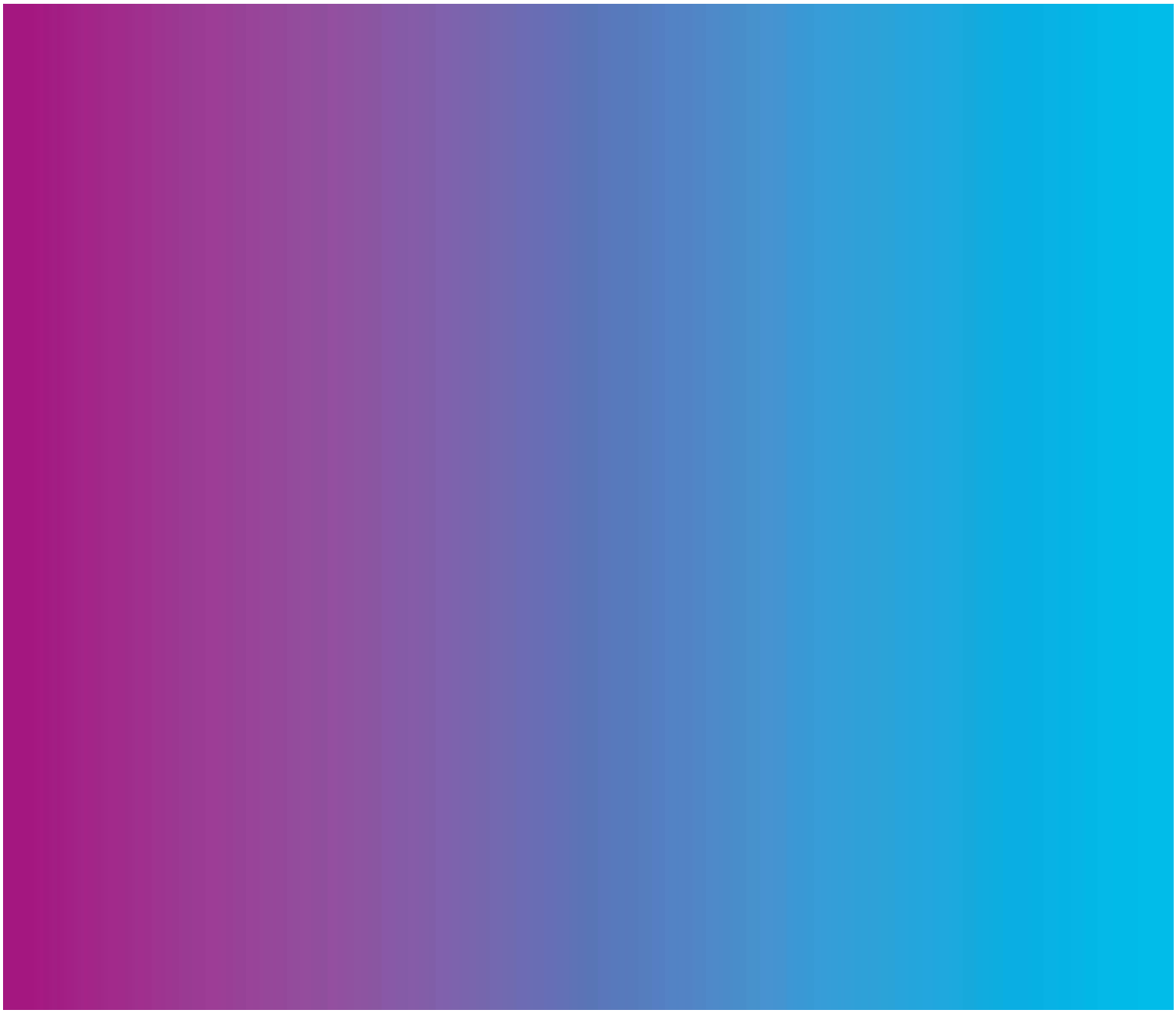
Submitted to:
PPG

Submitted by:
AECOM
Piscataway, New Jersey
60314351
September 2018

Remedial Action Work Plan (Soil) Rev. 4

Garfield Avenue Group Sites
Jersey City, Hudson County, New Jersey

Final



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Reviewed By
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REPORT CERTIFICATION

PPG

Final Remedial Action Work Plan (Soil) Rev. 4
Garfield Avenue Group Sites
Jersey City, Hudson County, New Jersey

The following certification shall be signed by the highest-ranking individual at the site with responsibility for the overall operation of the site or activity. Where there is no individual at the site with overall responsibility for that site or activity, this certification shall be signed by the individual having responsibility for the overall operation of the site or activity.

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.

Typed/Printed Name Mark Terril

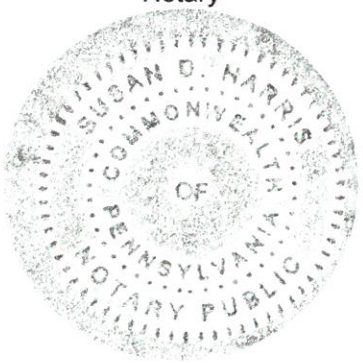
Title Corporate Director, Environmental Affairs

Signature Mark Terril Date September 27, 2018

Sworn to and Subscribed Before Me on this 27th

Date of SEPTEMBER 2018

Susan D. Harris
Notary



COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Susan D. Harris, Notary Public
City of Pittsburgh, Allegheny County
My Commission Expires May 1, 2020
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

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List of Acronyms/Definitions

The following definitions apply solely to this document.

AAC	Acceptable Air Concentration
Accessible CCPW	CCPW except Inaccessible CCPW
Accessible Soil	All soils within the Project Area except Inaccessible Soil
ACO	Administrative Consent Order
ACM	asbestos-containing material
AECOM	AECOM Environment
Ag	Silver
AMP	Air Monitoring Plan
amsl	Above mean sea level
As	Arsenic
AST	Aboveground Storage Tank
Ba	Barium
Be	Beryllium
Bench Scale Testing	Testing of materials, methods, or chemical processes on a small scale, such as on a laboratory worktable.
bgs	below ground surface
BTEX	Benzene, ethylbenzene, toluene and total xylenes
BWA	NJDEP Bureau of Water Allocation
Ca	Calcium
Cap	A layer of impermeable material installed on top of impacted soil to prevent direct or airborne exposure to contaminants.
C&D Waste	Construction and demolition waste includes waste building material and rubble resulting from construction, remodeling, repair, and demolition operations on houses, commercial buildings, pavements and other structures, including treated and untreated wood scrap; tree parts, tree stumps and brush; concrete, asphalt, bricks, blocks and other masonry; plaster and wallboard; roofing materials; corrugated cardboard and miscellaneous paper; ferrous and non-ferrous metal; non-asbestos building insulation; plastic scrap; dirt; carpets and padding; glass (window and door); and other miscellaneous materials and land-clearing debris.

CCPW	Chromate Chemical Production Waste, a by-product generated from the production of sodium bichromate, including Chromite Ore Processing Residue (COPR), Green-Gray Mud, and fill mixed with COPR or Green-Gray Mud.
Cd	Cadmium
Chromium	An element found in nature that is commonly used in manufacturing activities. Chromium may be present in soil or water as trivalent chromium and hexavalent chromium (Cr^{+6}). Trivalent chromium is an essential nutrient at trace concentrations. Cr^{+6} can be present in many forms, some of which are carcinogenic at high concentrations. Total chromium, as measured in soil or groundwater, is the sum of trivalent and Cr^{+6}.
CID	Case Inventory Document
cm	Centimeter
Co	Cobalt
COPR	Chromite Ore Processing Residue is a specific type of CCPW generally characterized as a reddish brown, coarse to fine, gravel with varying amounts of sand and silt particles. The gravel portion of the matrix is typically defined as nodules from the chromium manufacturing process that range in size from 3/4 to 1/8 inches in diameter. However, nodules have been infrequently detected at diameters of over an inch. Different size nodules may be found cemented together to form larger clusters. The matrix of these clusters may consist of cement-like silt. These nodules can be disintegrated easily with a hammer. Occasionally when detected in the saturated zone, COPR nodules may appear as a fine grained material that has been weathered. The permeability of this material is variable. The inner matrix of COPR nodules typically contains higher concentrations of Cr^{+6} than the surface of the nodules but lower concentrations than Green-Gray Mud. Typical approximate range of Cr^{+6} is between 300 and 5,000 mg/kg.
COC	Contaminant of concern
CrSCC	Chromium soil cleanup criteria pursuant to the *Chromium Soil Cleanup Criteria* (NJDEP, September 2008a, last revised April 20, 2010)
Cr^{+6}	Hexavalent chromium
Cr^{+3}	Trivalent chromium
CSM	Conceptual Site Model
Cu	Copper
CVOCs	Chlorinated volatile organic compounds
DCP	Dust Control Plan
DNAPL	Dense Non-Aqueous Phase Liquid
Environmental Media	A major environmental category that surrounds or contacts humans, animals, plants and other organisms, such as surface water, groundwater, soil or air, which may be impacted by contaminants.

EPH	Extractable petroleum hydrocarbons
Ex-Situ Treatment	Ex-situ technologies are remediation options where the affected medium (soil, water) is removed from its original location and treated on-site or off-site. Examples: bioremediation or soil washing.
Fe	Iron
Feasibility Study	A study designed to develop and evaluate options for remedial action using data gathered during the remedial investigation to develop the objectives of the remedial action, and to develop possible remedial action alternatives, to evaluate those alternatives and create a list of feasible alternatives, and to analyze the engineering, scientific, institutional, human health, environmental, and cost of each selected alternative.
FSP-QAPP	Field Sampling Plan - Quality Assurance Project Plan
FSPM	NJDEP Field Sampling Procedures Manual (August 2005, with updates) (NJDEP, 2005a)
GIS	Global Information System
GGM	Green-Gray Mud is generally a lime green dense silt, with minor amounts of fine sand and clay. When found in the saturated zone, the grain size of this material may have been affected further due to weathering processes. This can give the material a wet, clayey silt or silty clay appearance with little or no physical or structural integrity. This material has a low permeability. The pH of this material is generally 11 to 12 units. Typical approximate range of Cr^{+6} is greater than 5,000 mg/kg.
gpd	gallons per day
gpm	gallons per minute
Groundwater	The supply of fresh water found beneath the Earth's surface, which can be extracted by wells or through natural springs.
GWQC	Groundwater Quality Criteria, pursuant to *Groundwater Quality Standards* (GWQS), (N.J.A.C. 7:9C-1 et. seq.) (NJDEP, 2009b).
GWTP	Groundwater Treatment Plant
HASP	Health and Safety Plan
HCC	Hudson County Chromate
Hg	Mercury
HSO	Health and Safety Officer
HEPSCD	Hudson-Essex-Passaic Soil Conservation District
Impacted Soil	Soil that does not contain “CCPW” and contains Cr^{+6} in excess of 20 mg/kg.

Inaccessible Areas	Areas within the Project Area that are currently inaccessible to excavation for several reasons including the presence of roads, utilities, buildings and the rail road.
Inaccessible Soil	Soil located in or adjacent to the Project Area where its removal may damage or otherwise compromise nearby properties, structures and/or surface or subsurface infrastructure. Specific locations of Inaccessible Soil are being determined in cooperation with NJDEP and will be defined in the RAWP and/or specific Technical Execution Plans developed for specific areas of the site in proximity to these potential inaccessible areas.
Inaccessible CCPW	CCPW located in, or adjacent to the Project Area where its removal may damage or otherwise compromise nearby properties, structures and/or surface or subsurface infrastructure. Specific locations of Inaccessible CCPW are being determined in cooperation with NJDEP and will be defined in the RAWP and/or specific Technical Execution Plans developed for specific areas of the site in proximity to these potential inaccessible areas.
In-Situ Treatment	In-situ technologies are remediation options where the affected medium (soil, water) remains in its original location as it is treated on-site. Examples: soil blending and groundwater injections.
IRM	Interim Remedial Measure. Remedial action taken at a contaminated site to reduce the potential for human health or environmental exposure to contaminants at a site before a remedial investigation is complete.
ISRA	Industrial Site Recovery Act. Pertaining to Industrial Site Recovery Act (ISRA) Rules, pursuant to N.J.A.C. 7:26B.
JCMUA	Jersey City Municipal Utilities Authority
JCRA	Jersey City Redevelopment Authority
JCO	Judicial Consent Order
K	Potassium
LNAPL	Light Non-Aqueous Phase Liquid
MOA	Memorandum of Agreement
Mixed Fill/COPR	A matrix that, in addition to COPR nodules, may contain, soil and miscellaneous fill materials including cinders, brick, glass, metal and concrete fragments. Although isolated samples contain high levels of Cr^{+6}, the average Cr^{+6} content of this material is much lower than COPR (Cr^{+6} concentrations typically found at less than 300 mg/kg).
Meadow Mat	A naturally occurring organic estuarine deposit located at approximately 13 to 20 feet below the ground surface, pre-excavation.
Mg	Magnesium
mg/kg	Milligram per Kilogram
mg/l	Milligram per Liter

MGP	Manufactured gas plant
ml	Milliliter
mm	Millimeter
msl	mean sea level
Mn	Manganese
Na	Sodium
N/A	Not applicable
NAVD 88	North American Vertical Datum of 88
Ni	Nickel
N.J.A.C.	New Jersey Administrative Code, Title 7 Environmental Protection (N.J.A.C. 7)
NJDEP	New Jersey Department of Environmental Protection
ORP	Oxidation Reduction Potential (Eh)
PAHs	Polycyclic aromatic hydrocarbons
Pb	Lead
PBR	Permit-by-Rule
PCBs	Polychlorinated biphenyls
PCE	Perchloroethylene, tetrachloroethene
PID	Photoionization Detector
Pilot Scale Treatment	A pilot test usually involves at on-site test using the actual treatment processes and data collection process on a small scale to get feedback on whether or not the processes are likely to work as expected in a "real world" situation. These tests are also used to help refine process parameters such as reagent dosing and mixing methods.
PM_{10} or PM10	Airborne Particulates less than 10 microns in size
PPE	Personal Protection Equipment
PPG Site 114	Garfield Avenue Site
PPM or ppm	parts per million

Project Area	Garfield Avenue Group Sites, including Sites 114, 132, 133, 135, 137, and 143, Carteret Avenue (from Garfield Avenue to Pacific Avenue), Garfield Avenue (from the light rail south of Union Street to Carteret Avenue); Halladay Street (from Caven Point Avenue to Forrest Street); Forrest Street (from Site 114 to Halladay Street); the Former Fishbein Property; the Former Ten West Apparel Property; the Al Smith Moving Property; the Former Halsted Property; and the Forrest Street Properties
PSEG	Public Service Electric and Gas Company
PSEG SC	Public Service Electric and Gas Company Services Corporation
PRMP	Post-Remediation Management Plan
PVC	Polyvinyl Chloride
PVSC	Passaic Valley Sewerage Commission
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RAWP	Remedial Action Work Plan. A document describing how a responsible party intends to remediate a contaminated site.
RAR	Remedial Action Report
RCRA	Resource Conservation and Recovery Act
RE	Receptor Evaluation
Remedial Design	Includes development of engineering drawings and specifications for a site cleanup.
Remediation	Actions to reduce, isolate, or remove contamination with the goal of protecting human health and the environment.
Responsible Party (RP)	Individuals, businesses or other entities accountable for remediating a contaminated site.
RI	Remedial Investigation. A study to determine the nature and extent of impacts to soil and ground water.
RIWP	Remedial Investigation Work Plan
RIR	Remedial Investigation Report
ROW	Right-of-Way
SA	Site Administrator
Sb	Antimony
Se	Selenium

SESCP	Soil Erosion and Sedimentation Control Plan
SIR	Site Investigation Report
Site Administrator (SA)	Under terms of an agreement among PPG, the New Jersey Department of Environmental Protection and the City of Jersey, this court-appointed individual is responsible for: • Developing a master schedule; • Resolving issues that might arise; • Obtaining technical expertise required for the review of PPG's submittals; and • Maintaining regular communications with community representatives.
SMP	Stockpile Management Plan
Soil	All solid material (other than CCPW). Exceptions to this definition are specifically noted in the text.
SOPs	Standard operating procedures
SVOCs	Semi-volatile Organic Compounds
TAL	Target Analyte List
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure. Toxicity characteristic leaching procedure (TCLP) is a soil sample extraction method for chemical analysis employed as an analytical method to simulate leaching through a landfill.
TEP	Technical Execution Plan
TICs	Tentative identified compounds
Tl	Thallium
Treatability Study	The purpose of the studies is to demonstrate the feasibility or effectiveness of a treatment technology by testing it at a laboratory or on a small field-scale before applying the technology to the larger field problem. In some cases, these studies are reported in the scientific literature. In other cases, especially with pilot scale studies, the studies would be completed by the consultant for the responsible party or by a subcontractor marketing the technology.
TRSR	Technical Requirements for Site Remediation (N.J.A.C. 7:26E)
TSCP	Traffic Safety and Control Plan
TVOC	Total Volatile Organic Compounds
TWA	Treatment Works Approval
ug/kg	Micrograms per Kilogram
ug/l	Micrograms per Liter
USCS	United Soil Classification System
USDOT	United States Department of Transportation

USEPA	United States Environmental Protection Agency
USGS	United States Geological Service
UST	Underground Storage Tank
V	Vanadium
VOC	Volatile Organic Compound
WUR	Water Use Registration
XRF	X-Ray Fluorescence (XRF) Spectrometry is a non-destructive analytical technique used to identify and determine the concentrations of elements present in soil. The spectrometer measures the individual component wavelengths of the fluorescent emission produced by a sample when irradiated with X-rays.
Zn	Zinc

1.0 Introduction and Purpose

On behalf of PPG, AECOM has prepared this Soil Remedial Action Work Plan (RAWP) to present the cleanup approach for the non-residential chromate waste sites known as the Garfield Avenue Group or GA Group Sites in Jersey City, Hudson County, New Jersey. The GA Group Sites include:

- Sites 114, 132, 133, 135, 137, 143, and 186;
- Carteret Avenue (from Garfield Avenue to Pacific Avenue);
- Garfield Avenue (from the light rail south of Union Street to Carteret Avenue);
- Halladay Street (from Caven Point Avenue to Forrest Street);
- Forrest Street (from Site 114 to Halladay Street);
- The Former Fishbein Property;
- The Former Ten West Apparel Property;
- The Al Smith Moving Property;
- The Former Halsted Property; and
- The Forrest Street Properties.

Site 186 will not be addressed as part of this RAWP. A RAWP for Site 186 was submitted in April 2013 and approved June 13, 2013. Remedial activities (RA) were completed at Site 186 and a Remedial Action Report (RAR) was submitted in March 2014 and approved on April 16, 2014. Collectively, all the Garfield Avenue Group sites (except Site 186) are hereinafter referred to as "the Project Area." **Figure 1-1** (USGS Site Location Map) shows the general location of the Project Area. **Figure 1-1a** (Site Map) presents the locations of each of the GA Group Sites.

A summary of the RAWP submittal/approval history is as follows:

- On April 17, 2012, PPG/AECOM issued the *Draft Remedial Action Work Plan (Soil), Rev. 2, Garfield Avenue Group – Sites 114, 132, 133, 135, 137 and 143, Jersey City, New Jersey* (2012 RAWP) (AECOM, 2012d).
- On May 11, 2012, the New Jersey Department of Environmental Protection (NJDEP) found the 2012 RAWP to be administratively complete and issued a Conditional Approval in a letter from Thomas J. Cozzi to M. Michael McCabe, Subject: *Remedial Action Work Plan (Soil), Rev. 2, Garfield Avenue Group – Sites 114, 132, 133, 135, 137 and 143, Jersey City, New Jersey* (NJDEP, 2012c).
- On December 5, 2014, PPG/AECOM issued the *Draft Remedial Action Work Plan (Soil) Rev. 3, Garfield Avenue Group – Sites 114, 132, 133, 135, 137 and 143, Jersey City, New Jersey* (Draft 2014 RAWP) (AECOM, 2014e), documenting compliance with the conditions of NJDEP's Conditional Approval.
- On February 28, 2018, Weston Solutions, Inc. (Weston), on behalf of NJDEP, issued an email that requested minor editorial changes to the Draft 2014 RAWP (Weston, 2018a).
- On May 15, 2018, PPG/AECOM issued the *Final Remedial Action Work Plan (Soil) Rev. 3, Garfield Avenue Group Sites, Jersey City, New Jersey* (Final RAWP Rev. 3) (AECOM, 2018).
- On July 12, 2018, NJDEP/Weston issued an additional comment on the Final RAWP Rev. 3 (Weston, 2018b).

- On August 21, 2018, on behalf of the City of Jersey City (the City), ERFS provided comments on the Final RAWP Rev. 3 (ERFS, 2018).

This Final RAWP Rev. 4 addresses NJDEP and the City's final comments. **Table 1-1** presents the achievement of NJDEP's May 2012 conditions for approval of the RAWP.

Except where otherwise specified, the information presented in this Final RAWP Rev. 4 reflects the project status as of December 2014. Sections of the RAWP that have been updated to reflect the September 2018 status and conditions include:

- Portions of Section 1.1 – Site Description
- Section 4.0 – Remedial Action Selection
- Section 15.2 – Engineering Controls

Remedial Action Reports (RARs) will be issued for the GA Group Sites to provide the details concerning the actual remedial actions implemented to comply with the remedial goals for chromium and non-chromium impacted soils, as described in **Section 17.3**.

Prior to the implementation of this RAWP, AECOM completed several Remedial Investigations (RIs). To date the RIs have demonstrated a thick layer of fill material above a native meadow mat layer. The fill layer appears to be a heterogeneous mixture of construction debris (concrete, steel, and wood) intermixed with several historical site manufacturing products/byproducts. The two most evident products/byproducts are associated with a historical Manufactured Gas Plant (MGP) operations and historical chromate operation. Both analytical and visual inspection have shown MGP source (free phase) material has descended to below the meadow mat, while the Chromate Chemical Production Waste (CCPW) has been detained by the meadow mat (where present). Dissolved phase MGP constituents and chromium have been identified in both shallow and deep groundwater aquifers, but will be addressed in separate groundwater RAWPs. The products/byproducts (MGP and CCPW) that have been identified on site have two distinctly different origins and two distinctively separate responsible parties linked to each release. The responsible party for the MGP has been identified as Public Service Electric and Gas Company (PSEG), while PPG has taken responsibility for the CCPW.

Similar to most release sites, there are varying degrees of impacts to media throughout the vertical and horizontal horizons within the Project Area. Soils within the Project Area demonstrate concentrations of hexavalent chrome that range from non-detectable concentration to a maximum concentration of 59,600 parts per million (ppm) or milligrams per liter (mg/kg). A significant portion of the elevated soil concentration is shown to be in the fill layer above the meadow mat. Hexavalent chromium (Cr^{+6}) is very soluble in water and a sizable portion of this fill layer is beneath the water table. The soil concentrations from below the meadow mat are believed to be influenced by this dissolved phase within the groundwater; therefore, results from soil samples from below the water table cannot be directly compared to their counterparts above the water table. The groundwater concentrations within the same area show levels of contamination that vary from non-detectable concentrations to over 2,000 milligrams per liter (mg/l), thus justifying the aforementioned peripheral effects of groundwater on soil within the Project Area.

In 2010 and into early 2011, PPG implemented Interim Remedial Measures #1 (IRM #1) at Site 114. This IRM included excavation and off-site disposal of approximately 75,000 tons of chromium impacted material. Details of the IRM work including lessons learned are included in this RAWP.

In December of 2010, PPG worked with the New Jersey Department of Environmental Protection (NJDEP) and other stakeholders to develop a conceptual plan for remediation of the Project Area. The

Conceptual Plan specifies removal of Accessible CCPW (including Chromite Ore Processing Residue (COPR), Green-Gray Mud and fill mixed with COPR or Green-Gray Mud) in accessible areas to a maximum depth of 35 feet below ground surface (bgs). Subsequently, PPG has expanded the excavation plan to include Impacted Soil (soil containing Cr^{+6}over 20 ppm) to the meadow mat or a depth of 20 feet. Excavation of Impacted Soil below 20 feet to a maximum depth of 35 feet will also be conducted under certain circumstance explained later in this document. Containment or treatment and institutional controls are specified for areas that are currently inaccessible.

PPG has been working with PSEG to develop a coordinated remedial approach in areas where both CCPW and MGP material is present. A separate RAWP has been prepared by PSEG for the MGP material.

1.1 Site Description

Table 1-2 presents the Block and Lot boundaries at the Garfield Avenue Group Sites, updated through September 2018.

Note that new tax Block and Lots were assigned to all City of Jersey City properties in February 2012, and **Table 1-2** below reflects the February 2012 Block(s) and Lots, which remain current as of September 2018, with the exception of Site 199 (Sludge Line #2). On October 19, 2017, the Jersey City Municipal Utilities Authority (JCMUA) transferred the Site 199 property to the Jersey City Redevelopment Agency (JCRA), which combined the property into a single lot, as reflected in **Table 1-2**.

Although not anticipated at this time, if the presence of CCPW-related impacts is identified on other adjacent properties, remediation may be addressed under this RAWP (as part of Phase 5).

Table 1-2 Non-Residential Chromate Chemical Production Waste Site Property Owners

Site Number (PI Number)	Site Name	Location	Property Owner	Current Usage	Block	Lot
Properties Remediated or to be Remediated According to the RAWP						
114 (G000005480)	Former MGP facility and COPR stockpile area	Southwest and Eastern portions of Site 114, including 880 Garfield Ave. and 2 Dakota St.	City of Jersey City (Jersey City Redevelopment Agency)	Vacant Land	21501	16, 17, 18, 19
	Former Chromate Chemical Production Facility	Northwest portion of Site 114, 900 Garfield Ave.	900 Garfield Ave, % Ryann LLC (900 Garfield Avenue, LLC)	Vacant Land	21501	20
132 (G000008749)	Town & Country Linen (former name)	824 Garfield Ave.	City of Jersey City (Jersey City Redevelopment Agency)	Vacant Land	21510	2
133 West (629345)	Ross Wax (former name)	15 Halladay St.	PPG Industries, Inc.	Vacant Land	21510	5
133 East (025695)	Ross Wax (former name)	22 Halladay St.	PPG Industries, Inc.	Vacant Land	21509	1
135 (246332)	Vitarroz a.k.a. Narula (former names)	51-99 Pacific Ave.	PPG Industries, Inc.	Vacant land	21509	2
137 (G000008753)	TSI City Carriers (now known as 25 Halladay St., LLC)	25 Halladay St.	PPG Industries, Inc.	Vacant Land	21510	4
	Rudolf Bass, Inc. (former name)	45 Halladay St.	PPG Industries, Inc.	Vacant Land	21510	3
143 (G000008759)	F. Talarico Auto (former name)	846 Garfield Ave.	PPG Industries, Inc.	Vacant Land	21510	1
(629388)	Former Fishbein Property	816 Garfield Ave.	PPG Industries, Inc.	Vacant Land	21510	11
(777089)	Former Ten West Apparel Property	800 Garfield Ave.	PPG Industries, Inc.	Active Warehouse	21510	39
(775998)	Al Smith Moving Property	33 Pacific Ave	NJEDA,C/O A.SMITH MOVING & FURN	Vacant Land	21509	3
(G000005480)	Halladay St. South	West of Site 135	City of Jersey City	Vacant Land	n/a	n/a
(G000005480)	Halladay St. North	East of Site 114	City of Jersey City	Active Roadway	n/a	n/a
(722429)	Halsted Property	78 Halladay Street	PPG	Inactive Warehouse	21502	12 - 17
(775706)	Forrest St.	West of Halladay St.	City of Jersey City	Active Roadway	n/a	n/a
(775706)	Forrest St. Properties	West of 100 Forrest Street	Caragliano, 100 Forrest Associates, LLC	Vacant Land	21501	15

Table 1-2 Non-Residential Chromate Chemical Production Waste Site Property Owners (continued)

Site Number	Site Name	Location	Property Owner	Current Usage	Block	Lot
Properties to be Remediated According to GA Group RAWP Addenda						
(G000005480)	Carteret Avenue	Between Pacific Ave. and Garfield Ave.	City of Jersey City	Vacant Land, Active Roadway	n/a	n/a
(G000005480)	Garfield Avenue	West of Site 114	City of Jersey City	Active Roadway	n/a	n/a
114 (G000005480)	Western Sliver	East of Garfield Ave.	900 Garfield Ave, % Ryann LLC	Vacant Land	21501	20
Properties to be Remediated According to Site-Specific RAWP						
(775706)	Forrest Street (Utility Offset Area)	West of Halladay St.	City of Jersey City	Active Roadway	n/a	n/a
(775706)	Forrest Street Properties	86 – 100 Forrest Street	Caragliano, 90 and 100 Forrest Associates, L.L.C.	Commercial Properties	21501	11, 12, 14
Properties to be Remediated Separately						
199	Sludge Line 2	163 Halladay Street	Jersey City Redevelopment Agency	Light Rail Right of Way	21501	1.01

Source: http://tax1.co.monmouth.nj.us/cgi-bin/prc6.cgi?menu=index&ms_user=glou&passwd=data&district=0801&mode=11

NOTE: Site 199 includes a portion of the HBLR north of Site 114 between Garfield Avenue and Halladay Street.

a.k.a – also known as

PI Number – Program Interest Number

1.1.1 Site Location, Description, and History of Site 114

Site 114 is vacant land located in a commercial and residential area on Garfield Avenue in Jersey City, Hudson County, New Jersey. **Figure 1-1** (USGS Site Location Map) shows the general location of the Project Area. Site 114 is described in the Administrative Consent Order (ACO) as Block 2026.A, Lots 1 and 3A and Block 2026.1, Lots 2A, 3B and 4A. As presented on the Existing Condition Plan (**Drawing 1-2**), Site 114 is bordered to the west by Garfield Avenue; to the south by Carteret Avenue; to the east by Halladay Street; and to the north by Forrest Street and an active railroad (Site 199) operated by New Jersey Transit.

The total area encompassed by Site 114 is 16.6 acres. Site 114 is the former location of a chromate chemical production facility and a MGP. The former Morris Canal, a man-made surface water body trending northeast/southwest, bisected Site 114 into eastern and western portions. The canal was decommissioned in the 1920s and was later filled. The MGP facility operated on the portion of Site 114 located east of the former Morris Canal between 1886 to the mid-1930s. The western half of Site 114 was the location of the former chromate production facility that operated from about 1911 to 1963. The chromate operation included a large stockpile of CCPW, primarily consisting of COPR, extending from the eastern portion of Site 114 southward onto Site 137. The locations of the former chromate plant and the CCPW storage pile were identified using historic aerial photographs that are provided in the March 2011 Remedial Investigation Work Plan (RIWP) (AECOM, 2011a).

Following demolition of above-grade structures associated with the chromate production facility and the MGP facility, the remaining foundations were buried, raising the ground surface elevation by several feet, and three warehouse structures were constructed on the property in the late 1960s. These warehouses were demolished down to the concrete floor slabs between August and December 2002.

Additional activities performed as part of the warehouse demolition included an asbestos survey; a lead and hazardous materials survey and removal; block wall preparation; and removal and disposal of debris inside and outside the buildings. Information pertaining to the demolition of Site 114 buildings was previously submitted in March 2011 RIWP. The warehouse foundations remained on the property and covered an area of approximately 5.2 acres. The 900 Garfield Avenue slab was removed as part of IRM #1. The slabs of two of the former warehouses at 880 Garfield Avenue and 2 Dakota Street were removed as part of the current remedial action under the Technical Execution Plan (TEP) for the Southwest Area (SW TEP) and the TEP for Phase 2B-1 Area (Phase 2B-1 TEP), respectively.

Prior to the current remedial action at Site 114, there was approximately 4.0 acres of paved areas (roadways and parking), including Dakota Street, which bisected the Site 114 in an east-west direction starting at Garfield Avenue. Dakota Street was not an active public Right-of-Way (ROW); it is currently enclosed within the fenced area of Site 114. Prior to remedial activities approximately 1.8 acres of Site 114 consisted of landscaped and open areas surrounding the concrete slabs of the warehouses. The landscaped areas consisted primarily of long and narrow vegetated strips along the edges of the concrete slabs. There was a 4.0-acre area on-site that was capped with stone overlying a polyethylene liner which was constructed by PPG in 1992 as an IRM. In late 2011, IRM #1 was covered with a high density polyethylene liner with an area of 1.3 acres. The remaining 0.3 acres consisted of open areas on the eastern side of Site 114 between the paved areas. At the present, the site remains completely enclosed by a barrier fence and remains secure.

Western Sliver (Status as of September 2018)

The Western Sliver is the 5- to 10-feet wide strip of land located between the shoring for IRM #1 and the Site 114 property line along Garfield Avenue. Excavation of the Western Sliver began on March 18, 2014 and was completed on June 11, 2014; however, in certain locations proposed terminal excavation elevations were not achieved and, based on supplemental sampling results, remediation was not completed in accordance with the *Updated Method to Determine Compliance with Chromium Policy* (NJDEP, 2013). The remedial approach for CCPW-related impacts remaining in the Western Sliver's footprint (in-situ soil treatment) has been presented in the *PPG Garfield Avenue Group Sites, Remedial Action Workplan Addendum, Site 114 Western Sliver Remediation* (Arcadis, 2018).

1.1.2 Site Location and Description of Remaining Garfield Avenue Group Sites

The remaining sites that comprise the Garfield Avenue Group Sites are proximate to each other and located on abutting parcels. **Figure 1-1a** presents the locations of the Garfield Avenue Group Sites, updated through September 2018. **Drawings 1-2** and **1-3**, the Existing Conditions Plan, depict Site 114, the Garfield Avenue Group Sites, and the surrounding Project Area through December 2011.

Site 132 – Town and Country

Site 132 is located in a commercial and residential area on Garfield Avenue in Jersey City, Hudson County, New Jersey. As depicted on **Drawing 1-2**, Site 132 is bordered to the west by Garfield Avenue; to the south by commercial property (800 Garfield Avenue [a.k.a. the Former Ten West Apparel Property]); to the east by Site 137, beyond which is Halladay Street; and to the north by Site 143 and Carteret Avenue.

The total area encompassed by Site 132 is 3.16 acres. A vacant warehouse constructed circa 1971, along with grassy and paved areas, was demolished in July 2013 and the building slab was subsequently removed. The warehouse was previously occupied by the Town and Country Linen Warehouse.

Site 133 – Ross Wax

Site 133 is located in a commercial and industrial area on Halladay Street in Jersey City, Hudson County, New Jersey. As depicted on **Drawings 1-2 and 1-3**, the western parcel of Site 133 (Site 133W) is bordered to the west by 800 Garfield Avenue (a.k.a. the Former Ten West Apparel Property); to the south by Caven Point Avenue, to the east by Halladay Street; and to the north by Site 137. The eastern parcel of Site 133 (Site 133E) is bordered to the west by Halladay Street; to the south by Caven Point Avenue; to the east by Site 135, beyond which is Pacific Avenue; and to the north by Carteret Avenue.

The total area encompassed by Site 133 is 2.41 acres. Several contiguous warehouses were located on Site 133E, which covered an area of approximately 1.7 acres. The warehouses were demolished from September through October 2014. Previous site uses included varnish and paint manufacturing.

Site 135 – Vitarroz

Site 135 is located in a commercial and industrial area on Pacific Avenue in Jersey City, Hudson County, New Jersey. As depicted on **Drawings 1-2 and 1-3**, Site 135 is bordered to the west by Site 133E; to the south by commercial property, beyond which is Caven Point Avenue; to the east by Pacific Avenue; and to the north by Carteret Avenue.

The total area encompassed by Site 135 is approximately 1.5 acres. Several contiguous warehouses are located on the property and cover an area of approximately 1.2 acres. Previous site uses included general grocery warehousing, occupancy by the Clorox Chemical Co., and other manufacturing.

Site 137 – Rudolf Bass & TSI City Carriers

Site 137 is located in a commercial and industrial area on Carteret Avenue in Jersey City, Hudson County, New Jersey. As depicted on **Drawing 1-2**, Site 137 is bordered to the west by Site 132 and 800 Garfield Avenue (a.k.a. the Former Ten West Apparel Property); to the south by Site 133W, beyond which is Caven Point Avenue; to the east by Halladay Street, beyond which is Site 133E; and to the north by Carteret Avenue, beyond which is Site 114.

The total area encompassed by Site 137 is approximately 3.24 acres. Two warehouses and paved areas were on the property. The larger of the two former warehouses was located at 45 Halladay Street formerly owned and operated by Rudolf Bass and warehoused used industrial machinery for resale. The smaller warehouse located at 25 Halladay Street was formerly occupied by TSI City Carriers. Prior to the construction of the warehouses, Site 137 was used to stockpile CCPW generated at the former PPG chromium ore processing facility. The CCPW appeared to have been stockpiled at Site 137 until about 1961, when the site appeared to be cleared and leveled. The 45 Halladay Street building was demolished in March 2014 and 25 Halladay Street was demolished from late August through early September 2013.

Site 143 – F. Talarico Auto

Site 143 is located in a commercial and residential area on Garfield Avenue in Jersey City, Hudson County, New Jersey. As depicted on **Drawing 1-2**, Site 143 is bordered to the west by Garfield Avenue, beyond which are residential properties; to the south and east by Site 132; and to the north by Carteret Avenue, beyond which is Site 114.

The total area encompassed by Site 143 is approximately 0.72 acres. A building (constructed between 1963 and 1966) and paved areas was present on the property. The property formerly operated as Talarico Auto and was used for auto repair and sales. Previous site uses included vacancy, auto salvage stockpile, and residential. The building was demolished in July 2013, and the building slab was subsequently removed, in preparation for soil remediation.

Former Fishbein Property (Status as of September 2018)

The Former Fishbein Property is located at 816 Garfield Avenue (Block 21510, Lot 11) and is bordered to the north by Site 132, to the south by the Former Ten West Apparel Property, to the east by Site 137, and to the west by Garfield Avenue, beyond which is vacant land and residences. The area encompassed by the property is 0.26 acres. The property is a rectangular-shaped, paved vacant lot.

Former Ten West Apparel Property (Status as of September 2018)

The Former Ten West Apparel Property is located at 800 Garfield Avenue (Block 21510, Lot 39) and is bordered by the Former Fishbein Property to the north, Caven Point Avenue to South, Site 133 and Site 137 to the west, and 784 Garfield Avenue, 802 Garfield Avenue, and Garfield Avenue to the east, beyond which is vacant land and residences. The area encompassed by the property is 2.1 acres. The property is generally flat with a slight downward slope towards the southeast. The property is occupied by a single-story concrete block warehouse.

Al Smith Moving (Status as of September 2018)

The Al Smith Moving Property is located at 33 Pacific Avenue (Block 21509, Lot 3), and is bordered by Site 135 to the north, Pacific Avenue to the east, Caven Point Avenue to the south, and Site 133 East to the west. The area encompassed by the property is 0.5 acres. The property's topography is relatively flat. A commercial warehouse formerly occupied the majority of the property, which extended to the property's northern, southern, and eastern boundaries and the western edge was occupied by an alleyway. The Al Smith Moving Property excavation began on August 2, 2017 and was completed on January 8, 2018. The property is now vacant land.

Phase 4 – Roadways (Status as of September 2018)

Roadways designated within the GA Group Sites include Halladay Street, Carteret Avenue, Forrest Street, and Garfield Avenue.

Halladay Street runs approximately north-south and is bordered to the west by Site 114, Site 137, and Site 133 West and to the east by Site 133 East and the former Halsted Property. The area encompassed by the roadway is approximately 2.1 acres. The section of the roadway identified as the GA Group Site extends from Caven Point Avenue to Forrest Street and is divided into two sections: Halladay Street South (south of Carteret Avenue) and Halladay Street North (north of Carteret Avenue). Remediation of Halladay Street South is complete (except for the southern portion associated with Phase 3B South). Remediation of Halladay Street North is pending an agreement between the JCO parties regarding the approach for remediation in proximity to the 30-inch sewer line present within Halladay Street North.

Carteret Avenue runs approximately east-west and is bordered by Site 114 and the Former Halsted Property to the north, and Sites 143, 132, 137, 133 East, and 135 to the south. The area encompassed by the roadway is approximately 1.4 acres. The section of the roadway identified as a GA Group Site

extends from Garfield Avenue to Pacific Avenue. Remediation in Carteret Avenue will be limited by the presence of a 96-inch diameter sewer line running parallel to and within the footprint of the roadway. The remedial approach for Carteret Avenue will be presented in a forthcoming addendum to this RAWP.

Garfield Avenue runs approximately north-south and is bordered to the east by Site 114 and to the west by Frenchpark Warehouse Co., Jersey Auto Repair, and vacant land. The area encompassed by the roadway is approximately 0.9 acres. The section of the roadway identified as a GA Group Site extends from Carteret Avenue to the New Jersey Transit Hudson-Bergen Light Rail. The remedial approach for Garfield Avenue will be presented in a forthcoming addendum to this RAWP.

Forrest Street runs approximately east-west and is bordered to the south by Site 114, to the west by one of the Forrest Street Properties, beyond which is Site 114, and to the north by the Forrest Street Properties. The area encompassed by the roadway is approximately 0.3 acres. The section of the roadway identified as the GA Group Site extends west from Halladay Street to the end of the roadway. Excavation of a portion Forrest Street began on March 27, 2017 and was complete on August 4, 2017. To protect the Forrest Street Properties buildings and the utilities located within Forrest Street's footprint, remediation of soil within Forrest Street adjacent to the Forrest Street Properties buildings is being achieved through engineering controls appropriate for the properties' current use. The proposed remedial approach for this area (capping) is presented in the site-specific RAWP titled, *Interim Remedial Action Work Plan, Forrest Street and Forrest Street Properties Deferred Remediation Areas* (AECOM, 2018). As of September 2018, approval of the site-specific RAWP is pending and implementation of the proposed remedial approach is ongoing. When this area becomes accessible (i.e., when the Forrest Street Properties buildings are demolished for redevelopment for residential use), remediation can be conducted in accordance with this RAWP.

Former Halsted Property (Status as of September 2018)

The Former Halsted Property is located at 78 Halladay Street and is bordered by Halladay Street to the northwest, by commercial properties to the northeast and east (beyond which is Pacific Avenue), and by Carteret Avenue to the southwest. The property encompasses approximately 1 acre. The topography is relative flat.

A medical care facility (Fresenius Kidney Care) is located on Pacific Avenue southeast of Halsted. There is a used automobile business (Turnpike Auto) that occupies the two buildings along Halladay Street North between Halsted and Forrest Street.

The footprint of a vacated warehouse covered most of the property. As of September 2018, demolition of the warehouse, and remedial excavation and backfilling are complete.

Forrest Street Properties (Status as of September 2018)

The Forrest Street Properties include 84, 86, 90, 98, and 100 Forrest Street (Block 21501, Lots 11, 12, and 14) and the Skyways property (Block 21501, Lot 15), and are bordered to the north by the New Jersey Transit Hudson-Bergen Light rail, to the south by Forrest Street, beyond which is Site 114, to the east by residential properties, and to the west by Site 114. The properties encompass approximately 1.4 acres. The Forrest Street Properties area is relatively flat in topography with a slight northerly slope. The Skyways property slopes downward from north to south.

