cores were collected continuously from the ground surface throughout the depth of the boring for visual inspection, geologic characterization, and the collection of samples. Rods were properly decontaminated between each boring with decontamination waste collected and stored within 55 gallon steel drums, pending offsite disposal.

3.6.1 January/February 2011 Soil Investigation

A total of forty-nine (49) soil borings were advanced at Site 107 in January and February 2011 as shown on **Figure 5**. Each soil boring was advanced a minimum of eight (8) feet below the fill/native soil interface which ranged between five (5) feet bsg and ten (10) feet bsg.

A total of four hundred and forty-seven (447) soil samples were analyzed during the January and February 2011 soil investigation. Soil samples were collected from a discrete six (6) inch interval as outlined in the RIWP. The number and depth of each soil sample location was dependent on the location of the soil boring. The following soil sampling procedure was followed:

- One surface soil sample from 0-0.5 feet bsg (or from the first 6-inch soil);
- One sample within each subsequent 4-foot interval (unless CCPW is visually identified;
    - If visually identified, one sample collected directly above CCPW and one sample directly below the bottom of the visible CCPW;
- One sample directly above the first native soil;
- One sample approximately four (4) feet below the fill/native soil interface, and
- One sample approximately eight (8) feet below the fill/native soil interface

All soil samples collected in January and February 2011 were analyzed for hexavalent chromium, total chromium, metals potentially associated with CCPW (antimony, nickel, thallium, and vanadium), pH and oxidation-reduction potential (Eh). All soil samples were transported to Test America Laboratories under proper chain-of-custody procedures.

3.6.2 June 2011

<u>Site 107</u>

A total of twenty-three (23) soil borings were advanced at Site 107 in June 2011 as shown on **Figure 5** and total of ninety-four (94) soil samples were collected. The purpose of each soil boring advanced was to delineate the soil impacts detected during the January and February 2011 mobilization. All soil samples were analyzed for hexavalent chromium, pH, and Eh and, depending on the location, select metals potentially associated with CCPW. All soil samples were transported to Test America Laboratories under proper chain-of-custody procedures.

<u>Site 108 Hotspot</u>

The NJDEP approved a small area of CCPW impact at the northwest corner of Site 108 to be “carved-out” and independently reported and remediated as a “stand alone” area of concern (AOC) during the future RIR and remedial actions. Therefore, pursuant to Dresdner Robin’s letter to the NJDEP dated May 31, 2011 (**Attachment B**), it was determined due to the proximity of the hexavalent chromium exceedance located on Site 108 (sample location 108_M018_3.5) all remediation associated with this location would be conducted

and reported as part of Site 107. As such, additional investigation/remediation activities were conducted at sample location 108_M018_3.5 (3.5-4.0 feet bsg) where hexavalent chromium was detected at a concentration that exceeded its RDCSRS and NRDCSRS of 20 mg/kg during the Site 108 RI activities in February 2011. The June 2011 activities included removal, transportation, and disposal of soil and the collection of confirmatory post-excavation samples. Specifically, a 5-foot deep by 5-foot wide by 5-foot long area of soil was excavated around soil boring location 108-M018. All soil was placed in a roll off container for appropriate off-site disposal. A total of eight (8) post-excavation soil samples were collected. One (1) sample was collected from 2.5-3.0 feet bsg and one (1) sample was collected 3.5-4.0 feet bsg along each post-excavation sidewall. The eight (8) post-excavation soil samples were analyzed only for hexavalent chromium. All soil samples were transported to Test America Laboratories under proper chain-of-custody procedures. Please see **Figure 6** for the location of the post-excavation soil samples.

3.6.3 July 2011

Site 108 Hotspot

Based on the results of the Site 108 hotspot, June 2011 post-excavation soil samples, one (1) sample (108_M018_N) contained hexavalent chromium at a concentration greater than 20 mg/kg and therefore, additional remediation was required. On July 1, 2011 the excavation was extended three feet to the northeast in order to delineate the northeast edge of the hexavalent chromium impacts and to remove the hexavalent chromium impacts associated with 108_M018_N. All soil was placed in a roll off container for appropriate offsite disposal. A single post-excavation sample (108-M018-N-0) was collected 2.0-2.5 feet bsg from the northeast excavation sidewall. The location of the additional post-excavation is depicted on **Figure 6.** The soil sample was analyzed only for hexavalent chromium and transported to Test America Laboratories under proper chain-of-custody procedures.

3.6.4 August 2011

Site 107

A total of nine (9) soil borings were advanced at Site 107 in August 2011 as shown on **Figure 5** with a total of forty (40) soil samples collected. The purpose of each soil boring advanced was to delineate the soil impacts detected during the June 2011 mobilization. All soil samples were analyzed for hexavalent chromium, pH, Eh and one sample was analyzed for vanadium. All soil samples were transported to Test America Laboratories under proper chain-of-custody procedures.