Excavation at the Forrest Street Properties began on March 27, 2017 and was complete on July 19, 2017. To protect the Forrest Street Properties buildings, remediation of soil within the footprints of and within prescribed distances from the buildings is being achieved through engineering controls appropriate for the properties' current use. The proposed remedial approach for these areas (primarily capping) is presented in the site-specific RAWP titled, *Interim Remedial Action Work Plan, Forrest Street and Forrest Street Properties Deferred Remediation Areas* (AECOM, 2018). As of September 2018, approval of the site-specific RAWP is pending and implementation of the proposed remedial approach is ongoing. When this area becomes accessible (i.e., when the Forrest Street Properties buildings are demolished for redevelopment for residential use), remediation can be conducted in accordance with this RAWP.

Site 199 (Status as of September 2018)

Site 199 is located along the New Jersey Transit Hudson-Bergen Light Rail tracks between Garfield Avenue and Halladay Street (Block 21501, Formerly Lots 1, 2, and 3, currently Lot 1.01). The Site covers approximately 2.4 acres. The majority of the Site is covered with gravel. A New Jersey Transit Right-of-Way extends approximately 50 feet on both sides of the light rail. In the 1950s, the Jersey City Sewerage Authority installed two six-inch diameter sludge lines along the Site. The sludge lines were later abandoned in the 1970s. The area around the two sludge lines is believed to have been backfilled with COPR during their installation (AMEC, 2014). There is currently a 54-inch diameter sewer line that runs beneath the north side of the light rail tracks.

Responsibility for remediation of Site 199 is shared between Honeywell and PPG; Honeywell is the lead party per the Consent Judgment filed on September 7, 2011 between NJDEP, the Administrator of the Jersey Spill Compensation Fund, Honeywell International Inc., Occidental Chemical Corporation, and PPG.

1.2 Surrounding Land Use

1.2.1 Site 114

The areas adjacent to and across the surrounding streets from Site 114 are generally characterized as commercial and light industrial. Along the northern Site 114 boundary, a New Jersey Transit Light Rail railroad ROW (Site 199) bounds the site. A Light Rail Transit Station is present to the west-northwest of the site. Toward the northeast and across Forrest Street, warehouse buildings are present. Further to the north and beyond the railroad ROW are commercial, light industrial and residential properties. To the east of the Site 114, across Halladay Street, a bag manufacturer/warehouse and an auto body shop are present. Further to the east and southeast are commercial, light industrial, railroad ROW, and material recycling facilities. To the west, across Garfield Avenue, an office furniture manufacturer/warehouse and auto repair shop is present. Further to the west, residential areas are present. To the south, a former auto body shop/used car dealer, former abandoned warehouse, and former light industrial machinery/box manufacturer/general storage warehouses were present. Further to the south, commercial areas exist. The residential areas north and west of Site 114 have been identified as part of the JCRA-approved Canal Crossing Redevelopment Plan. Final details of this redevelopment have not been identified to date. An area to the north of the Light Rail ROW has been designated as the Berry Lane Park project. Soil remediation activities and initial phases of park construction are complete at Berry Lane Park.

1.2.2 Garfield Avenue Group Sites South of Carteret Avenue

Commercial properties and businesses, including warehousing, scrap metal, recycling, and light manufacturing, as well as automotive service businesses are located to the north, east and south of the GA Group sites south of Carteret. Residences are located to the west, across Garfield Avenue. The residential areas located to the southwest have been included in the JCRA-approved Canal Crossing Redevelopment Plan.

The GA Group sites south of Carteret are situated to the south of Site 114. The chromate operation in the Project Area included a COPR storage pile located at the southeastern quadrant of Site 114 which extended southward onto Site 137. The location of the plant and COPR storage pile on Site 114 was previously determined from aerial photographs during an investigation at that site.

1.3 Topography

The United States Geological Service (USGS) Map (**Figure 1-1**) presents the regional topography on the Project Area. Site 114 has little topographic relief, with ground surface elevation ranging from approximately 10 to 16 feet relative to the North American Vertical Datum of 1988 (NAVD 88). However, just to the west of Garfield Avenue, the topography rises approximately 30-40 feet within several hundred yards of the Project Area. In general, the former warehouse foundations at Site 114 are elevated two to five feet above the surrounding ground surface. The topography of the area that includes GA Group sites south of Carteret generally ranges in elevation from approximately 9 to 15 feet NAVD 88.

1.4 Geology

The Project Area lies within the glaciated section of the Piedmont physiographic province of the Appalachian Highlands along the eastern edge of the Newark Basin (Killam, 1988). The region is underlain by formations of recent Pleistocene age, Triassic and Early Jurassic ages. The Triassic age bedrock in most of the region is composed of sedimentary rocks consisting of sandstone, mudstone and conglomerate. The Early Jurassic age bedrock is composed of an intrusive diabase dike. Site-specific geologic findings are further described below.

During soil boring advancement for sample collection and well installation, soil samples were visually characterized using a modified Burmeister Soil Classification System. All soil descriptions include a color description based on the Munsell® Soil Chart. The boring logs for boring locations prior to 2006 are provided as Appendix E of the March 2006 Remedial Investigation Report (RIR) (ENSR, 2006a). Boring logs for borings advanced from 2006 to the present are provided as Appendix S in March 2006 RIR (ENSR, 2006a). The soils either underlying a concrete slab or asphalt within the Project Area generally include artificial fill (wood, brick, glass, CCPW, coal, and clinkers in a sandy silt matrix) underlain by silt, clay and organic material (meadow mat) and/or coarse to fine sand and gravel. Bedrock in the Project Area has been classified as diabase.

Cross-sections were prepared to depict the sub-surface geology relative to the CCPW. These cross-sections are presented in **Drawing 1-4** through **Drawing 1-16**. These cross-sections illustrate maximum and minimum elevations were CCPW was identified in boring logs to date. A mean elevation for the groundwater table and the identified meadow mat was also superimposed on the cross-section for a greater dynamic understanding of geologic and hydraulic conditions.

1.4.1 Shallow Soil Findings

The shallow soils are generally defined as those from surface grade to the top of the meadow mat layer, where present, or in the same vertical range as the meadow mat layer (13 to 20 feet bgs), where meadow mat is not present. Where the meadow mat is not present, other natural materials such as marine sands and silts or glacial materials were observed. Overlying the meadow mat layer is fill, which consists of CCPW (COPR, Green-Gray Mud and COPR/Soil mixtures), and common fill (construction refuse [i.e., cinders, brick, wood, ash, concrete, slag, metal, and glass], topsoil, and roadway gravel base).

Where found, the thickness of the CCPW varies. Meadow mat is fairly pervasive throughout the project area. Where present, the meadow mat thickness ranged up to approximately 8 feet thick.

1.4.2 Intermediate Soil Findings

The intermediate soils are generally defined as those just below the meadow mat layer, where present, or just below the same vertical range as the meadow mat layer, where not present. These naturally-occurring soil types range from low hydraulic conductivity soils such as silts and clays to more permeable fine to coarse sands. The thickness of the intermediate zone is approximately 20 feet, and generally ranges from the bottom of the meadow mat to 40 feet bgs.

1.4.3 Deep Soil Findings

The transition between the intermediate and deep soil is generally defined by a low permeability silt or clay zone that is fairly laterally extensive and is generally encountered between 32 and 40 feet bgs. There did not appear to be a clear contact between alluvial, glacial, or lacustrine soils and a till layer located directly on top of the bedrock. Instead, there was a progressive increase in grain size with depth, which is consistent with the description of regional till. The total thickness of unconsolidated materials between the bedrock and below the meadow mat varies significantly across the Project Area. Bedrock has been observed at very shallow depths along Garfield Avenue and points west. The bedrock surface has also been observed at depths exceeding 100 feet bgs southeast of Site 114. Generally, the deep soils are approximately 50 feet thick, and range from approximately 35 feet bgs (bottom of intermediate zone soils) to 100 feet bgs. At increasing depths, soils tended to be coarser with isolated areas of gravel. In several locations off-site towards the south-southeast where the bedrock was found deep, a clay layer 15-30 feet thick was evident. The clay layer was usually found close to the surface of the bedrock.

1.4.4 Bedrock Findings

Bedrock was observed on Site 114 and in surrounding areas at depths ranging from 6 to 103 feet bgs (7.03 to -90.67 feet NAVD88). The diabase observed is dense, hard, and sparsely fractured. To date, the following bedrock monitoring wells (PPG-114-4D, PPG-114-6D, and PPG-114-7D) have been installed at Site 114. Additionally, one bedrock well (PPG-114-16B) has also been installed, to the southwest across Garfield Avenue. Eleven other wells in the Project Area confirmed the top surface of bedrock when the drilling rig encountered refusal at depth. The top elevation of the bedrock trends deeper from northwest to southeast across the Project Area. Monitoring Wells PPG-114-15A and PPG-114-16B which are located on the west side of Garfield Avenue encountered bedrock at elevations of 8.28 mean sea level (msl) and -2.22 msl, respectively. In contrast, Monitoring Wells PPG-133-1C, PPG-137-2C, PPG-114-19C, and PPG-135-1C at elevations of -63.90 msl, -58.29 msl, -89.42 msl and -91.86 msl, respectively.

Where bedrock coring was performed or drill cuttings were discernible at Site 114 and the Off-site area along Garfield Avenue southwest of Site 114, the bedrock was observed to be diabase. The diabase consists of fine-grained dikes; medium to coarse grained intrusions of dark greenish-gray to black diabase. Because of its relative hardness and competency, diabase bedrock comprises the majority of the high topographic regions in Jersey City. It is composed mostly of plagioclase feldspar (primarily anorthite), clinopyroxene (mostly augite), and magnetite and ilmenite. Accessory minerals include apatite, quartz, alkali feldspar, hornblende, titanite, and zircon, with olivine not as common. The diabase dikes range in thickness from 10 to 50 feet and several miles long (Drake et al., 1996).

1.4.5 Discussion of Geologic Findings

The urban/anthropogenic fill material which is overlying the meadow mat is comprised of sand, silt, clay, and various man-made refuse, most notably COPR and Green-Gray Mud, by-products of the chromate operations. Below the fill material, a discontinuous meadow mat unit was observed. In some instances where the discontinuities exist, waste materials, such as COPR and mud are present. Below the meadow mat, deposits of clay, silt, and sand are interbedded with a relatively smooth transition to till, which is characterized by a general increase in grain size with depth. In general, the amount of silt and clay in the deeper soils is much less than that found in the shallow and intermediate soil zones. As shown on the cross-sections, diabase bedrock was encountered during the installation of bedrock wells PPG-114-4D, PPG-114-6D, PPG-114-7D and PPG-114-16B. In addition, several deep wells were installed from October 2005 through May 2007. Bedrock was encountered at depths ranging from 6 to 103 feet bgs. Review of the elevations at which bedrock was encountered indicates that elevations of bedrock increase toward the west and north. This trend follows surface topography in the area, as there is a somewhat sharp rise to the west.

1.4.6 Bedrock – Triassic Newark Supergroup

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

The Stockton Formation is a light gray, light grayish-brown, yellowish- to pinkish-gray, or violet-gray to reddish-brown, medium to coarse grained arkosic sandstone and reddish- to purplish-brown mudstone, silty mudstone, siltstone, and shale. The maximum thickness of the Stockton Formation is approximately 4,070 feet (Drake et al., 1996).

The Lockatong Formation is a cyclically deposited sequence of light to dark gray, greenish-gray, and black silty argillite, laminated mudstone, silty to calcareous sandstone and siltstone, and minor silty limestone. Lithologic sequences average between 10.5 to 17 feet thick. The maximum thickness of the Lockatong Formation is approximately 3,510 feet (Drake et al., 1996).

The Passaic Formation is the thickest unit (approximately 11,500 feet) of the Triassic Newark Supergroup and is found west of the Project Area. The formation consists of a reddish-brown to brownish-purple and grayish-red siltstone and shale (Drake et al., 1996). Generally, the Triassic Newark Supergroup exhibits a slight dip to the northwest and local warping and occasional faulting (Herpers and Barksdale, 1951). Rock beds in this basin generally strike northeast to southwest and dip between 10 to 20 degrees northwest.

Bedrock on Site 114 is diabase; however, a gradational contact and/or interfingering with the Lockatong and Stockton Formations may exist near the Project Area. The diabase consists of fine-grained to

aphanitic dikes; medium to coarse grained intrusions of dark greenish-gray to black diabase. Diabase is dense, hard, and sparsely fractured. Because of its relative hardness and competency, diabase bedrock comprises the majority of the high topographic regions in Jersey City. It is composed mostly of plagioclase feldspar (primarily anorthite), clinopyroxene (mostly augite), and magnetite and ilmenite. Accessory minerals include apatite, quartz, alkali feldspar, hornblende, titanite, and zircon. Olivine is rare. Diabase dikes range in thickness from ten to 50 feet and may be several miles long (Drake et al., 1996).

1.4.7 Overburden Soil – Glacial Outwash Valley

According to the New Jersey Geologic Survey, surficial deposits in Jersey City include alluvial, estuarine, and eolian (windblown) deposits of post-glacial age and glacial lacustrine deposits and till of late Wisconsin Age.

Overlying the Triassic Newark Supergroup, the Rahway Till consists of a glacially-deposited, poorly sorted, reddish-brown to reddish-yellow, silty sand to sandy silt with some pebbles and cobbles. This unit has a reported thickness of up to 50 feet. Lake-Bottom Deposits overlie the Rahway Till and these consist of a well sorted and stratified, gray to reddish-brown clay, silt, and fine sand. This unit can be up to 150 feet in thickness. Estuarine and salt marsh deposits and/or deltaic deposits overlie the Lake-Bottom Deposits. The estuarine deposits consist of black, dark brown and dark gray organic silt and clay, and salt marsh peat (meadow mat), some sand, and occasional shells. These deposits can range in thickness from 20 to 40 feet, though the thickness can vary regionally. The deltaic deposits consist of well sorted and stratified reddish-brown, reddish-yellow to gray sand, some gravel, and minor cobbles, and ranges in thickness up to 100 feet. Fill material typically overlies these formations and can consist of non-native soils (i.e., sand, gravel, silt, rock, clay) and miscellaneous refuse.

At Site 114, organic estuarine deposits were identified at a number of, but not all boring locations site-wide. These deposits are hereinafter referred to as meadow mat. The meadow mat was notably absent from the northern area of Site 114 near where the Morris Canal formerly bisected the Site in a north-south alignment, in the north-central portion of Site 114 as well as other isolated areas of Site 114. It is possible that the meadow mat was removed during construction of the canal. Historic records indicate that the canal was approximately 40 feet wide and 25 feet deep. During the 1920's, the canal was filled with non-native soils and other materials.

In the GA Group Sites south of Carteret and nearby areas, meadow mat was encountered in soil borings from depths ranging from 13 feet to 20 feet bgs.

Overlying the meadow mat in the Project Area are fill materials consisting of construction refuse (i.e., cinders, brick, wood, ash, concrete, slag, metal, glass), and trash and other landfill items, in addition to non-native soils. The thickness of the fill material is generally less than 20 feet.

Below the meadow mat, the soils are unconsolidated and characterized by fine to medium sand and silt with clay and some gravel, all typical of glacial outwash.

1.5 Hydrogeology

Groundwater occurs in the vicinity of the Project Area in four general geologic formations: bedrock (bedrock zone); an unconsolidated native deposit including glacial silt, sand and gravel (deep zone); recent deltaic deposits of alluvium (intermediate zone); and in non-native fill (shallow zone). Each of these is discussed below.

1.5.1 Bedrock Zone Hydrogeology

Hydrogeologic properties of the diabase bedrock are not well-documented. Matrix hydraulic conductivity is extremely low and groundwater storage is limited to thin, sometimes discontinuous fractures. Therefore, the diabase is not considered a reliable groundwater source in this area. The water-bearing properties of the bedrock aquifer, (i.e., storage capacity and transmissivity) are due to secondary porosity and permeability, which are characterized by flow within fractures. The thickness of the water-bearing zones is small, with estimates ranging from a few inches to 20 feet. Groundwater occurrence and flow is controlled either by vertical or near-vertical fractures (Herpers and Barksdale, 1951). Well yields range from a fraction of a gallon per minute (gpm) to five to ten gpm, with yields generally decreasing with depth. Groundwater in these formations primarily occurs under unconfined conditions.

1.5.2 Deep Zone Hydrogeology

Groundwater flow in the deep zone glacial deposits and alluvium is controlled by primary permeability or flow through the interconnected pore spaces in the soil matrix. Of the glacial deposits and alluvium, the bedrock, and the fill, 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).

1.5.3 Intermediate Zone Hydrogeology

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.

1.5.4 Shallow Zone Hydrogeology

Groundwater in the fill is typically encountered within 5 to 10 feet bgs. In general, shallow groundwater flow patterns are the result of groundwater elevations which are a subdued version of 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, spatially variable recharge due to the presence of impervious surfaces, and the former Morris Canal.

1.6 Receptor Evaluation

Receptor Evaluation (RE) Report, Revision 3 dated March 20, 2012 was submitted to the NJDEP on March 23, 2012 (AECOM, 2012b). The Final Garfield Avenue Group RE/Ground Water RE/Baseline Ecological Evaluation Reports were submitted to the NJDEP on July 22, 2013. Refer to **Appendix H** for a copy of this submittal.

2.0 Results of Previous Investigations

Remedial Investigation activities at several of the sites in the Project Area have been performed and were detailed in the following reports previously submitted to the NJDEP:

- April 2003 RIWP – Site 114;
- March 2006 RIR – Site 114;
- March 2006 RIWP – Site 114 (Off-site);
- September 2006 RIWP – Sites 132, 133, 135, 137 and 143;
- December 2009 Integrated RIR – Sites 114, 132, 133, 135, 137 and 143;
- March 2011 RIWP – Sites 114, 132, 133, 135, 137, and 186;
- November, 2011– Draft RIR – Soil Garfield Avenue Group Non-Residential CCPW Sites 114, 132, 133, 135, 137, 143 and 186; and
- February 2012 RIR – Soil Garfield Avenue Group Non-Residential CCPW Sites 114, 132, 133, 135, 137, 143 and 186.

A detailed description of previous site investigations was presented in Section 3.9 of the 2003 RIWP and in Section 2.2.4 of the 2012 RIR (AECOM, 2012a). The following sections provide a summary of RI activities conducted in Project Area. Detailed descriptions of the prior RI activities were previously presented in the above-referenced RIWPs and RIRs.

2.1 Summary of Findings of Remedial Investigation

Past RI activities conducted at Site 114 focused on soil and groundwater investigation within two main Areas of Concern (AOC):

1. The former MGP facility (Halladay Street Gas Works); and
2. The former chromite ore processing facility.

The former MGP facility, the Halladay Street Gas Works, operated from 1886 to the mid-1930s in the eastern portion of the Site. CMX (formerly Schoor DePalma), conducted a RI in 2007 for the MGP portion of the Site on behalf of Public Service Electric and Gas Services Corporation (PSEG SC), focusing on volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and cyanide related to former MGP operations. The former MGP facility was located on the eastern portion of Site 114.

PSEG SC conducted a phased RI at the former MGP facility in the eastern portion of Site 114. The RI focused on Contaminants of Concern (COCs), which included VOCs, SVOCs, metals, and cyanide related to former MGP operations. The RI field work was often conducted concurrently with PPG's RI activities so that both MGP and CCPW COCs were properly identified, characterized, and delineated. PSEG SC's 2007 RIR (PSEG, 2007) stated that MGP related compounds, oil-impacted material, and tar-impacted material had been horizontally and vertically delineated to the property boundaries and recommended no further soil investigation for the MGP COCs. However, some non-MGP compounds, (i.e., lead) may require further delineation. PSEG SC's 2007 RIR indicated that delineation of non- MGP compounds will be addressed by future RI activities associated with CCPW-related impacts.

The remainder of Site 114 is associated with chromate production and CCPW-related impacts. The RIs for the former chromate production facility and the former MGP facility were implemented concurrently through an agreement between PPG and PSEG SC, in order to ensure the proper identification and sample collection for the CCPW and MGP-related contaminants historically identified at the Site.

Soil and groundwater results from the 2009 RIR (AECOM, 2009) are discussed below.

2.1.1 Soil Results

The COCs in soil related to CCPW and CCPW-impacted materials include Cr^{+6} and five of the United States Environmental Protection Agency (USEPA) Target Analyte List (TAL) Metals: antimony (Sb), chromium (Cr), nickel (Ni), thallium (Tl), and vanadium (V). Additional COCs related to PPG's former ownership of Site 114 include VOCs, SVOCs, polychlorinated biphenyls (PCBs), and TAL Metals.

Total Cr and Cr^{+6} were detected above their respective Chromium Soil Cleanup Criteria (CrSCC) in shallow soils within the Project Area. The highest concentrations of total Cr and Cr^{+6} were associated with the Green-Gray Mud, CCPW, and mixed fill material in shallow soils. The highest concentrations of total Cr and Cr^{+6} were reported most frequently between 10 and 12 ft. bgs, which is where the majority of the Green-Gray Mud, CCPW, and mixed fill were observed Project Area. The highest concentrations of Cr^{+6} were reported in the northwest quadrant of Site 114 and on Site 137. In general, the concentrations of Cr^{+6} in the shallow non-native fill are substantially lower south of Site 137, east of Site 133, and along the eastern and western property boundaries of Sites 114, 132, and 143.

Cr^{+6} was detected at concentrations exceeding the CrSCC in the native soils of the intermediate zone especially where the meadow mat layer is absent such as the former Morris Canal footprint at the northern end of Site 114. Cr^{+6} concentrations in the native soils of the intermediate zone are substantially lower than in the fill material of the shallow zone. The CCPW material was deposited within the fill of the shallow zone. The lower permeability silts and clays of the organic sediments and meadow mat at the top of the intermediate zone appear to limit the downward migration of Cr^{+6} and CCPW-related contamination.

In addition to CCPW and CCPW-impacted materials present in the Project Area there are additional COCs on or potentially emanating from Site 114. These additional COCs include benzene, toluene, ethylbenzene, xylenes (BTEX), chlorinated volatile organic compounds (CVOCs), SVOCs, metals (including non-CCPW metals), and PCBs.

- **BTEX** - Concentrations of BTEX compounds have been detected at concentrations exceeding the Soil Remediation Standards (SRS) and/or Default Impact Ground Water Soil Screening Levels (DIGWSSL) in soil samples from Site 114. Some of these compounds, primarily on the eastern portion of Site 114, are related to historic MGP operations and were delineated by PSEG SC during their RI. Benzene unrelated to the former MGP facility was reported at a boring along the northwestern boundary of Site 114 at a concentration exceeding the SRS.
- **CVOCs** - CVOCs were reported at concentrations exceeding the SRS and DIGW SSLs primarily at the northern and northeastern portions of Site 114. The suspected source of these CVOCs is likely the former commercial businesses succeeding PPG's operations at the site. These CVOCs primarily consisted of tetrachloroethene (PCE), trichloroethylene (TCE), and vinyl chloride and were limited to shallow soils.
- **SVOCs** - SVOCs related to former MGP activities (primarily polycyclic aromatic hydrocarbons (PAHs) as well as several other SVOCs related to historic operations at Site 114 were reported

at concentrations exceeding the SRS and DIGWSSLs throughout Site 114. MGP-related SVOCs were delineated by PSEG SC during their RI and were pervasive through the eastern portion of Site 114. Non-MGP-related SVOCs including compounds, typically identified in historic fill, were reported in the western portion of Site 114. In general, SVOC were reported in the fill above the meadow mat.

- **Metals and Cyanide** - Metals in addition to Cr^{+6} and Cr were reported throughout the Project Area, generally located in the fill above the meadow mat. Metals were related to three potential sources: 1) former MGP operations, 2) former chromium ore processing operations, and 3) general site issues and historic fill.

  Metals related to historic MGP operations at the former Halladay Street Gas Works include arsenic (As), lead (Pb) and mercury (Hg). Cyanide related to the former MGP operations was delineated by PSEG SC and has not been investigated by PPG.

  Metals related to former chromium ore processing operations include Sb, Ni, Tl, and V in addition to Cr^{+6} and Cr.

  Several additional metals related to miscellaneous site issues and historic fill were reported at concentrations exceeding the SRS and/or DIGWSSLs. The NJDEP historic fill database lists historic fill-related metals as As, beryllium (Be), cadmium (Cd), Pb, and zinc (Zn).

- **PCBs** - PCBs were reported at concentrations exceeding the SRS and/or DIGWSSLs at a few relatively isolated areas at Site 114 in the fill above the meadow mat. The PCBs detected in samples collected in the northeastern corner of Site 114 were from a transformer spill related to the former warehouse operations at Site 114. Isolated PCB detections were also reported at the western side of Site 114 along Garfield Avenue and the eastern boundary of Site 114 at Halladay Street.

In summary, PPG has conducted several RI phases throughout Sites 114, 132, 133, 135, 137, and 143. The PPG RIs targeted VOCs, SVOCs, PCBs, TAL Metals, Cr^{+6}, and CCPW on and adjacent to Site 114. South of Site 114 on Hudson County Chromate (HCC) Sites 132, 133, 135, 137, and 143, the RI focused primarily on TAL Metals and Cr^{+6}. Data collected during the RI indicated that further delineation of VOCs, SVOCs, PCBs, and TAL Metals and Cr^{+6} would be needed at portions of Site 114 and adjacent properties. Additional delineation of Cr^{+6} and CCPW-related metals has been conducted on and/or adjacent to HCC Sites 132, 133, 135, 137, and 143.

AECOM's March 2011 RIWP proposed additional soil RI activities to delineate the horizontal and vertical extent of CCPW and CCPW-related impacts in soil within the Project Area and to identify non-CCPW related compounds on or potentially emanating from Site 114. NJDEP approved the March 2011 RIWP in correspondence dated March 21, 2011 and the RI fieldwork began in April 2011. The Remedial Investigation was completed delineating the COCs for the Garfield Avenue Group of Sites and was submitted to the NJDEP on November 23, 2011. The investigation also identified the presence of CCPW beyond the limits of the Project Area. These areas will be addressed as future addendums to this RAWP.

2.1.2 Groundwater Results

At Site 114, depth to groundwater ranged from ground surface (0.04 feet bgs) to 10.97 feet bgs and groundwater elevations typically ranged from 7.60 to 10.16 feet NAVD 1988. Groundwater flow directions in the shallow groundwater zone are multidirectional with components of flow toward Garfield Avenue, Carteret Avenue, Halladay Street, and Forrest Street. At the southern end of the

Site, flow appears to divide and flow both to the southwest and southeast. This division may be influenced by the lower permeability of the former Morris Canal.

Shallow groundwater elevations appear to fluctuate with specific precipitation events rather than seasonal variations at Site 114. Potential groundwater recharge areas tend to be limited by impervious structures such as pavement, buildings, and subsurface structures. Groundwater flow from the intermediate zone appears to flow toward Garfield Avenue, Carteret Avenue and Halladay Street. Groundwater elevations in the deep zone indicate groundwater flow towards the south/southeast. In addition, an upward vertical gradient from the deep groundwater zone to the intermediate zone was observed.

In general, the most elevated Cr^{+6} concentrations in shallow groundwater were predominantly detected on the western portion of the Site. In the intermediate groundwater zone, groundwater concentrations of Cr^{+6} follow a similar pattern as the shallow zone. Higher concentrations were observed in the north central portion of the Site and lower concentrations observed on the northern and eastern edges. Unlike the shallow zone however, higher concentrations of Cr^{+6} were observed at the southern boundary of Site 114. Several factors may influence intermediate groundwater concentrations including the absence of a meadow mat in some areas, a downward vertical gradient allowing Cr^{+6} concentrations from the shallow zone to be transferred into the intermediate zone, and an upward vertical gradient from the deep to intermediate zones. Cr^{+6} concentrations in deep zone groundwater were markedly lower than those detected in the intermediate and shallow zones on-site.

Additional groundwater contaminants of concern detected at concentrations above their respective Ground Water Quality Standards (GWQS) include BTEX and several CVOCs, SVOCs, metals, and cyanide.

Based on the groundwater data generated to date, additional RI activities are needed to horizontally delineate groundwater COCs on or emanating from Site 114. PPG/AECOM will complete a groundwater sampling event which will include an assessment of water levels and analysis of samples from all serviceable monitoring wells within the Project Area in the future. In addition, a separate groundwater RIWP will be prepared.

2.2 Findings to Date From the IRM Work

Several Interim Remedial Measures (IRMs) have been conducted in the Project Area prior to implementing full scale soil remedial activities. These IRMs include:

- Fencing and demolition of the above ground buildings and structures on Site 114;
- Capping and/or paving areas of exposed CCPW and CCPW impacted materials in the southern portion of Site 114;
- Installation of a groundwater recovery system to collect CCPW-impacted groundwater along Garfield Avenue on Site 114 for off-site disposal;
- Installation of physical barriers to address possible exposure chromium blooms on sites. Specifically, a 4-acre portion of Site 114 was capped with stone overlying a polyethylene liner constructed by PPG in 1992, asphalt paved areas of Site 132, 133, 137, and 143, and plastic and wood coverings in building interiors of Site 133 and 137 are/were inspected and reported on a quarterly basis (refer to Attachment G of **Appendix H** for figures showing the locations of the IRMs) ; and
- Removal of CCPW (COPR and Green-Gary Mud) in the 900 Garfield Avenue slab area and the Morris Canal, totaling approximately 1.5 acres. This IRM is discussed in more detail below.

An IRM to address CCPW, which is defined as COPR, Green-Gray Mud, and fill mixed with COPR or Green-Gray Mud, was completed at the location of the 900 Garfield Avenue slab (IRM #1 Area) on Site 114 (refer to **Drawing 6-1**). The IRM is detailed in the June 2010 Final Interim Remedial Measures Work Plan #1 (AECOM, 2010d), which was subsequently revised in an Addendum dated January 31, 2011. The objectives of the IRM are summarized below.

The initial objectives of the IRMs were to excavate CCPW with Cr^{+6} concentrations greater than 600 to 1,000 mg/kg and buried debris, and to backfill the area in preparation for future feasibility studies and pilot testing of reductant injections to treat remaining non-CCPW soils and groundwater. It was later decided to fully excavate and dispose of CCPW and non-CCPW soils with Cr^{+6} concentrations above the current cleanup criteria of 20 mg/kg or excavated down to meadow mat, whichever depth was encountered first.

IRM-related work was initiated in the northwestern portion of the Site 114 on June 22, 2010. At the end of July 2011, approximately 72,800 cubic yards of CCPW and non-CCPW soils had been excavated from the IRM #1 Area and disposed of off-site. As a part of the IRM, the 900 Garfield Avenue slab and subsurface foundations were removed and excavated down to the meadow mat. As verified by confirmatory soil sampling analytical results, the finished excavation depths range from 13.5 feet bgs to 20 feet bgs. Cr^{+6} concentrations have exceeded 20 mg/kg in only three of the 79 pit bottom samples. Additional excavation was since completed for the three grids where Cr^{+6} concentrations exceed 20 mg/kg (consistent with the remedial strategy presented to the Court in July 2011, soils with Cr^{+6} concentrations greater than the applicable remedial standard at depths shallower than 20 feet below grade will be excavated, unless concentration are below 1,000 ppm and further excavation would compromise the meadow mat). The completed portion of IRM #1 was also capped with stone overlying a 40 mil high density polyethylene liner with 10 oz. geotextile fabric for protection.

Lessons learned from the IRM #1 work and incorporated into this RAWP are as follows:

- Dust can be effectively controlled to achieve the goals for fenceline concentrations (an average concentration of less than 49 nanograms per cubic meter Cr^{+6} [see Attachment B in the Air Monitoring Plan (AMP) for acceptable air concentration (AAC) calculations)]. The IRM work allowed PPG to better understand specific sources of dust that may contain Cr^{+6} and refine specific methods to control dust generation. This is discussed in more detail in **Section 12**.
- Methods were developed to efficiently remove the extensive reinforced concrete encountered in the chromate production area.
- Groundwater removal rates and concentration of chromium in extracted groundwater were used for the design of an on-site groundwater treatment system.

Plans for a second IRM (IRM #2) to be conducted east of IRM #1 were cancelled. While the original plan of limited source removal could have been conducted, a more comprehensive excavation similar to IRM #1 was not possible without first developing a plan to address MGP materials in this area.

2.3 Pilot Studies of Treatment Technologies

PPG had proposed a series of pilot scale treatment tests to assist in the design of treatment method for the Project Area. These tests were presented in the Draft Feasibility Study Work Plan (FSWP) (AECOM, 2010b); however, the FSWP was never approved by the NJDEP. PPG subsequently submitted a Technical Execution Plan (TEP) and Permit-by-Rule (PBR) to NJDEP for a soil treatment method developed by ARCADIS. The ARCADIS process was tested in a soil cell on Site 114 during

February through April 2011. Post treatment testing for the ARCADIS test cell was completed. The test area has since been remediated and the soils were removed as part of the excavation activities in Phase 1C.

PPG has developed an amendment to add to the clean backfill placed into the completed excavations. The purpose of the amendment is to prevent recontamination of soil and to begin groundwater treatment. Bucket testing and a pilot test have been completed. A conceptual approach to using the backfill amendment is provided in this RAWP. The backfill amendment was approved for use, and additional details on its use are provided in the TEPs for the different phases of work. Permit-by-Rule (PBR) applications have been submitted and approved for use of the amendment site-wide. The PBR for the use of backfill amendment for the Morris Canal area was approved on March 8, 2012 and the Site-wide PBR was approved on October 17, 2012.

PPG also plans to test other technologies for groundwater treatment. These technologies were discussed in detail in the FSWP, and presented in a groundwater TEP and PBRs.

2.4 Case Inventory Document

A case inventory document (CID) is attached to this RAWP.

3.0 Goals and Applicable Remediation Standards

3.1 Background

This RAWP addresses CCPW and soil impacted with Cr^{+6} (Impacted Soil).

COCs for the Project Area were divided into two categories: 1) compounds that are on or emanating from Site 114, and 2) CCPW-related compounds for areas other than Site 114. The compounds that are on or emanating from Site 114 are related to PPG's former ownership of the Site 114 property. These COCs include the following:

Cr^{+6}: Samples analyzed for Cr^{+6} were also analyzed for pH and Eh (laboratory-based ORP analysis)

Metals: TAL Metals include silver (Ag), aluminum (Al), As, barium (Ba), Be, calcium (Ca), Cd, cobalt (Co), Cr, copper (Cu), iron (Fe), Hg, potassium (K), magnesium (Mg), manganese (Mn), sodium (Na), Ni, Pb, Sb, selenium (Se), Tl, V, and Zn

VOCs: Primarily benzene, toluene, ethylbenzene and xylenes (BTEX) compounds and CVOCs

SVOCs: Generally PAHs, but include a few non-PAH compounds

PCBs: Total PCBs

The COCs for areas other than Site 114 include the following CCPW-Related compounds:

Cr^{+6}: Samples analyzed for Cr^{+6} were also analyzed for pH and Eh (laboratory-based ORP analysis)

Metals: Specific TAL Metals (Cr, Ni, Sb, Tl and V)

In addition, the compounds exceeding NJDEP criteria were reviewed for the potential source of the constituent. These sources include historic chrome production operations prior to PPG operations, historic PPG operations, operations of PSEG's predecessor relating to the former MGP facility, compounds associated with historic fill material, and compounds to be addressed by PPG as the former property owner (i.e. compounds that are not directly attributable to PPG chrome operations, MGP operations, or historic fill). These potential sources are summarized on **Table 3-1**. **Table 3-2** provides the soil remediation standards and goals in effect at the time this RAWP was written. In general, the compounds exceeding the NJDEP criteria will be addressed as chromium impacted material is removed or by placement of a cover. The following paragraphs provide greater detail on Impacted Soil.

Impacted Soil is defined as soil containing Cr^{+6} in excess of 20 mg/kg. Overall objectives for these media are:

- Elimination of potential exposure to Cr^{+6} in CCPW and Impacted Soils due to direct contact or windborne dust;
- Removal of Accessible Impacted Soil (Cr^{+6} over 20 ppm) at depths less than 20 feet bgs and above the meadow mat;
- Removal of CCPW and certain Impacted Soil to depths greater than 20 feet but to a maximum of 35 feet where: a) the meadow mat is not present, and b) removal is technically prudent and beneficial to the future groundwater remediation; and
- Establishing site conditions suitable for future uses of the Site.

While the remedial activities described in this RAWP for CCPW and Impacted Soil will have a significant beneficial impact on groundwater, goals for groundwater and remedial actions for groundwater will be addressed as a separate RAWP at a later date.

Remedial measures for CCPW and Impacted Soil in areas that are currently inaccessible will be addressed as Phase 4 of the remedial action (under a separate RAWP Addendum or TEP).

The primary documents that were used in developing the remedial goals for soil within the Project Area are listed below:

- February 8, 2007 Memorandum from NJDEP Commissioner Lisa P. Jackson to Irene Kropp, Subject: Chromium Moratorium (the 20/20 Chromium Policy) (NJDEP, 2007);
- August 13, 2013 Letter from NJDEP to W. Michael McCabe, Subject: Re: Updated Method to Determine Compliance with the Department's Chromium Policy, Garfield Avenue – Sites 114, 132, 133, 135, 137, and 143, Jersey City, NJ;
- PPG Conceptual Plan for Remediation of CCPW for Garfield Avenue Group, dated November 2010 (the Conceptual Plan);
- July 15, 2011 court submittal;
- 1990 ACO; and
- 2009 Judicial Consent Order (JCO).

All documents are provided as **Appendix F**.

Sections 3.2 through **3.5** provide additional details on implementation the remedial goals at the Project Area. Decision trees designed to guide the excavation work are provided as **Appendix F**.

3.2 Excavation of CCPW

The selected remedial action for CCPW is excavation and off-site disposal. In areas where CCPW is present and accessible, excavation will continue vertically until all CCPW is removed or a maximum of 35 feet below pre-remedial ground surface is reached. To date, CCPW in or below the meadow mat layer has not been identified and is not anticipated to be encountered. In areas where the meadow mat is absent and CCPW could be present at a greater depth, the practical limit of excavation is defined to be 35 feet bgs.

As discussed in **Section 3.5**, Inaccessible CCPW and Inaccessible Impacted Soil will not be excavated until such time as conditions change and these areas become accessible.

3.3 Preservation of the Meadow Mat Layer

The meadow mat provides a natural barrier to chromium migration and, therefore, will be protected from damage to the extent practical. The meadow mat provides a geochemically reductive environment that facilitates the transformation of Cr^{+6} into a less toxic valence state of Cr^{+3}. The meadow mat limits the vertical migration of groundwater impacted with Cr^{+6}. Removal of the Meadow Mat could possibly allow increased vertical migration of Cr^{+6} in groundwater.

To date, CCPW has not been encountered in or below the meadow mat. Cr^{+6} concentrations exceeding 20 mg/kg have been detected in the surficial meadow mat, but the majority of these elevated concentrations have been addressed thus far by carefully removing a thin (up to one foot) layer of the meadow mat. The remainder of the elevated concentrations will be addressed as indicated below. Refer to **Appendix F** for the procedure for addressing CCPW and Cr^{+6} over 20 mg/kg in meadow mat:

- If the meadow mat is co-mingled with CCPW, excavation will continue until the CCPW is removed.
- If excavation can continue without compromising the meadow mat (resulting in a meadow mat thickness of less than one foot), then additional excavation will be conducted and the pit bottom re-sampled.
- If the CCPW has been removed and the excavation is at 20 feet below pre-excavation ground surface, excavation will be discontinued.
- Meadow mat material with Cr^{+6} concentrations in the range of 20 to 1,000 mg/kg will be left in place if continued excavation would compromise the meadow mat. PPG will conduct treatment in these areas as part of the groundwater RA. However, no subsequent excavation will occur if treatment proves unsuccessful.

3.4 Excavation and Treatment of Soil Containing Cr^{+6} in Excess of 20 mg/kg

The proposed excavation will meet the 20/20 chromium policy by achieving pit bottom samples with Cr^{+6} concentrations of less than 20 mg/kg or by reaching a depth of 20 feet bgs or greater. Refer to the August 13, 2013 Letter from NJDEP to W. Michael McCabe, Subject: Re: Updated Method to Determine Compliance with the Department's Chromium Policy, Garfield Avenue – Sites 114, 132, 133, 135, 137, and 143, Jersey City, NJ in **Appendix F**.

Recognizing that where the meadow mat is not present under some circumstances excavation of soil with elevated Cr^{+6} deeper than 20 feet bgs would be technically prudent, PPG will implement the following strategy for Soils that do not contain CCPW at depths greater than 20 feet and where the meadow mat is not present:

- All material with Cr^{+6} concentrations exceeding 5,000 mg/kg will be excavated to a maximum depth of 35 feet bgs.
- Fine sands, silts, and clays with Cr^{+6} concentrations in the 1,000 to 5,000 mg/kg range will be excavated to a maximum depth of 35 feet bgs.
- Higher permeability soil (United Soil Classification System [USCS] Classification of GW, GP, SW and SP) with Cr^{+6} concentrations in the 1,000 to 5,000 mg/kg range will not be excavated. Refer to **Appendix F** for USCS Classifications.

- Soil with less than 1,000 mg/kg Cr^{+6} at depths greater than 20 feet will not be excavated.
- Impacted soil beneath the meadow mat will not be excavated.

Areas where excavation exceeded 20 feet bgs for the removal of Cr^{+6} impacts were within the former Morris Canal adjacent to the IRM#1, Phase 1C, and Phase 3A Areas. Other areas of deep excavation may be identified during pre-design investigations or during the excavation work. Additional shoring or other measures will be deployed as need to achieve the required excavation depths as long as the shoring or other measures can be installed safely without jeopardizing the integrity of surrounding properties or structures.

3.5 Remedial Actions for Inaccessible Areas

Inaccessible Areas are defined by major infrastructure features that exist in and around the Project Area. These include the light rail (Site 199), roads (Garfield Avenue, Halladay Street, Carteret Avenue, and Forrest Street), and buried utilities (gas, combined sewer, water). Specific locations of Inaccessible Soil will be determined in cooperation with the NJDEP and will be delineated in the TEPs for the adjacent areas. As utilities are repaired, buildings removed, roadways repaired or realigned, PPG will work with the property owners to remove CCPW and/or Impacted Soil. PPG will not initiate work related to these features but will remove chromium impacted material in the proximity of these features as these areas become accessible on a case by case basis. Inaccessible Areas will be addressed as addendums to this RAWP or in TEPs as these areas become accessible.

PPG will install and maintain containment measures and controls as necessary to address chromium impacted materials in the Inaccessible Areas.

Identification of Inaccessible Areas and remedial measures to be conducted in Inaccessible Areas are presented in **Section 6.6**.

3.6 Remedial Actions for Non-Chromium Impacts

As part of PPG's consent order, PPG has an obligation to implement remedial remedies for constituents (TAL Metals, SVOCs, PCBs (if data demonstrates total or individual Aroclors concentrations exceed the soil remediation standard of 0.2 mg/kg) and VOCs) for Site 114 and aforementioned Sites if such constituents are emanating from Site 114. By far, a majority of these constituents' remedial remedies will be resolved as part of the chromium remediation. Constituents (greater than applicable standards) that are not addressed as part of the primary chromium remediation will be further evaluated for the need to implement new remedial remedies or the need to add additional remedies.