Site 108 Hotspot

The result of the post-excavation soil sample (location 108-M018-N-0) collected in July 2011 revealed a concentration of hexavalent chromium that exceeded its NRDCSRS and RDCSRS of 20 mg/kg. Therefore, on August 16, 2011 three soil borings (108_M018_A, 108_M018_B, 108_M018_C) were advanced ten (10) feet to the northeast of the 108_M018_N_0 to horizontally and vertically delineate the hexavalent chromium hotspot (twenty (20) and thirty (30) feet from the original location, respectively). A total of nineteen (19) soil samples were collected from the three (3) soil borings and all samples were analyzed for hexavalent chromium. All soil samples were transported to Test America Laboratories under proper chain-of-custody procedures. The locations of the soil borings are depicted of **Figure 6.**

3.6.5 December 2011

Conrail Property

A total of twenty-seven (27) soil borings were advanced along the northwestern property and on the Conrail Property in December 2011 as shown on **Figure 7** with a total of 146 soil samples collected. The goal of the mobilization was to delineate soil impacts detected during the January/February, June, and August

mobilizations. All soil samples were analyzed for hexavalent chromium and/or vanadium, and pH and Eh. All soil samples were transported to Test America Laboratories under proper chain-of-custody procedures.

3.6.6 July 2012

Conrail Property

A total of ten (10) soil borings were advanced at the Conrail Property as shown on **Figure 7**. A total of forty-five (45) soil samples were collected with the goal of delineating soil impacts detected during the December 2011 mobilization. All soil samples were analyzed for hexavalent chromium and/or vanadium, and pH and Eh. All samples soil were transported to IAL Laboratories under proper chain-of-custody procedures.

3.6.7 November 2012

Conrail Property

A total of seven (7) soil borings were advanced at the Conrail Property as shown on **Figure 7**. A total of twenty-three (23) soil samples were collected with the goal of delineating hexavalent chromium impacts detected during the July 2012 mobilization. All soil samples were analyzed for hexavalent chromium, pH and Eh. All samples were transported to IAL Laboratories under proper chain-of-custody procedures.

3.7 Ambient Air Monitoring: Dust Control and Monitoring

As the potential for dust generation during the soil investigations was considered possible, three (3) Thermo MIE DR-4000's were utilized to measure particulate concentrations from 0.0001 mg per cubic meter up to 400 mg per cubic meter.

- One (1) instrument was located in an upwind location,
- One (1) instrument was located in a downwind location, and
- One (1) instrument was located local to the work in progress.

The primary activities which were judged to generate dust included movement of heavy equipment in areas that were not paved and subsurface drilling. Monitoring was conducted during all mobilizations (i.e., January/February 2011, June 2011, July 2011, August 2011, December 2011, July 2012, and November 2012).

3.8 Groundwater Investigation Procedures

3.8.1 February 2011 Groundwater Investigation

In February 2011, four (4) soil boring locations (107_D019, 107_I042, 107_K034, 107_M046) were converted to temporary well points (identified as 107-TMW-D019, 107-TMW-I042, 107-TWP-K034, 107-TMW-M046, respectively) by a New Jersey-licensed driller from EMC. Following the completion of the soil boring, 1-inch-diameter PVC screen (0.010-inch slot size), connected to a PVC drive point and threaded PVC riser, was inserted into the borehole. The installation of all temporary well points was overseen by a Dresdner Robin geologist.

All groundwater samples were collected by a representative of Test America laboratories. Test America is a certified laboratory for the required "analyze-immediately" parameters. All groundwater samples were analyzed for hexavalent chromium, total chromium, CCPW metals (antimony, nickel, thallium, vanadium), oxidation-reduction potential (ORP) and pH. One groundwater sample was collected at each temporary well point and each temporary well point was abandoned following the completion of sampling within 48 hours after installation.

The location of the temporary well points are provided on **Figure 8**.

3.9 Low flow Sampling

Low-flow sampling techniques were used to purge and sample the temporary well points. For the temporary well points, a peristaltic pump was used to purge the wells. The wells were purged until the appropriate indicator parameter readings stabilized. Samples were then collected directly from the dedicated Teflon tubing into laboratory-supplied bottle ware. Well purging information and indicator groundwater parameter readings for pH, temperature, conductivity, ORP, DO, and turbidity were recorded on field sampling logs. Observations of sheen and/or distinctive odors were recorded, if encountered. Groundwater Sampling Logs are included as **Attachment C**.

3.10 Investigation Derived Waste

Investigation-derived wastes ("IDW") generated during the field operations included drill cuttings, contaminated personal protective equipment ("PPE"), decontamination fluids, well purge water, and trash. IDW was placed into United States Department of Transportation ("USDOT") approved 55-gallon drums. All drums were labeled as hazardous waste and temporarily staged on site within containment areas pending offsite disposal. All drums were subsequently picked up and transported to an appropriate offsite facility for disposal after each mobilization. PPG was listed as the generator; disposal manifests are available upon request. All waste disposal documentation will be provided in the Remedial Action Report (RAR).

3.11 Remedial Investigation Work Plan Deviations

As previously stated, this RIR documents the findings of the soil and groundwater investigation conducted at Site 107, at the Site 108 hotspot, and the Conrail Property. The initial investigation at Site 107 was conducted in accordance with AECOM's October 2010 RIWP. However, additional investigations were conducted to delineate hexavalent chromium and CCPW. Soil borings advanced with the goal of delineating impacts and may not have been installed directly on the pre-established grid. All delineation soil borings were surveyed and are represented accurately. In addition, soil boring 107_D019 was installed on slightly on Site 108 due to site constraints at Site 107; however, the soil boring is reported as part of the Site 107 RI.