As a part of the RAWP, 10% of all pit bottom samples will be collected for the full list analyses referenced in the preceding paragraph. The RI will also be evaluating the extent of elevated concentration of the other constituents that were identified during the 2011 RI activities. Since not all sampling have been collected, analyzed or results reviewed for these constituents, there is some uncertainty to the extent of these impacts. After this data has been collected and further review is completed, remedial remedies will be evaluated. All selected remedies will be pre-approved by the NJDEP prior to implementation.

3.7 Achieving the Remedial Goals

The approach for achieving these goals is as follows:

- The RA (Remedial Action) will excavate and remove CCPW from the Project Area. It is estimated that approximately 850,000 to 950,000 tons of CCPW, Accessible Impacted Soil and concrete debris will be removed from the Project Area.
- The RA will install a capillary break, where necessary, between the groundwater and the ground surface to eliminate the chance of chromate crystallization from impacted groundwater wicking to surface. The capillary break will be installed at an elevation that is above the water table. This capillary break will be subject to a Groundwater Remedial Action Permit (RAP). PPG presented the design and extents of the capillary break in the Capillary Break Design Report (Revision 2) (AECOM, 2017), which is included as **Appendix L**.
- In the process of conducting RA, sheet pile shoring will be installed to protect adjacent roadways and utilities, and to maximize the volume of contaminated material to be removed. A decision to remove all or a portion of the shoring will be made as part of the groundwater RAWP. Sheet pile maintenance will be on-going, as required.
- In the process of conducting RA, a liquid-tight stormwater drainage system will be installed on-site, and discharge to the adjacent City stormwater system. This liquid-tight stormwater drainage system will keep impacted groundwater from entering the stormwater system.
- For non-chromium constituents (greater than applicable standards and greater than background that are not controlled or remediated as part of the chromium remediation) on Site 114 or emanating from Site 114, remedial remedies will be evaluated and implemented within the constraints of the NJDEP Regulations. In cases where these constituents are not addressed by remediation during Phase 1 through Phase 3 activities, these areas will be addressed in an addendum to this RAWP or through TEPs.

4.0 Remedial Action Selection

As discussed in the Conceptual Plan (see Exhibit A in **Appendix F**), the primary remedial action for soil is excavation and off-site disposal. Engineering and institutional controls will also be components of the remedy. For CCPW and Impacted Soils, excavation and off-site disposal was selected because it is effective and can be implemented within a relatively short timeframe. A summary of the elements of the selected remedial technologies are as follows:

Remedial Technology Selected for Soil Impacted by Cr^{+6} and Visible CCPW (Status as of September 2018)

The primary remedial action for soil impacted by Cr^{+6} and visible CCPW will be excavation of Accessible Soils to a maximum depth of 35 feet bgs. An estimated 850,000 to 950,000 tons of CCPW and soil overlying CCPW will be excavated and removed from the accessible areas of the site. Excavation areas will be backfilled with soil suitable for residential, commercial or other possible purposes.

Remedial Technology Selected for Soil Impacted by Non-Chromium Parameters (Status as of September 2018)

The primary remedial action for soil impacted by non-chromium parameters for which PPG is responsible under the ACO and JCO is excavation. However, the excavation extent is not driven by the presence of these non-chromium parameters; it is anticipated that the presence of these parameters will be resolved as a result of the excavation being driven by the presence of Cr^{+6} and visible CCPW.

Following remedial excavation for Cr^{+6} and visible CCPW, soil impacted by non-chromium parameters remaining in place at concentrations greater than the applicable standards, and that are not removed as part of the primary Cr^{+6} remediation, will be addressed through the placement of an engineering control (capping), institutional controls (a deed notice), and a corresponding RAP.

5.0 Post-Excavation and Post-Treatment Sampling Plan

Post-excavation sampling will be conducted on pit bottoms and sidewalls in excavation areas. All sampling will be performed in accordance with the Field Sampling Plan-Quality Assurance Project Plan (FSP-QAPP) (AECOM, 2010a) (as amended for this RAWP).

5.1 Sample Analysis Requirements

All pit bottom (this includes pre-excavation samples) and sidewall samples will be analyzed for hexavalent chromium, pH, and ORP.

Samples will be analyzed for additional parameters at a frequency of 10% (unless otherwise approved by the NJDEP) including:

- VOCs;
- SVOCs;
- PCBs (select areas only); and
- TAL Metals.

The combination of this additional sampling, the IRM sampling, and data collected during the RI provides adequate definition of the additional parameters in the Project Area.

In grids where Underground Storage Tanks (USTs) or Aboveground Storage Tanks (ASTs) are encountered during excavation, pit bottom samples will typically be sampled for the following additional parameters:

- VOCs;
- SVOCs with tentatively identified compounds (TICs);
- PCBs;
- TAL Metals; and
- Extractable Petroleum Hydrocarbons (EPH).

PPG may sample the contents of the UST and use that data to refine analytical parameters for pit bottom samples in that grid. In cases where the tanks contents are not identified, a forward library search for TICs may be conducted. Due to the proximity of many pit bottom samples to the meadow mat, TICs associated with naturally occurring humic acids may be detected.

To assure that the chromium removal also addresses PCBs, the excavation pit bottom sample in grid locations (C5A, A2A, DD3A, X6B, W11B, Y6B, and W7B) with PCB concentrations greater than or equal to 0.2 mg/kg will include PCB analysis.

As discussed in **Section 3** and depicted in **Appendix F**, remedial goals for soils below 20 feet will depend on the type of soil present. To confirm soil classifications made in the field, soil samples from below 20 feet (except meadow mat samples) will have a sieve analysis. In lieu of conducting the sieve analysis, PPG may assume that the soils in a grid are predominantly fine grain and apply the stricter (lower) hexavalent chromium criteria.

5.2 Sample Grids

Including the excavation pit bottom samples collected during the IRM, an estimated 1,300 post-excavation samples will be collected. Samples to confirm that the remediation goals are met may be collected from soil borings completed prior to excavation or collected from pit bottoms after a grid is excavated. The TEPs define the sample collection methods to be used. In the case of pre-excavation sampling, sample results will be used to define the terminal elevation of the excavation for specific grids. Pre-excavation sampling results and recommended terminal elevations are subject to review and approval by NJDEP. Grids locations where pre-excavation boring soil sampling has been conducted and terminal elevation has been established, no resampling will be conducted unless the following exceptions apply:

- Established excavation depth was based upon soil sample texture being coarse and soil texture at bottom of excavation is deemed fine.
- CCPW is identified at base of excavation.

Excavation pit bottom samples and pre-excavation samples will be collected on a 30-foot by 30-foot grid (900 square feet). After the start of the RA and assuming consistent results, PPG may propose a larger sampling grid for certain areas of the site. Partial grids (less than 900 square feet) along the perimeter of the excavation area will also be sampled. In most circumstances excavation grids are enclosed by shoring and/or adjacent to other grids being excavated. Therefore, sidewall sampling will not be conducted at these locations. In some cases, such as on Site 132, where grids may not be bounded by other excavation grids or the site boundary/shoring line, sidewall samples will be collected. Sidewall samples will be collected every 30 linear feet and at two foot depth intervals.

Sampling on the outside of the excavation area (typically in Inaccessible Areas) has been conducted and additional sampling is planned as part of the additional RI activities. As these areas become accessible to excavation, post remediation sampling will be conducted.

As presented in **Section 3**, soil remediation goals vary with excavation depth. The depth of excavation will be calculated based on the pre-remediation elevations. The average pre-remediation elevation will be determined for each grid based on existing topographic maps. If data gaps exist, additional survey work may be conducted prior to the start of remediation work. Pit bottoms will be surveyed to determine terminal elevation and compared to the pre-remediation elevation.

5.3 Sample Collection and Analysis

For all soil sampling activities, visual classification of soil samples will be performed. Post-excavation bottom samples or pre-excavation samples will be collected from within the 30-foot by 30-foot grids as illustrated in **Drawings 1-2** and **1-3**. Grids will be set-up using surveyed control points. Each grid will have a unique alphanumeric identifier. Samples will have unique sample number that includes the Site ID, Grid ID, sample depth and type of sample (pit bottom, treatment sample or sidewall). Refer to **Table 5-1** in the tables section of this report for a Sample Summary and examples of nomenclature. In addition to post-excavation/treatment sampling collection, soils will be visually logged. PPG may deploy field screening with X-ray fluorescence (XRF) for metals and a photoionization detector (PID) for VOCs as a means to provide a preliminary indication of soil contents. Only laboratory data (as opposed to field screening results) will be used to determine if the remedial goals have been met.

Pit bottom samples will be collected with a hand trowel or from the excavator bucket. In an attempt to streamline the excavation, PPG will collect excavation bottom samples prior to excavation of some grids, via geoprobe, hollow stem auger or similar equipment. Sample locations will be surveyed to allow completion of an accurate and detailed post excavation/treatment map.

Soil samples for laboratory analysis will be placed in pre-cleaned containers. The containers will be clearly labeled with the same identification, depth, date of collection, and analysis to be performed. Standard chain-of-custody procedures will be followed. Analysis of all samples will be performed by a NJ certified laboratory. Analytical analyses will be performed by a NJ-certified analytical laboratory in accordance with USEPA and NJDEP-approved analytical protocols and the revised FSP-QAPP, which was submitted to NJDEP under separate cover. Quality assurance analytical measures will be implemented in accordance with the *Technical Requirements for Site Remediation* (TRSR), (N.J.A.C. 7:26E) (NJDEP, 2005b). Field quality assurance samples (field blanks, trip blanks and field duplicates) will be collected in accordance with the NJDEP Field Sampling Procedures Manual (FSPM); however, field quality assurance samples will not be required for waste classification sampling activities.

Soil samples for physical grain size classification will be placed in pre-cleaned containers. The containers will be clearly labeled with the same identification, depth, date of collection, and analysis to be performed. Standard chain-of-custody procedures will be followed. Analysis of all samples will be performed by a geophysical laboratory. In general, the validation of analytical data will be conducted using NJDEP validation Standard Operating Procedures (SOPs) as discussed in the FSP-QAPP. Guidelines will be adapted for SW-846 methodologies where appropriate. Data used solely for waste characterization or classification will not be validated.

New Jersey SRS, adopted June 2, 2008, pursuant to the *Remediation Standards* (N.J.A.C. 7:26D et. seq.), amended November 4, 2009 (NJDEP, 2009c), will be utilized for soil delineation purposes for non-chromium compounds. [Note that N.J.A.C. 7:26D et. seq. was subsequently revised on September 18, 2017.] The most stringent (non-residential) CrSCC of 20 mg/kg for Cr^{+6}, and the most stringent (residential) soil cleanup criterion of 120,000 mg/kg for trivalent chromium, will be utilized for soil delineation purposes pursuant to the *Chromium Soil Cleanup Criteria* (NJDEP, September 2008, last revised April 20, 2010).

5.4 Summary Table

Excavation bottom samples will be collected by the following procedures detailed in the FSP-QAPP and, as depicted in attached as **Table 5-1**, all excavation bottom samples will be field screened analyzed for Cr^{+6}, Eh and pH. At least 10% (or other frequency approved by NJDEP) of these samples will also be analyzed for TAL Metals, VOCs and SVOCs. A map of sample results, tied to surveyed points, will be prepared once all objectives are met and will be included in the RAR.

6.0 Description of Remedial Action

The approach of this RAWP is to excavate soils until the goals described in **Section 3** are met. Impacted Soil will be removed to the meadow mat or to a depth of 20 feet. In certain circumstances, Impacted Soil may also be excavated below 20 feet to a maximum depth of 35 feet. Subsequent to the excavation work, the Project Area will be finished with clean fill and a capillary break, where required as described in **Appendix L**, will be added and the area will be contoured to allow for stormwater runoff to enter a newly constructed on-site stormwater drainage system. As part of this RAWP, the old stormwater drainage system will be dismantled and disposed and a new, non-permeable stormwater drainage system will be constructed.

Remedial activities will most likely be addressed in five phases: Phase 1 excavation activities will address soils in the western portion of Site 114; Phase 2 excavation activities will address soil in the eastern portion of Site 114; the sites south of Carteret will be addressed in the Phase 3 activities; Inaccessible Areas such as streets will be addressed in Phase 4; and Phase 5 is reserved for contamination emanating from Site 114 onto other off-site properties. The details on the exact limits of the inaccessible areas will be developed in cooperation with the NJDEP and the City of Jersey City. The exact sequence of excavation work may change based on access to the properties and other factors. Use of two or more teams at the same time in different areas is also possible.

As of November 2014, remedial excavation activities have been completed by PPG on Site 114, Site 132, and Site 143, under the oversight of the Site Administrator, his Technical Consultant (Weston Solutions), and NJDEP.

Descriptions of elements of this RAWP are detailed below.

6.1 Pre-Construction/Pre-Design

To improve the design of the RAWP, several pre-design activities have been conducted or are planned. These activities include soil borings, test pits, utility surveys, geotechnical assessments and sampling, and obtaining permits where required (copies of permits for the project are provided in **Appendix J**). These events are essential in defining the limits of excavation, the location underground utilities under road ways, obtaining geotechnical data for design of excavation support, and to determine the depth of excavation in specific grids. Additional details for pre-design work (where construction activities are planned; the location of construction facilities including details describing construction design; all applicable requirements and standards relating to construction for on-site remedial units including inspections and professional engineer certifications, and site restoration specifics for the area covered under the detailed design) have been developed for each phase of the work as submitted in the TEPs.

6.1.1 Utility Survey

New Jersey law requires that a utility clearance be performed within least ten days prior to initiation of any subsurface work. The Contractor will contact New Jersey One Call (1-800-272-1000) or 811 to request a mark-out of natural gas, electric, telephone, cable television, water and sewer lines in the proposed work locations within the Project Area. Work will not begin until the required utility clearances have been performed (minimum of ten business days). Due to the size and duration of this project, New

Jersey One Call tickets will be renewed (every 45 days) and new tickets will be acquired prior to ground penetrating activities start in non-ticketed areas.

Public utility clearance organizations typically do not mark-out underground utility lines that are located on private property. As such, the contractor must exercise due diligence and try to identify the location of any private utilities on the property being investigated. The contractor can fulfill this requirement in several ways, including:

- Obtaining as-built drawings for the areas being investigated from the property owner;
- Visually reviewing each proposed excavation location with the property owner or knowledgeable site representative;
- Performing a geophysical survey to locate utilities;
- Hiring a private line locating firm to determine the location of utility lines that are present at the property; or
- Hand digging in those proposed locations if insufficient data is available to accurately determine the location of the utility lines.

Subsequent to New Jersey One Call's underground survey, AECOM will complete a review of historical utility plans and locate all the underground utilities on Site 114, 132, 133, 135, 137, and 143. All underground utilities entering the Project Area will either be stubbed in accordance with utility owners and regulations, or marked-out and protected with physical barriers.

A Level 3 utility survey was completed by Enviroscan for the Project Area in September of 2011. The final report for this survey is presented in **Appendix I**.

PPG has coordinated and is continuing to coordinate with area utility companies, including JCMUA and PSEG, to ensure utilities are protected or relocated as needed. Additionally, PPG and JCMUA coordinated a sewer survey with RedZone. RedZone conducted surveys of the 96-inch sewer line in Carteret Avenue on July 23 and September 30, 2014. The results of the RedZone surveys were reviewed at the JCMUA office on October 14, 2014.

6.1.2 Site Feature Survey

Following the utility mark-outs, a NJ-licensed land surveyor will be acquired and a baseline survey will be performed. The surveyor will perform a survey which includes the following: ground surface elevation, property line survey and a stormwater system survey. They surveyor will also supply the contractor with a set of bench marks to be used to validate grades and work completed. A surveyor may be retained for other tasks on an as needed basis.

6.1.3 Pre-Excavation Confirmatory Sampling

Prior to excavating material, soils samples from select grid cell locations will be used to pre-characterize the material. Soils will be analyzed for a multitude of parameters depending on the need. Soils maybe analyzed for grain size, parameters required for disposal, and post-excavation parameters. The collection of this data will allow the project to move forward with greater efficiency, limiting down time required to test soils as they are exposed and reducing the duration excavation pits are left open (which also benefits excavation water management). The frequency of this sampling will be assessed as the project moves forward.

6.1.4 Geotechnical Borings

A majority of the excavations for this project will take place within the confinements of shoring. The type of sheet and bracing is based upon geotechnical information obtained from borings. The installation of a series of borings along the planned excavation limits will allow engineers to design shoring that will resist deformation under loading from external forces behind the shoring and beyond the excavation limits. The frequency of borings may change as the engineer sees fit.

6.1.5 Lateral Exploration Borings

Upon review of the RI (AECOM, 2012a), some lateral exploration is warranted to define the extent of materials containing Cr^{+6} greater than 20 mg/kg. A series of borings will be installed in strategic locations to assess soil characteristics such as: Cr^{+6} concentrations and the presence of CCPW. After the assessment of this data is complete, a determination will be made whether excavation is warranted and if shoring alignments will need to be altered. Areas outside of the Project Area that show the presence of CCPW will be further evaluated and remedies for the areas will be completed as addendums to this RAWP or in TEPs.

6.1.6 Roadway Test Pit Excavation

Excavating test pits within the roadways to locate utilities will be needed to ensure excavation and shoring does not impact the subsurface utilities. Limited information has been obtained from the utility companies that have infrastructure located under the roadways that surround the Garfield Avenue Group Sites. Test pit excavations will reduce uncertainty in the location of these utilities and allow for a safer and larger excavation footprint.

6.1.7 Building Demolition Sampling

A majority of Phase 3 excavation was below buildings. As properties became available for demolition, an array of sampling was conducted to segregate media streams. Since all the former buildings pre-dated 1980, suspect building materials were sampled for lead, PCBs, and asbestos following a comprehensive pre-demolition survey by a licensed inspector (certified in asbestos, lead and universal wastes). Some of the building materials were also subject to Cr^{+6} analysis. Sampling plans were developed as the RAWP progressed and buildings became available.

The extent of demolition and remediation of Site 135 (51-99 Pacific Avenue – Vitarroz Property) has not been determined. Prior to the demolition of the building, an abatement contractor will be acquired to remove universal waste materials and asbestos-containing material (ACM) and a NJ Certified Hygienist will certify the post abatement structure air quality. A contractor will demolish the structures down to concrete slabs, segregate waste streams and dispose of the waste per local, state, federal and New Jersey Department of Transportation (NJDOT) regulations.

6.2 Air Monitoring

As a part of normal remedial construction, air monitoring stations will be installed in strategic locations. Air monitoring stations were utilized as a part of IRM #1's remedial activities. Future air monitoring activities will be comparable to the IRM #1 activities. A brief description of the air monitoring is provided below. A more detailed description of the Air Monitoring Plan is provided in **Appendix A**.

As the project progresses, strategic location, quantity and features of air monitoring will be reviewed and altered as necessary through the submittal of Air Monitoring Plan Amendments.

6.3 CCPW and Impacted Soil Beneath Structures

The limits of this RAWP extend beyond Site 114 to several neighboring properties that contain active and former commercial businesses. CCPW may be present beneath both active and inactive structures, several of which have been demolished. Several structures were evaluated for the presence of CCPW or Impacted Soil beneath them, through additional remedial investigation and/or pre-design investigation sampling. Further assessment of these structures will be conducted to determine a safe excavation offset distance. At a time in which the structure (or a portion thereof) can be removed, the remaining materials will be excavated and disposed of off-site.

6.3.1 Excavation Strategy Beneath Structures

The process of excavating soils beneath structures can happen in few ways; excavate up to the structure maintaining a safe slope and excavate soils left behind at a future date when structure is removed, or remove structure and excavate soils. Since there are many unknowns with respect to these structures, these two options are presently being reviewed as viable approaches to meet the RAWP cleanup goals.

6.3.2 Strategy for Excavations Adjacent to Buildings

Phases 3 and 5 of the RA address structures that are or were owned by various business owners. If some buildings are to remain in place, excavations up to buildings will be limited to what is considered what is structurally prudent. Excavations will maintain a safe slope from building's existing foundation footprint, as determined by a geotechnical engineer, unless stabilized by other means such as shoring. If shoring is installed, shoring will be placed as close to building as technically feasible, which will be calculated/determined as necessary. Structural and geotechnical engineers will develop excavations plans that allow the removal of as much Impacted Soil as practical. The final limits of excavation near buildings will be determined in cooperation with the NJDEP, the building owner, and PPG.

6.4 Excavation Shoring

Excavation shoring will consist of steel sheet piling. The shoring will serve several purposes. First, the shoring will allow excavation as close as possible to roadways, utilities, and other features which might otherwise be damaged by excavation. Shoring will allow the work areas to be divided into manageable areas to minimize groundwater recharge during excavation. Shoring will also allow deeper excavations while minimizing sloughing of material from the sidewalls. Shoring will also be used to isolate the MGP portion of Site 114 from the area that is only impacted with chromium.

Based on the planned depth of excavation, soil types and need to protect nearby structures, a detailed shoring design will be developed and stamped by a NJ-licensed Professional Engineer. The detailed design will include load calculations, specific sheet specifications (materials, type of interlock, use of water tight seals, thickness of sheet, and length). PPG has completed a series of geotechnical borings around the northern perimeter of Site 114 and in and around the Morris Canal on Site 114. This work will provide data necessary for design of the shoring in these areas. Minimizing groundwater infiltration is a key issue because, regardless of treatment plant design capacity, the discharge rate to the sewer is limited. Further, discharge during rain events is prohibited when the sewer lateral where discharge is occurring is flowing half full or greater. Thus, the shoring design will consider methods to minimize water flow thorough the shoring such as the use of a sealant.

As shown in **Drawing 6-5** through **Drawing 6-8**, shoring will vary in depth depending on the required depth of excavation and proximity to features that need to be protected. While the general depth of

excavation is 15-20 feet, the shoring design will allow deeper excavation in certain areas. To prevent MGP migration and allow deeper excavation, the shoring on the eastern side of the Morris Canal on site 114 is expected to be driven to 50 feet bgs or deeper. The shoring design will allow for excavation to up to 35 feet in depth in Morris Canal between IRM #1 and IRM #2 and in the area North of IRM #1.

Following completion of the shoring design, the alignment for shoring will be marked out and a utility survey completed. Pre-trenching to remove concrete, buried utilities and other obstacles will likely be necessary. The shoring will then be driven to the design depth.

In general, the shoring will remain in place after the excavation work is complete. However, the final status of the shoring (left in place, removed, cut down to a desired elevation) will be determined in cooperation with the owner of the property where it is installed.

6.5 Excavation

The anticipated final limits of excavation on Site 114 and elsewhere are expected extend to beyond property lines and onto City property. Additional excavation of Impacted Soil in current Inaccessible Areas will be conducted as these areas become accessible for excavation and be an addendum to this RAWP. The approximate limits of excavation are depicted in **Drawing 6-5** through **Drawing 6-8**. The excavation of the Impacted Soil is estimated to be approximately 850,000 to 950,000 tons, of which two-thirds is within from Site 114 and one-third is from the remaining sites. Accessible Impacted Soil will most likely be excavated in three phases: Phase 1 excavation activities will address soils in the western portion of Site 114; Phase 2 excavation activities will address soil in the eastern portion of Site 114; and the sites south of Carteret will be addressed in the Phase 3 activities. The exact sequence of excavation work may change based on access to the properties and other factors. Use of two or more teams at the same time in different areas is also possible. The excavation limits for Phase 1 through 3 are anticipated to coincide with the location of sheet pile shoring as depicted in **Drawing 6-5** through **Drawing 6-8**.

The shoring and dewatering systems (see **Section 7**) will be in place prior to the start of excavation work. The shoring and dewatering design will allow for the dewatering of broad areas (over one acre) at once. This will facilitate excavation, post excavation sampling, and backfilling.

Impacted Soil will be removed from within the shoring limits. The excavation work will be closely monitored by an engineer or geologist. Excavation will continue until the goals stated in **Section 3** are achieved. The process will be as follows:

- The grid identification number and starting elevation will be determined.
- For some grids, the terminal elevation for excavation will be determined based on pre-excavation sampling.
- Once all excavation, dust control, and air monitoring equipment and personnel are in place, excavation will begin.
- Excavators will be outfitted with flat bladed buckets to facilitate final removal of Impacted Soil.
- Excavation will continue until visually identifiable CCPW and obviously Impacted Soil (green or yellow in color or XRF over 1,000 ppm) is removed, or the meadow mat is reached, or a depth of 20 feet is reached without encountering the meadow mat.

- If CCPW and Impacted Soil appear to have been removed, and the meadow mat has not been reached and the depth is less than 20 feet, a pit bottom sample for laboratory analysis will be collected. If the Cr^{+6} concentration is less than 20 mg/kg, excavation will stop at that point. If the pit bottom result exceeds 20 ppm, excavation will continue.
- If the meadow mat is reached a laboratory sample will be collected. Typically excavation will stop at the meadow mat. Conditions where excavation of meadow mat would occur are discussed in **Section 3.3**.
- If the excavation has reached 20 feet and CCPW is not present, the geologist or engineer will determine the predominant soil type (either course grained or fine grained) using the USCS. (Refer to the *Updated Method to Determine Compliance with the Chromium Policy* in **Appendix F**.) For the purpose of this RAWP, coarse grained materials will be defined as GW, GP, SW, and SP. Fine grained materials will be defined as SM, SC, GM, GC ML, CL, OL, MH, CH and OH. Fine and coarse materials can be determined visually by looking at the sample grain sizes. When materials straddle USCS classification (i.e.: SW-SM), materials will be considered to be the finer USCS classification by default. If the material is not considered coarse grained then it is considered by default to be fine grained. Fine grained materials with Cr^{+6} concentrations exceeding 1,000 mg/kg will require further excavation, and coarse grained materials with Cr^{+6} concentrations less than 5,000 mg/kg will not require excavation. Any material with Cr^{+6} concentrations exceeding 5,000 mg/kg will require additional excavation. The geologist/engineer may use XRF readings and visual examination to make a preliminary determination if further excavation is warranted. However, a laboratory sample is required to determine both the Cr^{+6} concentration and soil type (if sample is considered coarse). Compliance with the remedial goals will ultimately be determined based on laboratory results and not field observations. Excavation will terminate at a maximum depth of 35 feet regardless of soil type or concentration of Cr^{+6}.
- In some grids, especially grids where meadow mat may not be present, soil borings will be conducted prior to the start of excavation to determine the terminal excavation depth in advance. The sampling data and recommended excavation depth will be submitted to NJDEP for their approval. In these cases, excavation will proceed to the approved elevation, a survey will be conducted to confirm the elevation and the excavation will be backfilled. No post excavation sampling will be conducted unless the following exception apply:
    - Established excavation depth was based upon soil sample texture being coarse and soil texture at base of excavation is deemed fine.
    - CCPW is identified at base of excavation.

If necessary, excavated materials will be stabilized to prevent leaching of water in transport on an as-needed basis, segregated, transferred to stockpile area, or live loaded. Several options for transport and disposal of excavated material will be deployed. These include but are not limited to:

- Loading into lined and covered trucks for shipment to a rail yard for subsequent transport via lined and covered rail cars;
- On-Site loading into lined and covered container boxes and subsequent truck and/or rail shipment; and
- Loading into lined and covered trucks and direct shipment to the disposal facility.

All materials will be sampled to the satisfaction of the receiving facility to determine the appropriate regulatory status (hazardous or non-hazardous) and to verify that the material meets the acceptance criteria of the receiving facility. Sampling may be conducted in-situ prior to or during excavation, post-

excavation in the stockpile area, or periodically on the shipments as they leave the site or arrive at the facility.

Additional issues presented by work within the MGP area (Phase 2) are discussed in **Section 8**.

6.6 Inaccessible Areas

Areas surrounding the Project Area are currently inaccessible to excavation for several reasons including the presence of roads, utilities, and the rail road. The exact delineation of Inaccessible Areas will be developed in cooperation with NJDEP and the City of Jersey City as part of the TEPs for each area. In this section the Inaccessible Areas are generally identified, the nature of chromium impacts presented and remedial actions presented. The general approach to remediation in the Inaccessible Areas is presented in the paragraphs that follow.

The excavation work is designed to minimize the size of Inaccessible Areas. Steel shoring will be used to allow excavation to be conducted as close to buildings, roadways, utilities, and railways as safely possible. Through meetings and correspondence with the City's Engineer, JCMUA and the NJDEP, AECOM has defined Site 114's exterior shoring alignment along Garfield Avenue and Carteret Avenue for the Phase 1 and 2 activities. Similar discussions with New Jersey Transit have also been completed for the northern edge of Site 114 adjacent to the light rail (Site 199). Final limits for the Phase 3 shoring are still being developed. Shoring alignments shown on Drawings are subject to change based on obtaining more data (test pits, soil borings) conducting geotechnical evaluations and coordination with the various parties involved.

CCPW and Impacted Soil will be excavated in Inaccessible Areas as these areas become accessible. As utilities are repaired, buildings removed, roadways repaired or realigned, PPG will work with the property owners to remove CCPW or Impacted Soil.

Shallow excavation (6 feet deep) was conducted along the Garfield Avenue Sidewalk adjacent to Site 114 to provide a clean corridor, allowing removal of CCPW at shallow depth and allowing construction of soil and groundwater engineering controls (capping and capillary break).

Existing paved surface may also be used as containment features (i.e., engineering controls). Institutional controls are typically used to maintain the effectiveness of the engineering controls. Where needed, institutional controls are planned to mitigate future activities that could lead to exposure to soil or groundwater, that exceed applicable standards, in areas that remain inaccessible.

Use of sealed steel sheeting to further mitigate potential groundwater migration for Inaccessible Areas is also planned.

These areas will be remediated when they become accessible. As areas become accessible addendums to this RAWP and/or TEPs will be completed to address said areas.

7.0 Groundwater Management

7.1 Dewatering Plan

Groundwater in the Project Area is fairly shallow; therefore, a majority of the excavation activities will be in the saturated zone. To provide a proper excavation, groundwater will be removed from the excavation pit. Dewatering plans will be developed for each Phase of the Excavation Work.

As discussed in **Section 6**, steel shoring will be installed on the perimeter and in certain interior portions of the Project Area. This will serve to minimize groundwater infiltration and allow effective dewatering in closed cells. As the project evolves, the construction water will be removed prior to excavation and during excavation activities. Within deep excavations (greater than 20 feet) dewatering activities will draw down the water table by pumping water via submersible pumps from a series of large diameter wells. The shallower (less than 20 feet) excavations may draw the water table down by utilizing a negative pressure pump that will extract water from well point boreholes. A typical dewatering layout is illustrated in **Drawing 7-3**. Since a majority of the excavation will be will be terminated at the meadow mat, perched water within the base of the excavation will be removed from the excavation via sumps and pumps. These sumps will be placed in strategic locations based on in the field determination. All water extracted from the Project Area's water table will be stored in tanks prior to being treated in the on-site Groundwater Treatment Plant (GWTP) or transported off-site to an approved water treatment facility.

7.2 Groundwater Mounding Evaluation to Support Barrier Walls

Evaluations of the potential flooding due to the installation of sheet piling are provided in TEPs for each area. In the event that the proposed sheet piling exacerbates flooding during storm event, engineering controls (i.e. pumping surface water, drawing groundwater table down or pulling full or partial sheet pilings) to mitigate the flooding to the extent practicable will be implemented.

Installation of groundwater monitoring wells on the outside of the sheet piling is proposed. Groundwater elevations in the newly installed wells will be compared to elevations recorded prior to installation of the sheet pile wall. Historical data suggests that groundwater has been close to the ground's surface near Carteret and Garfield Avenues. This is a possible result of interactions between the true groundwater, surface water infiltration, and effects of various utilities in the area. The effect of the shoring on groundwater mounding will be minimal. The shoring will be left above ground surface and storm water on-site will be captured to the maximum extent practical. The overall effect on groundwater elevations and potential surface water flooding from the shoring is expected to be minimal or a slight improvement (less flooding).

The model presented herein is considered a reasonable representation of general site conditions. However, there are a number of limitations to the model and modeling approach including the following:

- All models are necessarily simplifications of complex natural systems and are based on a number of simplifying assumptions.
- Model input parameters are based on averages of field results at discrete locations as well as literature results and the calibration process. In reality, subsurface conditions are typically heterogeneous at both large and small scales. These heterogeneities are not usually characterized in detail, and can have important influence on actual groundwater elevation changes.

- Modelling outcomes are non-unique. The predictions of groundwater flow and flux presented herein represent one valid calibration. It is possible other valid calibrations could be achieved with a different range of values for model input parameters. In addition, this model was calibrated primary to conditions in the deeper aquifers, rather than the shallow zones being simulated here.

A monitoring well network will be installed to monitor and evaluate groundwater mounding within and outside of the sheet piles for a one-year period after completion of remedial activities in this area. If at any point during the evaluation period the mounding is deemed to be significant, sheet piling depth and alignment will be re-evaluated and modified as warranted. Removal of the sheets or sections of the sheets is a likely remedy to significant mounding.

Evaluation of mounding has been incorporated in the TEPs.

7.3 Design/Construction of Groundwater Treatment System

As part of the design, PPG is pre-treating the extracted water and discharging to the publicly owned treatment works via an existing stormwater manhole on Site 114. JCMUA conveys the discharges to Passaic Valley Sewerage Commission (PVSC), the facility that treats and ultimately discharges to the Upper New York Bay. A treatment system has been designed, built and permitted for operations. During the first year of operation, chromium was the primary constituent requiring treatment. During later phases of the project, VOCs and SVOCs from a former MGP have been significant constituents in addition to chromium. As a part of the treatment area, two 245,700-gallon modular tanks were installed in close proximity to the treatment facility. Both the treatment facility and the modular tanks were installed within a secondary containment berm. Detailed drawings for the construction of the secondary containment and the proposed layout of the treatment area can be viewed in **Drawing 7-1** and **Drawing 7-2**.

Modifications to the Groundwater Treatment System (GWTS) and/or increases to flow discharge greater than 8,000 gallons per day (gpd) will be requested and approved by appropriate authorities before implementing changes.

A contract has been awarded to ProAct (formerly Acquabella) for the design, installation and operation of the water treatment system. The treatment system is design to treat two influent streams: the construction dewatering discharge influent and MGP-impacted construction water.

A seepage system was installed to control hydraulic conditions along Garfield Avenue. This system was decommissioned as part of the remediation and restoration in the area. The former seepage system captured an average of 5,130 gallons per day gpd with total chromium concentration ranging from 800 to 2,800 mg/l.

During the IRM #1 excavation, the monthly extraction rates were as follows:

Month	Total Gallons Shipped	GPM for 24/7	Approx. Open Area	Other Notes
Dec 2010	441,748	10	1 acre	some down time
Jan 2011	661,728	15	1.25 acre	
Feb 2011	845,659	21	1.5 acre	
March 2011	1,119,538	26.6	2.0 acre	snow melt and rain

Note: These flow rates are for an open excavation; full-scale design will be fully surrounded by water-tight sheet piling.

Influent Cr^{+6} concentrations during the IRM# 1 excavation were typically in the 1,000 to 2,000 mg/l range, with some results in the 300 mg/l range. Because the IRM #1 area contains the highest levels of Cr^{+6} in groundwater, typical concentrations during the overall remediation are expected to be significantly lower. Both influent streams demonstrate elevated pH (11-13 standard units (SU). The total system influent flow rate is expected to average out to approximately 25 gpm (36,000 gpd).

The water treatment system for the full-scale remediation has the following capacities:

- Will typically run at 50 gpm but has capacity to increase to 130 gpm;
- Will treat 1,000 mg/l Cr^{+6} down to PVSC discharge requirements;
- Includes 490,000 gallons storage/settling tanks capacity (13 days storage/settling capacity at 25 gpm); and
- Includes treatment elements to address MGP constituents.

Treated and processed water will be sampled to confirm concentrations are below discharge criteria. The discharged water will be conveyed through an on-site stormwater drainage system to a 96-inch steel drainage line that feeds Jersey City's combined surface water and sewer system. The discharge will be regulated by both JCMUA and PVSC. The added treatment and storage/settling capacity are necessary for times during rainfall events when the JCMUA and/or PVSC will not allow any discharge.

Safety features include:

- Triple containment for storage/settling tanks (double wall liner with internal leak indicator plus outer containment liner and berms);
- Automatic shutdown for high tank levels and leak alarms;
- Remote monitoring and alarms features;
- Water treatment system are also within a containment structure;
- Operation will include daily inspections to assure all tanks and equipment are in good working order; and
- Automatic shut-off and backflow preventer to case of high water levels in JCMUA sewers.

7.4 Dealing with MGP Co-mingled Wastes

In Phase 2 of the RAWP, co-mingled groundwater contamination is expected to be a derivative of MGP and chrome. Since a majority of the RAWP excavation will be below the water table, construction dewatering will have to be managed in a different manner. Light Non-Aqueous Phase Liquid (LNAPL) from the historical MGP operation will be collected prior to entering the on-site holding tanks via an oil water separator. Dissolved phase MGP waste will either be treated on site with the water treatment facility or be disposed of at an off-site water treatment facility. LNAPL will be containerized and disposed of at a permitted disposal facility. Dense Non-Aqueous Phase Liquid (DNAPL) will also have to be removed if it becomes entrained in the groundwater extraction system.

The baseline groundwater treatment design includes carbon filtration and room to add an oil/water separator and another ion exchange process to treat MGP. The flow capacity of 120 gpm is more driven by the PVSC maximum under the permit than a plant capacity. Whether the plant can handle flow from a large deep (35 feet) excavation will depend on if shoring is used to create small cells for excavation.

8.0 Coordination with MGP Remediation

8.1 Summary of Historical MGP Information

PSEG's former MGP Site (8.5 acres) is located within the eastern portion of HCC Site 114 (16.3 acres). PSEG has investigated the MGP portion of HCC Site 114. Site 114 is associated with historical COPR and has been investigated by PPG. PPG's Garfield Avenue Site is the subject of a Settlement Agreement dated June 26, 2009 in the Superior Court of New Jersey between the NJDEP, the City of Jersey City and PPG for remediation of chromium contamination. PSEG has coordinated its MGP remediation efforts with PPG because chromium-related contamination was partially overlying and intermingled with MGP contamination.

Historical information indicates that Consumers Gas Works Company of Jersey City began MGP operations at the Site circa 1884. United Gas Improvement Company operated at the Site from 1886 to 1889. Hudson County Gas Company operated at the Site from 1889 to 1903. PSEG and its predecessor companies (Public Service Corporation and Public Service Gas Company) operated at the Site from approximately 1903 to 1955. Most of the structures associated with the MGP were removed between 1926 and 1940; however, the gas holders remained at the Site until the early 1950's. In 1955, Public Service Electric and Gas Company, the successor to Public Service Corporation, sold a portion of Site 114 to Columbia Southern Chemical Company, a subsidiary of PPG. Subsequently, the property was sold to Clif Associates, Fred Fishbein, *et al.* in 1964 along with the chromate chemical processing facility on the western portion of Site 114. In 2010, the Site was occupied by a vacant gravel lot and foundation remnants of former warehouses. Asphalt pavement surrounds the immediate areas of the building foundations. Chain link fencing surrounds the entire property (MACTEC, 2010).

PSEG submitted a Preliminary Assessment Report/Remedial Investigation Work Plan (PAR/RIWP) to NJDEP in May 2002. Site investigations have been conducted by since 2002 in accordance with the NJDEP TRSR and the terms of the Memorandum of Agreement (MOA) dated May 14, 2002, executed by PSEG and the NJDEP for the Site.

A Site Investigation Report (SIR) was submitted by PSEG to the NJDEP in December 2003, and indicated soil and groundwater impacts with MGP-related contaminants including VOCs (mainly benzene), SVOCs (mainly PAHs) and various inorganic contaminants. Three interim data submittals were transmitted by PSEG to the NJDEP from 2004 through 2006, documenting RI activities related to the delineation of MGP impacts in soil and groundwater. Additional RI activities were performed in 2006 and 2007 in an effort to complete the delineation activities. In 2006, additional soil investigations were performed by both PSEG and PPG; PPG submitted a RIR in 2006 (ENSR, 2006a). In 2007, PSEG conducted additional off-site groundwater investigation and results were presented in a comprehensive RIR dated December 2007. Subsequent to submittal of the December 2007 RIR, PSEG has conducted additional RI activities mainly related to off-site delineation; prior document submittals include a RIR Addendum dated July 2008 (including results of off-site verification borings), RI Progress Report dated December 2009 (including results of off-site groundwater delineation to the east), and VI Investigation Work Plan dated March 2010 (MACTEC, 2010).

Based on the investigation and delineation activities, the MGP impacted area is estimated to be approximately 6.7 acres as indicated in **Drawing 8-1**. The depths of the MGP impacts range from a

minimum elevation of -39.2 to 9.95 (NAVD 88). The estimated volume of free-phase MGP (tar or tar-like material) impacted soil exceed 100,000 cubic yards.

8.2 MGP Waste Considerations

During the RAWP excavation activities MGP wastes, both aqueous and solid, will inherently be comingled with CCPW in Phase 2 of the RAWP and will need to additional consideration. Aqueous and solid MGP materials will be encountered during excavation dewatering activities, while solids will be removed during the soil excavation activities. Comingled solids will be segregated from the CCPW and sampled for off-site disposal. Saturated soils maybe stabilized prior to disposal if required. Dissolved phased MGP waste will either be treated on site with the water treatment system or be disposed at an off-site water treatment facility. The water treatment system was upgraded to handle dissolved phased MGP-impacted water through the addition of an oil water separator, additional granular activated carbon units and an ion exchange unit to remove cyanide as remediation progressed to Phase 2.

PPG has included the following Design Considerations to address MGP:

- PPG has included a deep (50 feet or to bedrock) sheet pile wall between the MGP impacted area of Site 114 and the chromium impacted area. This wall is located along the eastern side of the Morris Canal.
- PPG designed the on-site wastewater treatment plant to be readily upgraded to treat MGP residuals. The flow capacity (50 gpm average, 130 gpm maximum) was adequate for the MGP excavation depending on open area and depth during MGP excavation.
- PPG has included additional soil stockpile capacity to facilitate sampling and segregation of soil containing just chromium, just MGP, and comingled MGP and chromium. It is desirable to minimize the volume of comingled soil to the extent possible. Total stockpile volume will not exceed 8,000 cubic yards unless pre-approved by the NJDEP.
- To mitigate MGP odors during RAWP excavation activities, a six step odor suppression process will be implemented, on an as-needed basis:
    - Direct application of Rusmar wintergreen foam or similar product (foam) to the excavation(s).
    - Direct application of foam to soil stockpiles on-site.
    - Direct application of foam to the excavator's bucket during disturbance of soils (during excavation, stockpiling, and loading of soils into truck).
    - Direct application of a cherry odor neutralizer into the top of the excavated soils loaded into trucks exiting the site.
    - At the end of each day's work, open excavation(s) and soil stockpiles will be foamed and covered with tarps.
    - If additional odor suppression is necessary, the use of a fenceline drip system to provide a continuous drip of neutralizer onto hay bales surrounding all or a part of the excavation or similar system will be evaluated.

Additional MGP issues expected to be addressed by PSEG in the MGP RAWP:

- Monitoring and mitigation for potential MGP related constituents in air and potential MGP odor issues;
- Excavation design depth and additional shoring or other measures to achieve the excavation design depth;
- Engineer Controls and Institutional Controls related to any residual MGP constituents that may be present after remedial action;
- Vapor mitigation or control measure that may be necessary to prevent indoor air issue for future buildings; and
- Control, containment or treatment of dissolved phase MGP constituents in groundwater.