4.0 REMEDIAL INVESTIGATION FINDINGS

Laboratory results for soil samples collected as part of the remedial investigation were reviewed and compared with the NJDEP's June 2008 (last amended October 3, 2011) Soil Remediation Standards (SRS) consisting of the Residential Direct Contact Soil Remediation Standard (RDCSRS) and Non-Residential Direct Contact Soil Remediation Standard (NRDCSRS) and the default Impact to Groundwater Soil Screening Levels (IGWSSL). It should be noted, the default IGWSSL were solely applied to those soil samples collected in the unsaturated zone. The most stringent (non-residential/residential) chromium soil cleanup criteria of 20 mg/kg for hexavalent chromium, and the most stringent (residential) soil cleanup criteria of 120,000 mg/kg for trivalent chromium were utilized for soil delineation purposes pursuant to the *Chromium Soil Cleanup Criteria* (NJDEP, September 2008 revised April 2010).

Laboratory results for groundwater samples collected as part of the remedial investigation were reviewed and compared with the NJDEP's Groundwater Quality Standards (GWQS).

The analytical results for soil and groundwater are summarized and presented in **Tables 4 through 8** and are depicted on **Figures 9 through 14**.

4.1 Soil Investigation Results – January and February 2011

4.1.1 Hexavalent Chromium

A total of forty-nine (49) soil borings were advanced at Site 107 in January and February 2011. From those forty-nine (49) soil borings, four hundred and forty-seven (447) soil samples were analyzed for hexavalent chromium. Review of the soil analytical results indicate hexavalent chromium at a concentration greater than its RDCSRS and NRDCSRS of 20 mg/kg in twenty (20) samples. The concentration of hexavalent chromium exceedances ranged from 20.2 mg/kg (in soil sample 107_G036_6.0) to 263 mg/kg (in soil sample 107_M032_1.5). Results are shown on **Figure 9**.

4.1.2 Total Chromium

Review of the soil analytical results for samples collected in January/February 2011 revealed concentrations of total chromium indicate the concentrations did not exceed the most stringent (residential) soil remediation standards of 120,000 mg/kg in any sample.

4.1.3 Metals Potentially Associated with Chromate Chemical Production Waste (CCPW)

Antimony, nickel, thallium, and vanadium are potentially associated with CCPW. While no CCPW metal was detected at a concentration greater than its NRDCSRS, antimony, nickel, and vanadium were detected at a concentration above their respective RDCSRS. Antimony was detected at a concentration greater than its RDCSRS in three samples collected during the January/February investigation. The concentrations of antimony were 44.9 mg/kg (in sample 107_E029_3.5), 69.8 mg/kg (in sample 107_I038_7.0), and 171 mg/kg (in sample 107_I038_12.0). Nickel was detected at a concentration greater than its Residential SRS in three (3) soil samples during the January/February investigation. The concentrations of nickel were 2,220 mg/kg (in sample 107_E031_11.5), 6,150 mg/kg (in sample 107_EI042_14.5), and 7,020 mg/kg (in sample 107_I044_11.5). Vanadium was detected at a concentration greater than its RDCSRS in forty-six (46) samples during the January/February investigation with the maximum concentration of 827 mg/kg (from sample 107_G038_6.0). Thallium was not detected at a concentration greater than its RDCSRS or NRDCSRS. However, one (1) sample (107_M028_1.0) indicated a MDL (7.3 mg/kg) greater than the RDCSRS (5 mg/kg). Results are shown on **Figure 10A – 10D**.

As previously stated, the default IGWSSL were applied to those soil samples collected in the unsaturated zone (i.e., above the depth-to-water detected during the soil boring advancement – please refer to **Table 5** and **Figure 11** for the depth-to-water measurements that were extrapolated across the Site). Concentrations of antimony (in 15 samples), nickel (in 84 samples), and thallium (in 3 samples) were detected in samples greater than their IGWSSL. It should be noted, thallium has been included due to its MDL that was greater than

IGWSSL of 3 mg/kg in three (3) of those samples. The concentrations of metals vanadium, chromium, and hexavalent chromium do not exceed an IGWSSL. Results are shown on **Figure 11**.

4.2 Soil Investigation Results – June 2011

Site 107

In June 2011, ninety-eight (98) soil samples were collected to delineate impacts (hexavalent chromium and vanadium) detected during the January/February 2011 mobilization. All ninety-eight (98) soil samples were analyzed for hexavalent chromium and 11 soil samples were analyzed for vanadium. Of the ninety-eight (98) samples collected, twenty-seven (27) contained a hexavalent chromium concentration greater than its NRDCSRS and RDCSRS of 20 mg/kg. The concentrations that exceeded 20 mg/kg ranged from 26.1 mg/kg (in sample 107_I038S_8.0) to 11,700 mg/kg (in sample 107_F040W_6.5). Of the eleven (11) soil samples analyzed for vanadium, three (3) contained a vanadium concentration greater than the RDCSRS of 78 mg/kg. The concentrations that exceeded 78 mg/kg were 94.5 mg/kg (in sample 107_F040S_6.0), 195 mg/kg (in sample 107_F036_3.5), and 822 mg/kg (in sample 107_F040S_4.5). Results are shown on **Figure 10**.

Site 108 Hotspot

In June 2011, eight (8) post-excavation samples were collected following the excavation of soil in the vicinity of soil boring location 108_M018_3.5 and analyzed only for hexavalent chromium. Of the eight (8) samples collected, only one (1) sample contained a hexavalent chromium concentration greater than its NRDCSRS and RDCSRS of 20 mg/kg. The sample, 108_M018_N_2.0, contained a concentration of 20.8 mg/kg. The remaining seven (7) post-excavation samples collected during the June 2011 mobilization contained hexavalent chromium concentrations that ranged from not detected (multiple locations) to 10.5 mg/kg (at 108_M018_W). Results are shown on **Figure 6**.

4.3 Soil Investigation Results – July 2011

Site 108 Hotspot

In July 2011, the excavation was extended three (3) feet to the northwest with the goal of removing the hexavalent chromium detected in soil sample 108_M018_N_2.0. One (1) post-excavation soil sample was collected on July 1, 2011 and analyzed for hexavalent chromium. The concentration detected in soil sample 108_M018_N_070111 was 306 mg/kg, exceeding the hexavalent chromium NRDCSRS and RDCSRS of 20 mg/kg. Results are shown on **Figure 6**.

4.4 Soil Investigation Results – August 2011

Site 107

In August 2011, forty-four (44) soil samples were collected as delineation soil samples for impacts detected during the June 2011 mobilization. All forty-four (44) soil samples were analyzed for hexavalent chromium and one (1) was analyzed for vanadium. Of the forty-four (44) samples collected, twenty-seven (27) contained a hexavalent chromium concentration greater than its RDCSRS and NRDCSRS of 20 mg/kg. The concentrations that exceeded 20 mg/kg ranged from 22.1 mg/kg (in sample 107_F038_5.0) to 7,830 mg/kg (in sample 107_F036W_4.0). The (1) one sample analyzed for vanadium contained a concentration of 243 mg/kg which exceeded the RDCSRS for vanadium (78 mg/kg). Results are shown on **Figures 9 and 10**.

Site 108 Hotspot

In August 2011, nineteen (19) soil samples were collected from three (3) delineation soil borings (108_M018_A, 108_M018_B, and 108_M018_C). At least one soil sample at each soil boring location contained a hexavalent chromium soil concentration that exceeded the RDCSRS and NRDCSRS of 20 mg/kg. However, analytical results indicated higher concentrations of hexavalent chromium in soil boring 108_M018_A. Specifically, the highest hexavalent chromium concentration detected among these soil

samples was detected in 108_M018_A_2.5 (collected from a depth of 2.5-3.0 feet bsg) at 9,140 mg/kg. Results are shown on **Figure 6**. 4.5 Soil Investigation Results – December 2011

Conrail Property

In December 2011, one hundred and forty-six (146) soil samples were collected along the northwest property line and on the Conrail Property to delineate impacts of hexavalent chromium and vanadium that were detected during the January/February mobilization. Of the 146 soil samples analyzed for hexavalent chromium, sixty-two (62) samples contained a concentration of hexavalent chromium greater than its NRDCSRS and RDCSRS of 20 mg/kg. The sixty-two (62) samples were collected from a total of fourteen (14) soil boring locations. The concentrations that exceeded the NRDCSRS and RDCSRS ranged from 20.9 mg/kg (in sample 108_M018W1_1.0) and 11,700 mg/kg (in sample 107_M020E1_2.5). Results are shown on **Figure 12**.

4.6 Soil Investigation Results – July 2012

Conrail Property

In July 2012, forty-five (45) soil samples were collected on the Conrail Property to delineate impacts of hexavalent chromium that was detected during the December 2011 mobilization. Of the forty-five (45) soil samples analyzed for hexavalent chromium, seven (7) samples contained a concentration of hexavalent chromium greater than its NRDCSRS and RDCSRS of 20 mg/kg. The concentrations that exceeded the NRDCSRS and RDCSRS ranged from 24 mg/kg (in sample 107_M018E2_N) to 556 mg/kg (in sample 108_M018W2_1). Results are shown on **Figure 12**.

A total of twenty-four (24) samples were analyzed for vanadium and nine (9) samples contained a vanadium concentration greater than its RDCSRS of 78 mg/kg. Specifically, concentrations that exceeded its RDCSRS ranged from 81.6 mg/kg (in sample 108_M018W2_1) to 417 mg/kg (in sample 108_M018N_1). Results shown on **Figure 13**.

4.7 Soil Investigation Results – November 2012

Conrail Property

In November 2012, twenty-three (23) soil samples were collected on the Conrail Property to delineate hexavalent chromium impacts that were detected during the July 2012 mobilization. Of the twenty-three (23) soil samples analyzed for hexavalent chromium, one (1) sample contained a concentration of hexavalent chromium greater than its NRDCSRS and RDCSRS of 20 mg/kg. The concentration that exceeded the hexavalent chromium standard was 106 mg/kg and was collected from sample 108_M018W2_2-2.0-2.5. All other soil samples, including the delineation soil sample for 108_M018W2_2-2.0-2.5, had concentrations of hexavalent chromium below 20 mg/kg. Results are shown on **Figure 12**.