9.0 Permits

Prior to implementation of the RAWP activities, all required local, State and Federal permits will be obtained. The following is a list of types of permits and approvals that will be required to be obtained:

- Soil Erosion and Sediment Control Plan (SESCP) approval for full scale remediation activities from Hudson-Essex-Passaic Soil Conservation District (HEPSCD);
- Permits required by the City of Jersey City and/or Hudson County will be obtained prior to initiation of RAWP activities. These permits may include: building or demolition permits, zoning department approval for large excavations, and temporary sidewalk/road closure and street opening permits;
- Well abandonment permits for removal of wells in the target area;
- Well permits will be obtained for the installation of new wells (dewatering, relief, monitoring);
- New Jersey One-Call will be contacted prior to any intrusive actives so that buried utilities are marked to the property line for each property within the target area. In addition, a private utility location/geophysical contractor will be contacted to locate possible buried utilities within the boundaries of the remedial activities. Any abandonment of on-site utilities will be coordinated with the appropriate utility companies and the City of Jersey City;
- Sewer use and connection permits with JCMUA and PVSC;
- Dewatering Permit-by-rule where required;
- PBRs for use of Soil Amendment; and
- RAP for Soil will be applied for following filing of the deed notice(s).

Additionally, a Water Use Registration (WUR) Permit through the NJDEP Bureau of Water Allocation has already been approved for Site 114. The permit is required for having a combined capacity to pump groundwater at a rate equal or greater than 70 gpm and for diversions totaling less than 3.1 million gallons per month. The WUR will be updated prior to work outside Site 114 to include the other GA Group Sites that make of the Project Area in this RAWP.

Furthermore a Treatment Works Approval (TWA No 11-0256) was obtained for the sewer lateral connection between the groundwater treatment system and the public sewer system. Any modifications to the flow, concentration or discharge will require a TWA modification.

JCRA submitted an Application for Project Authorization pursuant to the New Jersey Register of Historic Places Act for the former Morris Canal area within Site 132. The State Historic Preservation Office determined the project as proposed is in conformance with the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation. Project work within the former Morris Canal area within Site 132 will be carried out under the approved archaeological monitoring plan submitted with the Application for Project Authorization.

Copies of all permits obtained (with exception of well-related permits and expired City permits) at the time of submittal are provided in **Appendix J**. Due to the number of permits, some local permits (e.g. demolition, trailer posted, street opening) and well permits are not included in this RAWP; however, all local permits and well permits obtained are on file at the field office.

10.0 (Optional) Soil Reuse Plan

The soil reuse plan has been prepared in accordance with NJAC 7:26E-6.4 and NJDEP *Guidance Document for the Remediation of Contaminated Soils* (1998).

A few areas within the Project Area have Cr^{+6} concentrations that are below the most stringent (nonresidential) chromium soil cleanup criterion (20 mg/kg). Additional material may exist within the Project Area and will be characterized during RA activities. If the material meets the criteria described below, then the material will be used in conjunction with clean backfill to fill excavated areas. If the cost to re-use this material exceeds the cost savings, the material will be loaded out for off-site disposal.

For reuse of material as backfill, the material must first be moved to and stockpiled in a designated area or graded into adjacent receiving grids. Equipment used to move the material must be at least grossly decontaminated (removal of visual soil). Creation of a new stockpile area is not allowable; the material will have to take up space in the existing soil stockpile area.

The material designated for possible reuse will be assessed for objectionable odors and for color. If the material exhibits a strong odor or has an obvious yellow or green color the material will not be reused and will be sent for off-site disposal.

Samples for Cr^{+6}, VOCs, SVOCs, TAL Metals, PCBs, total petroleum hydrocarbons via EPH and pH will be collected at a frequency required under the NJDEP Alternative and Clean Fill Guidance for SRP Sites. One sample will also be collected for Toxicity Characteristic Leaching Procedure (TCLP) analysis for RCRA metals to determine if the material exhibits the characteristics of a hazardous waste.

Soil analytical results will be compared to NJDEP SRS at N.J.A.C. 7:26D. The most stringent (nonresidential) CrSCC of 20 mg/kg for Cr^{+6}, and the most stringent (residential) CrSCC of 120,000 mg/kg for trivalent chromium, will be compared to the NJDEP's February 8, 2007 and September 2008 Chromium Soil Cleanup Criteria, last revised April 2010. Additionally, the TCLP results must be below the limits for hazardous waste (5 mg/l for total chromium).

The material planned for reuse will be below the most stringent (nonresidential/residential) soil cleanup criteria; therefore, a level of no significant risk can be assumed. To further reduce exposure to the reused material, reused materials will be placed at least 2 feet below the ground surface.

A plan will be developed and submitted to the NJDEP for approval for any material proposed for reuse.

11.0 Site Restoration

The final phase of remedial activities to be conducted within Phases 1 through 3 of the Project Area will include site restoration activities before demobilization from the area. Site restoration activities are addressed in greater detail in the TEPs and the *Restoration Technical Execution Plan* (*Revision 1)* (AECOM, 2017). The site restoration activities, include, but are not limited to, the following:

- Meeting the proposed final grades indicated on the engineering drawings will be met to facilitate the restoration of the Project Area;
- Installation of the capillary break (where required as described in **Appendix L**) and other material to facilitate site drainage;
- Use of a backfill amendment to prevent recontamination of soil (subject to permit-by-rule approval from the NJDEP);
- Final surface is to be determined and may include applying seed and mulch to certain areas, or a crushed stone cover, or asphalt or other surface finish;
- Clearing the municipal roadways of any temporary construction equipment;
- Cleaning the municipal roadways of any residual dust or soil;
- Repairing any breaches in the security fence to maintain security around the engineering controls;
- Removal of any temporary signs used for traffic control;
- Removal of temporary soil erosion and sediment control measures that are independent of the establishment of permanent vegetative growth;
- Repairing any damage to roadway features such as curbing or manholes; and
- Installation of an on-site stormwater drainage system.

Restoration details will be in compliance with applicable law.

12.0 Other Related Program and Project Documents

PPG has prepared several documents specifically related to the scope of work addressed in this Work Plan and related to PPG's overall Jersey City Chromium Remediation Program. These documents include an AMP, a Dust Control Plan (DCP), a Traffic Safety and Control Plan, a Soil and Stockpile Management Plan, a Health and Safety Plan, and a FSP-QAPP. Below is a list of provided in the appendices of this RAWP:

- Appendix A – Air Monitoring Plan
- Appendix B – Dust Control Plan
- Appendix C – Traffic Safety and Control Plan
- Appendix D – Soil and Stockpile Management Plan
- Appendix E – Health and Safety Plan
- Appendix K – Contingency and Communications Plan

Each of the above-mentioned supporting documents is considered a "living" document and is subject to updates and revisions as needed. Updates to this plan or any of the documents above will be issued as Addendums.

13.0 Waste Management Procedures

This section describes the material handling procedures to be followed during excavation activities associated with this RAWP. Specifically, this section describes the procedures for the evaluation, handling, testing (if applicable) and final disposition of the soil, debris, waste material and groundwater that may be encountered during these activities.

Construction activities associated with this RAWP will include excavation with dewatering and off-site disposal of soil and other materials. All materials excavated from the limit of excavation for the RAWP will be classified and disposed of in appropriately permitted facilities.

13.1 Excavated Material Management

For the area to be excavated, the primary contaminant of concern will be chromium and Cr^{+6}. Visual examination of excavated soil and screening of the excavation limits with a PID will be conducted. Should any PID readings around the excavation limits exceed 100 ppm or if obvious MGP odors are detected by on-site personnel, the soil will be screened using the PID. If MGP waste is encountered and odor control is required, foam may be deployed and applied directly to the soils. Stockpile covers will also reduce the potential for MGP waste odor issues, if encountered. If soil screening PID readings exceed 100 ppm, the soil in question will be segregated within the soil stockpile area (shown in **Drawing 6-1** through **Drawing 6-3**), headspace readings collected, and soil samples collected for laboratory analysis in accordance with disposal facility requirements.

The following procedures will be implemented as part of the excavation process:

- The management of excavated materials will be conducted in such a manner as to prevent the spread of contamination and/or contaminated materials. All work must be performed in accordance with the approved SESCP.
- If not directly loaded into trucks for off-site transport, soils and concrete/debris material will be stockpiled in the areas designated as temporary stockpile area in **Drawing 6-1** through **Drawing 6-3**. These locations may be relocated within the Project Area if found to limit project efficiency.
- If necessary, visually impacted chromium contaminated materials (i.e., bright green chromium stained materials, Green-Gray Mud and COPR) will be stockpiled separately from materials not showing visual impairment.
- Soils with visual or olfactory evidence of petroleum contamination or with PID readings greater than 100 ppm will be segregated separately for further analysis.
- Disposal of soils with MGP impacts will be coordinated with PSEG.
- Concrete/debris will be stockpiled separately as required by the disposal facilities. Excess soils will be shaken from concrete/debris to the reasonable extent possible prior to stockpiling.
- Detailed records of sampling activities and laboratory analyses will be maintained.
- Sampling procedures will conform to the most recent guidance in N.J.A.C. 7:26E TRSR and the NJDEP FSPM.

All wastes generated during the field operations at the Project Area will be handled as generally detailed in the NJDEP *Guidance Document for the Remediation of Contaminated Soils* (NJDEP, 1998), and the FSP-QAPP and disposed of off-site as either non-hazardous or hazardous waste or designated for beneficial reuse. Wastes that will be generated include excavated soils, concrete and debris, contaminated clothing, decontamination fluids, purge water, dewatering liquids, and general garbage. Solids such as well abandonment cuttings and decontamination solids will be containerized in United States Department of Transportation (USDOT) approved 55-gallon drums or stockpiled for disposal off-site. All drums will be stored on-site in the stockpile area shown on **Drawing 6-1** through **Drawing 6-3.** Waste characterization sampling will be performed as required by the disposal facility.

Excavated materials will be staged in the designated stockpile area, as depicted on **Drawing 6-1** through **Drawing 6-3**. Alternatively, excavated materials may be directly loaded for off-site disposal/reuse. Dewatering fluids will be pumped directly into holding tanks for on-site treatment at the water treatment facility or off-site disposal as non-hazardous contaminated waste or as hazardous waste. Stockpiles of saturated soils will allow water to drain, pumped to GWTS and discharged to POTW after treatment. All waste will be transported in compliance with regulatory and the disposal facility's requirements.

13.2 Stockpile Sampling and Waste Classification

The following discussion applies to segregated materials that are stockpiled during construction activities. The following procedures will also be used to determine the appropriate option for the ultimate off-site disposal of each material.

13.2.1 Soil Stockpile Sampling

If required by disposal facilities, soil will be characterized in place prior to excavation or samples will be collected from soil stockpiles. Sampling frequency and parameters will be determined by the receiving facility. Sampling of stockpiled material, as required, will be conducted in general accordance with Section V.C.2.a (4) of the NJDEP *Guidance Document for the Remediation of Contaminated Soils* (NJDEP,1998), or as required by disposal facilities. Any deviation from the guidance documents will be documented and addressed with NJDEP if required. It is anticipated that the majority of excavated material will be shipped and disposed as hazardous waste. Therefore, a relatively small sampling frequency may be used and all the soil will be assumed to contain elevated levels of chromium dependent upon disposal facility selection. Soils not exhibiting visual impacts will be segregated and stockpiled separately for waste classification and off-site disposal.

13.2.2 Concrete and Debris Stockpile Sampling

Stockpiling of concrete and debris (e.g. rebar and underground utilities) is not anticipated during RAWP activities except during building demolition, unless required by disposal facilities. Concrete that is visibly contaminated (e.g., green in color) will be assumed hazardous and segregated from other concrete not exhibiting visual impacts. All other concrete that is not visually assumed hazardous will be classified for off-site disposal. Where possible, direct loading for off-site waste disposal will be considered when in-situ waste classification sampling is performed and waste profile acceptance is received prior to exhuming the waste.

To the extent possible, concrete and debris will be demolished inside the RAWP excavation limits and live loaded into lined disposal trucks. Concrete or debris that does not show visual impairment will be stockpiled for waste classification. Concrete and debris sampling and analysis will also be performed in general accordance with the NJDEP *Guidance Document for the Remediation of Contaminated Soils*

(NJDEP, 1998), or as required by the disposal facilities. If a stockpile is needed for debris, it will be constructed in the same area as the soil stockpile. No concrete will be sent off-site for recycling.

13.2.3 Building Demolition Debris

Prior to the start of building demolition work, an inventory of potential PCB, asbestos and lead containing material will be logged and sampled in accordance with local regulations. Sample locations exhibiting positive results will be abated prior to demolition work in accordance with local, state and federal regulations.

Building demolition debris that is visibly contaminated, (e.g., green in color) will be assumed hazardous and segregated from other building demolition debris not exhibiting visual impacts. All other materials that are not visually assumed hazardous will be classified for off-site disposal.

13.3 Off-Site Disposal

All materials excavated during this phase of the RAWP will be handled, transported and disposed of as non-hazardous contaminated waste or hazardous waste dependent upon waste classification sampling. Waste characterization sampling will be performed as required by the disposal facilities. Details regarding waste classification sampling requirements will be determined based on the disposal facilities selected. Details regarding sampling requirements by disposal facilities, if any, will be submitted to NJDEP in an addendum when details have been determined with the disposal facilities. Transportation and disposal of all materials will be in accordance with applicable disposal facility requirements and federal, state, and local regulations. The appropriate transport documentation will be completed before any materials are removed from the Site.

13.4 Stormwater and Stockpile Management

As necessary, all stockpiles will be placed on a minimum of one layer of 20-mil polyethylene sheeting or similar non-permeable material. Separate stockpiles for soil, concrete, and/debris will be limited in size and located in proposed stockpile area as shown in **Drawing 6-1** through **Drawing 6-3**. Stockpiles will be securely covered with a tear resistant, fiber reinforced liner during inclement weather and when soils are not actively being added or removed from the stockpile. A water spray will be utilized for dust suppression and foam will be utilized for stabilization of stockpiles, if necessary. The containment area will be maintained for the duration of the staging period in order to prevent runoff from contaminated soil, leaching of contaminants into runoff water and fugitive dust emissions. Any stockpiles which may receive saturated soil will be equipped with diversionary structures in order to contain and collect all water which may drain from the soils. Stormwater which enters any active excavation or stockpile location will be collected and containerized for disposal as needed. Detailed information regarding stockpiles is provided in the Soil and Stockpile Management Plan (**Appendix D**).

14.0 Demobilization

Following completion of excavation and backfilling activities, the dewatering sumps in the excavation area may be deactivated and removed. However, depending on their possible use during future activities or the need to continue hydraulic control over any seep expression, the sumps may be left in place. Equipment will be decontaminated in designated areas. Any soil or water produced during decontamination activities will be stored on site in appropriate containers for future disposal, or as otherwise described in **Section 13**. Water storage tanks will be decontaminated following completion of all other decontamination activities and will be removed from the site, unless maintained on-site for possible future use to support potential future work or other future remediation at the site. A portion of the sheet piling will be left in place along the perimeter of the excavation to impede migration of hexavalent chromium for future remedial activities. Shoring around the perimeter of the Project Area and possibly the interior shoring will be left in place until a determination of its continued usefulness is made.

Stockpile containment areas will be demolished and removed from the site. Containment areas will be decontaminated, dismantled and loose materials will be disposed of off-site. Wash water from the containment areas will be pumped into on-site process holding tanks for treatment disposal following conclusion of field activities. Since stockpiles will be stored on layers of fiber reinforced liners located on either concrete or asphalt impervious caps, subsurface soil sampling will not be necessary. Any soil observed on the concrete or asphalt cap that originated from a stockpile will be removed via pressure washer and/or vacuum and properly disposed. Following removal of soil stockpiles and decontamination of process holding tanks, any remaining materials (soil, debris, or water) will be contained on-site in 55-gallon drums pending disposal or as otherwise described in **Section 12**. After the removal of stockpile containment areas is complete, a composite sample will be collected for Cr^{+6} analysis from the former footprint in cases where stockpile footprint is above clean material (i.e. clean backfill or material that was not excavated as part of the RAWP).

Excavators, front end loaders, and any other on-site equipment utilized during excavation activities will be decontaminated by high pressure water and/or steam prior to removal from the site. The tracking pad, decontamination areas, truck scale, and site trailers may remain in place for use during future remedial activities. All excavated soil, debris, and trash will be removed and disposed as described in **Section 12**. Any infrastructure damaged on or off-site as a result of remedial activities will be returned to pre-existing conditions following conclusion of field activities. Site features will be returned to pre-existing conditions following conclusion of all remedial field activities, as appropriate.

If the groundwater treatment plant will not be used as part of the groundwater remediation or other beneficial uses, the groundwater treatment system will be cleaned and disassembled. If portions of the system are not salvageable, they will be disposed of in accordance with city, state and federal regulation.

A survey of the Project Area will be conducted at the conclusion of remedial activities to develop as-built drawings as part of the RA Report.

15.0 Post-Remediation Controls

The need for post-remediation controls has not been established or agreed to among the various parties. PPG will obtain Soil Remediation Action Permits following the approval of the RAWP and the filing of deed notices. All the controls identified in this section will be incorporated into the permit.

Following the completion of the soil RA activities, a task oriented schedule for monitoring, maintenance and controls may need to be implemented. The Post-Remediation Management Plan (PRMP) will address this need by listing of tasks and a timeline in which these tasks are completed. This PRMP will include, monitoring and maintenance, and the implementation of institutional controls. A Draft PRMP is provided as an exhibit in **Appendix G**.

15.1 Monitoring

A capillary break is proposed to be installed as a groundwater engineering control for portions of the Project Area, as described in **Appendix L**. Certified clean fill and crushed stone will be imported placed and graded, as necessary for, use as the final cover. Alternatively, other materials may be used as final cover, such as pavement, or clay and topsoil/vegetative cover. These areas will be inspected for vegetative cover, erosion issues, defects in the pavement and maintenance requirements. Periodic inspection and maintenance of the cover will be conducted following completion of cover stabilization measures in accordance with the RAP.

Periodic inspections will also be conducted to assure that all aspects of the engineering control remain in place and that the site owners/occupants understand the controls.

A groundwater monitoring plan will be developed as part of the Groundwater RAWP anticipated to follow soil remedial activities and groundwater pilot testing activities.

15.1.1 Maintenance

Repairs to surface cover due to erosion or damage to the cover will be performed as necessary based on periodic inspections. Inspection procedures, inspection frequencies, and repair procedures will be detailed in the future RAP.

15.2 Engineering Controls (Status as of September 2018)

Engineering controls will be monitored and inspected in accordance with the future RAPs.

15.2.1 Soil Engineering Controls

In select circumstances, soil capping will be utilized as an engineering control where soil impacts remain in place at concentrations greater than the applicable standards.

15.2.2 Potential Groundwater Engineering Controls

During soil remediation and restoration activities, potential groundwater engineering controls were installed and/or maintained, including a capillary break, amended backfill, competent meadow mat, and sheet pile. The groundwater engineering controls will be formally proposed in the future as part of the

GA Group groundwater RAWP, finalized as part of the groundwater remedial action, and documented in the groundwater RAP.

The selected remedial option to address concerns for human health and the environment surrounding the Project Area was the implementation of a PRMP with a capillary break to minimize the migration of Cr^{+6} from groundwater to the surface. The capillary break along with the surface cover prevents direct-contact exposure with the contaminated materials, by eliminating water infiltration through the capillary break. The capillary break thereby significantly reduces the mobility of chemical constituents from the groundwater within the Project Area to the surface environment.

PPG has developed the use of a backfill amendment, FerroBlack-H, to prevent re-contamination of soil by groundwater and to start the groundwater treatment process. Details on use of the amendment are provided in the TEPs for each area and in Permit-by-Rule submittals for each area. As of October 2012, use of FerroBlack-H has been approved for use throughout the Project Area.

Competent meadow mat (MM) (i.e., MM 1 foot or greater in thickness) is present in portions of the GA Group Sites at approximately 10 to 15 feet below ground surface, and may serve as a groundwater engineering control.

A portion of the sheet pile shoring will be left in place along the perimeter of all phases of excavation. This will act as a low-permeability media that will retard the Cr^{+6} groundwater plume. The removal of the perimeter sheet pile shoring will be evaluated during the groundwater RA.

15.2.3 Institutional Controls

At this time the need for a deed notice and content of a notice is under evaluation by various parties.

PPG's remediation strategy for the Project Area is based upon the current and future use of the property as mixed-used residential. The draft deed notice provided in **Appendix G** includes detailed plans, specifications, and operation and maintenance requirements for implementation of the institutional and engineering controls for soils that have documented impacts greater than the residential soil cleanup criteria.

An example draft deed notice, specifying the identified soil impacts and proposed engineering controls, has been developed for the Site 114 and is provided in **Appendix G**. A separate deed notice will be filed for each property within the Project Area as the Sites are remediated.

To the extent future redevelopment activities require removal or disturbance of caps or other surface cover materials included as an engineering control as part of the remedy set forth in the draft Deed Notice provided in **Appendix G**, those persons conducting such redevelopment activities will be responsible to replace such materials in accordance with both Department requirements as well as in accordance with the Final PRMP (an example PRMP is provided in **Appendix G**). Any disturbance of the engineering controls will be documented in the Biennial Inspection Reports. Any future disturbance of soils in the Project Area will need to meet the requirements of the Deed Notice and engineering controls Operations and Maintenance Plan as well as applicable regulations at the time of disturbance. Notification of disturbance of engineering controls will be in accordance with the deed notice requirements for alterations, improvements and disturbances.

PPG is working with property owners in obtaining written concurrence on the installation of engineering controls (soil capping) and the establishment of institutional controls (Deed Notice).

16.0 Community Relations During Remedial Activities

PPG will work with the Site Administrator (SA) under the JCO to conduct public relations with community stakeholders regarding Garfield Avenue Group Sites in compliance with N.J.A.C. 7:26E-1.4(a) [later replaced by N.J.A.C. 7:26C-1.7], and to address the Department's recent Public Outreach Guidance. The SA is responsible to maintain regular communications with community representatives to solicit their opinions and ideas and communicate community concerns to the partnership. PPG continues to coordinate closely with the NJDEP's Office of Community Relations, and has provided numerous fact sheets and other documentation related to ongoing and future public relation efforts. The SA will continue to host public meetings and coordinate additional public outreach to keep the communities apprised of plans and progress. During execution of the RA, AECOM will assist PPG and the SA in these efforts by providing frequent detailed updates of the status of field activities, remedial objectives, goals, and schedule.

In the event of an incident with off-site impact, PPG will supplement Jersey City's municipal emergency communications plan with telephone calls and e-mails to a list of community contacts the company has developed. The list includes elected officials as well as the leaders from area block associations and non-profit organizations. Additionally, the members of this list have been provided with telephone numbers and e-mails addresses for contacting the SA or the company's community relations consultants, 24 hours a day, seven days a week. In conjunction with the SA, the company will also develop fact sheets for distribution and use at its community information center at the Garfield Avenue Redevelopment Corporation office, located at 90 Forrest Street, adjacent to the site.

PPG's community information center is staffed Tuesdays and Thursdays, from 10 a.m. to 2 p.m. Also, interested parties can schedule appointments with the SA to coordinate discussions with the company's community relations consultants. The community information center contains a map of Jersey City that lists all sites for which PPG is responsible. The center also serves as a repository for documents filed with the NJDEP and contains binders with the latest filing for each site. A meeting room in the rear of the center is made available to community groups in the neighborhood.

17.0 Schedule and Reporting

In accordance with the 1990 ACO and JCO, implementation and completion of all work to remediate soils and sources of contamination at 20 Hudson County Chromium sites is proposed for completion in accordance with a judicially enforceable Master Schedule. The Master Schedule has undergone several revisions during the course of the project. As of September 2018, the most current Master Schedule was issued in July 2018. However, the remainder of Section 17 reflects the status of the project as of December 2014.

In this section the proposed sequence and timing for work in the various areas that comprise the Garfield Avenue Groups of sites is presented. The overall project has been divided into various phases as depicted on **Figure 17-1**. As discussed in the subsections that follow, the sequence and timing for work are well defined and that work is already underway. The sequence and timing of work in subsequent phases may change as issues such as site access, permits and other factors affect the schedule. Schedule updates are provided on a quarterly basis as part of the Quarterly Remedial Action Progress Reports.

Assumptions relative to the schedule information present in the section that follow include:

Submittal assumptions:

1. Assumes that owner agreements for Deed Notices will not necessarily occur simultaneously.
2. Note that NJDEP approval is required for Permit(s)-by-Rule; however, NJDEP approval is not required for TEPs. TEPs are not a regulatory requirement and represent internal detailed design documents that are prepared for use by the field team and contractors in order to provide additional detail on the scope of work.
3. Inaccessible Areas include areas inaccessible due to the presence of major utilities or roadways (e.g., Carteret Avenue, Halladay Street and respective utilities).
4. Off-Site Areas are beyond the property/site boundaries and potentially beyond the adjacent streets (e.g., south of Town and Country, North of Forrest Street, etc.).

Assumptions for conduct of fieldwork:

1. Assumes submission milestones are met and that NJDEP will approve Permit-by-Rule for Backfill Amendment with each TEP/Phase.
2. Assumes that PSEG begins and completes their work in Phase 2A in a reasonable timeframe and does not interfere with PPG operations.
3. Assumes no significant weather-related delays.
4. Assumes no significant union-related work interruptions.
5. Assumes that property owners provide acceptable access.
6. Assumes that property owners agree to reasonable purchase terms, where applicable.
7. Assumes that property owners and tenants vacate properties, where applicable.

8. Assumes no significant unexpected subsurface conditions including but not limited to buried foundations and utilities.
9. Assumes no significant work restriction requirements, work stoppage or legal action modifying the execution of the work in a timely manner by outside parties, (e.g., property owners, tenants, New Jersey Transit, City of Jersey City, NJDEP, JCMUA, residents, regulators, etc.).
10. Assumes that waste disposal facilities and haulers can handle volume of waste from concurrent CCPW remedial actions, when they occur.
11. Assumes that PVSC and JCMUA do not further limit discharge of treated groundwater.
12. Assumes no significant interruption in supply of necessary remedial equipment and materials, (e.g., FerroBlack-H, treatment plant chemicals, sheeting, liner, backfill, etc.).
13. Assumes no significant delays in permit approvals, (e.g., demolition/building permits, etc.).
14. Assumes that no non-remediation-related work is required of PPG to address the interests of outside parties, (e.g., redevelopment improvements, utility upgrades, etc.).
15. Start dates are heavily dependent upon agreement and cooperation from parties outside of PPG. Site Administrator/NJDEP/City of Jersey City assistance in maintaining these dates may be required.

17.1 Sequence of Work and Schedule

As shown in **Figure 17-1**, the work areas have been divided into three main areas (Phases 1, 2 and 3) and several sub-areas. Work in the adjacent streets (Carteret, Halladay, Forrest, and Garfield) will be completed in Phase 4. Work on properties beyond those currently identified as the Garfield Group will be completed as Phase 5.

To the extent possible, work will proceed west to east. This progression of work will minimize re-contamination of placed clean fill, over-excavation, and relocation of support facilities. The subareas and sequence is as follows:

Phase 1A – Morris Canal between IRMs #1 and #2: As of early April 2012 the necessary permits and approvals were in place and this work was completed in June 2012.

Phase 1B – Southwestern Portion of Site 114: As of early April 2012, the necessary permits and approvals were in place. The perimeter shoring has been installed. The majority of the excavation work in this area was completed on June 28, 2013. The excavation was fully completed on June 5, 2014. The restoration work was substantially completed as of August 30, 2013 for the majority portion of Phase 1B. Restoration work will be completed by September 2015.

Phase 1C – Northwestern Portion of Site 114: The approvals have been obtained. Excavation in this area started on July 16, 2013 and was completed on July 9, 2014. The restoration work is anticipated to be completed by June 2015.

Phase 2A – Eastern Portion of Site 114: This work was completed by PSEG. Work in this area is designed to remove MGP structures. The area was surrounded by shoring to minimize cross-contamination during excavation. Excavation and backfill is complete, and restoration activities are underway.

Phase 2B – Eastern Portion of Site 114: The approvals have been acquired. Excavation commenced on May 9, 2013. Excavation was completed on November 24, 2014 and restoration activities in Phase 2B are scheduled to be complete by September 2015.

Phase 3A – Talarico and Town and Country Properties Sites 132 and 143: The required access agreements and approvals have been obtained for this phase. The site work activities are in progress and excavation began on March 4, 2014 and was completed on September 5, 2014. Restoration activities are anticipated to be completed by December 2015.

Phase 3B – Site 137 (Bass and TSI Properties) and Site 133W (15 Halladay Street): The properties are owned by PPG and the required access agreements and approvals have been acquired for this phase. The site work activities have been initiated and excavation began on July 9, 2014. Excavation is scheduled to be complete by September 2015 and completion of restoration is planned for December 2015.

Phase 3C – Ross Wax and Vitarroz Sites 133E and 135: The Ross Wax property has been procured by PPG. The required access to Vitarroz is being evaluated. Approvals are being acquired and site work activities have been initiated, and excavation is anticipated to start by May 2015. Excavation and restoration activities are projected to be complete by October 2015 and December 2015, respectively.

Phase 4 – Roadways: This work includes excavation of impacted soils in Carteret Avenue, Halladay Street, and possibly Forrest Street. While portions of this work may be completed before December 2015, a schedule for this work cannot be developed at this time. The start of this work is dependent on several factors. These factors may include findings of the infrastructure study, re-development plans, inspection of the sewer lines, and plans Jersey City may have for repair or replacement of utilities or the streets. An addendum to this RAWP will be prepared when details of the work in the streets is known.

Phase 5 – Off-Site Properties: Remedial Investigation work is on-going for areas beyond the identified Garfield Avenue Group of Sites, including the 86 Forrest Street Building (Block 21501, Lot 12), 98 Forrest Street Building (Block 21501, Lot 14), the Former Ten West Apparel Property (800 Garfield Avenue; Block 21510, Lot 39), the Former Fishbein Property (816 Garfield Avenue; Block 21510, Lot 11), and a small property south of Caven Point Avenue. As the need for remedial action in these areas is identified, addendums to this RAWP or TEPs will be prepared. Interim remedial activities have been initiated in the 98 Forrest Street Building; the remaining programs will commence when access and approvals are obtained. Remediation activities were completed at a small property south of Caven Point Avenue in May 2014.

Master schedule restoration completion dates for each Phase of work are as follows:

Phase	Estimated Completion Date
Phase 1A	June 2012
Phase 1B	September 2015
Phase 1C	June 2015
Phase 2B	September 2015
Phase 3A	December 2015
Phase 3B	December 2015
Phase 3C	December 2015

These dates are dependent on several factors and are subject to change.

The general sequence of work in each area will be:

- Permit submittals (as needed);
- Pre-construction sampling (geotechnical, pre-excavation pit bottoms, utility investigations, waste classification, and building sampling);
- Technical Execution Plan;
- Remove buildings (if present);
- Install shoring (as needed);
- Install dewatering points and tie into groundwater treatment plant;
- Set-up field trailers, electrical connections, soil stockpile areas, decontamination areas, air monitoring stations, and soil loading areas;
- Excavation;
- Amendment blending (where recommended and approved);
- Backfilling, capillary break and final cover; and
- Demobilization.

A conceptual sequence of work activities is provided in **Figure 17-2** through **Figure 17-10**. A summary version of the project's schedule, updated as of September 2014, is provided as **Figure 17-11**. The sequence and schedule information is provided for information only and subject to change as the work proceeds.

In order to achieve the schedule goal, two or more teams may be working at once. Pre-construction sampling will be underway in several areas while excavation work is proceeding in other areas. Two or more teams will be performing excavation work to the extent practical. The ability to ship soil and receive soil at the disposal facilities at a rate to sustain two or more excavation crews may be a problem at times during the project. The problem may be aggravated if soil is also being shipped from non-Garfield avenue sites at the same time. **Figure 17-12** provides a target average tons/day by quarter for loading of soil for off-site disposal. This is a conceptual depiction and is subject to change. Loading

rates per excavation team are expected to range from 400 to 800 tons per day depending on conditions in each area.

17.2 Progress Reporting

During the implementation of the full scale remedial measures, written Remedial Action Progress Reports (RAPR) will be submitted to NJDEP quarterly 6 weeks following the end of the quarter. A final RAPR will be submitted after completion of all activities required under the RAWP. The progress report will include, as applicable, the following items:

- Description of actions taken toward achieving compliance with the 1990 ACO and JCO during the previous year,
- A summary of sampling results and tests and other data received during that period in the implementation of the RAWP,
- Description and a schedule of actions which are expected to be initiated or completed during the upcoming year, and
- Other information regarding the percentage of completion, including a description of delays encountered or anticipated that may affect the future schedule for completion of the Work Plan and include a description of efforts made to mitigate delays encountered or anticipated.

Cost evaluations are being performed and will be developed at a later stage.

17.3 Final Reporting

AECOM will submit final RARs to NJDEP for review and approval after completion of all activities required under the RAWP that summarizes the actions taken to comply with the JCO. The final RARs will conform, at a minimum, to N.J.A.C. 7:26E-6.7 [later replaced by N.J.A.C. 7:26E-5.7 per the August 6, 2018 amendment].

The final RARs will include the following:

- Summary of previous investigations;
- Description of remedial activities completed;
- A detailed description of all NJDEP-approved modification to the RAWP that occurred during performance of the work;
- A list of the remediation standards achieved for each remedial action;
- As-built survey drawings showing the extent of excavation(s);
- Description of site restoration activities;
- Remedial action costs incurred to date; and
- Certification signed by a person who supervised or directed the Final Report preparation.

The overall performance of the remedial measures, excavation and shoring, water management, waste management, dewatering data, laboratory documentation, and air monitoring data will also be summarized and/or included in the RARs. Supporting tables and figures will be included with the report detailing the excavation area(s), volume of impacted soil removed, and sampling results. Fully executed manifests and weight tickets documenting off-site disposal will be included in an appendix of the RARs prepared for submittal to NJDEP.

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Tables

Table 1-1
Achievement of NJDEP Conditions for Approval
Final GA Group RAWP Rev. 4
PPG, Jersey City, New Jersey

On May 14, 2012, NJDEP issued a Conditional Approval letter for the *Remedial Action Work Plan (Soil), Rev. 2 Garfield Avenue Group – Sites 114, 132, 133, 135, 137 and 143, Jersey City, New Jersey.* The letter stated that NJDEP had determined that the RAWP was administratively complete and approvable provided that the following conditions were met. This table documents achievement of the conditions.

NJDEP CONDITION FOR APPROVAL	PPG RESPONSE
PPG/AECOM will submit a final RAWP, which incorporates all of the below conditions, to the Department consistent with the time established in the Master Schedule.	The FINAL RAWP Rev. 4 achieves NJDEP's conditions, as documented herein.
PPG obtains property owner's consent to accept a deed notice for each parcel where a deed notice is required as a component of the remedial action, pursuant to N.J.A.C. 7:26E-6.2(a)16. If the owner of any real property covered in this RAWP does not consent to the recording of the deed notice required for the proposed remedial action described here-in; PPG will remediate that property to the conditions established in the Chromium Moratorium memo (February 8, 2007) for an unconditional NFA for soils. Those conditions are as follows: "An unconditional NFA approval relative to chromium can be issued for soils if 1) hexavalent chromium contamination in excess of 20 ppm is excavated and removed from the site and 2) any remaining chromium contamination that fails the SPLP test for impact to ground water is excavated and removed, from the site or treated and left on site provided the treated chromium will not fail the SPLP test in the future. An unconditional NFA approval relative to chromium can also be issued for soils if hexavalent chromium contamination in excess of 20 ppm is treated and left on site provided the resulting concentration of hexavalent chromium in the soil remains below 20 ppm (i.e., no "rebound effect" for hexavalent chromium)."	On May 7, 2012, NJDEP updated the TRSR, N.J.A.C. 7:26E (NJDEP, 2012) to implement the Site Remediation Reform Act, N.J.S.A. 58:10C-1 et seq. The May 7, 2012 updated version of the TRSR does not include (former) 7:26E-6.2, Remedial Action Workplan, which NJDEP references in their May 14, 2012 conditional approval of the DRAFT RAWP Rev. 2. Requirements for remedial action work plans are now provided in the May 7, 2012 updated TRSR in 7:26E-5.5, which does not include the requirement that a RAWP shall include a copy of the property owner's written agreement to record the deed notice whenever a deed notice is required as a component of the remedial action. PPG will continue to seek the property owners' acceptance of deed notices for remaining parameters that are PPG's responsibility, as required for the issuance of RAPs. Note that PPG has remediated, or is remediating, chromium-impacted soil at the GA Group Sites in accordance with the Chromium Moratorium, except in special instances covered by RAWP Addenda. As such, deed notices are expected to be primarily limited to non-chromium parameters on a subset of the GA Group Sites.
The installation of a capillary break cannot be deferred until redevelopment activities at the site and must be completed immediately upon completion of backfilling activities, unless the redevelopment of the site will proceed immediately following backfilling.	Acknowledged. The capillary break (a groundwater engineering control) is being installed where required per the Master Schedule as part of the Restoration Complete Milestone.
The Excavation Decision Tree (Figure 3-1) shall be revised to mirror the text outlined in Sections 3.3, 3.4, and 6.5 of the RAWP. In lieu of modifying Figure 3-1, PPG/AECOM can choose to accept a revised Figure 3-1, developed by Weston to match the RAWP text, presented as an attachment to this correspondence.	This comment no longer applies as Excavation Decision Tree Figure 3-1 developed by Weston has since been replaced by a revised Figure 3-1, Figure 3-1A and Figure 3-2 in accordance with the *NJDEP Updated Method to Determine Compliance with the Department's Chromium Policy dated August 13, 2013* , and is currently used in the determination of terminal excavation elevations. **Appendix F** provides the current Excavation Decision Trees.
In addition to cells J8B and C8B, PPG shall re-excavate cell B8B (which is adjacent to C8B) since hexavalent chromium concentration were detected at concentrations exceeding 20 ppm at depths of less than 20 feet below grade. According to field observations during excavation, meadow mat was encountered during excavation activities; however, the sample was collected from Impacted Soil left in place above the meadow mat. Therefore, re-excavation to the meadow mat is required.	This exceedance was removed in the IRM #1 Northwest Grid Excavation, which was completed on June 20, 2014.
Consistent with the original post-excavation sampling approach for sidewall samples, in areas where sidewall samples will be collected, they shall be collected at a frequency of every 30 linear feet and every 2-foot depth interval to the base of the excavation and shall be analyzed for hexavalent chromium, pH and Eh and 10% of those samples shall be analyzed for TAL Metals, VOCs and SVOCs.	Acknowledged. **Section 5** reflects this requirement.
Although acknowledged in PPG's response-to-comment table, the RAWP text shall be revised to document that in areas where CCPW remains, PPG shall use a grinding and blending procedure to ensure that the sample is representative of the entire matrix (including COPR nodules) in determining compliance with the remedial limit of 20 mg/kg Cr^{+6}. The grinding/blending method developed with the analytical laboratory(ies) shall be provided to the Department for review.	This comment is no longer applicable. PPG is conducting excavation to remove visual CCPW, and as such, the procedure for grinding and blending samples has not been utilized. References to this procedure have been removed from the RAWP.
An evaluation of the potential flooding due to installation of sheet piling will be provided in TEPs as each area is addressed. In the event that the proposed sheet piling exacerbates flooding during storm events, PPG/AECOM will implement additional engineering controls to mitigate the flooding to the extent practicable. In addition, Appendix G of the RAWP and all references to it within the document shall be removed in its entirety. Furthermore, PPG/AECOM will coordinate with JCMUA and the City of Jersey City on all stormwater management issues at the site.	Acknowledged. The former **Appendix G, Conceptual Dewater Plan for Southwestern Area of Site 114**, was removed from the RAWP.
While the Department acknowledges the schedule assumptions, its duty as a regulatory agency is to assure that the documents shall be administratively complete and technically compliant. PPG's obligation as a responsible party is to ensure that their submittals are compliant with the Department's rules and guidance documents. Since TEPs will contain information which has been deferred from the RAWP, the Department will review all TEPs and provide comments, but will not require approval except as otherwise specified in writing by the Department.	Acknowledged.

CCPW - Chromium Chemical Production Waste
COPR - Chromite Ore Processing Residue
Cr+6 - Hexavalent chromium
GA - Garfield Avenue
IRM - Interim Remedial Measure
JCMUA - Jersey City Municipal Utilities Authority
NFA - No Further Action
NJDEP - New Jersey Department of Environmental Protection
ppm - parts per million
RAWP - Remedial Action Work Plan
SPLP - Synthetic Precipitations Leaching Procedure
SVOCs - Semi-volatile Organic Compounds
TAL - Target Analyte List
TEP - Technical Execution Plan
TRSR - Technical Requirements for Site Remediation
VOCs - Volatile Organic Compounds

Table 3-1
Compounds Exceeding Regulatory Criteria On or Emanating from Site 114
PPG Industries, Jersey City, New Jersey
Remedial Action Work Plan - Soil

AECOM

Analyte[1]	CAS-RN	NJDEP Soil Standards			Historic Soil Exceedance		Potential Source[3]			
		RDCSRS[2] (mg/kg)	NRDCSRS[2] (mg/kg)	Default IGW SSL (mg/kg)	> SRS	> IGW SSL	PPG	MGP	Historic Fill	Property
Volatile Organic Compounds (VOCs)										
BTEX Related VOCs										
BENZENE	71-43-2	2	5	0.005	X	X		X		
ETHYLBENZENE	100-41-4	7800	110000	13		X		X		
TOLUENE (METHYLBENZENE)	108-88-3	6300	91000	7		X		X		
XYLENES	1330-20-7	12000	170000	19		X		X		
STYRENE (MONOMER)	100-42-5	90	260	3		X				X
CVOC Related VOCs										
1,1,1-TRICHLOROETHANE	71-55-6	290	4200	0.3		X				X
TRICHLOROETHYLENE	79-01-6	7	20	0.01		X				X
TRANS-1,3-DICHLOROPROPENE	10061-02-6	2	7	0.005	X					X
CHLOROBENZENE	108-90-7	510	7400	0.6		X				X
DICHLOROMETHANE	75-09-2	34	97	0.01		X				X
TETRACHLOROETHENE	127-18-4	2	5	0.005	X	X				X
VINYL CHLORIDE	75-01-4	0.7	2	0.005	X	X				X
Semivolatile Organic Compounds (SVOCs)										
MGP Related SVOCs										
ACENAPHTHENE	83-32-9	3400	37000	110		X		X		
BENZO(A)ANTHRACENE	56-55-3	0.6	2	0.8	X	X		X	X	
BENZO(A)PYRENE	50-32-8	0.2	0.2	0.2	X	X		X	X	
BENZO(B)FLUORANTHENE	205-99-2	0.6	2	2	X	X		X	X	
BENZO(K)FLUORANTHENE	207-08-9	6	23	25	X	X		X	X	
2-METHYLNAPHTHALENE	91-57-6	230	2400	8	X	X		X		
CHRYSENE	218-01-9	62	230	80	X	X		X		
DIBENZO(A,H)ANTHRACENE	53-70-3	0.2	0.2	0.8	X	X		X	X	
INDENO(1,2,3-CD)PYRENE	193-39-5	0.6	2	7	X	X		X	X	
NAPHTHALENE	91-20-3	6	17	25	X	X		X		
PYRENE	129-00-0	1700	18000	840	X			X		
Other SVOCs										
1,2,4-TRICHLOROBENZENE[4]	120-82-1	73	820	0.7		X				X
1,4-DICHLOROBENZENE[4]	106-46-7	5	13	2	X	X				X
3,5,5-TRIMETHYL-2-CYCLOHEXENE-1-ONE	78-59-1	510	2000	0.2		X				X
3+4-METHYLPHENOL	106-44-5	31	340	--	X					X
ACETOPHENONE	98-86-2	2	5	3	X					X
CARBAZOLE	86-74-8	24	96	--	X					X
PHENOL	108-95-2	18000	210000	8		X		X		X
Metals & Cyanide										
Chromium Related Metals										
ANTIMONY	7440-36-0	31	450	6	X	X	X			
CHROMIUM	7440-47-3	120000	--	--	X		X			
CHROMIUM (HEXAVALENT)	18540-29-9	240	20	--	X		X			
NICKEL	7440-02-0	1600	23000	48		X	X			
THALLIUM	7440-28-0	5	79	3	X	X	X			
VANADIUM	7440-62-2	78	1100	--	X		X			
MGP Related Metals										
ARSENIC	7440-38-2	19	19	19	X	X		X	X	
LEAD	7439-92-1	400	800	90	X	X		X	X	
MERCURY	7439-97-6	23	65	0.1	X	X		X		
CYANIDE	57-12-5	1600	23000	20		X		X		
Other Metals										
ALUMINUM	7429-90-5	78000	--	6000	X	X				X
BARIUM	7440-39-3	16000	59000	2100		X				X
BERYLLIUM	7440-41-7	16	140	0.7		X			X	
CADMIUM	7440-43-9	78	78	2		X			X	
COBALT	7440-48-4	1600	590	90		X				X
COPPER	7440-50-8	3100	45000	11000	X	X				X
MANGANESE	7439-96-5	11000	5900	65	X	X				X
SELENIUM	7782-49-2	390	5700	11		X				X
SILVER	7440-22-4	390	5700	1		X				X
ZINC	7440-66-6	23000	110000	930		X			X	
Pesticides										
BETA-BHC	319-85-7	0.4	2	0.002		X				X
GAMMA-BHC (LINDANE)	58-89-9	0.4	2	0.002		X				X
HEPTACHLOR EPOXIDE	1024-57-3	0.07	0.3	0.01		X				X
Polychlorinated Biphenyls (PCBs)										
Total PCB (AROCLORS)	1336-36-3	0.2	1	0.2	X	X				X

Notes:

1 - Analytes listed are historic (2003 - 2011) soil compounds that have exceeded either the CrSCC, SRS or the IGW SSL.