4.8 Groundwater Investigation Results

Groundwater samples were collected from four temporary well points on February 9, 2011 and February 24, 2011. The laboratory analytical results were compared to the GWQS, with the exception of hexavalent chromium and vanadium as no GWQS has been set for these analytes. However, hexavalent chromium results were compared to the GWQS for total chromium (70 ug/L). The groundwater sample results for the sampling event is presented on **Table 8** and depicted on **Figure 8.** In addition to hexavalent chromium and CCPW metals, the groundwater parameters, ORP and pH, were analyzed and are also provided in **Table 8.**

Chromium, nickel, and thallium were detected above their respective GWQS in at least one groundwater sample. Hexavalent chromium (when compared to chromium's GWQS) and antimony were not detected above their respective GWQS in any of the groundwater samples collected.

4.8.1 Hexavalent Chromium

Hexavalent chromium, when compared to the GWQS for chromium, wasn't detected at a concentration greater than 70 ug/L in any groundwater sample collected at the Site. The concentrations of hexavalent chromium ranged from not detected (in numerous samples) to 44.5 ug/L (in groundwater sample collected at the temporary well point 107-TMW-D019 in February 2011).

4.8.2 Total Chromium

Total chromium was detected at a concentration greater than its GWQS (70 ug/L) in two (2) groundwater samples at concentrations of 145 ug/L (in sample 107-TMW-D019) and 965 ug/L (in sample 107-TMW-M046).

4.8.3 Metals Potentially Associated with Chromate Chemical Production Waste (CCPW)

The metals attributed to CCPW include antimony, nickel, thallium, and vanadium. Only nickel and thallium were detected in groundwater samples at concentrations greater than their GWQS. Nickel exceeded its GWQS (100 ug/L) in groundwater samples 107-TMW-I042 and 107-TMW-M046 at concentrations of 161 ug/L, 169 ug/L, and 466 ug/L, respectively. Thallium exceeded its GWQS (2 ug/L) in one groundwater sample (107-TMW-M046) at a concentrations of 3.4 ug/L.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance/Quality Control sampling was performed to provide control over the collection of samples and the validity of analytical data. The sample analyses were performed in accordance with full and reduced laboratory data deliverables as needed. Analytical methods and quality assurance conform to the *NJDEP's Field Sampling Procedures Manual revised April 20, 2009*.

5.1 Field Blanks

Field blanks were collected by pouring demonstrated analyte free water through the sampling device (i.e., acetate sleeve for soil and Teflon bailer for groundwater) so that the rinsate flowed directly into the empty sample containers. The demonstrated analyte free water originated from one common source and physical location within the laboratory and was the same as the method blank water used by the laboratory performing the analysis. The field blanks were analyzed for the same parameters as samples collected that particular day. The field blanks were maintained at 4^{o}C while on-site and during shipment. A summary of the (aqueous) field blanks collected during the remedial investigations are provided in **Table 8**.

5.2 Trip Blank Samples

Trip blanks are used to assess the potential for contamination of samples due to VOC contaminant migration during sample shipment and storage. No trip blanks were collected during the remedial investigation as volatile organics analysis were not performed.

5.3 Duplicate Samples

Duplicate samples were collected to evaluate the laboratory's performance by comparing analytical results of two (2) samples from the same location. The duplicate samples were analyzed for the same parameters as the samples analyzed that day. A summary of the duplicate samples collected during the remedial investigations is provided in **Table 1**.

5.4 Sampling Methods

Soil samples were collected utilizing disposable plastic trowels and groundwater samples were collected directly through the pump.

5.5 Sample Storage, Handling and Preservation

The sample containers were labeled with sample number, date, time of collection, analytical parameters, preservatives, site name and person or persons performing the sampling. The laboratory performing the analysis was responsible for preserving the sampling bottles prior to shipment into the field. Samples were kept cool at 4^{o}C and transported in coolers to the laboratory. Proper chain-of-custody documentation was maintained, beginning with the laboratory's release of the bottles. A detailed soil sampling log has been prepared for each sampling location. The sample holding time began at the time of collection. Blanks and samples were not held on-site for longer than two (2) calendar days and arrived back in the lab within one (1) day of shipment from the field, constituting a four (4) day handling time.

5.6 Decontamination Procedures

Since samples were collected utilizing a disposable sampling device (i.e., plastic trowel/scoop, Teflon tubing, and acetate liners), no decontamination procedures were required.

5.7 Field Instrumentation

A PID was utilized during field activities. The PID lamp was cleaned regularly and the battery fully charged prior to the start of field activities.

As previously outlined in Section 3.7, dust was continuously monitored using three (3) Thermo MIE DR-4000's. Instruments were checked every morning in dust free air to confirm zero.

Groundwater field parameters (pH, dissolved oxygen (DO), oxygen reduction potential (ORP), specific conductivity, turbidity and temperature) were measure using a Horiba U-52. The field instrument and calibration data forms are provided in **Attachment C**.

5.8 Containers and Chain-of-Custody Procedures

Clean sample containers were supplied by the laboratory for the sampling event(s). The appropriate preservatives were added to the sample bottles by the laboratory prior to shipment. The chain-of-custody accompanied the bottles during transportation from the laboratory to the field, sample collection, transportation back to the laboratory, analysis and final disposal of the sample. The chain-of-custody listed each of the individual sample containers and was signed by one of the sampling team members. Samples were stored on ice at $4^{o}C$ in a secure area until they are relinquished to a laboratory courier for delivery to the laboratory.

5.9 Laboratory Data Deliverable Format

In accordance with Appendix A of the NJDEP Technical Requirements for Site Remediation dated November 2009 last amended October 3, 2011, full laboratory data deliverables have been included for hexavalent chromium, pH and Eh. Reduced laboratory data deliverables have been included for all other analyses. Laboratory data packages are included as **Attachment D**.

5.10 Data Validation

Validation of laboratory deliverables was performed by Environmental Quality Assurance, Inc. of Middletown, New York in accordance with appropriate NJDEP and EPA protocols. The data validation reports are included as **Attachment E.**

Although the data validation qualified some soil samples that were analyzed for hexavalent chromium as rejected, none of the samples were used to determine final limits of delineated areas. Please see **Table 4** and **Figure 9**, which identified the qualified results.

6.0 DISCUSSION

6.1 Soil

All soil sample results are provided in **Tables 4 through 7** and depicted of **Figures 9 through 14.** Below is a discussion of the findings based on the analytical results.

6.1.1 Hexavalent Chromium

6.1.1.1 Site 107

During the Site 107 investigation, hexavalent chromium was detected at concentrations greater than its RDCSRS and NRDCSRS in three (3) distinct areas of the Site: along the northwest property line adjacent to the Conrail Property, in the center of Site 107 at soil boring locations 107_I038 and 107_I038S, and along the eastern boundary edge adjacent to Site 67. See **Figure 9**.

At the center of Site 107, hexavalent chromium exceedances were detected at two (2) soil boring locations: 107-I038 and 107-I038S at a depth interval of 7.0 to 8.5 feet bsg in each boring. Vertical delineation at each sample location was achieved at 10-10.5 feet bsg. Horizontal delineation was achieved through soil samples collected from the following soil boring locations: 107-I038N, 107-I038E, 107-H038, and 107-I038W, all located fifteen (15) feet in each direction from 107-I038 and 107-I038S. As a result, the hexavalent chromium exceedances at these two (2) locations have been successfully horizontally and vertically delineated. It should be noted, the delineation locations listed above did not contain visible CCPW.

Hexavalent chromium was detected at a concentration greater than its NRDCSRS and RDCSRS along the southeastern portion of Site 107 in multiple soil boring locations. The soil boring locations which contain a hexavalent chromium exceedance in at least one sample (i.e., one depth interval) include:

- 107-F035 (vertical delineation achieved at 4.0-4.5 feet bsg),
- 107-F036W (vertical delineation not achieved),
- 107-G036 (vertical delineation achieved at 7.0-7.5 feet bsg),
- 107-E036 (vertical delineation not achieved),
- 107-F036 (vertical delineation achieved at 5.0-5.5 feet bsg) ,
- 107-F036S (vertical delineation not achieved),
- 107-G037 (vertical delineation achieved at 6.0-6.5 feet bsg),
- 107-G037N (vertical delineation not achieved),
- 107-F037 (vertical delineation achieved at 5.5-6.0 feet bsg),
- 107-F037E (vertical delineation achieved at 8.5-9.0 feet bsg),
- 107-F038 (vertical delineation achieved at 6.0-6.5 feet bsg),
- 107-F039W (vertical delineation not achieved),
- 107-F039 (vertical delineation not achieved),
- 107-F040W (vertical delineation not achieved),
- 107-F040S (vertical delineation achieved at 6.5-7.0 feet bsg),
- 107-F040 (vertical delineation achieved at 11.5-12.0 feet bsg),
- 107-F040E (vertical delineation not achieved),
- 107-F041 (vertical delineation achieved at 6.5-7.0 feet bsg),
- 107-040N (vertical delineation achieved at 7.5-8.0 feet bsg).

These hexavalent chromium exceedances were horizontally delineated (via analytics) by the following soil boring locations: 107-E034, 107-G034, 107-G035, 107-G036W, 107-G036N, 107-H036, 107-H038, 107-G038, 107-G040, and 107-G042. However, due to the presence of visible CCPW delineation cannot be considered complete using these locations. Delineation of hexavalent chromium and visible CCPW along the southeast portion of Site 107 is achieved through locations 107-E034, 107-G034, 107_I034, 107-M036, 107-J038, 107-I042, and 107-G044. The only direction delineation of hexavalent chromium isn't achieved is to the southeast of Site 107, offsite. In addition, isolated locations, such as 107-D019, 107-E026A, and 107-G046 have visible CCPW and will be addressed in the RAWP.

In addition, vertical delineation was not achieved at eight (8) soil boring locations in this area of the Site. Vertical delineation at these locations are proposed to be addressed via post excavation sampling during remedial activities.

Hexavalent chromium was initially detected at a concentration greater than its NRDCSRS and RDCSRS along the northwest property line at the Conrail Property at multiple soil boring locations. The soil boring locations that contained hexavalent chromium at a concentration greater than 20 mg/kg includes: 107_M020 (exceedances from 1.0-3.5 feet bsg), 107_M026 (exceedances from 0.5-3.5 feet bsg), 107_M028 (exceedances from 1.0-3.5 feet bsg), 107_M030 (exceedances from 0.5-1.0 feet bsg), 107_M032 (exceedances from 0.5-2.0 feet bsg). Delineation of these hexavalent chromium impacts to the northwest on the Conrail Property is discussed in Section 6.1.1.3.