2 - For hexavalent chromium, the NJDEP Chromium Soil Cleanup Criteria (CrSCC) has been used.

3 - Potential sources are based on NYSDEC *"Contamination at MGP Sites"*, PPG list of CCPW compounds, and NJDEP TRSR.

4 - Compound analyzed as either SVOC or VOC fractions in Remedial Investigation dataset.

CAS-RN = Chemical Abstract Service Registry Number

CCPW = Chromite Chemical Production Waste

CVOC = Chlorinated Volatile Organic Compound

MGP = Manufactured Gas Plant

NJDEP = New Jersey Department of Environmental Protection

NYSDEC = New York State Deparment of Environmental Conservation

TRSR = Technical Requirements for Site Remediation

RDCSRS - NJDEP Residential Direct Contact Soil Remediation Standard

NRDCSRS - NJDEP Non-residential Direct Contact Soil Remediation Standard

IGW SSL - NJDEP Default Impact to Groundwater Soil Screening Level

All results are reported in milligrams per kilogram (mg/kg).

TABLE 3-2
Remedial Standards for Soil
PPG Industries, Jersey City, New Jersey
Remedial Action Work Plan - Soil

Category	Analyte	CAS	MSSRS	DIGWSSL	units
Cr+6	CHROMIUM (HEXAVALENT)	18540-29-9	20	--	mg/kg
Metals	ALUMINUM	7429-90-5	78000	6000	mg/kg
Metals	ANTIMONY	7440-36-0	31	6	mg/kg
Metals	ARSENIC	7440-38-2	19	19	mg/kg
Metals	BARIUM	7440-39-3	16000	2100	mg/kg
Metals	BERYLLIUM	7440-41-7	16	0.7	mg/kg
Metals	CADMIUM	7440-43-9	78	2	mg/kg
Metals	CHROMIUM	7440-47-3	120000	--	mg/kg
Metals	COBALT	7440-48-4	1600	90	mg/kg
Metals	COPPER	7440-50-8	3100	11000	mg/kg
Metals	LEAD	7439-92-1	400	90	mg/kg
Metals	MANGANESE	7439-96-5	11000	65	mg/kg
Metals	MERCURY	7439-97-6	23	0.1	mg/kg
Metals	NICKEL	7440-02-0	1600	48	mg/kg
Metals	SELENIUM	7782-49-2	390	11	mg/kg
Metals	SILVER	7440-22-4	390	1	mg/kg
Metals	THALLIUM	7440-28-0	5	3	mg/kg
Metals	VANADIUM	7440-62-2	78	--	mg/kg
Metals	ZINC	7440-66-6	23000	930	mg/kg
SVOC	1-1'-BIPHENYL	92-52-4	3100	140	mg/kg
SVOC	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	23	5	mg/kg
SVOC	2,4,5-TRICHLOROPHENOL	95-95-4	6100	68	mg/kg
SVOC	2,4,6-TRICHLOROPHENOL	88-06-2	19	0.2	mg/kg
SVOC	2,4-DICHLOROPHENOL	120-83-2	180	0.2	mg/kg
SVOC	2,4-DIMETHYLPHENOL	105-67-9	1200	1	mg/kg
SVOC	2,4-DINITROPHENOL	51-28-5	120	0.3	mg/kg
SVOC	2,4-DINITROTOLUENE	121-14-2	0.7	--	mg/kg
SVOC	2,6-DINITROTOLUENE	606-20-2	0.7	--	mg/kg
SVOC	2-CHLOROPHENOL	95-57-8	310	0.8	mg/kg
SVOC	2-METHYLNAPHTHALENE	91-57-6	230	8	mg/kg
SVOC	2-METHYLPHENOL	95-48-7	310	--	mg/kg
SVOC	2-NITROANILINE	88-74-4	39	--	mg/kg
SVOC	3,3'-DICHLOROBENZIDINE	91-94-1	1	0.2	mg/kg
SVOC	3,5,5-TRIMETHYL-2-CYCLOHEXENE-1-ONE	78-59-1	510	0.2	mg/kg
SVOC	3+4-METHYLPHENOL	106-44-5	31	--	mg/kg
SVOC	4,6-DINITRO-2-METHYLPHENOL	534-52-1	6	0.3	mg/kg
SVOC	ACENAPHTHENE	83-32-9	3400	110	mg/kg
SVOC	ACENAPHTHYLENE	208-96-8		--	mg/kg
SVOC	ACETOPHENONE	98-86-2	2	3	mg/kg
SVOC	ANTHRACENE	120-12-7	17000	2400	mg/kg
SVOC	ATRAZINE	1912-24-9	210	0.2	mg/kg
SVOC	BENZALDEHYDE	100-52-7	6100	--	mg/kg
SVOC	BENZO(A)ANTHRACENE	56-55-3	0.6	0.8	mg/kg
SVOC	BENZO(A)PYRENE	50-32-8	0.2	0.2	mg/kg
SVOC	BENZO(B)FLUORANTHENE	205-99-2	0.6	2	mg/kg
SVOC	BENZO(G,H,I)PERYLENE	191-24-2	380,000	--	mg/kg
SVOC	BENZO(K)FLUORANTHENE	207-08-9	6	25	mg/kg
SVOC	BENZYL BUTYL PHTHALATE	85-68-7	1200	230	mg/kg
SVOC	BIS(2-CHLOROETHYL)ETHER	111-44-4	0.4	0.2	mg/kg
SVOC	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	35	1200	mg/kg
SVOC	CAPROLACTAM	105-60-2	31000	12	mg/kg
SVOC	CARBAZOLE	86-74-8	24	--	mg/kg
SVOC	CHRYSENE	218-01-9	62	80	mg/kg
SVOC	DIBENZO(A,H)ANTHRACENE	53-70-3	0.2	0.8	mg/kg
SVOC	DIETHYL PHTHALATE	84-66-2	49000	88	mg/kg
SVOC	DI-N-BUTYLPHTHALATE	84-74-2	6100	760	mg/kg
SVOC	DI-N-OCTYL PHTHALATE	117-84-0	2400	3300	mg/kg
SVOC	FLUORANTHENE	206-44-0	2300	1300	mg/kg
SVOC	FLUORENE	86-73-7	2300	170	mg/kg
SVOC	HEXACHLORO-1,3-BUTADIENE	87-68-3	6	0.9	mg/kg
SVOC	HEXACHLOROBENZENE	118-74-1	0.3	0.2	mg/kg

TABLE 3-2
Remedial Standards for Soil
PPG Industries, Jersey City, New Jersey
Remedial Action Work Plan - Soil

Category	Analyte	CAS	MSSRS	DIGWSSL	units
SVOC	HEXACHLOROCYCLOPENTADIENE	77-47-4	45	320	mg/kg
SVOC	HEXACHLOROETHANE	67-72-1	35	0.2	mg/kg
SVOC	INDENO(1,2,3-CD)PYRENE	193-39-5	0.6	7	mg/kg
SVOC	NAPHTHALENE	91-20-3	6	25	mg/kg
SVOC	NITROBENZENE	98-95-3	31	0.2	mg/kg
SVOC	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	0.2	0.2	mg/kg
SVOC	N-NITROSODIPHENYLAMINE	86-30-6	99	0.4	mg/kg
SVOC	PENTACHLOROPHENOL	87-86-5	3	0.3	mg/kg
SVOC	PHENANTHRENE	85-01-8		--	mg/kg
SVOC	PHENOL	108-95-2	18000	8	mg/kg
SVOC	PYRENE	129-00-0	1700	840	mg/kg
VOC	1,1,1-TRICHLOROETHANE	71-55-6	290	0.3	mg/kg
VOC	1,1,2,2-TETRACHLOROETHANE	79-34-5	1	0.007	mg/kg
VOC	1,1,2-TRICHLOROETHANE	79-00-5	2	0.02	mg/kg
VOC	1,1-DICHLOROETHANE	75-34-3	8	0.2	mg/kg
VOC	1,1-DICHLOROETHYLENE	75-35-4	11	0.008	mg/kg
VOC	1,2,4-TRICHLOROBENZENE	120-82-1	73	0.7	mg/kg
VOC	1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	96-12-8	0.08	0.005	mg/kg
VOC	1,2-DIBROMOETHANE(EDB)	106-93-4	0.008	0.005	mg/kg
VOC	1,2-DICHLOROBENZENE	95-50-1	5300	17	mg/kg
VOC	1,2-DICHLOROETHANE	107-06-2	0.9	0.005	mg/kg
VOC	1,2-DICHLOROPROPANE	78-87-5	2	0.005	mg/kg
VOC	1,4-DICHLOROBENZENE	106-46-7	5	2	mg/kg
VOC	2-BUTANONE (MEK)	78-93-3	3100	0.9	mg/kg
VOC	ACETONE	67-64-1	70000	19	mg/kg
VOC	BENZENE	71-43-2	2	0.005	mg/kg
VOC	BROMODICHLOROMETHANE	75-27-4	1	0.005	mg/kg
VOC	BROMOMETHANE	74-83-9	25	0.04	mg/kg
VOC	CARBON DISULFIDE	75-15-0	7800	6	mg/kg
VOC	CARBON TETRACHLORIDE	56-23-5	0.6	0.005	mg/kg
VOC	CHLOROBENZENE	108-90-7	510	0.6	mg/kg
VOC	CHLORODIBROMOMETHANE	124-48-1	3	0.005	mg/kg
VOC	CHLOROETHANE	75-00-3	220	--	mg/kg
VOC	CHLOROFORM	67-66-3	0.6	0.4	mg/kg
VOC	CHLOROMETHANE	74-87-3	4	--	mg/kg
VOC	CIS-1,2-DICHLOROETHENE	156-59-2	230	0.3	mg/kg
VOC	CIS-1,3-DICHLOROPROPENE	10061-01-5	2	0.005	mg/kg
VOC	DICHLORODIFLUOROMETHANE	75-71-8	490	39	mg/kg
VOC	DICHLOROMETHANE	75-09-2	34	0.01	mg/kg
VOC	ETHYLBENZENE	100-41-4	7800	13	mg/kg
VOC	M+P-XYLENE	M+P-XYLENE	12000	19	mg/kg
VOC	M-DICHLOROBENZENE	541-73-1	5300	19	mg/kg
VOC	METHYL ACETATE	79-20-9	78000	22	mg/kg
VOC	METHYL-TERT-BUTYL ETHER	1634-04-4	110	0.2	mg/kg
VOC	O-XYLENE	95-47-6	12000	19	mg/kg
VOC	STYRENE (MONOMER)	100-42-5	90	3	mg/kg
VOC	TETRACHLOROETHENE	127-18-4	2	0.005	mg/kg
VOC	TOLUENE	108-88-3	6300	7	mg/kg
VOC	TRANS-1,2-DICHLOROETHENE	156-60-5	300	0.6	mg/kg
VOC	TRANS-1,3-DICHLOROPROPENE	10061-02-6	2	0.005	mg/kg
VOC	TRIBROMOMETHANE	75-25-2	81	0.03	mg/kg
VOC	TRICHLOROETHYLENE*	79-01-6	7	0.01	mg/kg
VOC	TRICHLOROFLUOROMETHANE	75-69-4	23000	34	mg/kg
VOC	VINYL CHLORIDE*	75-01-4	0.7	0.005	mg/kg
VOC	XYLENES	1330-20-7	12000	19	mg/kg
PCB	Total PCB (Aroclors)	TOT-PCB-ARO	0.2	0.2	mg/kg

Notes:

CAS = Chemical Abstract Serivce registry number

MSSRS = Most Stringent Soil Remediation Standard

DIGWSSL = Default Impact to Groundwater Soil Screening Levels

mk/kg = milligram per kilogram

* Method Detection Limit exceeds the current (Nov 2013) Default IGW SSL

TABLE 5-1
Sample Summary
PPG Non-Residential Chromium Remediation Project
Remedial Action Work Plan

Sample Location Name	Medium	Sample Depth[1]	Analytical Parameters	Sampling Method
Phase I				
114-Grid ID-Sample Interval/Depth	Soil	Excavation Bottom	Field Screening, Cr, Cr+6, Eh, pH[2,3]	Disposable Trowel/Pan
114-G1A-15-15.5 (example only)	Soil	Excavation Bottom	Field Screening, Cr, Cr+6, Eh, pH[2,3]	Disposable Trowel/Pan
Phase II[3]				
114-Grid ID-Sample Interval/Depth	Soil	Excavation Bottom	Field Screening, Cr, Cr+6, Eh, pH[2,3]	Disposable Trowel/Pan
114-N1B-15-15.5 (example only)	Soil	Excavation Bottom	Field Screening, Cr, Cr+6, Eh, pH[2,3]	Disposable Trowel/Pan
Phase III				
Site #-Grid ID-Sample Interval/Depth	Soil	Excavation Bottom	Field Screening, Cr, Cr+6, Eh, pH[2]	Disposable Trowel/Pan
143-B15A-15-15.5 (example only - bottom sample)	Soil	Excavation Bottom	Field Screening, Cr, Cr+6, Eh, pH[2]	Disposable Trowel/Pan
Site #-Grid ID-EWcoordinate(N, E, W, S, NE, NW, SE, SW)-Sample Interval/Depth	Soil	Excavation Sidewall	Field Screening, Cr, Cr+6, Eh, pH[2]	Disposable Trowel/Pan
132-B15A-EWNE-15 (example only - sidewall sample)	Soil	Excavation Sidewall	Field Screening, Cr, Cr+6, Eh, pH[2]	Disposable Trowel/Pan
132-B15A-EWE-15-15.5 (example only - sidewall sample)	Soil	Excavation Sidewall	Field Screening, Cr, Cr+6, Eh, pH[2]	Disposable Trowel/Pan
Public Roadways				
First 3 letters of street name-Grid ID-Sample Interval	Soil	Excavation Bottom	Field Screening, Cr, Cr+6, Eh, pH[2]	Disposable Trowel/Pan
CAR-K14A-15-15.5 (example only - bottom sample)	Soil	Excavation Bottom	Field Screening, Cr, Cr+6, Eh, pH[2]	Disposable Trowel/Pan
CARHAL-Y19A-15-15.5 (example only - bottom sample in intersection)	Soil	Excavation Bottom	Field Screening, Cr, Cr+6, Eh, pH[2]	Disposable Trowel/Pan
Waste Classification for All Remedial Activities				
114-A1-YYMMDD[4]	Waste Classification[5]	Composite	Full TCLP, RCRA, PCB, TCLVOC, TCLSVOC, TALMetals, TPH, Cr+6	Disposable Trowel/Pan
QA Samples for All Remedial Activities				
Site Number-FBYYYYMMDD	Field Blank	Composite	Same as sample parameters collected day of field blank collection	NA
Site Number-TBYYYYMMDD	Trip Blank	Composite	TCLVOC (aqueous only)	NA

Notes:

[1] Sample depth for excavation bottom will be field selected.

[2] Soils will be visually logged (test pit profiling, physical screening for screen size, visual screening for percent COPR) and field screened with a Photoionization Detector (PID) for volatile organic compounds (VOCs). Other field screening may include: 1) XRF screening for metals, and/or 2) calcium field screening with hydrochloric acid. 10% of samples will be analyzed for TAL metals, VOC, and SVOC.

[3] Additional PCB analysis will be added to grids C5A, A2A, DD3A, V7B, X6B, W11B, Y6B, V7B and W7B (which are known to have or had PCB contamination).

[4] The number of waste classification samples will vary dependent upon the total quantity and type of waste generated for offsite disposal. A1 = Stockpile designation which varies. YY = Last two digits of the year; MM = month; DD = day.

[5] Waste classification samples will be generally analyzed at a frequency of 1 composite per 500 tons. Field sample frequency and/or sample parameters will be dependent upon disposal facility selection.

Cr - Total chromium

Cr+6 - Hexavalent chromium

Eh - Laboratory based oxidation reduction potential

pH - pH standard units

COPR - Chromite Ore Processing Residue

NA - Not applicable

SPLP - Synthetic Precipitation Leaching Procedure

Field Exam - Visual and sieve analysis for percent COPR and presence of Green-Gray Mud

RCRA 8 - 8 RCRA metals

TCLP - Toxicity Characteristics Leaching Procedure (TCLP)

TCLVOC - Target Compound List Volatile organics

TCLSVOC - Target Compound List Semi-volatile organics

TALMetals - Target Analyte List Metals

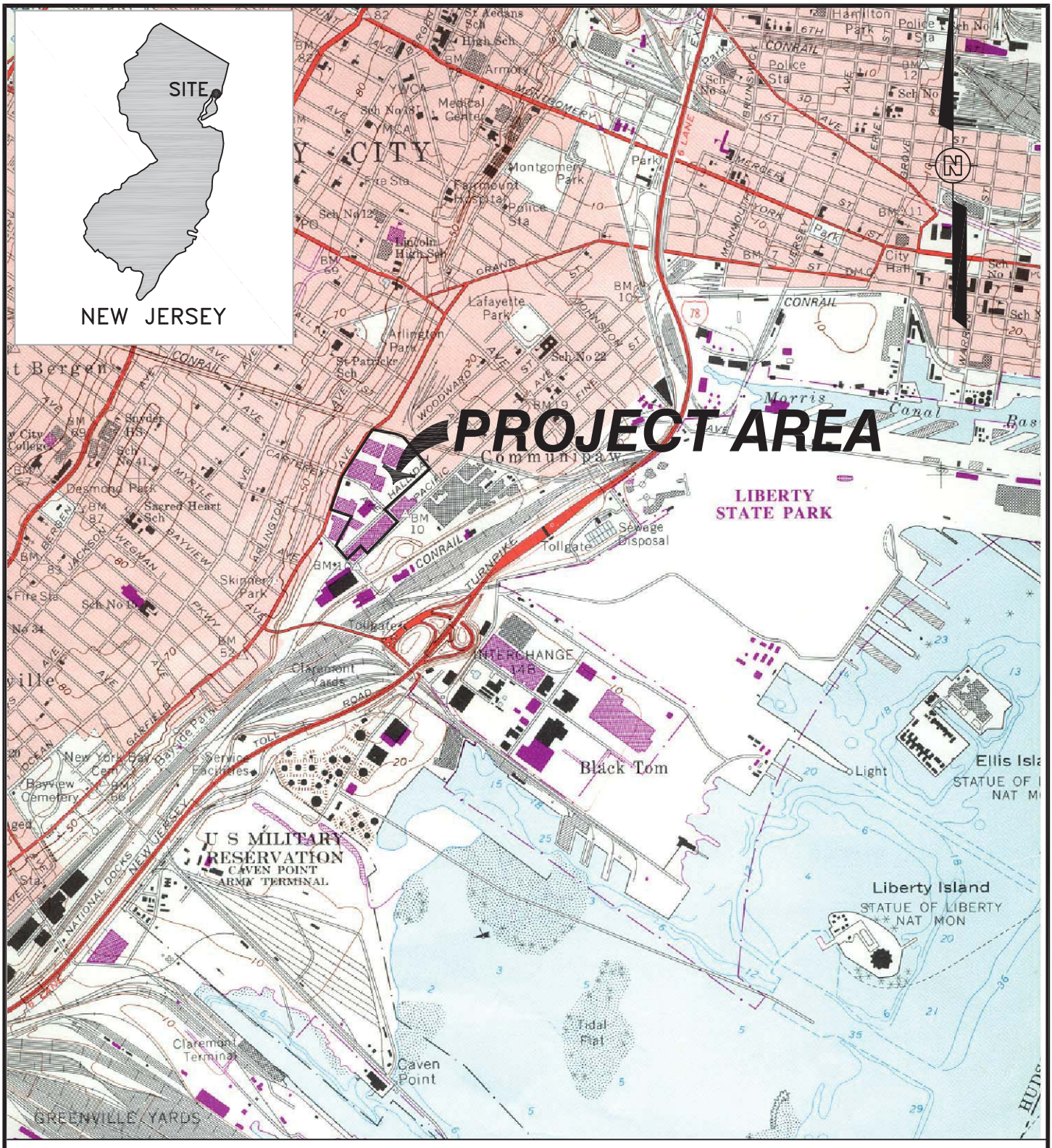
PCB - Polychlorinated biphenyls

TOC - Total Organic Carbon

RCRA - RCRA Characteristics of Ignitability, Corrosivity and Cyanide/Sulfide Reactivity

TPH - Total Petroleum Hydrocarbons

Figures



SOURCE: U.S.G.S. 7.5 MIN TOPOGRAPHIC MAP OF JERSEY CITY, NEW JERSEY DATED 1967, PHOTOREVISED 1981.

J:\Rem_Eng\Project Files\PPG Industries\Garfield Avenue\30% Design\CADD\RAWP\Figure 1-1 - Site Location 1981.dwg

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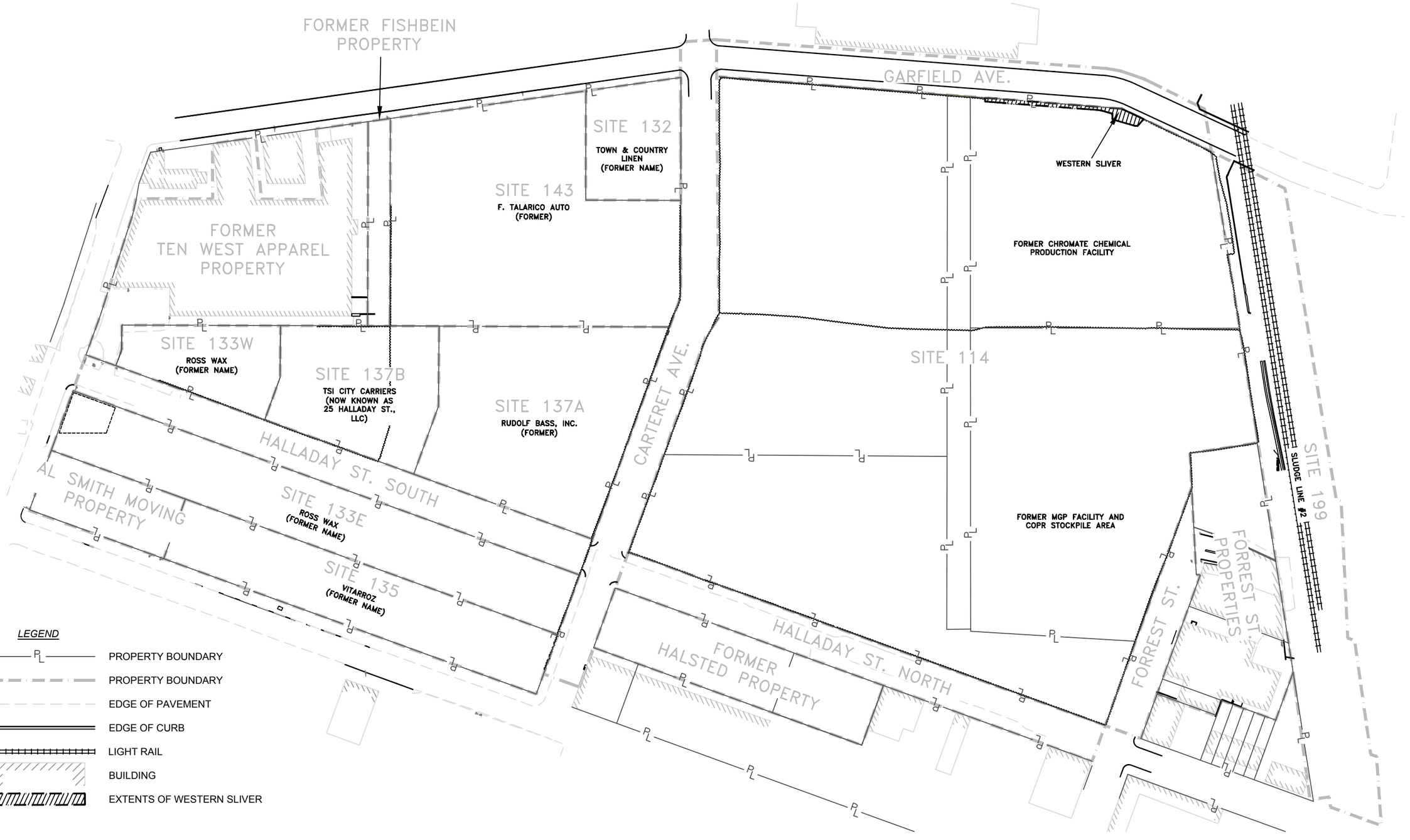
USGS SITE LOCATION MAP - 1981

PPG INDUSTRIES – GARFIELD AVENUE
PROJECT AREA, JERSEY CITY
HUDSON COUNTY, NEW JERSEY

FIGURE NUMBER: 1-1

DRAWN BY:	DATE:	PROJECT NUMBER:	SHEET NUMBER:
/jk	05/03/11	60240740	1 of 1



LEGEND

- PROPERTY BOUNDARY
- PROPERTY BOUNDARY
- EDGE OF PAVEMENT
- EDGE OF CURB
- LIGHT RAIL
- BUILDING
- EXTENTS OF WESTERN SLIVER

NOTE:

THE GA GROUP SITES ARE IDENTIFIED BY SITE NUMBER, WITH THE SITE'S NAME PROVIDED BELOW. WHEN A SITE DOES NOT HAVE A SITE NUMBER, THE SITE IS IDENTIFIED BY THE SITE NAME.

AECOM

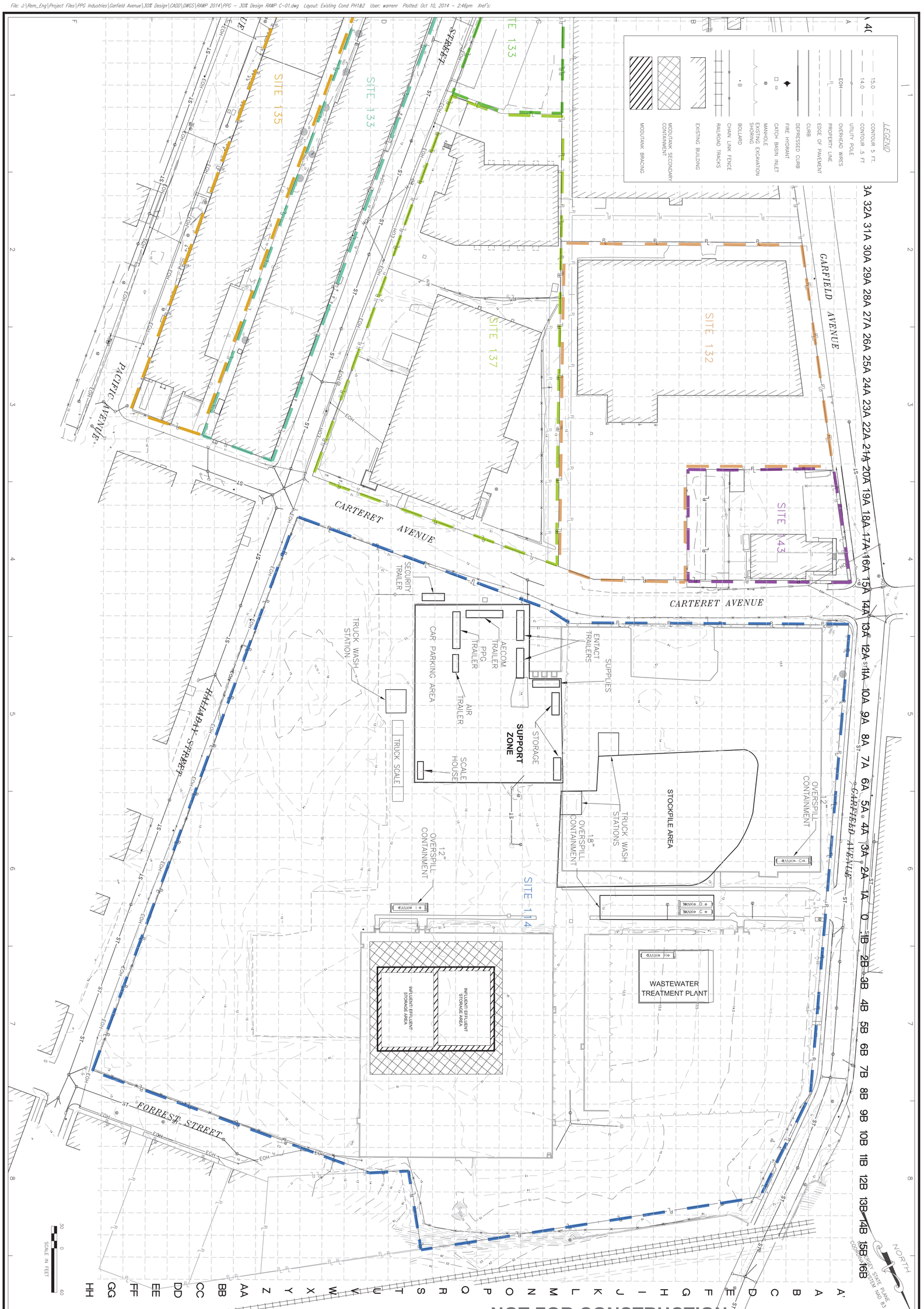
N

75 0 150

GRAPHIC SCALE IN FEET

PPG GARFIELD AVENUE GROUP SITES JERSEY CITY, NEW JERSEY			**SITE MAP** **REMEDIAL ACTION WORKPLAN**
DATE: 09/20/2018	DRWN: ALC		**FIGURE 1-1A**

File: \\uschl1fp001\Data\Projects\Jobs\Rem_Eng\Project Files\PPG Industries\Garfield Avenue\30% Design\CADD\DWGS\GA Group RAWP\2018-09-20_Figure1A.dwg Layout: Figure 1-1A User: carlsona1 Plotted: Sep 20,



2011 EXISTING CONDITIONS PHASE 1 & 2	PPG INDUSTRIES GARFIELD AVENUE SITES JERSEY CITY, HUDSON COUNTY, NEW JERSEY	AECOM 30 Knightsbridge Road, Suite 520 Piscataway, NJ 08854 www.aecom.com
REMEDIAL ACTION WORK PLAN	PROJ. NO.: 60190341.500A DATE: 10/10/14	

DRAWING NUMBER: 1-2
SHEET NUMBER:
REVISION: C

NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
C	RCW	10/10/14	FINAL RAWP EDITS				
B	R.M.T.	12/05/11	NJ DEP COMMENTS EDITS	C.W.M.	12/05/11	H.N.O.	12/06/11
A	RCW	05/16/11	RAWP				

NOT FOR CONSTRUCTION

NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
C	RCW	10/10/14	FINAL RAWP EDITS				
B	R.M.T.	12/05/11	NJ DEP COMMENTS EDITS	C.W.M.	12/05/11	H.N.Q.	12/06/11
A	RCW	05/16/11	RAWP				

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PPG INDUSTRIES
GARFIELD AVENUE SITES
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

PROJ. NO.: 60190341.500A DATE: 10/10/14

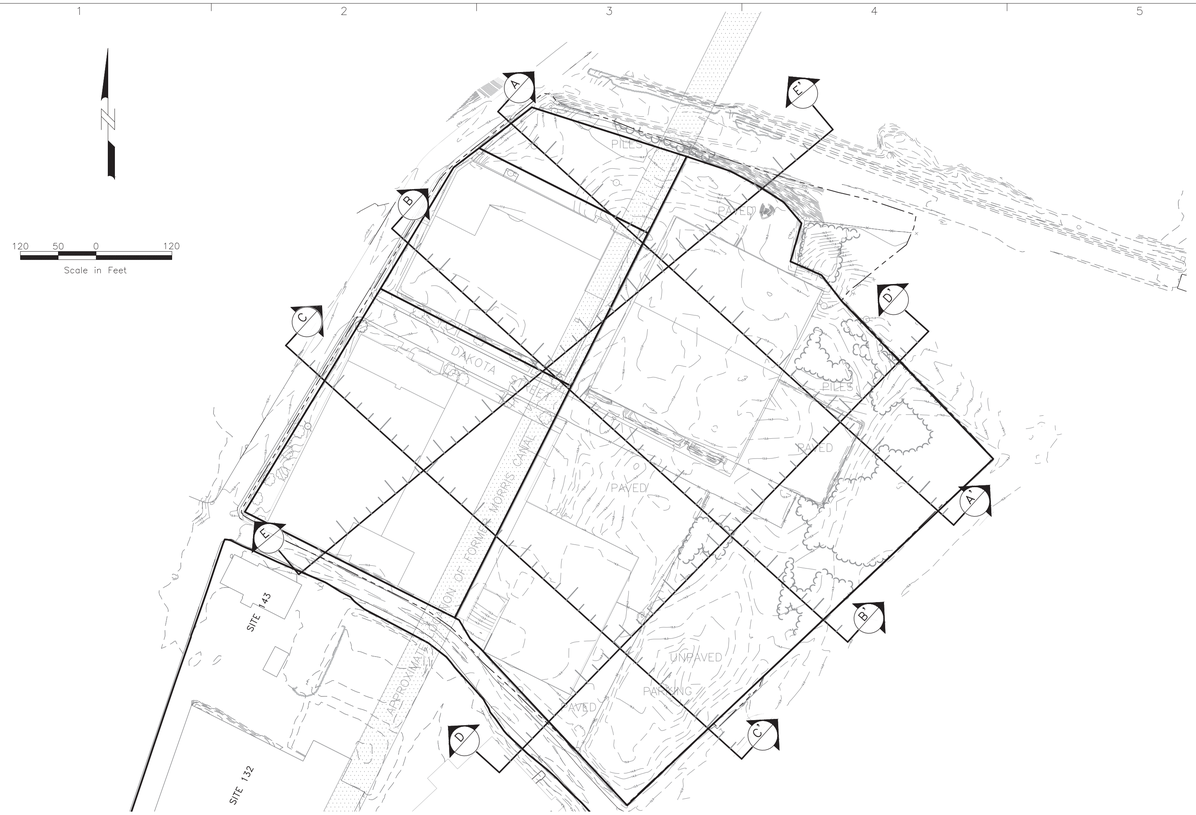
2011 EXISTING CONDITIONS PHASE 3

REMEDIAL ACTION WORK PLAN

DRAWING NUMBER: 1-3

SHEET NUMBER:

REVISION C



LEGEND

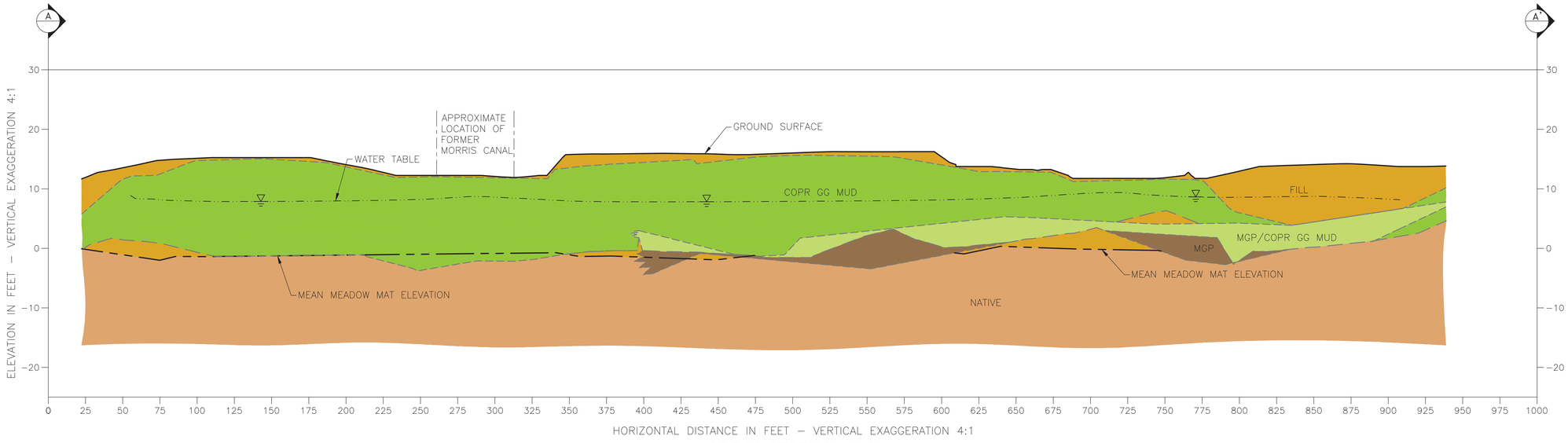
- = APPROXIMATE LOCATION OF THE FORMER MORRIS CANAL
- = ARTIFICIAL FILL
- = COPR GG MUD
- = MGP/COPR GG MUD
- = MGP
- = NATIVE
- = MEAN MEADOW MAT ELEVATION
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 0, 5, 10

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100

NOT FOR CONSTRUCTION

SITE LAYOUT AND CROSS SECTION LOCATIONS



CROSS SECTION - A-A'

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
A	R.M.T	05/16/11	RAWP				

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PPG INDUSTRIES
GARFIELD AVENUE SITES
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

DATE: 05/16/11

PROJ. NO.: 60190341.500A

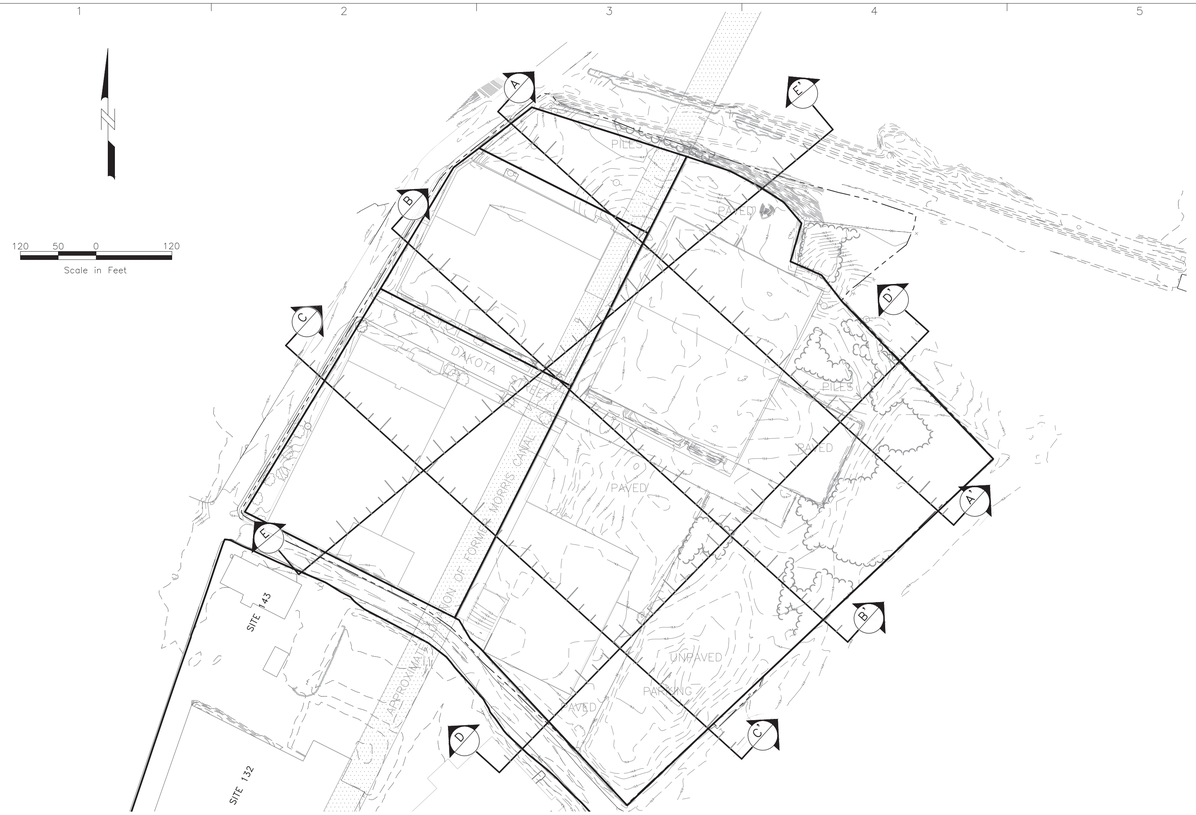
CROSS SECTION A-A'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER:
1-4

SHEET NUMBER:

REVISION A



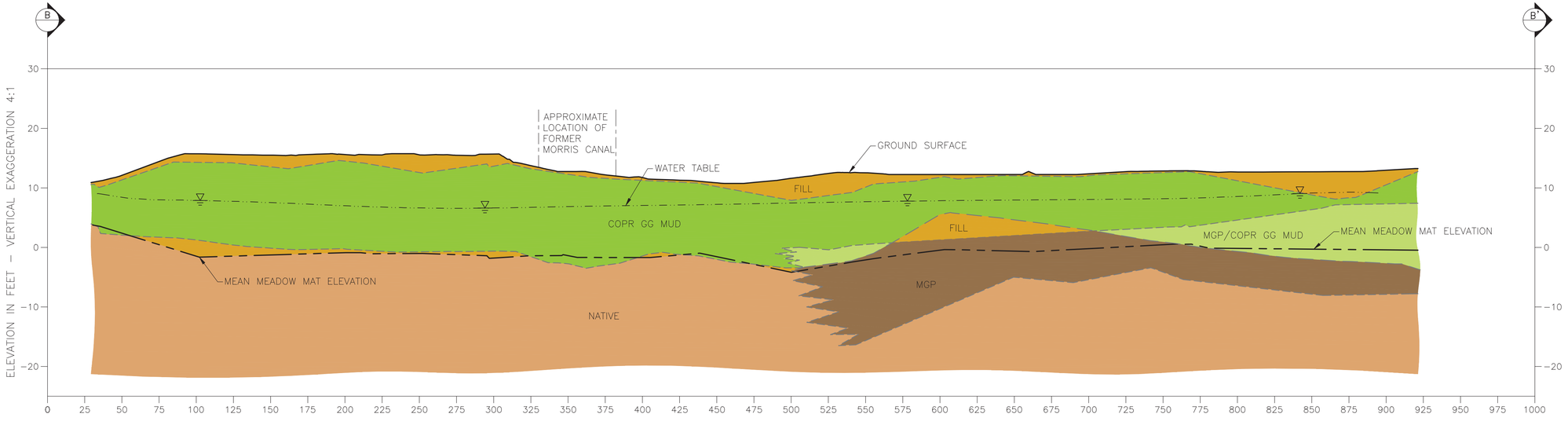
SITE LAYOUT AND CROSS SECTION LOCATIONS

LEGEND

- = APPROXIMATE LOCATION OF THE FORMER MORRIS CANAL
- = ARTIFICIAL FILL
- = COPR GG MUD
- = MGP/COPR GG MUD
- = MGP
- = NATIVE
- = MEAN MEADOW MAT ELEVATION
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 10, 5, 0

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100



CROSS SECTION - B-B'

NOT FOR CONSTRUCTION

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A	R.M.T	05/16/11	RAWP				

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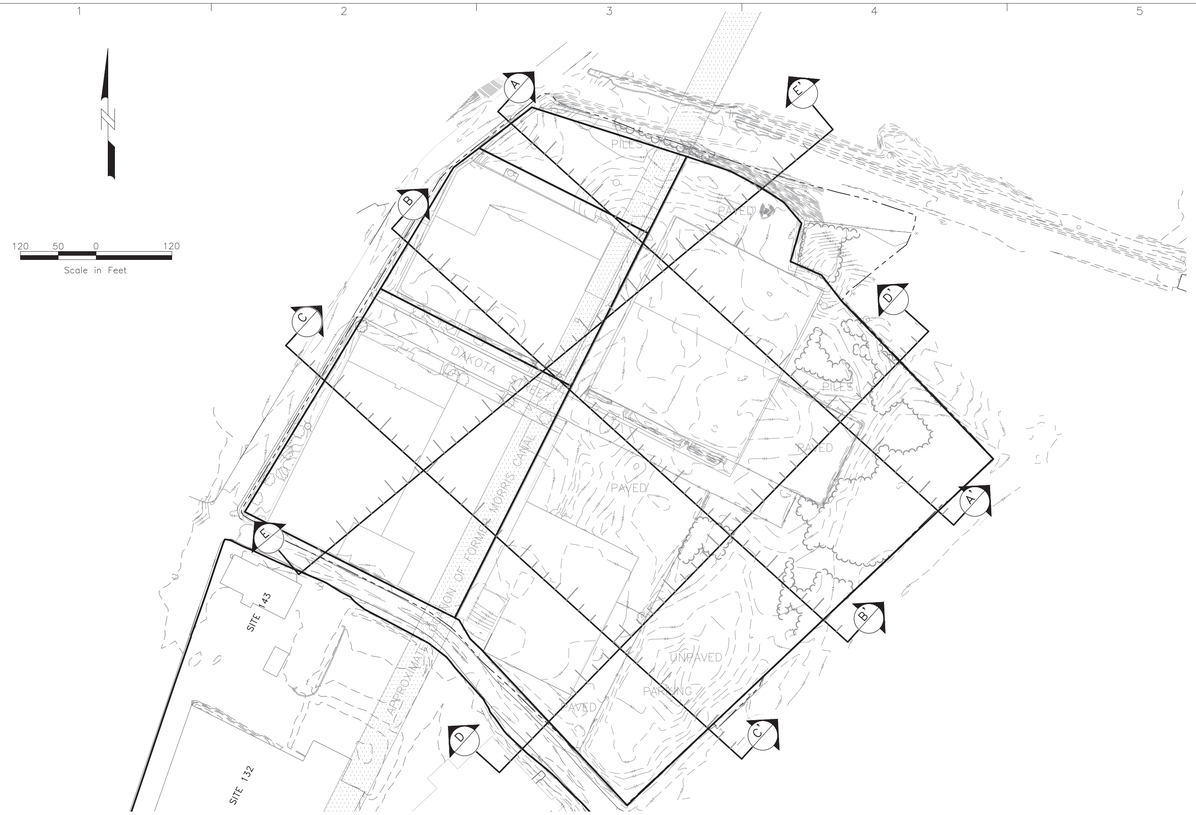
CROSS SECTION B-B'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 1-5

SHEET NUMBER:

REVISION A



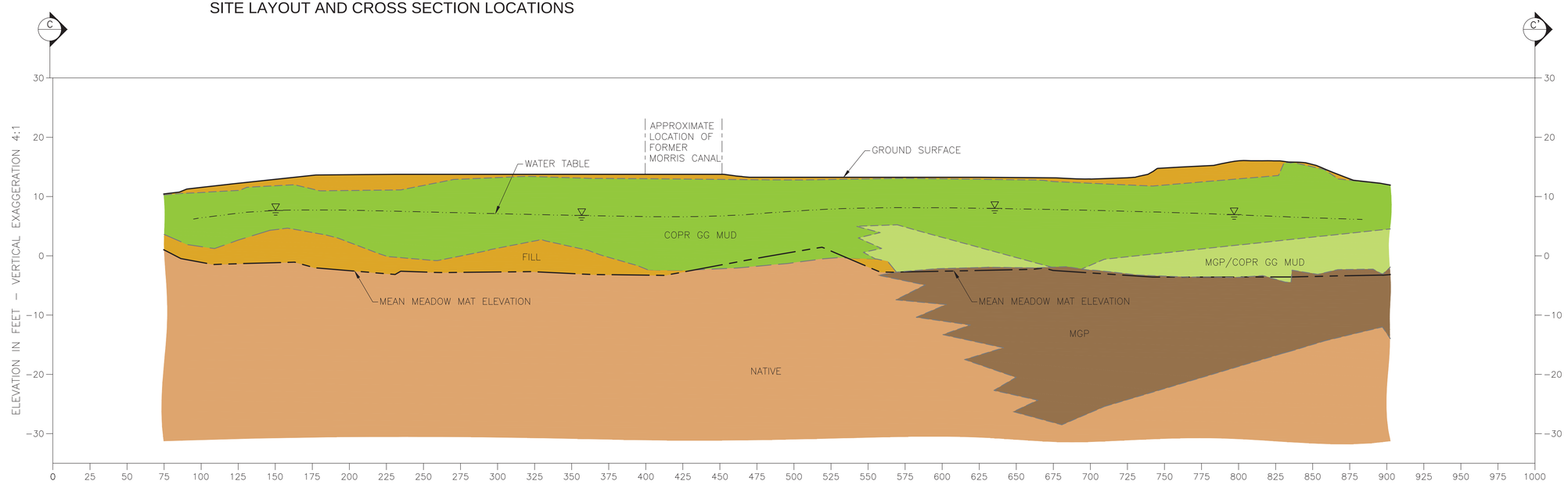
SITE LAYOUT AND CROSS SECTION LOCATIONS

LEGEND

- = APPROXIMATE LOCATION OF THE FORMER MORRIS CANAL
- = ARTIFICIAL FILL
- = COPR GG MUD
- = MGP/COPR GG MUD
- = MGP
- = NATIVE
- = MEAN MEADOW MAT ELEVATION
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 10, 5, 0

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100



CROSS SECTION - C-C'

NOT FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
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PROJ. NO.: 60190341.500A DATE: 05/16/11

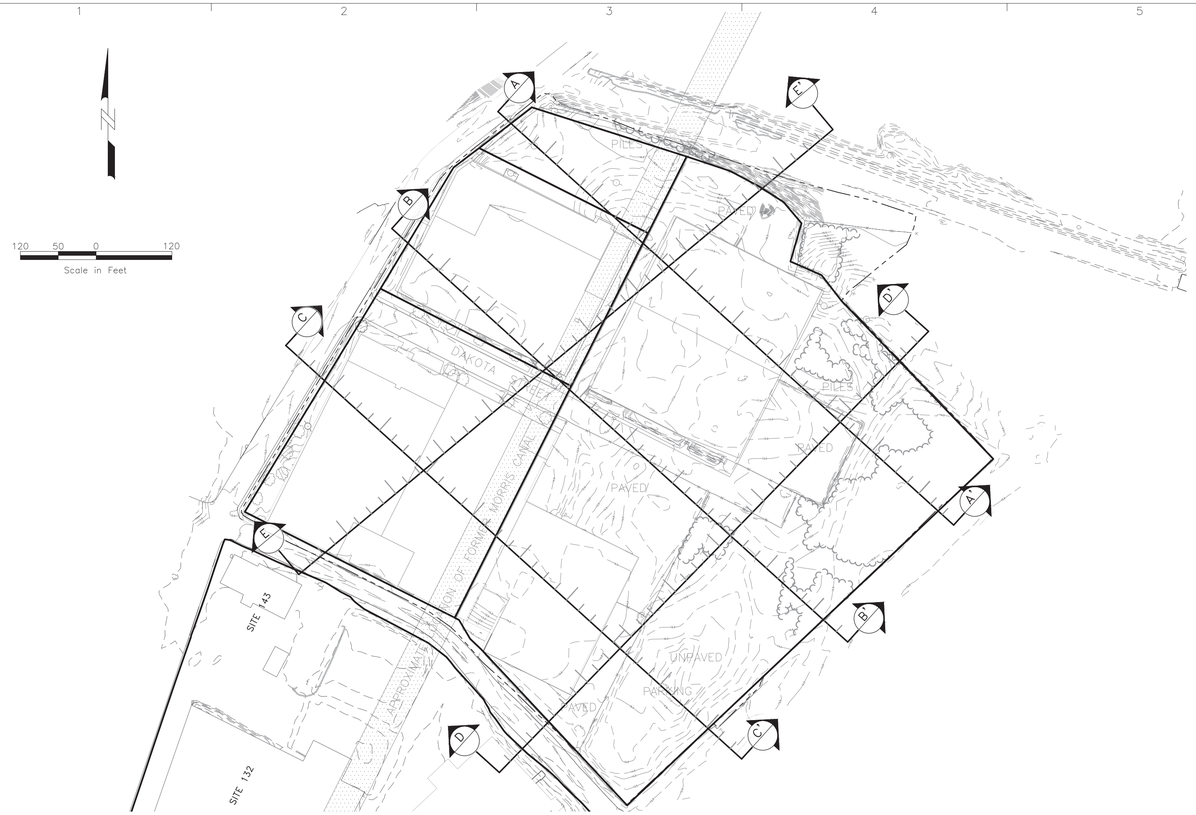
CROSS SECTION C-C'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 1-6

SHEET NUMBER:

REVISION A



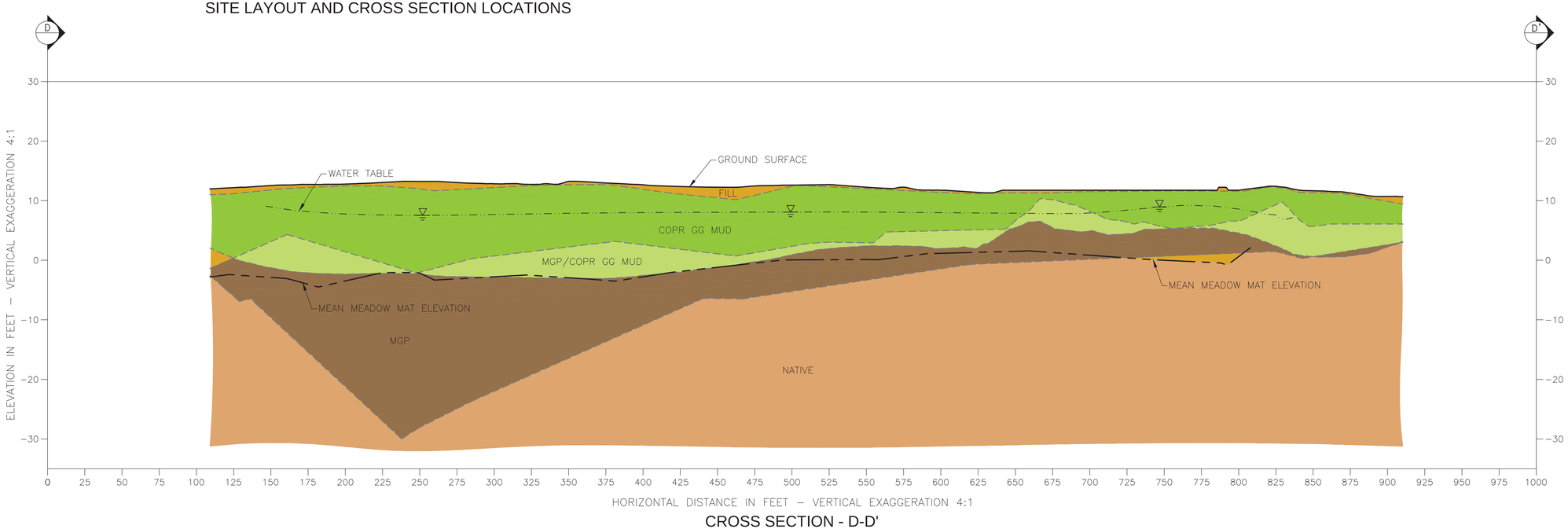
SITE LAYOUT AND CROSS SECTION LOCATIONS

LEGEND

- = APPROXIMATE LOCATION OF THE FORMER MORRIS CANAL
- = ARTIFICIAL FILL
- = COPR GG MUD
- = MGP/COPR GG MUD
- = MGP
- = NATIVE
- = MEAN MEADOW MAT ELEVATION
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 10, 5, 0

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100



CROSS SECTION - D-D'

NOT FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
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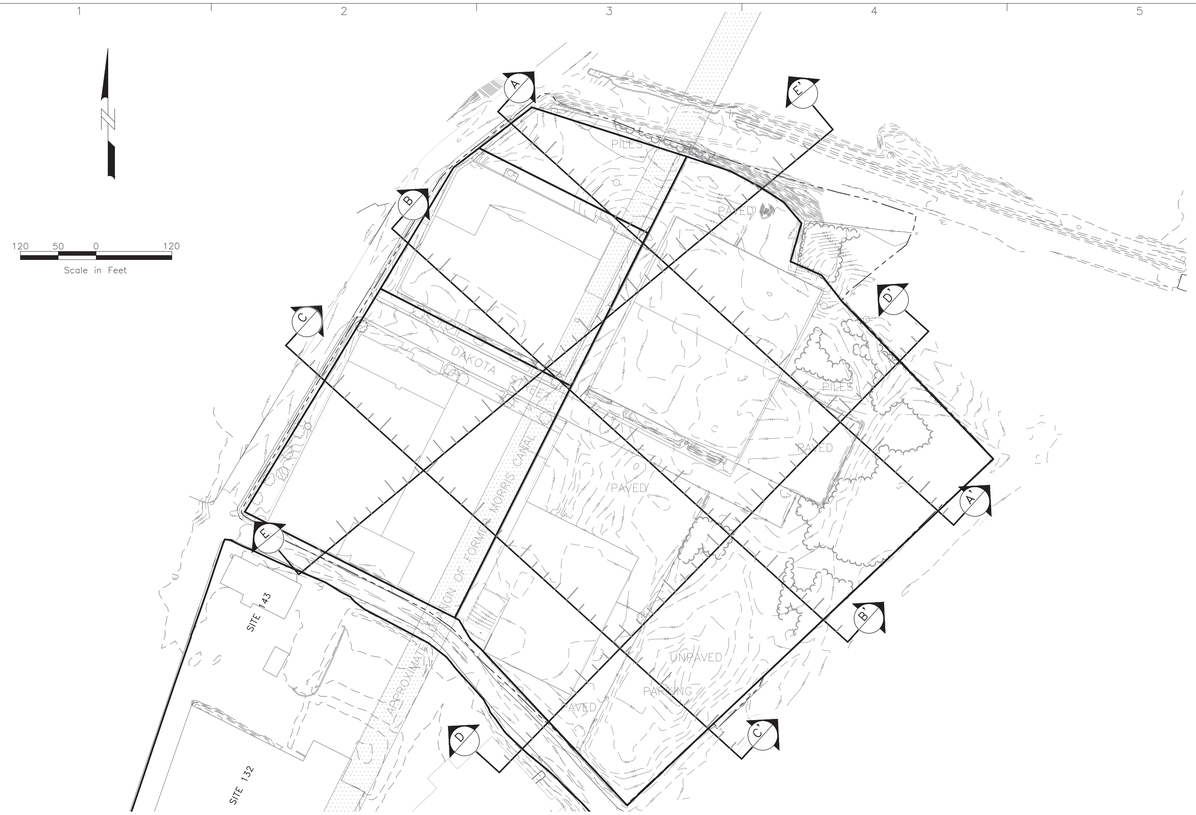
CROSS SECTION D-D'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 1-7

SHEET NUMBER:

REVISION A



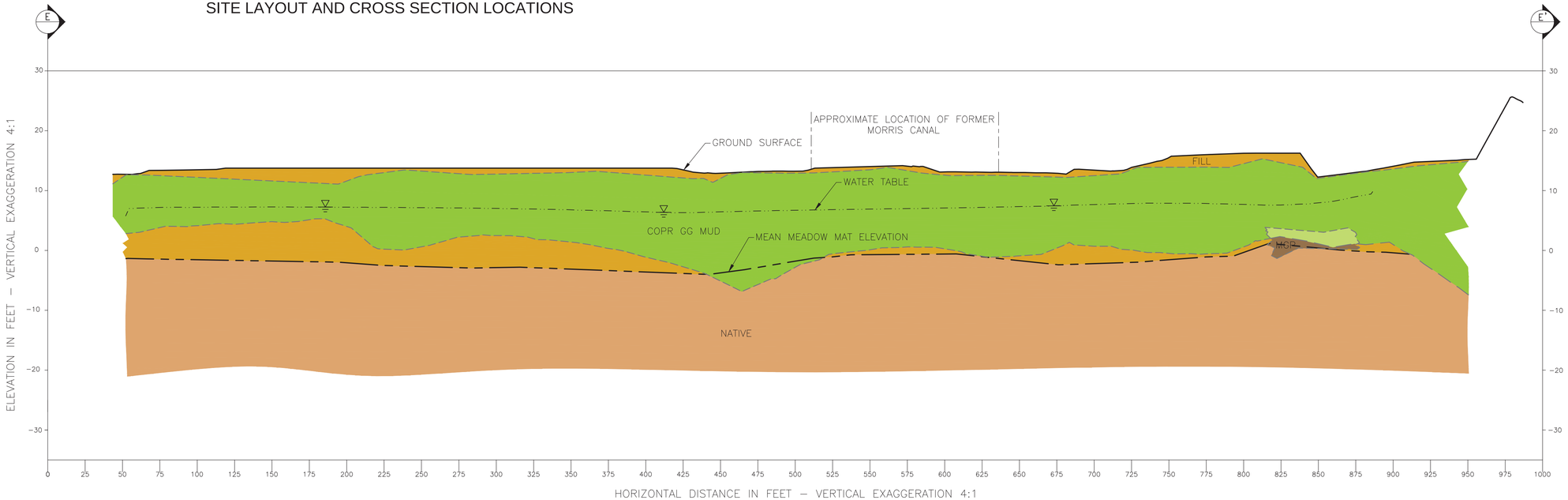
SITE LAYOUT AND CROSS SECTION LOCATIONS

LEGEND

- = APPROXIMATE LOCATION OF THE FORMER MORRIS CANAL
- = ARTIFICIAL FILL
- = COPR GG MUD
- = MGP/COPR GG MUD
- = MGP
- = NATIVE
- = MEAN MEADOW MAT ELEVATION
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 0, 5, 10

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100



CROSS SECTION - E-E'

NOT FOR CONSTRUCTION

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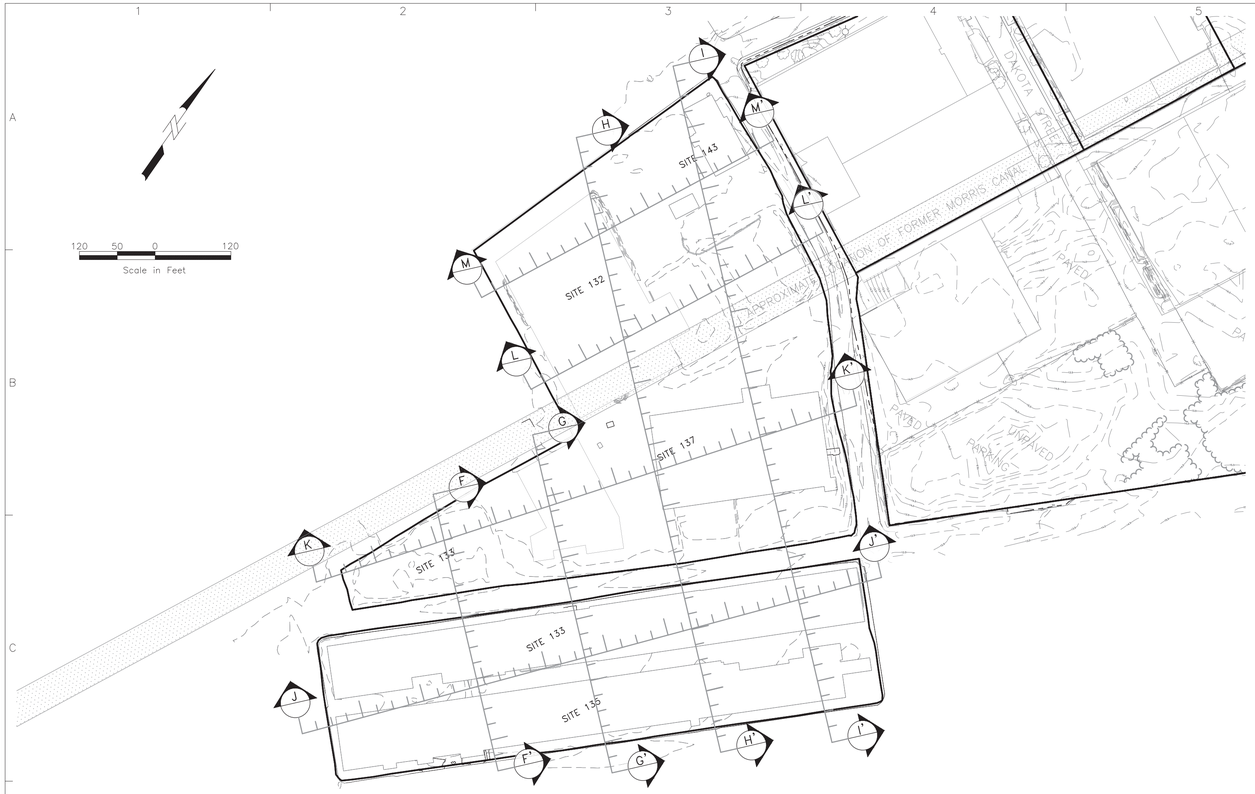
CROSS SECTION E-E'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 1-8

SHEET NUMBER:

REVISION: A



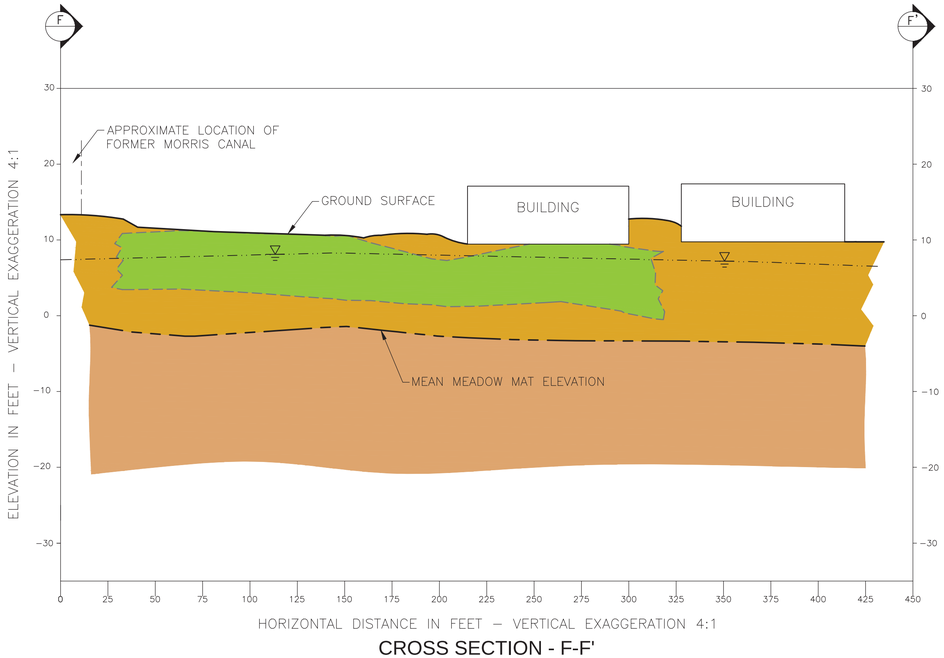
SITE LAYOUT AND CROSS SECTION LOCATIONS

LEGEND

- = APPROXIMATE LOCATION OF THE FORMER MORRIS CANAL
- = ARTIFICIAL FILL
- = COPR GG MUD
- = MGP/COPR GG MUD
- = MGP
- = NATIVE
- = MEAN MEADOW MAT ELEVATION
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 10, 5, 0

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100



CROSS SECTION - F-F'

NOT FOR CONSTRUCTION

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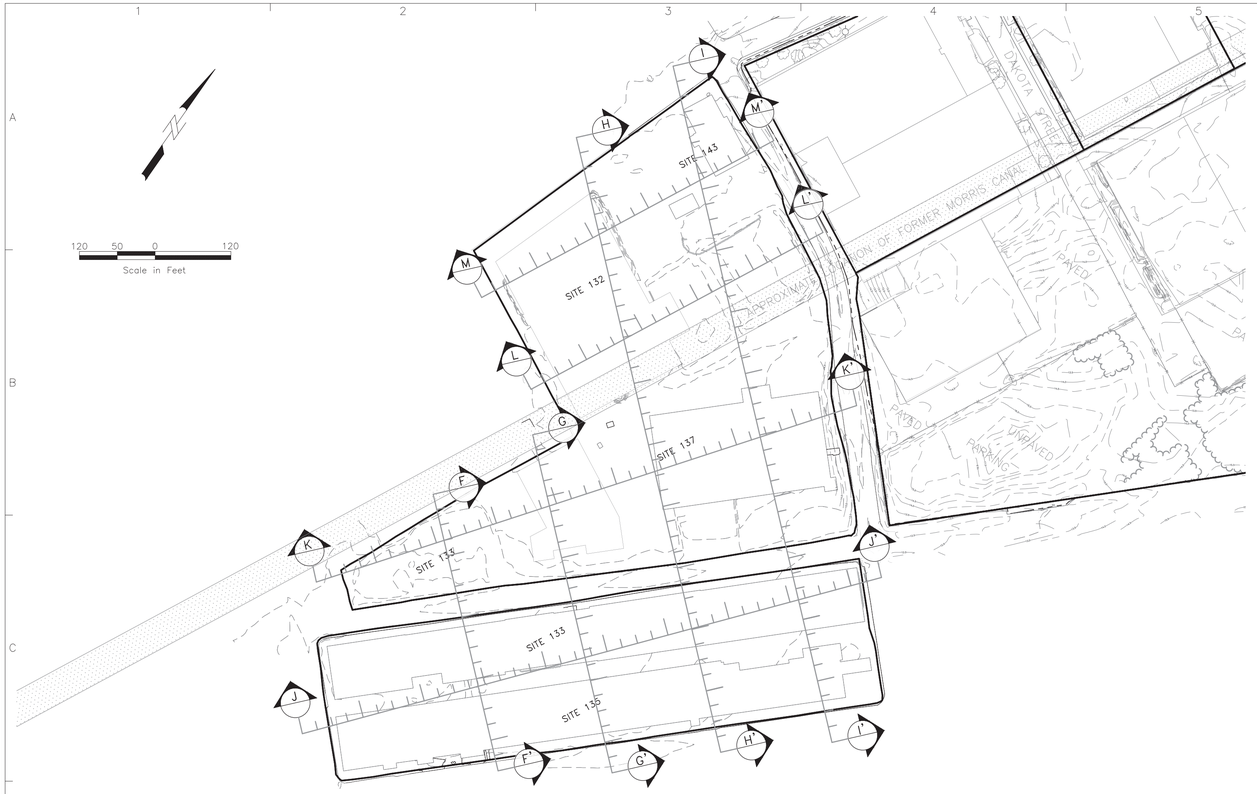
CROSS SECTION F-F'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 1-9

SHEET NUMBER:

REVISION A



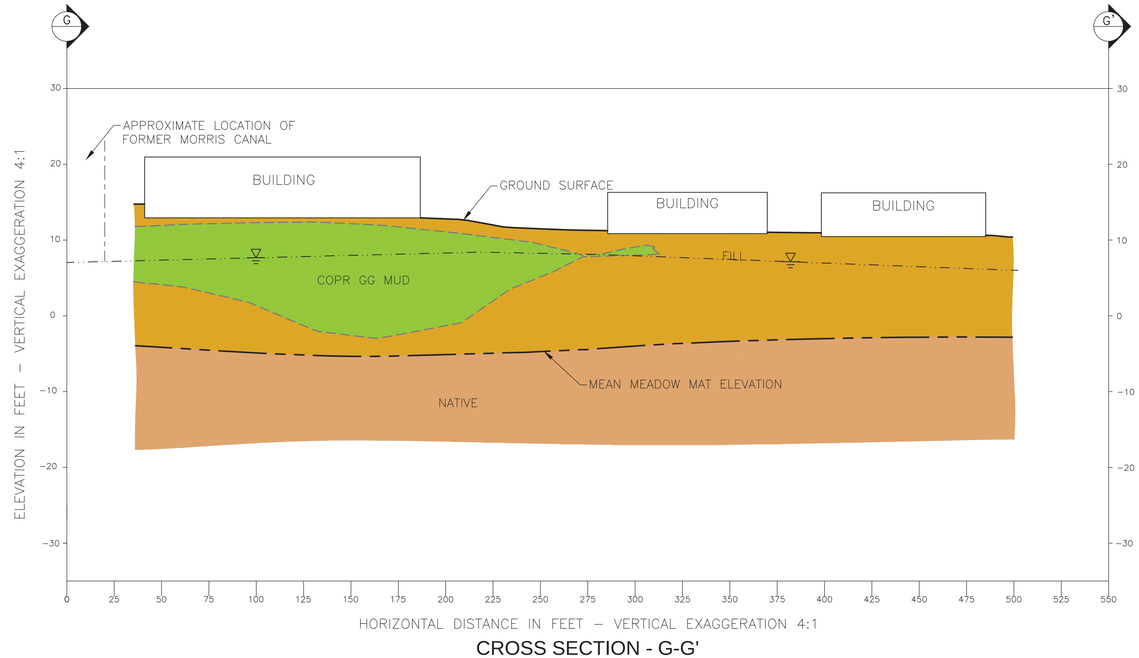
SITE LAYOUT AND CROSS SECTION LOCATIONS

LEGEND

- = APPROXIMATE LOCATION OF THE FORMER MORRIS CANAL
- = ARTIFICIAL FILL
- = COPR GG MUD
- = MGP/COPR GG MUD
- = MGP
- = NATIVE
- = MEAN MEADOW MAT ELEVATION
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 0, 5, 10

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100



CROSS SECTION - G-G'

NOT FOR CONSTRUCTION

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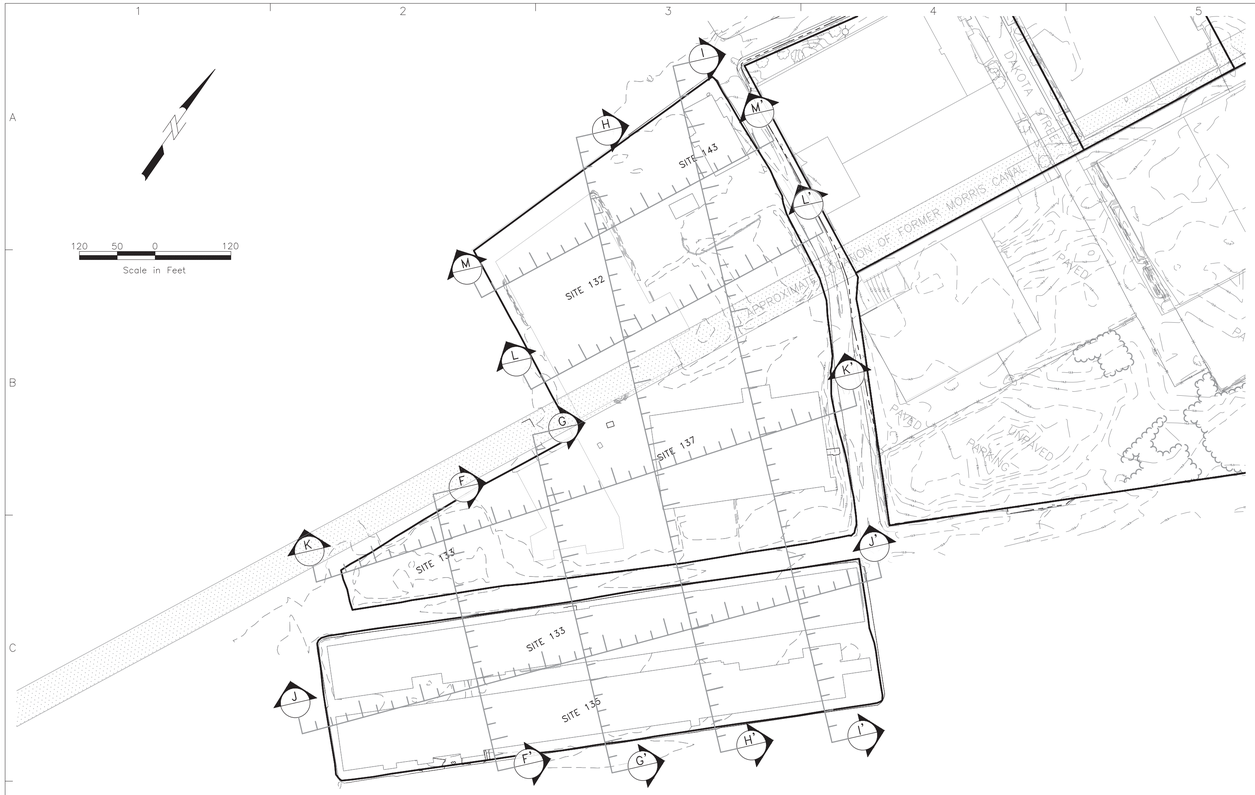
CROSS SECTION G-G'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 1-10

SHEET NUMBER:

REVISION B



SITE LAYOUT AND CROSS SECTION LOCATIONS

LEGEND

- = APPROXIMATE LOCATION OF THE FORMER MORRIS CANAL
- = ARTIFICIAL FILL
- = COPR GG MUD
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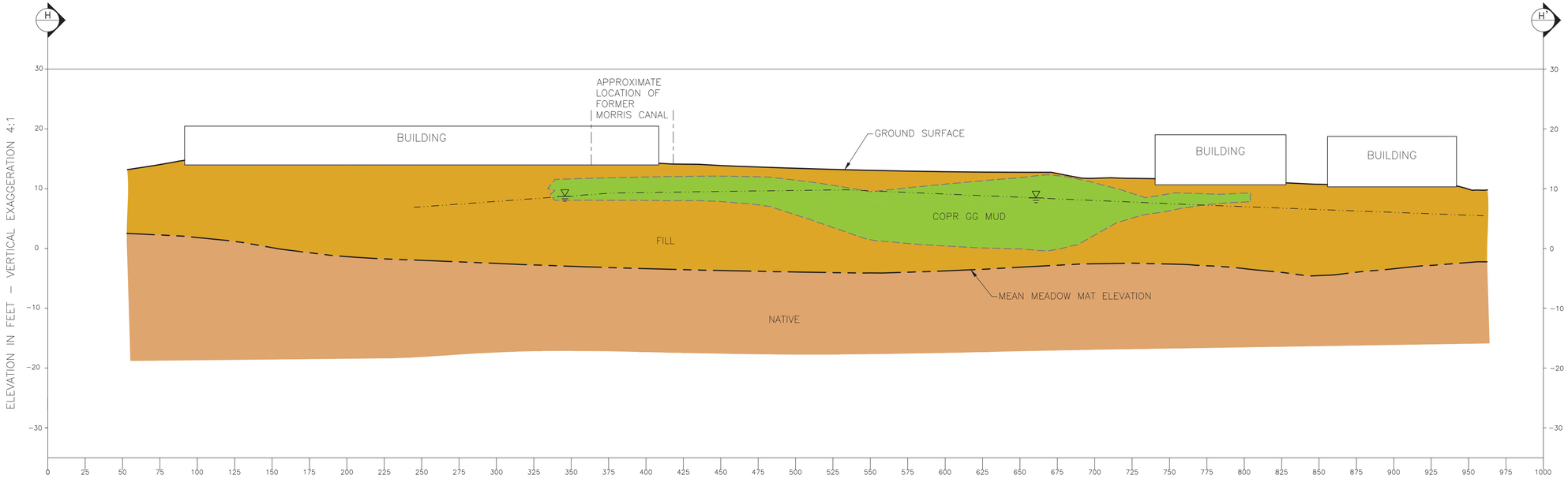
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 0, 5, 10

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100



CROSS SECTION - H-H'

NOT FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
B	R.M.T.	12/05/11	RI EDITS	C.W.M.	12/05/11	H.N.Q.	12/06/11
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PROJ. NO.: 60190341.500A DATE: 05/16/11

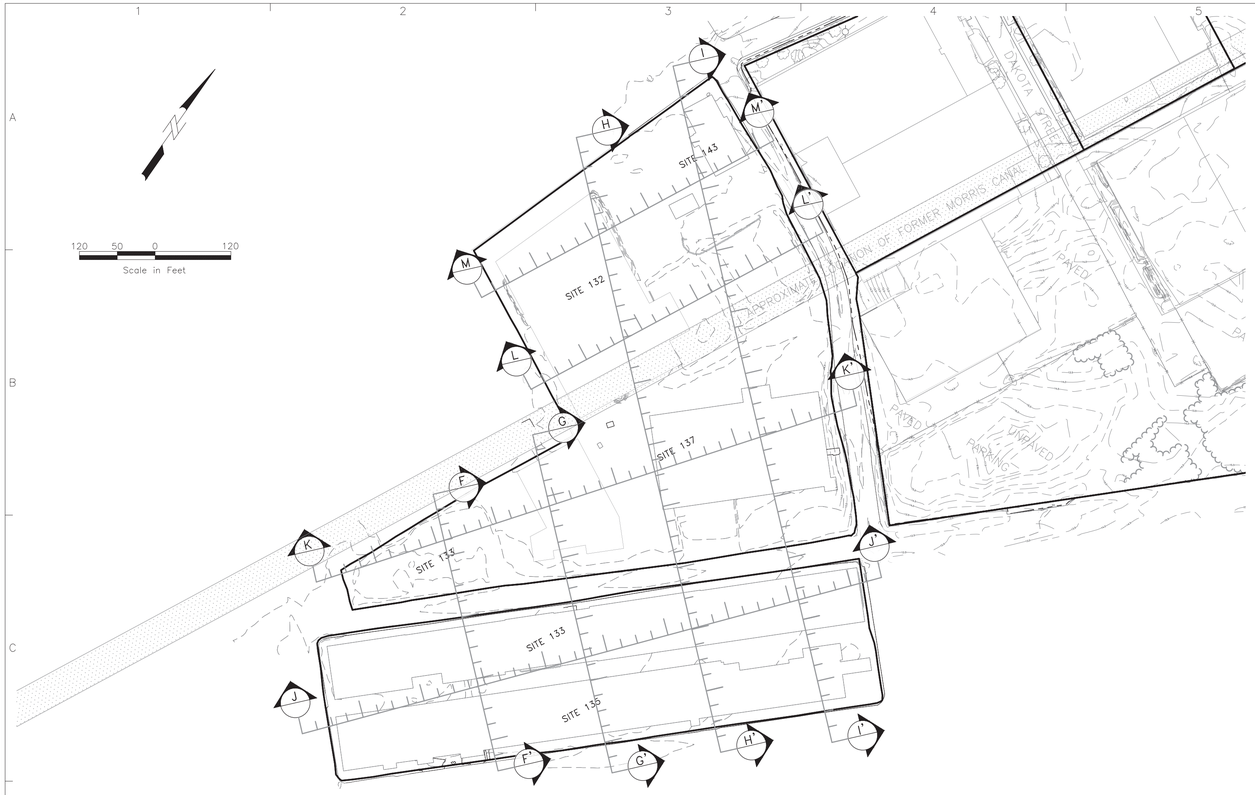
CROSS SECTION H-H'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 1-11

SHEET NUMBER:

REVISION B



SITE LAYOUT AND CROSS SECTION LOCATIONS

LEGEND

- = APPROXIMATE LOCATION OF THE FORMER MORRIS CANAL
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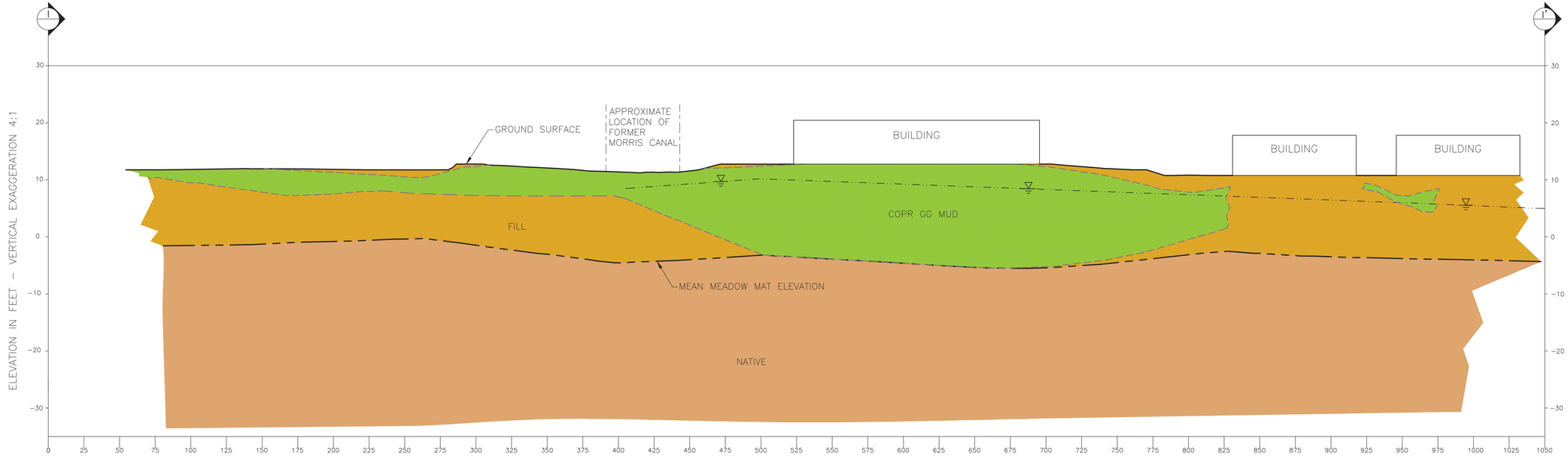
- = MEAN MEADOW MAT ELEVATION
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 0, 5, 10

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100



CROSS SECTION - I-I'

NOT FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
B	R.M.T.	12/05/11	RI EDITS	C.W.M.	12/05/11	H.N.Q.	12/06/11
A	R.M.T	05/16/11	RAWP				

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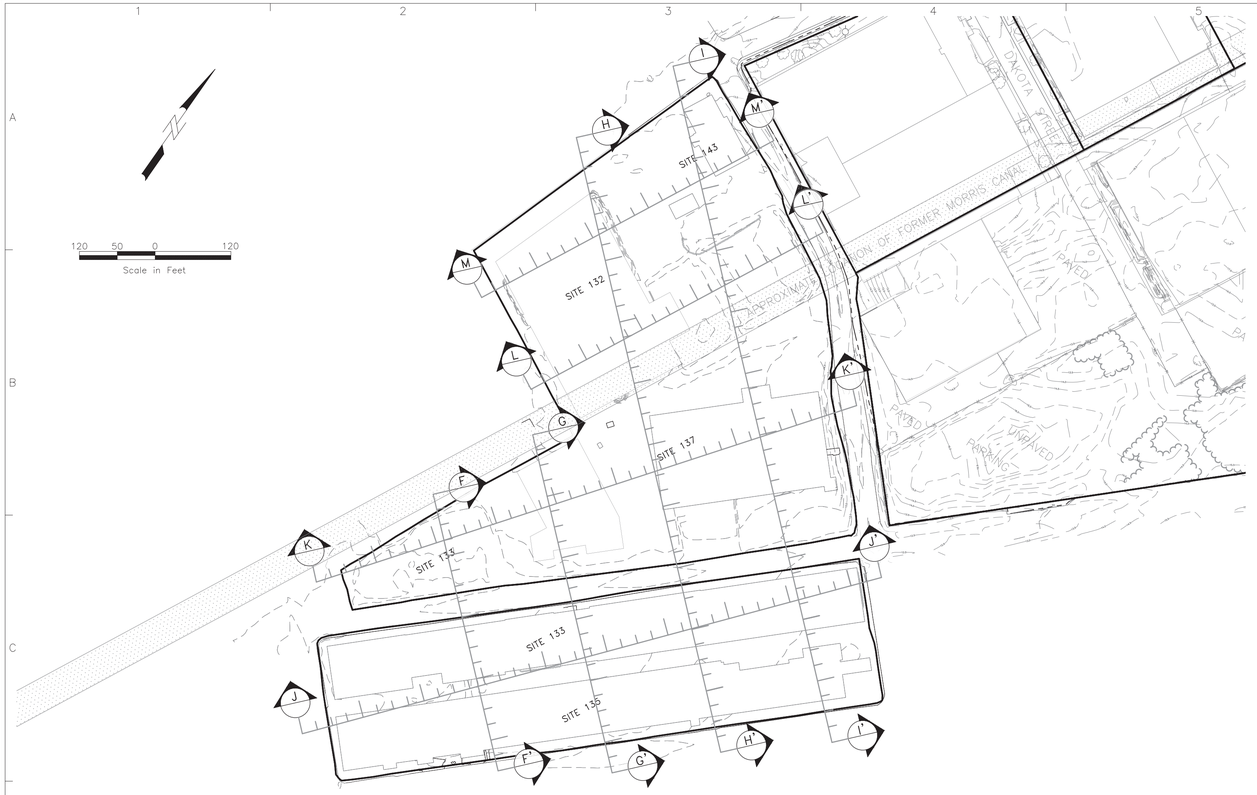
CROSS SECTION I-I'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 1-12

SHEET NUMBER:

REVISION B



LEGEND

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- = COPR GG MUD
- = MGP/COPR GG MUD
- = MGP
- = NATIVE
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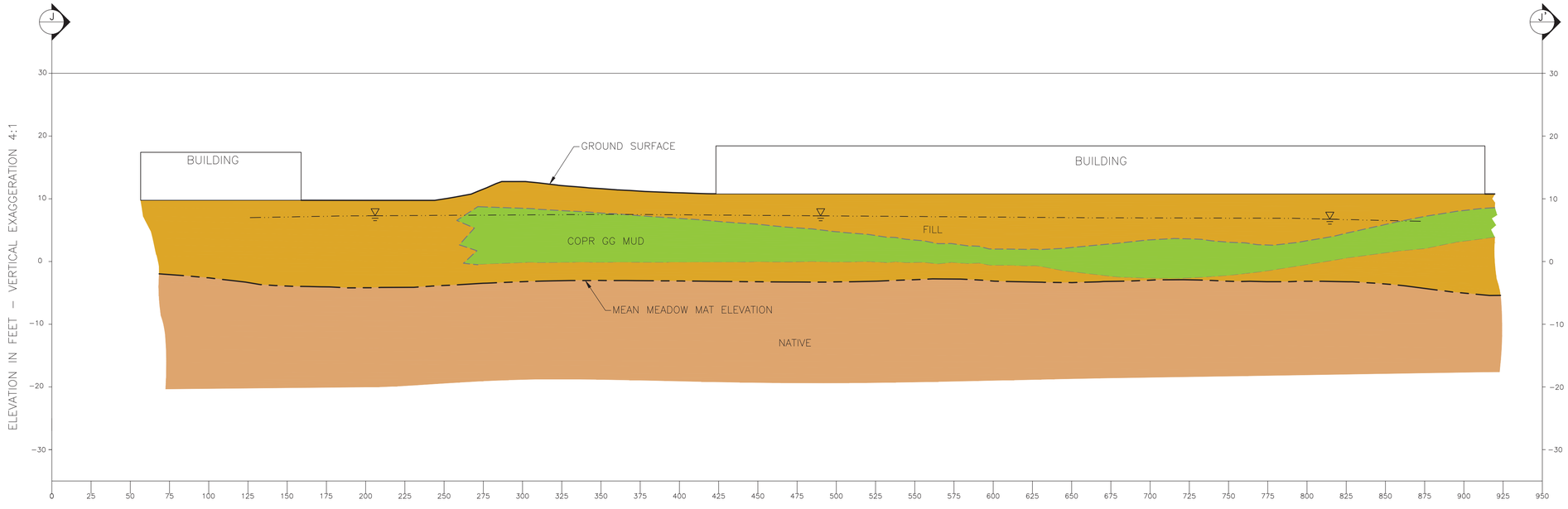
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 10, 5, 0

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100

SITE LAYOUT AND CROSS SECTION LOCATIONS



CROSS SECTION - J-J'

NOT FOR CONSTRUCTION

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DATE: 05/16/11

PROJ. NO.: 60190341.500A

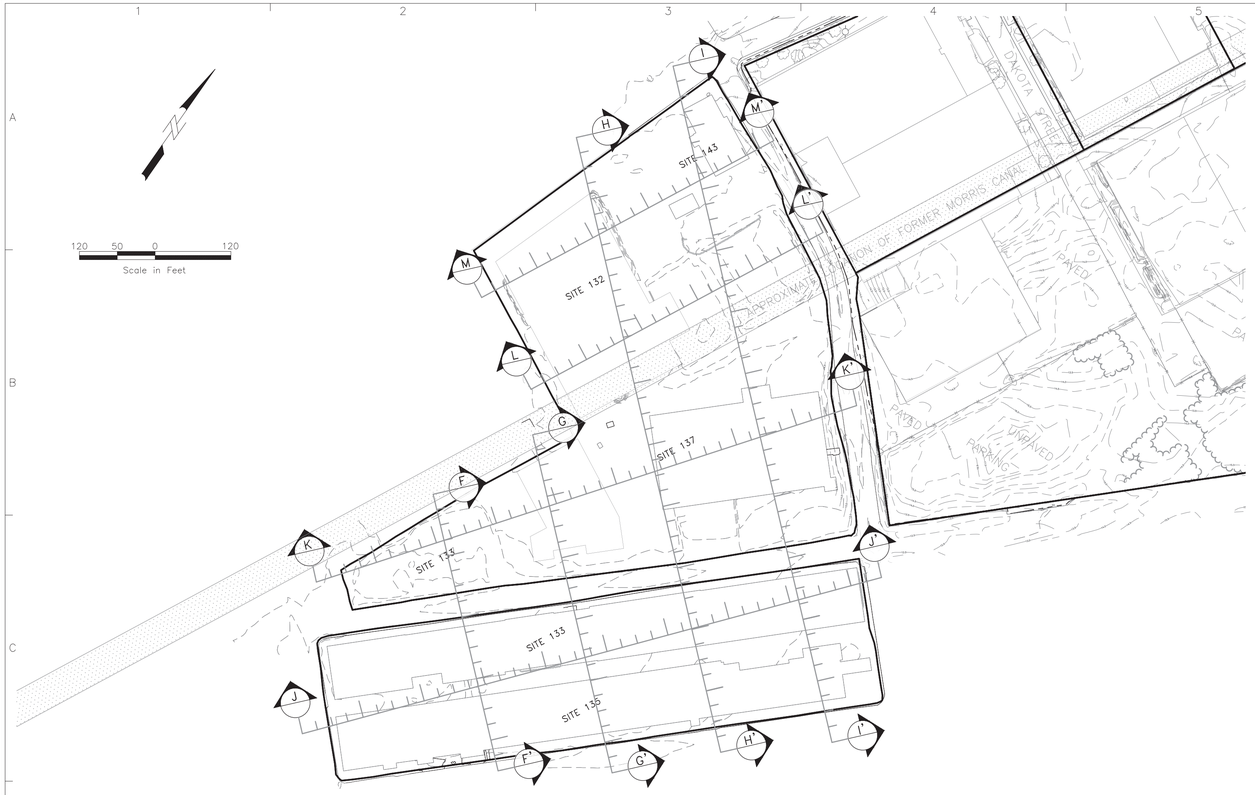
CROSS SECTION J-J'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER:
1-13

SHEET NUMBER:

REVISION A



LEGEND

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- = MGP/COPR GG MUD
- = MGP
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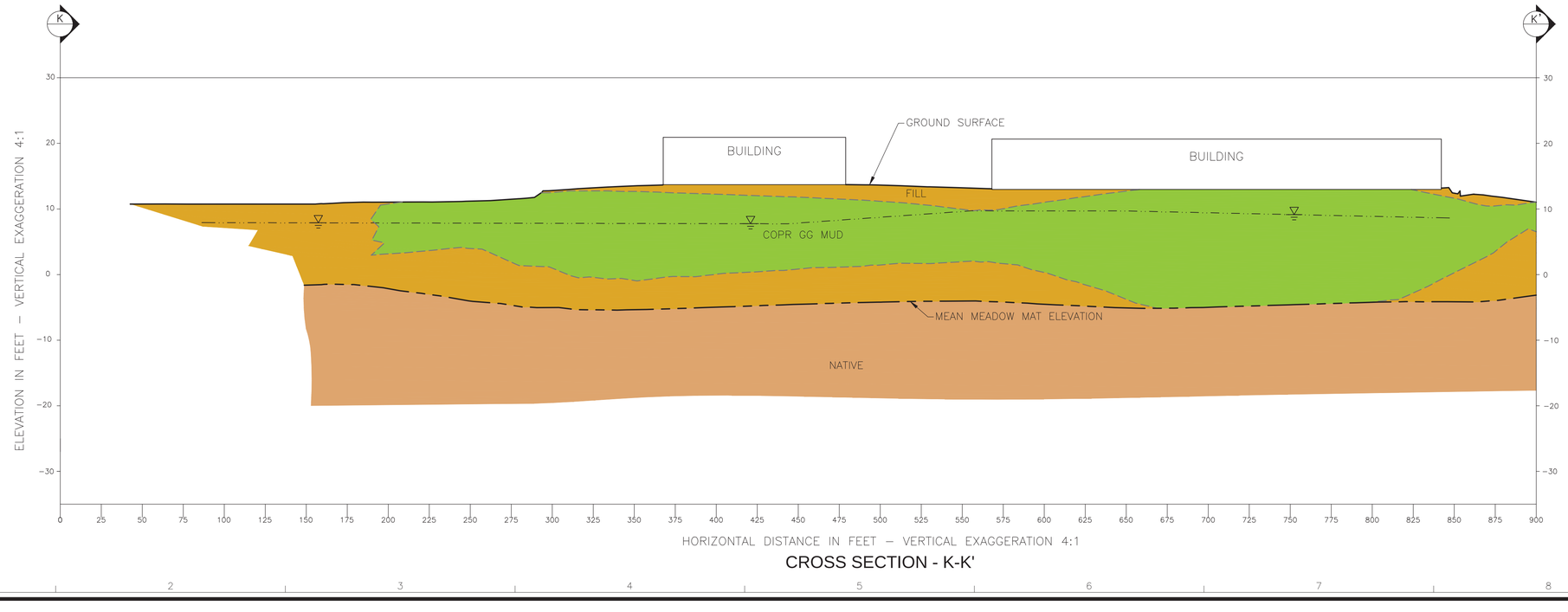
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 0, 5, 10

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100

NOT FOR CONSTRUCTION

SITE LAYOUT AND CROSS SECTION LOCATIONS



CROSS SECTION - K-K'

NO.	DRWN/DATE	REVISION	CHKD/DATE	APPVD/DATE
B	R.M.T. 12/05/11	RI EDITS	C.W.M.12/05/11	H.N.Q.12/06/11
A	R.M.T 05/16/11	RAWP		

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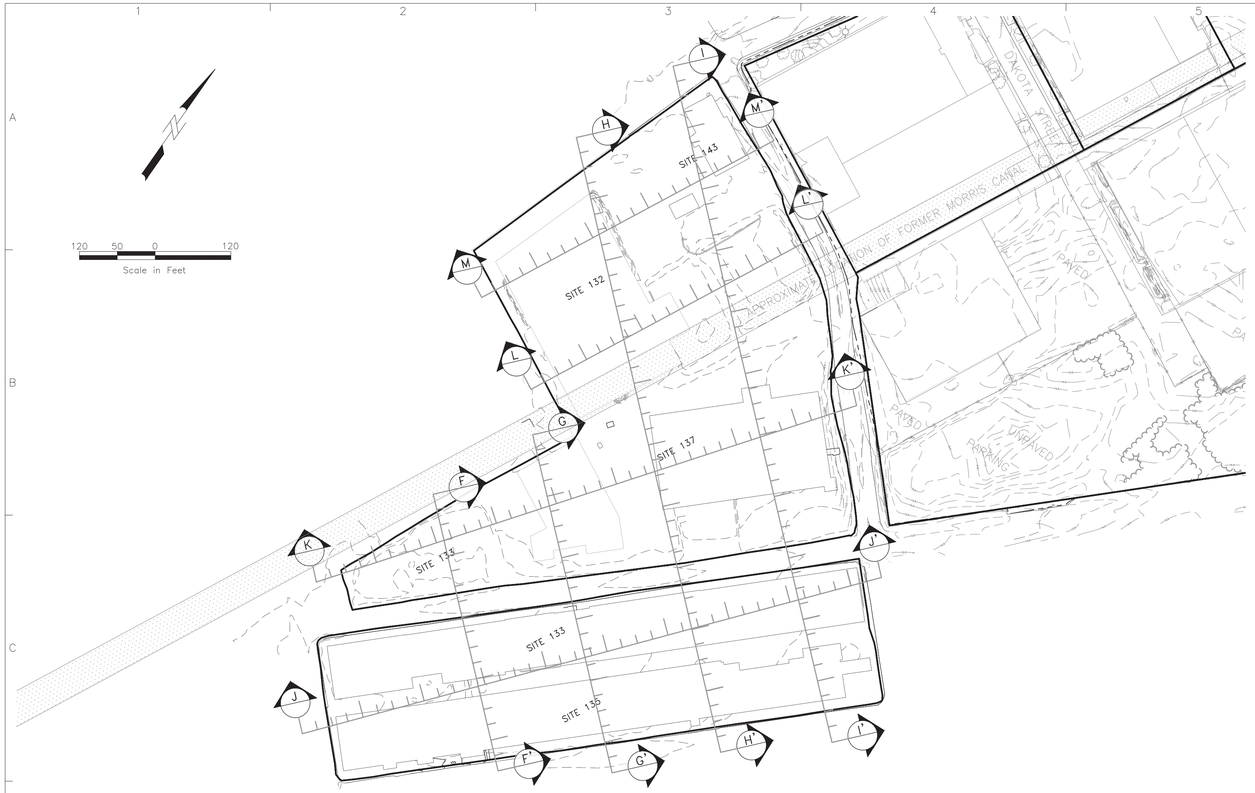
CROSS SECTION K-K'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 1-14

SHEET NUMBER:

REVISION B

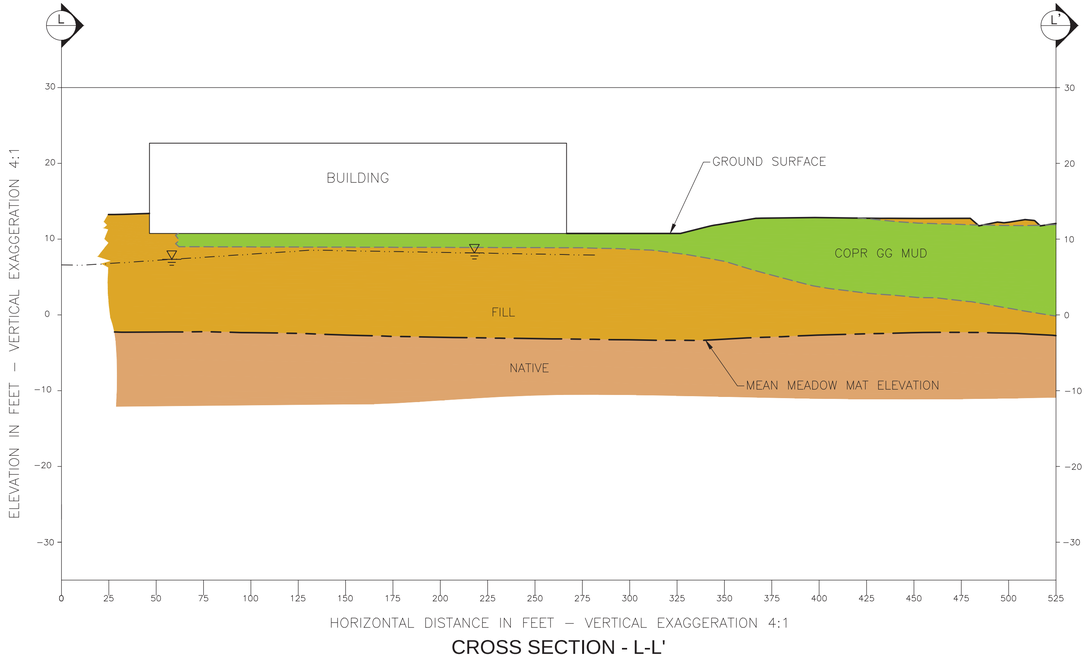


LEGEND

- = APPROXIMATE LOCATION OF THE FORMER MORRIS CANAL
- = ARTIFICIAL FILL
- = COPR GG MUD
- = MGP/COPR GG MUD
- = MGP
- = NATIVE
- = MEAN MEADOW MAT ELEVATION
- = MEAN WATER TABLE

VERTICAL SCALE IN FEET: 0, 5, 10

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100



CROSS SECTION - L-L'

NOT FOR CONSTRUCTION

NO.	DRWN/DATE	REVISION	CHKD/DATE	APPVD/DATE
B	R.M.T. 12/05/11	RI EDITS	C.W.M.12/05/11	H.N.Q.12/06/11
A	R.M.T 05/16/11	RAWP		

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DATE: 05/16/11

PROJ. NO.: 60190341.500A

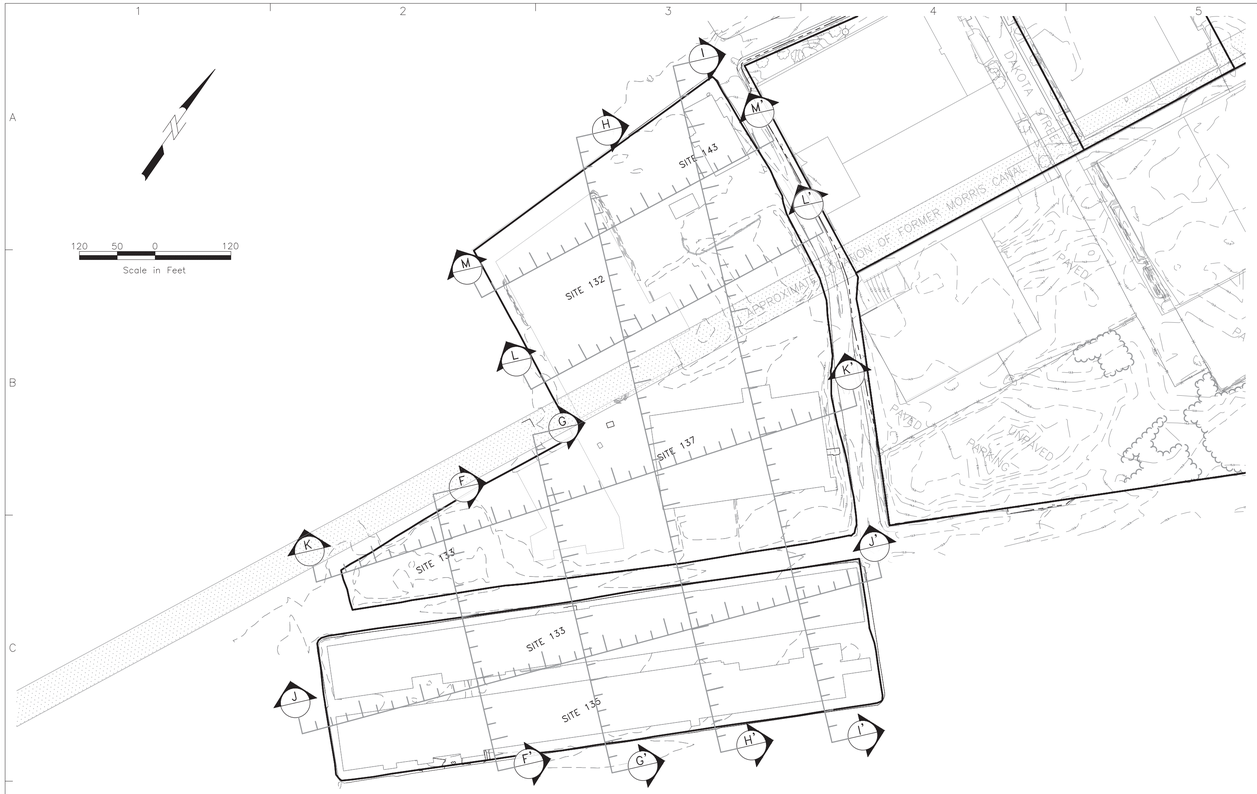
CROSS SECTION L-L'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER:
1-15

SHEET NUMBER:

REVISION B



SITE LAYOUT AND CROSS SECTION LOCATIONS

LEGEND

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- = ARTIFICIAL FILL
- = COPR GG MUD
- = MGP/COPR GG MUD
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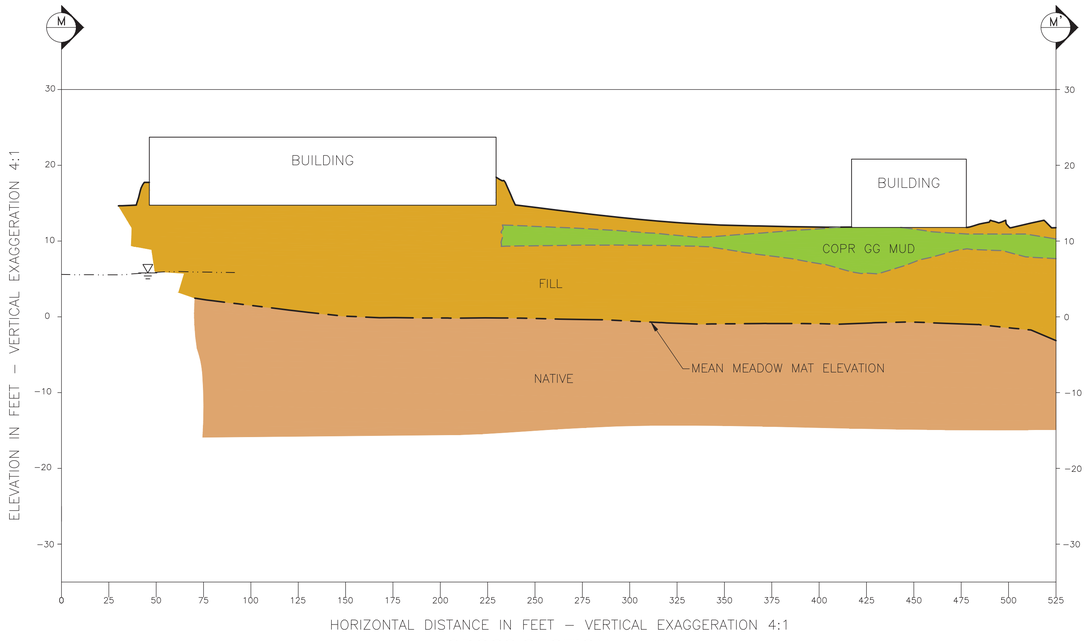
VERTICAL SCALE IN FEET: 10, 5, 0

HORIZONTAL SCALE IN FEET: 0, 25, 50, 100



CROSS SECTION - M-M'

NOT FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
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CROSS SECTION M-M'
CONCEPTUAL REMEDIAL DESIGN

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 1-16

SHEET NUMBER:

REVISION A

STORM DRAIN INLET PROTECTION 2 6-4

4 6-4 JERSEY BARRIER WITH FENCE

2 6-4 STORM DRAIN INLET PROTECTION

GARFIELD AVENUE

CARTERET AVENUE

NORTH

NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83

LEGEND

- UTILITY POLE
- OVERHEAD WIRES
- PROPERTY LINE
- EDGE OF PAVEMENT
- CURB
- DEPRESSED CURB
- FIRE HYDRANT
- CATCH BASIN INLET
- MANHOLE
- BOLLARD
- CHAIN LINK FENCE
- RAILROAD TRACKS
- EXISTING BUILDING
- JERSEY BARRIER W/FENCE
- STRAW BALE SILT FENCE
- EXCAVATION AREA
- MODUTANK SECONDARY CONTAINMENT
- MODUTANK BRACING
- IRM 1
- MONITORING WELL TO REMAIN
- MONITORING WELL PREVIOUSLY ABANDONED
- MONITORING WELL TO BE ABANDONED
- EXISTING EXCAVATION SHORING

IRM # 1

WASTEWATER TREATMENT PLANT

CONNECT JERSEY BARRIER TO EXISTING FENCE

CONNECT JERSEY BARRIER TO EXISTING FENCE

1 6-4 STRAW BALE/SILT FENCE

SUPPORT ZONE

DECON PAD

INFLUENT/ EFFLUENT STORAGE AREA

INFLUENT/ EFFLUENT STORAGE AREA

3 6-4 CONSTRUCTION ENTRANCE

6 6-4 DECONTAMINATION PAD

DECON PAD

DECON PAD

200 C.Y. STORAGE BIN

290 FEET

50 FEET

26 FEET

139 FEET

18 INCH BERM

SOIL STOCKPILES

136 FEET

320 FEET

POTENTIAL NON-HAZARDOUS MATERIAL STOCKPILE AREA

HAZARDOUS MATERIAL STOCKPILE AREA

7 6-4 STOCKPILE AREAS

STORM DRAIN INLET PROTECTION 2 6-4

STORM DRAIN INLET PROTECTION 2 6-4

STORM DRAIN INLET PROTECTION 2 6-4

STREET

CARTERET AVENUE

HALLADAY STREET

FORREST STREET

PACIFIC AVENUE

NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR LOCATING, DISCONNECTING, ABANDONING, AND/OR PROTECTING ALL UTILITIES WITHIN THE LIMIT OF WORK AS NEEDED.
2. CONTRACTOR SHALL PRE-EXCAVATE SHEET PILE ALIGNMENTS TO LOCATE AND PROTECT ALL UTILITIES AND REMOVE ALL OBSTRUCTIONS TO 15 FEET BELOW GROUND SURFACE.
3. CONTRACTOR TO CONSTRUCT AND PLACE CONSTRUCTION ENTRANCE, DECONTAMINATION PAD, AND STOCKPILES AS NECESSARY TO ACCOMMODATE EXCAVATION PHASING.

30 0 60
SCALE IN FEET

NOT FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION
C	RCW	10/10/14	FINAL RAWP EDITS
B	R.M.T.	12/05/11	NJ DEP COMMENT EDITS
A	RCW	05/16/11	RAWP

NO.	DATE	CHKD	APPVD
C	12/06/11	H.N.Q	C.W.M

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GARFIELD AVENUE SITES
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

PROJ. NO.: 60190341.500A DATE: 10/10/14

CONCEPTUAL PHASE 1 SITE PREPARATION AND EROSION CONTROL

REMEDIAL ACTION WORK PLAN

DRAWING NUMBER: 6-1

SHEET NUMBER:

REVISION C

LEGEND

- UTILITY POLE
- OVERHEAD WIRES
- PROPERTY LINE
- EDGE OF PAVEMENT
- CURB
- DEPRESSED CURB
- FIRE HYDRANT
- CATCH BASIN INLET
- MANHOLE
- BOLLARD
- CHAIN LINK FENCE
- RAILROAD TRACKS
- EXISTING BUILDING
- JERSEY BARRIER W/FENCE
- STRAW BALE SILT FENCE
- EXCAVATION AREA
- MODUTANK SECONDARY CONTAINMENT
- MODUTANK BRACING
- IRM 1
- MONITORING WELL TO REMAIN
- MONITORING WELL PREVIOUSLY ABANDONED
- MONITORING WELL TO BE ABANDONED
- EXISTING EXCAVATION SHORING

TEMPORARY CONSTRUCTION FENCE 5 6-4

STOCKPILE AREAS 7 6-4

CONSTRUCTION ENTRANCE 3 6-4

STORM DRAIN INLET PROTECTION 2 6-4

JERSEY BARRIER WITH FENCE 4 6-4

STRAW BALE/SILT FENCE 1 6-4

DECONTAMINATION PAD 6 6-4

CONNECT JERSEY BARRIER/FENCE TO CHAIN LINK FENCE

SUPPORT ZONE

GARFIELD AVENUE

CARTERET AVENUE

HALLADAY STREET

FOREST STREET

PACIFIC AVENUE

SOIL STOCKPILE

HAZARDOUS MATERIAL STOCKPILE AREA

POTENTIAL NON-HAZARDOUS MATERIAL STOCKPILE AREA

18 INCH BERM

200 C.Y. STORAGE BIN

DECON PAD

INFLUENT/ EFFLUENT STORAGE AREA

WASTEWATER TREATMENT PLANT

IRM # 1

NOTES:

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30 0 60
SCALE IN FEET

NORTH
NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD 83

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NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
C	RCW	10/10/14	FINAL RAWP EDITS	C.W.M.	12/05/11	H.N.Q.	12/06/11
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PROJ. NO.: 60190341.500A DATE: 10/10/14

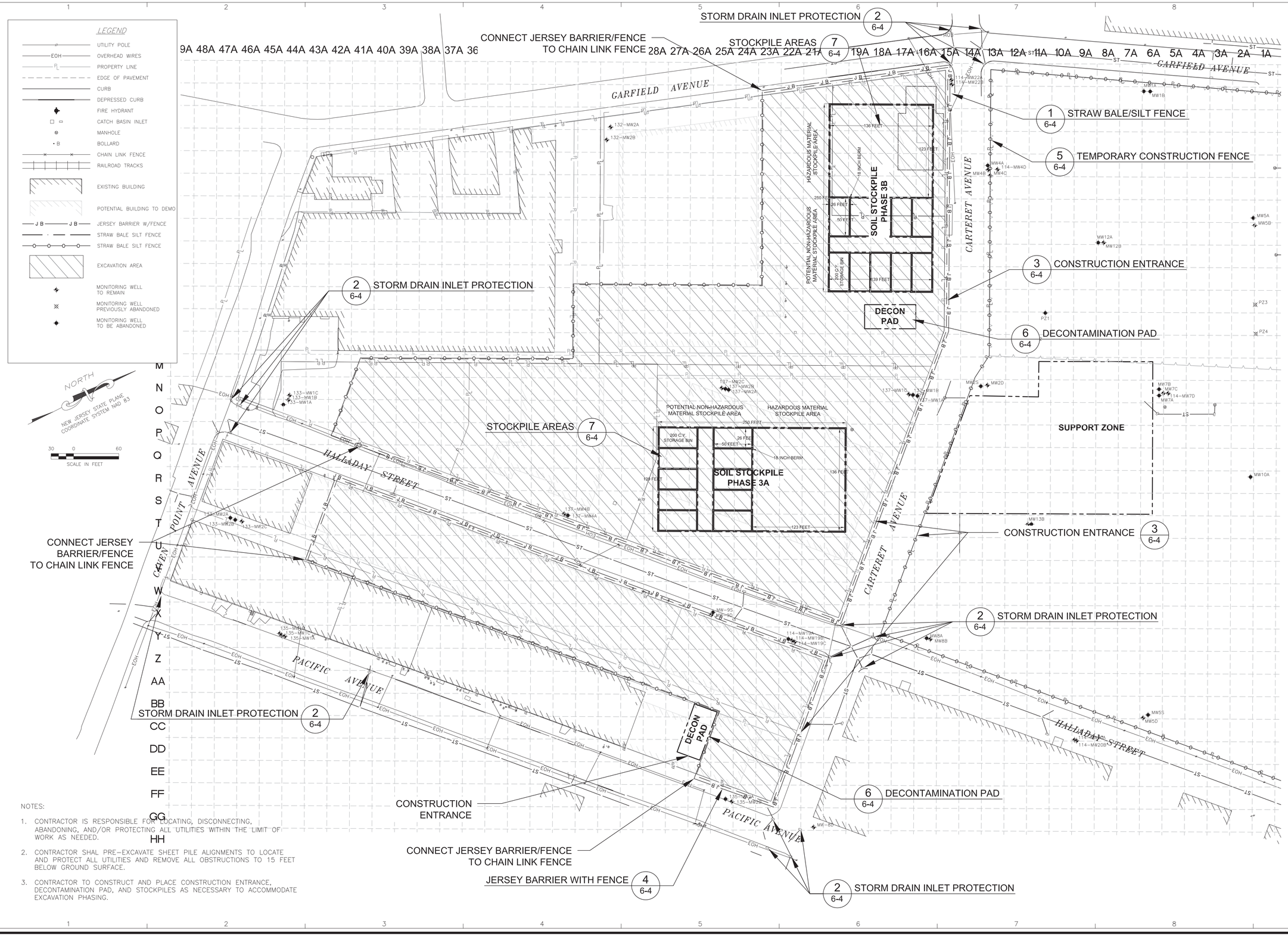
CONCEPTUAL PHASE 2 SITE PREPARATION AND EROSION CONTROL

REMEDIAL ACTION WORK PLAN

DRAWING NUMBER: 6-2

SHEET NUMBER:

REVISION C



NOTES:

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NO.	CHKD	DATE	APPVD DATE
	C.W.M.	12/06/11	H.N.Q. 12/07/11

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JERSEY CITY, HUDSON COUNTY, NEW JERSEY

PROJ. NO.: 60190341.500A DATE: 10/10/14

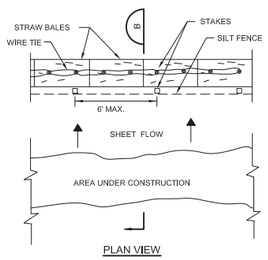
CONCEPTUAL PHASE 3 SITE PREPARATION AND EROSION CONTROL

REMEDIAL ACTION WORK PLAN

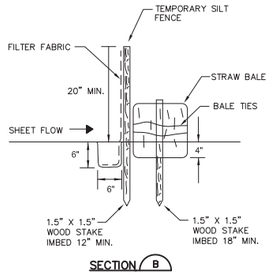
DRAWING NUMBER: 6-3

SHEET NUMBER:

REVISION C



PLAN VIEW



SECTION B

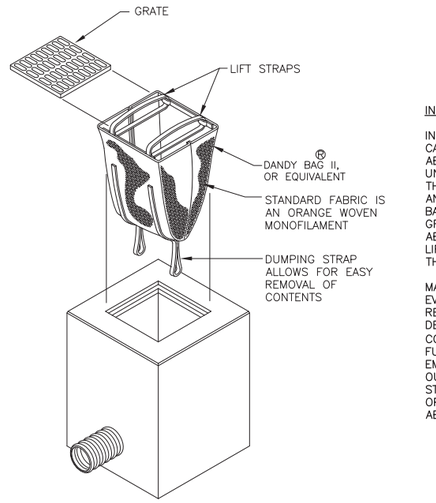
STRAW BALE INSTALLATION NOTES

1. EXCAVATE A 4" DEEP TRENCH TO MATCH THE WIDTH OF THE STRAW BALES.
2. PLACE BALES IN TRENCH WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
3. ANCHOR BALES BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. ADJOINING BALES SHALL BE SECURELY TIED TOGETHER TO PREVENT MOVEMENT.
5. STRAW WATTLES MAY BE USED IN LIEU OF STRAW BALES. IF USED, WATTLES SHALL BE INSTALLED AND SECURED IN PLACE PER MANUFACTURER'S RECOMMENDATIONS.
6. STRAW BALES SHOULD NOT BE USED FOR TURTLE EXCLUSION BARRIER.

SILT FENCE INSTALLATION NOTES

1. SET POSTS AND EXCAVATE A 6" BY 6" TRENCH UPSLOPE ALONG THE LINE OF POSTS.
2. ATTACH FILTER FABRIC TO FENCE POST AND EXTEND IT INTO THE TRENCH.
3. BACKFILL AND COMPACT THE TRENCH USING THE EXCAVATED SOIL.

1 / 6-1, 6-2, 6-3 — STRAW BALE/SILT FENCE — NTS

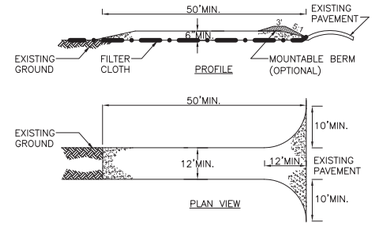


2 / 6-1, 6-2, 6-3 — STORM DRAIN INLET PROTECTION — NTS

INLET PROTECTION NOTES

INSTALLATION: REMOVE THE GRATE FROM CATCH BASIN. IF USING OPTIONAL OIL ABSORBENTS; PLACE ABSORBENT PILLOW IN UNIT. STAND THE GRATE ON END. MOVE THE TOP LIFTING STRAPS OUT OF THE WAY AND PLACE THE GRATE INTO THE DANDY BAG II, OR EQUIVALENT, SO THAT THE GRATE IS BELOW THE TOP STRAPS AND ABOVE THE LOWER STRAPS. HOLDING THE LIFTING DEVICES, INSERT THE GRATE INTO THE INLET.

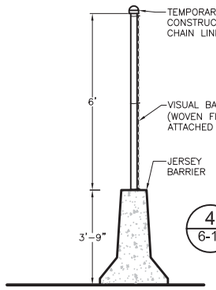
MAINTENANCE: INSPECT AFTER EACH STORM EVENT AND AT REGULAR INTERVALS. REMOVE ALL ACCUMULATED SEDIMENT AND DEBRIS FROM VICINITY OF UNIT. IF THE CONTAINMENT AREA IS MORE THAN 1/3 FULL OF SEDIMENT, THE UNIT MUST BE EMPTIED. TO EMPTY UNIT, LIFT THE UNIT OUT OF THE INLET USING THE LIFTING STRAPS AND REMOVE THE GRATE. IF USING OPTIONAL OIL ABSORBENTS; REPLACE ABSORBENT WHEN NEAR SATURATION.