6.1.1.2 Site 108 Hotspot

Horizontal delineation of the hexavalent chromium hotspot on Site 108 has been generally achieved in all directions. : However, a "tighter" delineation is required. As such, additional delineation of the Site 108 Hotspot has been conducted and will be reported in a Technical Memorandum submitted under separated cover. Delineation efforts conducted on the Conrail Property is discussed in Section 6.1.1.3.

Generally speaking, vertical delineation has been achieved at all locations associated with the Site 108 hotspot. The depths of achieved vertical delineation range from 2.0-2.5 feet bsg at sample location108_M018_N and 108_M018_C and 4.0-4.5 feet bsg at sample location 108_M018. Although vertical delineation has not been achieved at the specific location 108_M018_N-0, vertical delineation has been achieved at the two closest locations. As such, the forthcoming RAWP will ensure that vertical and horizontal delineation has been completely achieved.

6.1.1.3 Conrail Property

Horizontal and vertical delineation of hexavalent chromium as been achieved on the Conrail Property. The seven (7) soil borings advanced in November 2012, along with prior mobilizations at the Conrail Property, have successfully delineated the hexavalent chromium impacts at the Conrail Property. As shown on **Figure 12**, soil samples collected starting at grid number fifteen (15) through thirty-three (33) successfully delineated all hexavalent chromium impacts at the Conrail Property – horizontally and vertically.

6.1.2 Visible CCPW was identified at select boring locations along the Conrail/Site107 property line and will be addressed in the RAWP.Total Chromium

6.1.2.1 Site 107

Review of the soil analytical results for total chromium indicate the concentrations in all samples did not exceed the most stringent (residential) soil remediation standards of 120,000 mg/kg. Therefore, no further soil investigation of total chromium is recommended at Site 107.

6.1.2.2 Site 108 Hotspot

The soil samples collected as part of the Site 108 hotspot delineation were not analyzed for total chromium as delineation was already achieved; therefore, no further soil investigation of total chromium is recommended for this area.

6.1.2.3 Conrail Property

The soil samples collected as part of the Conrail Property investigation were not analyzed for total chromium as delineation was already achieved; therefore, no further soil investigation of total chromium is recommended for this area.

6.1.3 Metals Potentially Associated with CCPW

6.1.3.1 Site 107

The metals potentially associated with CCPW include antimony, nickel, thallium, and vanadium and all four metals were detected at a concentration greater than their SRS in at least one sample at Site 107 – see **Figure 10A through 10D**. Antimony was detected at a concentration greater than its SRS in three (3) samples from two (2) locations: 107_E029_3.5 and 107_I038_7.0 and 107_I038_12.0. At 107_I038 antimony has been horizontally delineated by locations 107_I038W, 107_I038N, 107_I038S, and 107_I038E. Antimony at location 107_E029 has been horizontally delineated in all directions with the exception of the southeastern property boundary.

Nickel was detected at a concentration greater than its RDCSRS at two locations at Site 107: 107_I044_11.5 and 107_E031_11.5. Vertical delineation was achieved at both locations, at a depth of 13.5 feet bsg (at location 107_I044_11.5) and 15.5 feet bsg (at location 107_E031_11.5). Horizontal delineation of nickel was achieved in all directions at location 107_I044 by locations 107_I042, 107_I046, 107_K044, and 107_G044. Horizontal delineation was achieved in all directions at location 107_E031 by locations 107_E029, 107_E034, 107_G032 with the exception of the southeastern property boundary.

Thallium was not detected at a concentration greater than its RDCSRS in any soil sample collected at Site 107. However, the reported MDL in one (1) sample was greater than its RDCSRS. As such, the sample, 107_M028_1.0 was identified as an exceedance. The thallium exceedance has been horizontally delineated by locations 107_M028N, 107_M028W, and 107_M028E1 and vertically delineated by sample 107_M028_3.5.

Vanadium was detected at a concentration greater than its RDCSRS in forty-nine (49) soil samples at thirty-one (31) soil boring locations. The vanadium exceedances are throughout most of Site 107. Specifically, vanadium is not horizontally delineated offsite at the Conrail Property; however, additional samples collected at the Conrail Property are discussed in Section 6.1.3.3. To the north, vanadium is partially delineated along the property line between Site 107 and Block 1505, Lot Z[1]. In addition, vanadium is partially delineated along the north and south eastern property line. Vertical delineation of vanadium has been achieved at all locations. Vertical delineation was achieved as shallow as 2.5-3.0 feet bsg at 107_M024 and as deep as 11.5-12.0 feet bsg at 107_F040.

6.1.3.2 Site 108 Hotspot

The soil samples analyzed as part of the Site 108 hotspot delineation were not analyzed for CCPW metals as delineation at Site 108 was largely achieved at that time and the hotspot was specifically to target hexavalent chromium; therefore, no further soil investigation of CCPW metals is recommended for this area.

6.1.3.3 Conrail Property

Vanadium was the only CCPW metal that was targeted during the Conrail Property investigation as it was not fully delineated along the Site 107 and Conrail Property boundary line. Vanadium was horizontally delineated at all soil boring locations on the Conrail Property with the exception of two (2) locations: 108_M018N_1 and 107_M028N. Vertical delineation of vanadium was achieved at 107_M028N at a depth of 3.0-3.5 feet bsg, but was not achieved at 108_M018N_1. Visible CCPW was identified at select boring locations along the Conrail/Site107 property line and will be addressed in the RAWP.

6.2 Visible CCPW

As discussed in Section 6.1.1.1, visible CCPW was identified during soil investigations at Site 107. Soil boring locations confirmed to have visible CCPW are provided on **Figure 14**.

6.3 Groundwater

A total of four (4) temporary well points were installed at Site 107 in February 2011. A total of four (4) groundwater samples were collected and analyzed for hexavalent chromium, total chromium, and CCPW

metals from the four (4) temporary well points. The groundwater sample results are provided in **Table 8** and depicted of **Figure 8.**

Review of the analytical result revealed concentrations of metals in excess of the NJDEP GWQS in three (3) of the four (4) temporary well points:

- Chromium was reported at a concentration of 145 ug/L and 965 ug/L in samples 107-TMW-D019 and 107-TMW-M046, respectively.
- Nickel was reported at a concentration of 161 ug/L, 169 ug/L, and 466 ug/L in sample 107-TMW-I042, the duplicate sample DUP-020911 and 107-TMW-M046, respectively.
- Thallium was reported at a concentration of 3.4 ug/L in sample 107-TMW-M046.

The results from the temporary well points are likely biased high due to the presence of suspended particulates in the water column and therefore the results should be largely used as a screening tool. Therefore, to confirm the presence or absence of chromium, nickel, and thallium at concentrations greater than their GWQS, permanent monitoring wells are proposed. Installation of monitoring wells are proposed at the location of the former temporary well points that contained exceedances (107-TMW-D019, 107-TMW-M046, and in the vicinity of 107-TMW-I042). In addition, three additional permanent monitoring wells are proposed: two (2) along the southeastern property line due to the high concentration of hexavalent chromium in soil and one (1) at the soil boring location 107_G046 due to the presence of visible CCPW.

7.0 RECOMMENDATIONS

7.1 Soil – Hexavalent Chromium

Delineation of hexavalent chromium, at a majority of the Site, has been achieved:

- Vertically and horizontally at the Conrail Property (i.e., the adjacent property to the west of Site107) with the exception of 107_M020E2_N and 107_M028E2 where visible CCPW has been identified;
- Vertically and horizontally at the Site 108 Hotspot, which will be reported in a Technical Memorandum under a separate cover;

Additional vertical delineation at Site 107, along the eastern property line (at eight (8) locations) is required. In addition, horizontal delineation is required, off-site, to the east at Site 67. Any on-site vertical delineation will be proposed in the forthcoming Remedial Action Workplan (RAWP) and completed during remedial activities. Off-site delineation of hexavalent chromium on Site 67 is not the responsibility of PPG; however, preliminary discussions with the Site 67 responsible party have been initiated with a resolution forthcoming. This information will be forwarded to the Department as soon as possible.

Also, additional horizontal and vertical delineation is required at isolated locations at Site 107 (107_G046, 107_D019, and 107_E026A).

As previously discussed with the Department, the entirety of the Site 107 building is underlain by CCPW and will be specifically addressed in the RAWP.

7.2 Soil – Metals Associated with CCPW

As previously identified, nickel, thallium, antimony, and vanadium were detected concentrations greater than their respective SRS in at least one sample. Thallium and antimony have been successfully delineated both vertically and horizontally at Site 107. Vanadium, which was detected at concentrations above its SRS at Site 107 and the Conrail Property have not be fully delineated. Vanadium delineation is required along the northern, eastern, and Conrail Property lines. As outlined above, delineation of vanadium will be proposed in the forthcoming RAWP and completed during remedial activities. In addition, nickel was requires delineation to the southeast along the Site 67 property line. Off-site delineation of metals associated with CCPW on Site 67 is not the responsibility of PPG ; however, preliminary discussions with the Site 67 responsible party have been initiated with a resolution forthcoming. This information will be forwarded to the Department as soon as possible.

7.3 Soil – Visible CCPW

As shown on **Figure 14**, visible CCPW was identified at various soil boring locations and beneath the entirety of the Site 107 building. The RAWP and future remedial actions will address the visible CCPW.

7.3 Groundwater

All proposed monitoring well locations are depicted of **Figure 15**. The proposed groundwater monitoring will include up to four (4) rounds of groundwater samples from all permanent and proposed monitoring wells and will include all monitoring wells on Site 108. Groundwater monitoring will consist of the measurement of the depth to water at each monitoring well. Depth to groundwater measurements will be made from a reference point of known elevation at each well and the groundwater elevation will be calculated. The groundwater samples will be analyzed for -nickel, thallium, and total chromium. Sampling will be conducted using low-flow purging and sampling methods in accordance with requirements in the NJDEP *Field Sampling Procedures Manual* dated August 2005. All future groundwater monitoring will encompass both Site 107 and Site 108 and will be documented in a Groundwater RIR Addendum.