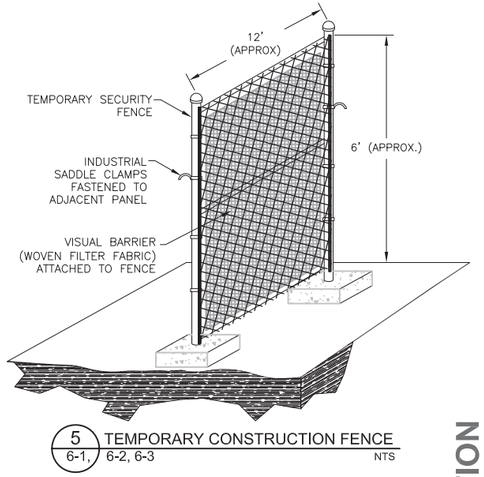
CONSTRUCTION SPECIFICATIONS

1. STONE SIZE – USE 2" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH – NOT LESS THAN 50 FEET.
3. THICKNESS – NOT LESS THAN SIX (6) INCHES.
4. WIDTH – TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. FILTER CLOTH – WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACTED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

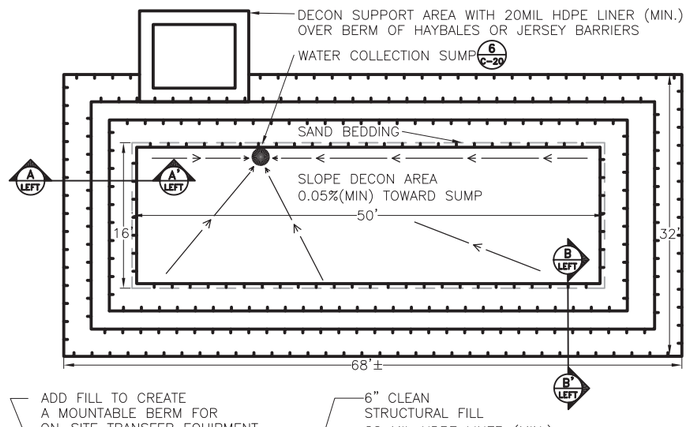
3 / 6-1, 6-2, 6-3 — CONSTRUCTION ENTRANCE — NTS



4 / 6-1, 6-2, 6-3 — JERSEY BARRIER WITH FENCE — NTS



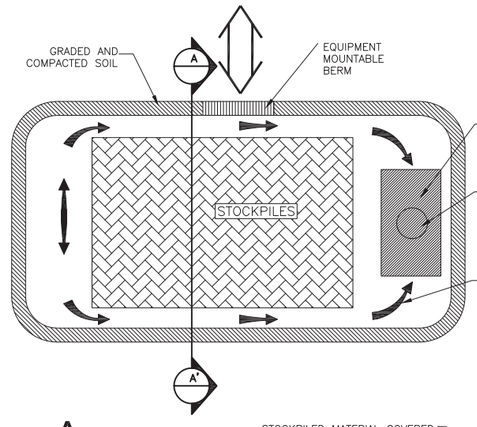
5 / 6-1, 6-2, 6-3 — TEMPORARY CONSTRUCTION FENCE — NTS

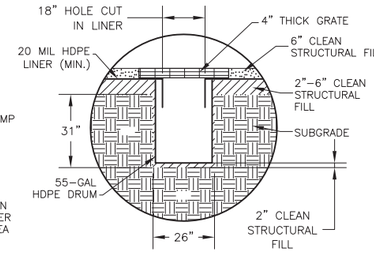


6 / 6-1, 6-2, 6-3 — DECONTAMINATION PAD — NTS

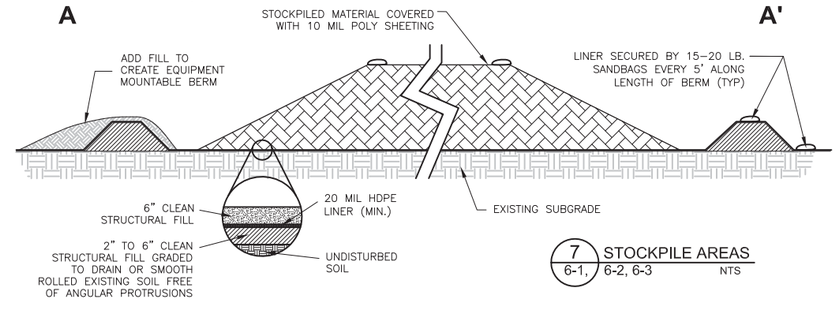
STOCKPILE AREA NOTES:

1. STOCKPILE AREA DIMENSIONS AND SHAPE MAY VARY. ACTUAL SIZE WILL BE DETERMINED BASED ON SITE CONDITIONS AND REQUIRED STORAGE AREA. SUBCONTRACTOR SHALL DETERMINE FINAL SIZE OF AREA WITH APPROVAL BY SITE ENGINEER.
2. EXISTING SUBGRADE SHALL BE FREE OF ANGULAR PROTRUSIONS. A TWO TO SIX INCH LAYER OF CLEAN STRUCTURAL BACKFILL SHALL BE PLACED, GRADED TO DRAIN AND COMPACTED TO A FIRM UNYIELDING SURFACE PRIOR TO PLACEMENT OF LINER.
3. STOCKPILE AREA IS TO BE GRADED TO POSITIVELY DRAIN TOWARDS THE STORMWATER COLLECTION AREA.
4. CONTAINMENT BERMS SHALL BE CONSTRUCTED OF IMPORTED CLEAN SOIL. NO ON SITE BORROW WILL BE AVAILABLE. PLACE STORMWATER CONTAINMENT BERM SOILS IN MAXIMUM OF 12" LIFTS.
5. STORMWATER CONTAINMENT BERMS ARE TO BE MOISTURE CONDITIONED AND COMPACTED TO A FIRM, UNYIELDING CONDITION, AS DIRECTED BY THE SITE ENGINEER.
6. INITIAL PLACEMENT OF EXCAVATED SEDIMENT WILL BE CAREFULLY PLACED IN A 12" LIFT SO THAT EQUIPMENT DOES NOT DAMAGE LINER.
7. DAILY INSPECTION AND MAINTENANCE OF THE STORMWATER CONTAINMENT BERMS IS REQUIRED FOR THE DURATION OF THE PROJECT.
8. STOCKPILED SOIL WILL BE COVERED WITH 10 MIL POLY SHEETING AT THE END OF EACH DAY AND WHEN NOT BEING WORKED ON.
9. WHEN ONE-HALF (1/2) FULL, THE STORMWATER COLLECTION SUMP IS TO BE PUMPED OUT. COLLECTED STORMWATER TO BE CONTAINED AND DISPOSED OF AT THE DIRECTION OF THE SITE ENGINEER.
10. SOLIDS ACCUMULATED IN THE SUMP WILL BE EXCAVATED PERIODICALLY AND PLACED ON THE WASTE MATERIAL STOCKPILE.
11. UPON COMPLETION OF THE WORK, THE STOCKPILE AREA SHALL BE REMOVED, AND THE AREA GRADED.
12. ANY DAMAGE TO STOCKPILE AREA MUST BE REPORTED TO THE SITE ENGINEER IMMEDIATELY.
13. LINER SHALL BE 20 MIL HDPE (MIN.) ONE SOLID SHEET OR SHALL HAVE SEAMS WELDED PER MANUFACTURER'S RECOMMENDATIONS. NO OVERLAP WILL BE ACCEPTED.
14. FLUSHMOUNT WELLS TO BE PROTECTED DURING INSTALLATION AND REMOVAL OF STOCKPILE AREA. LINER TO BE PLACED OVER TOP WELLS.





STORMWATER COLLECTION SUMP DETAIL



7 / 6-1, 6-2, 6-3 — STOCKPILE AREAS — NTS

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CONCEPTUAL
SITE PREPARATION AND
EROSION CONTROL DETAILS

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER: 6-4

SHEET NUMBER:

REVISION B

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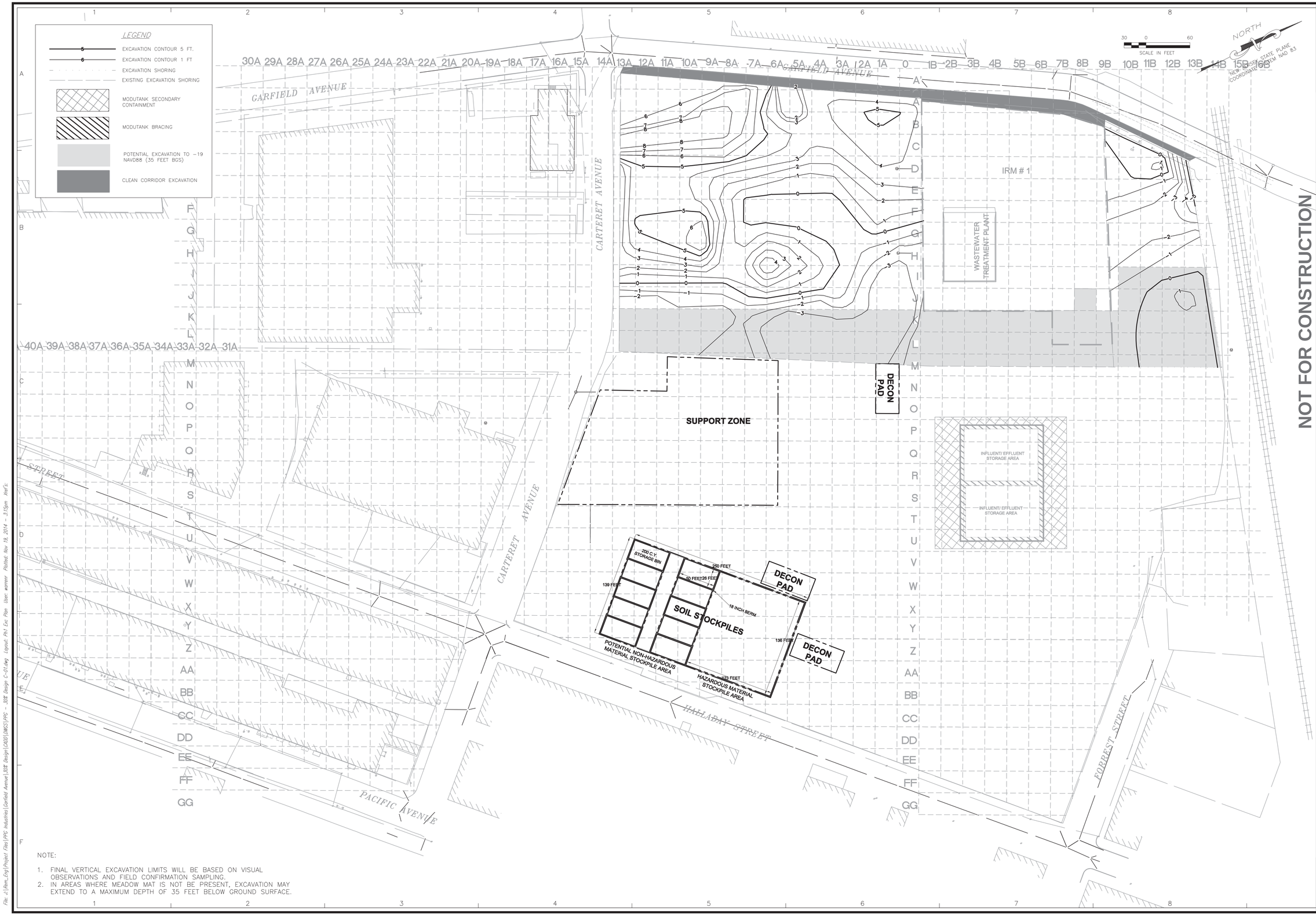

NOTE:

1. FINAL VERTICAL EXCAVATION LIMITS WILL BE BASED ON VISUAL OBSERVATIONS AND FIELD CONFIRMATION SAMPLING.
2. IN AREAS WHERE MEADOW MAT IS NOT BE PRESENT, EXCAVATION MAY EXTEND TO A MAXIMUM DEPTH OF 35 FEET BELOW GROUND SURFACE.

NOT FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
B	R.M.T.	12/05/11	NJ DEP COMMENT EDITS	C.W.M.	12/05/11	H.N.Q.	12/06/11
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GARFIELD AVENUE SITES
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

PROJ. NO.: 60190341.500A DATE: 05/16/11

CONCEPTUAL PHASE 1 EXCAVATION PLAN

REMEDIAL ACTION WORK PLAN

DRAWING NUMBER: 6-5

SHEET NUMBER: 1 of 1

REVISION B

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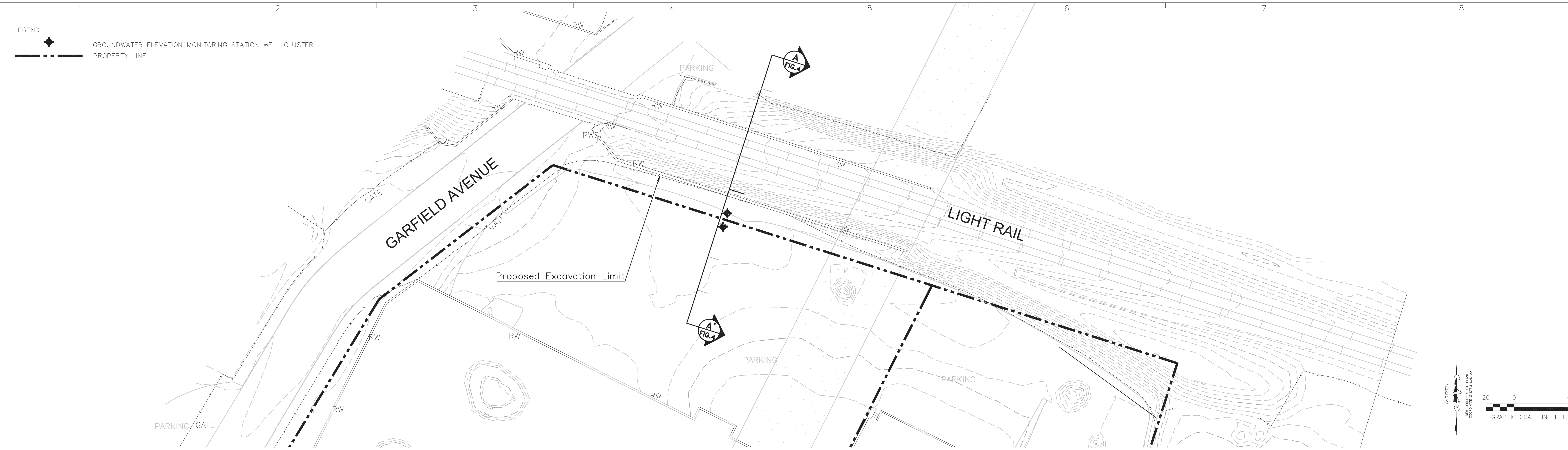

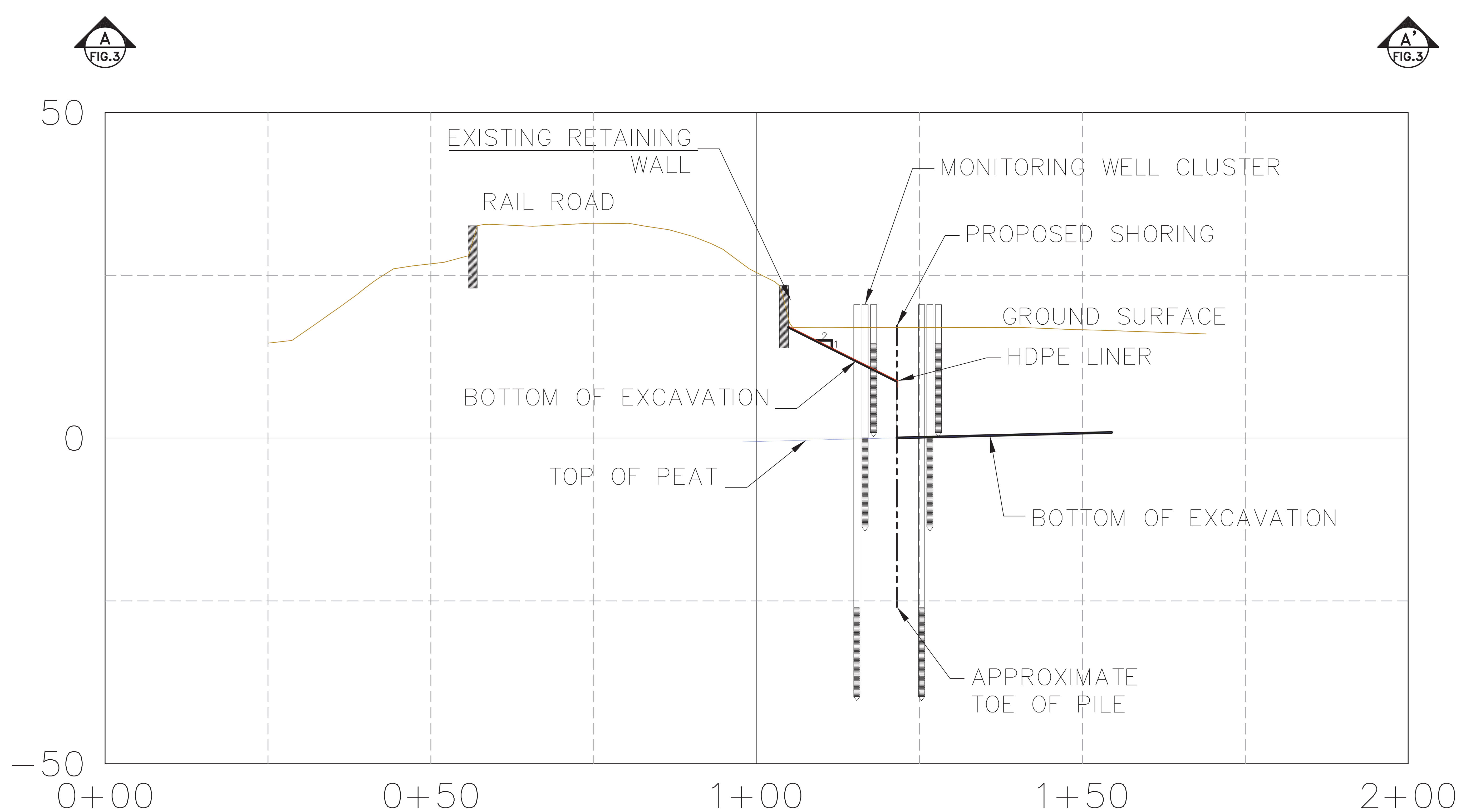

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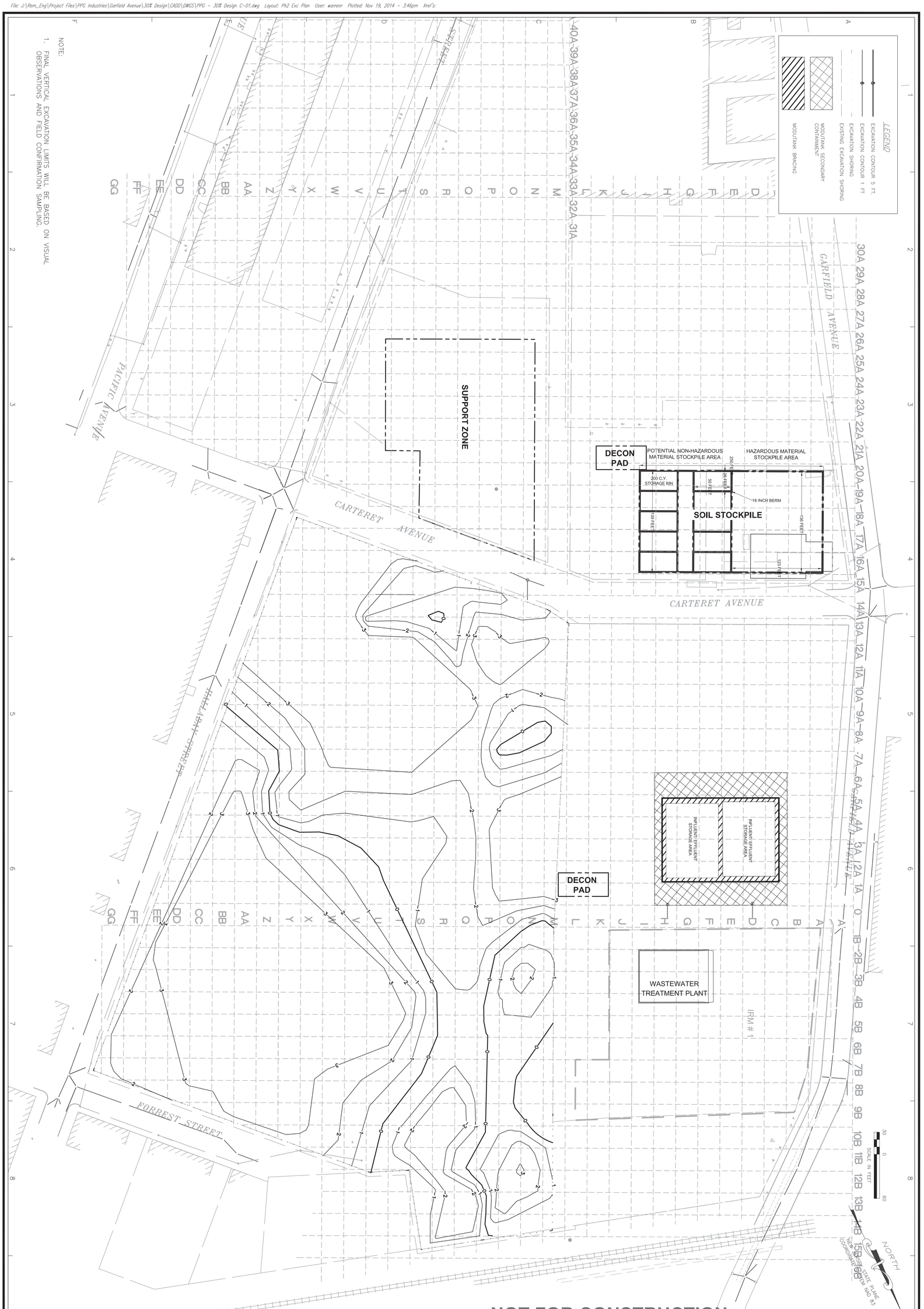
CONCEPTUAL
PHASE 1 EXCAVATION PLAN
NORTHERN EXCAVATION

REMEDIAL ACTION
WORK PLAN

DRAWING NUMBER:
6-6

SHEET NUMBER:
1 of 1

REVISION B



NOT FOR CONSTRUCTION

CONCEPTUAL PHASE 2 EXCAVATION PLAN

REMEDIAL ACTION WORK PLAN

PPG INDUSTRIES
GARFIELD AVENUE SITES
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

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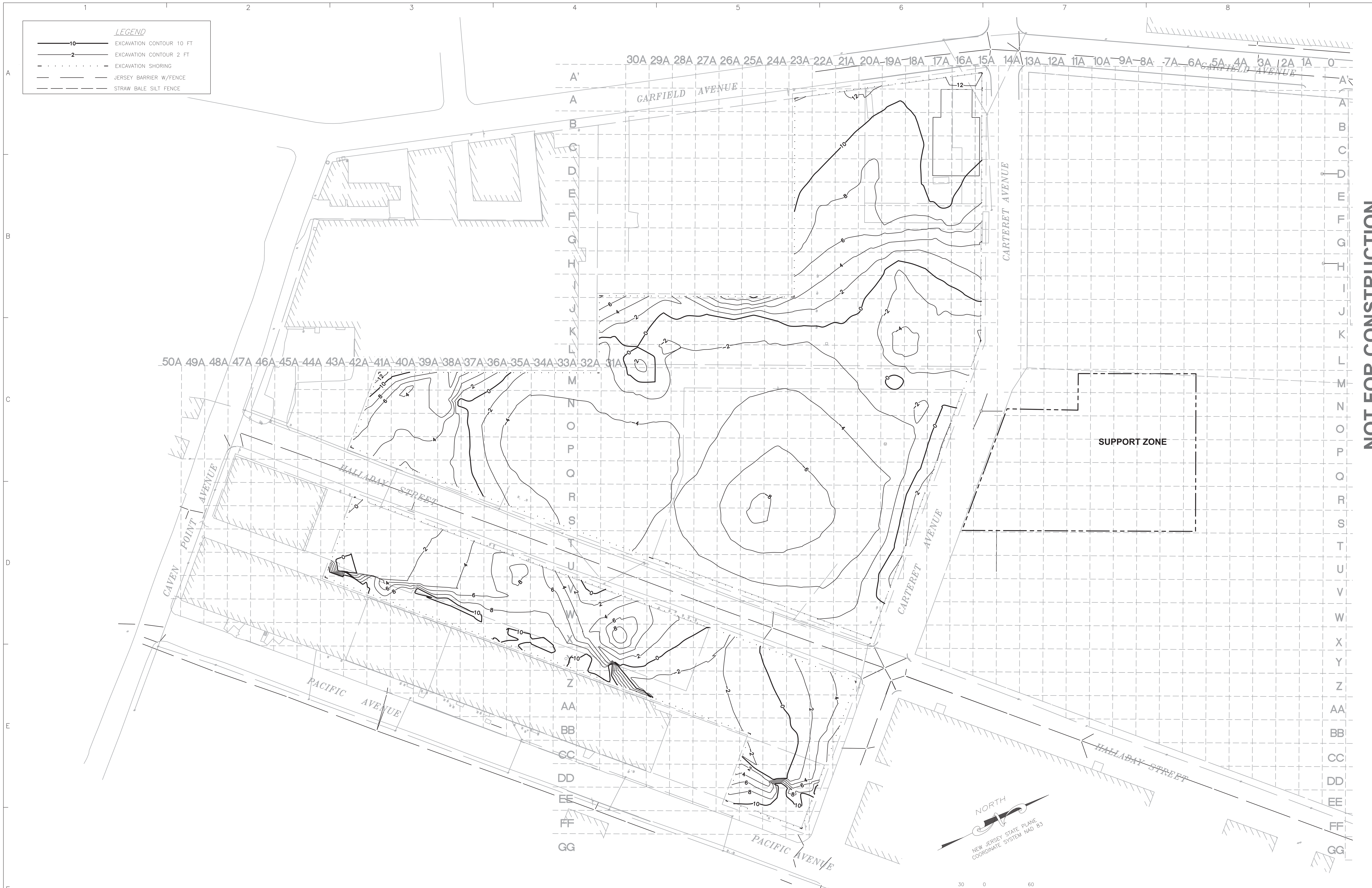
A	RCW	05/16/11	RAWP				

DRAWING NUMBER: 6-7
SHEET NUMBER:
REVISION: B



NOTE:

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NOT FOR CONSTRUCTION

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A	RCW	05/16/11	RAWP				

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JERSEY CITY, HUDSON COUNTY, NEW JERSEY

PROJ. NO.: 60190341.500A DATE: 05/16/11

CONCEPTUAL
PHASE 3 EXCAVATION PLAN

REMEDIAL ACTION
WORK PLAN

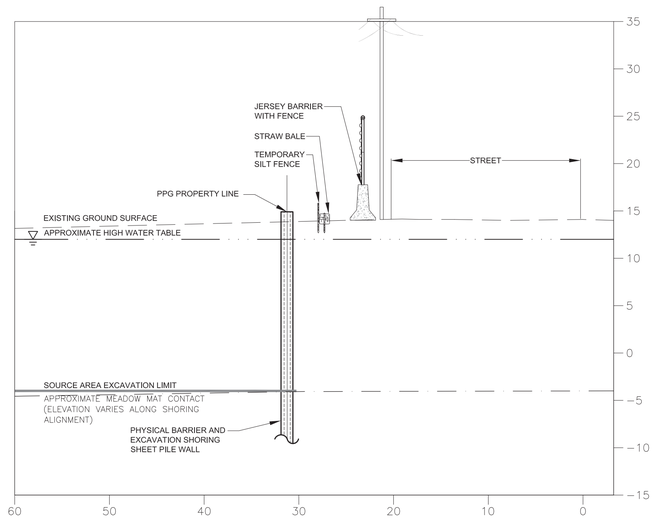
DRAWING NUMBER:
6-8

SHEET NUMBER:

REVISION B

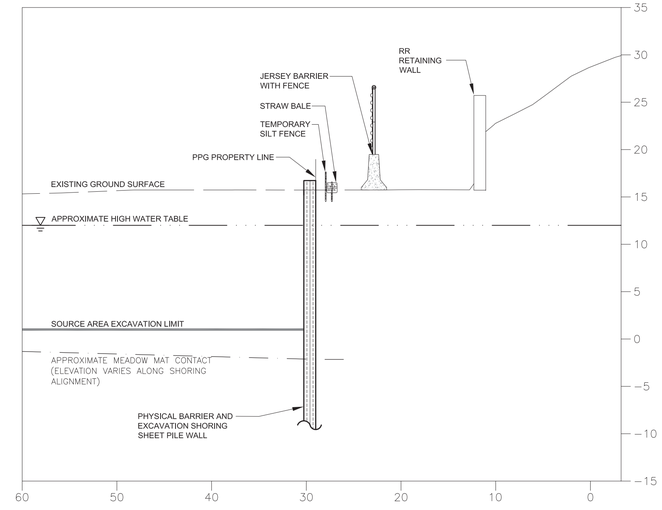
1 SHEET PILE ASSEMBLY

GRAPHIC SCALE IN FEET (1 0 2)



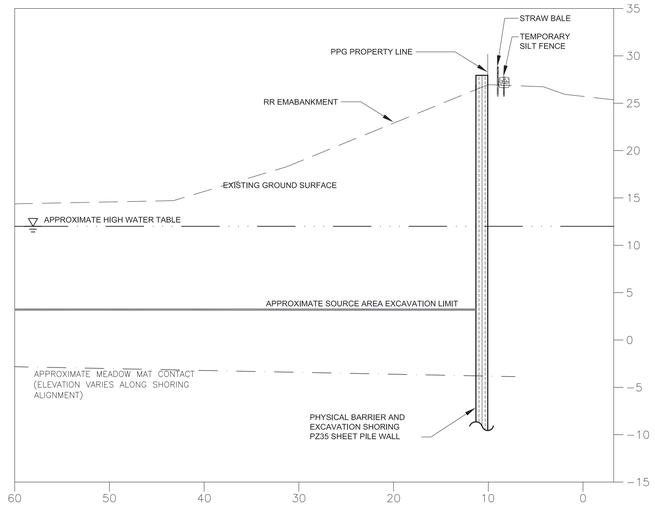
2 TYPICAL SHEET PILE CROSS SECTION ADJACENT TO ROAD

GRAPHIC SCALE IN FEET (4 0 8)



3 TYPICAL SHEET PILE CROSS SECTION ADJACENT TO RAILROAD RETAINING WALL

GRAPHIC SCALE IN FEET (4 0 8)



4 TYPICAL SHEET PILE CROSS SECTION IN RAILROAD EMBANKMENT

GRAPHIC SCALE IN FEET (4 0 8)

NOT FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
0		05/16/11	RAWP				

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SITE 114
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PROJ. NO.: 60190341.500A DATE: 05/16/11

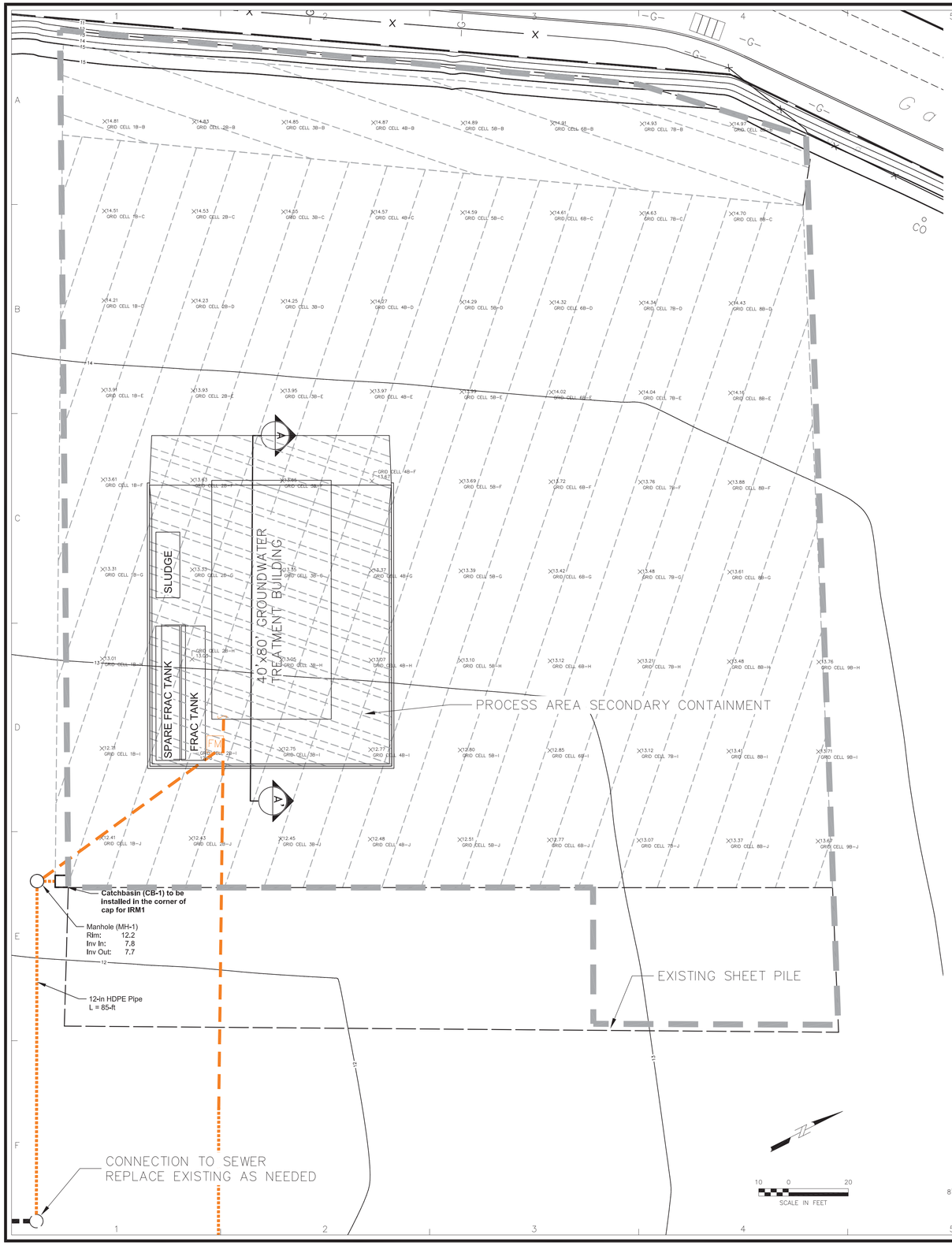
CONCEPTUAL SHEET PILE DETAILS

REMEDIAL ACTION WORK PLAN

DRAWING NUMBER: 6-9

SHEET NUMBER:

REVISION 0



LEGEND

- FENCE LINE
- PROPERTY LINE
- EXISTING SHORING
- FINAL GRADE CONTOUR 5 FT.
- FINAL GRADE CONTOUR 1 FT.
- BELOW GRADE GWTP CONNECTION
- ABOVE GRADE GWTP CONNECTION
- CONNECTION TO SEWER
- PROCESS AREA SECONDARY CONTAINMENT – 82' x 95' EARTHEN BERM TO ELEVATION 13.6
- LIMITS OF IRM 1
- GRID CELL FINAL GRADE ELEVATION CONTROL POINT
- LINER\GEOTEXTILE PLACEMENT EXTENTS BACKFILL TO FINAL GRADE
- DGA BACKFILL ONLY BACKFILL TO 1' BELOW FINAL GRADE
- FM FLOW METER

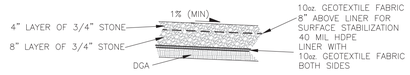
GRID CONTROL POINT TABLE

Point #	GRID CELL	X (EASTING)	Y (NORTHING)	ELEVATION
100	1B–J	611165.24	683552.87	12.41
101	2B–J	611178.74	683579.66	12.43
102	3B–J	611192.25	683606.45	12.45
103	4B–J	611205.76	683633.23	12.48
104	5B–J	611219.26	683660.02	12.51
105	6B–J	611232.77	683686.81	12.77
106	7B–J	611246.28	683713.60	13.07
107	8B–J	611259.78	683740.38	13.37
108	9B–J	611273.29	683767.17	13.67
109	1B–I	611138.45	683566.38	12.71
110	2B–I	611151.95	683593.17	12.73
111	3B–I	611165.46	683619.95	12.75
112	4B–I	611178.97	683646.74	12.77
113	5B–I	611192.47	683673.53	12.80
114	6B–I	611205.98	683700.32	12.85
115	7B–I	611219.49	683727.10	13.12
116	8B–I	611232.99	683753.89	13.41
117	9B–I	611246.50	683780.68	13.71
118	1B–H	611111.66	683579.88	13.01
119	2B–H	611125.17	683606.67	13.03
120	3B–H	611138.67	683633.46	13.05
121	4B–H	611152.18	683660.25	13.07
122	5B–H	611165.69	683687.03	13.10
123	6B–H	611179.19	683713.82	13.12
124	7B–H	611192.70	683740.61	13.21
125	8B–H	611206.21	683767.40	13.48
126	9B–H	611219.71	683794.18	13.76
127	1B–G	611084.87	683593.39	13.31
128	2B–G	611098.38	683620.18	13.33
129	3B–G	611111.89	683646.97	13.35
130	4B–G	611125.39	683673.75	13.37
131	5B–G	611138.90	683700.54	13.39
132	6B–G	611152.41	683727.33	13.42
133	7B–G	611165.91	683754.12	13.48
134	8B–G	611179.42	683780.90	13.61
135	1B–F	611058.09	683606.90	13.61
136	2B–F	611071.59	683633.69	13.63
137	3B–F	611085.10	683660.47	13.65
138	4B–F	611098.61	683687.26	13.67
139	5B–F	611112.11	683714.05	13.69

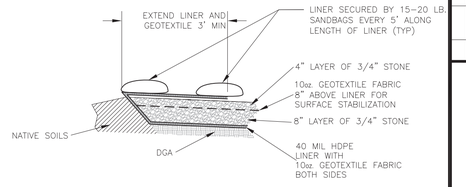
GRID CONTROL POINT TABLE

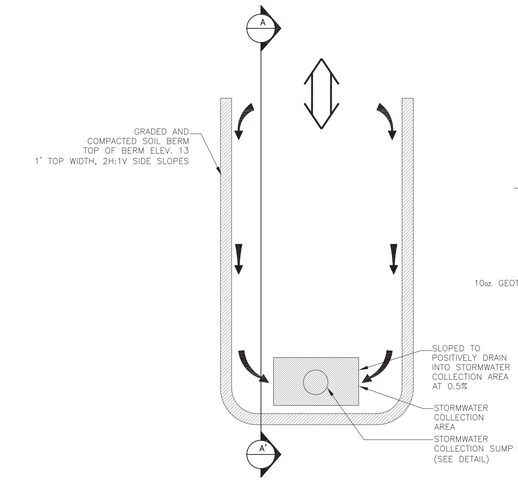
Point #	GRID CELL	X (EASTING)	Y (NORTHING)	ELEVATION
140	6B–F	611125.62	683740.84	13.72
141	7B–F	611139.13	683767.62	13.76
142	8B–F	611152.63	683794.41	13.88
143	1B–E	611031.30	683620.40	13.91
144	2B–E	611044.80	683647.19	13.93
145	3B–E	611058.31	683673.98	13.95
146	4B–E	611071.82	683700.77	13.97
147	5B–E	611085.32	683727.55	13.99
148	6B–E	611098.83	683754.34	14.02
149	7B–E	611112.34	683781.13	14.04
150	8B–E	611125.84	683807.92	14.16
151	1B–D	611004.51	683633.91	14.21
152	2B–D	611018.02	683660.70	14.23
153	3B–D	611031.52	683687.49	14.25
154	4B–D	611045.03	683714.27	14.27
155	5B–D	611058.54	683741.06	14.29
156	6B–D	611072.04	683767.85	14.32
157	7B–D	611085.55	683794.64	14.34
158	8B–D	611099.06	683821.42	14.43
159	1B–C	610977.72	683647.42	14.51
160	2B–C	610991.23	683674.21	14.53
161	3B–C	611004.74	683700.99	14.55
162	4B–C	611018.24	683727.78	14.57
163	5B–C	611031.75	683754.57	14.59
164	6B–C	611045.26	683781.36	14.61
165	7B–C	611058.76	683808.14	14.63
166	8B–C	611072.27	683834.93	14.70
167	6B–B	611018.47	683794.86	14.91
168	7B–B	611031.98	683821.65	14.93
169	8B–B	611045.48	683848.44	14.97
170	1B–B	610950.94	683660.92	14.81
171	2B–B	610964.44	683687.71	14.83
172	3B–B	610977.95	683714.50	14.85
173	4B–B	610991.46	683741.29	14.87
174	5B–B	611004.96	683768.07	14.89

IRM FINAL GRADING BACKFILL
NTS

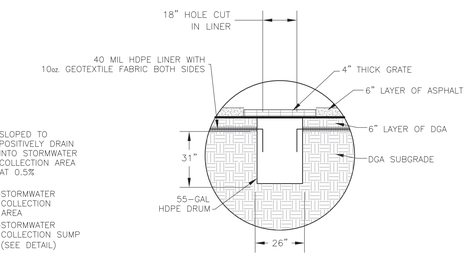


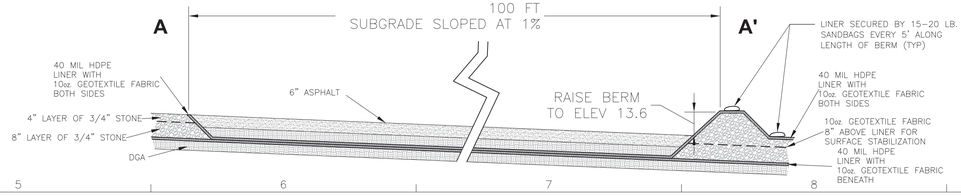
LINER TERMINATION
NTS





PROCESS AREA SECONDARY CONTAINMENT DETAIL
NTS





NOT FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
C	R.M.T.	12/05/11	NJ DEP COMMENT EDITS	C.W.M.	12/05/11	H.N.Q.	12/06/11
B	CCD	06/29/11	ISSUE FOR BID				
A	RCW	05/16/11	RAWP				

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JERSEY CITY, HUDSON COUNTY, NEW JERSEY

PROJ. NO.: 60190341.500A DATE: 06/22/11

IRM FINAL GRADING AND WATER TREATMENT SYSTEM SECONDARY CONTAINMENT

DRAWING NUMBER: 7-1

SHEET NUMBER: 1 of 2

REVISION C

LEGEND

- FENCE LINE
- PROPERTY LINE
- FORMER BUILDING PAD
- EXISTING SHORING
- EXISTING GRADE CONTOUR 2 FT. (16.0)
- EXISTING GRADE CONTOUR 0.5 FT. (15.5)
- CONNECTION TO SEWER
- JERSEY BARRIER
- INNER TANK PAD 71.2 FT BY 101.2 FT ELEV 17.13
- OUTER TANK PAD 5' PERIMETER MIN ELEV 17.00
- SECONDARY CONTAINMENT AREA PLACE 6" (MIN) DGA ON EXISTING CONCRETE PAD
- ABOVE GRADE GWTP CONNECTION
- BELOW GRADE GWTP CONNECTION

SCALE IN FEET: 10 0 20

CONNECTION TO SEWER
REPLACE EXISTING AS NEEDED

PLACE STORMWATER SUMPS
AT LOW POINTS
SEE DETAIL BELOW

MODUTANK PAD
SEE DETAIL BELOW
71.2' x 101.2'

MODUTANK SECONDARY CONTAINMENT BERM
SEE DETAIL BELOW
180' x 180'

Tank

Tank

CONCRETE WALK
POOR CONDITION

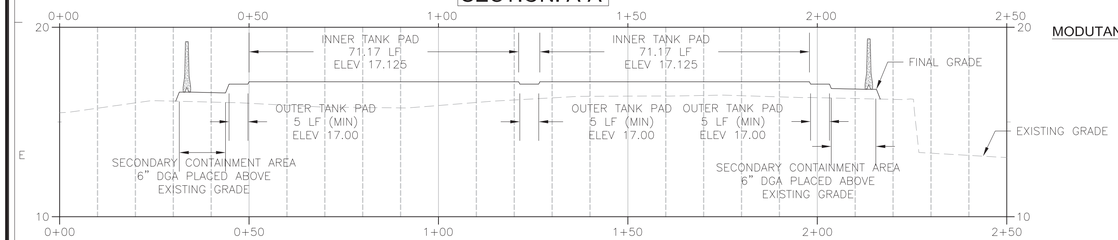
COVER

BROKEN
ASPHALT

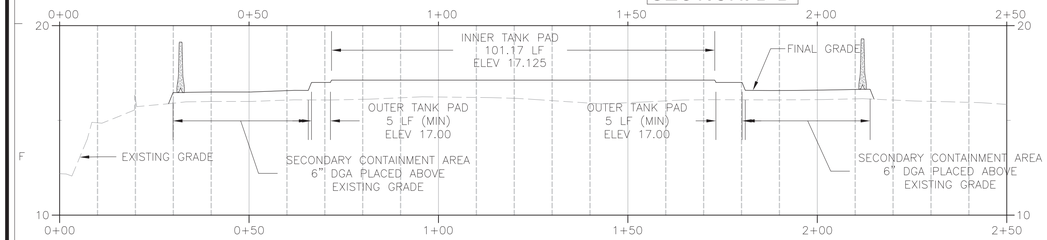
DIRT
PILE

NOT FOR CONSTRUCTION

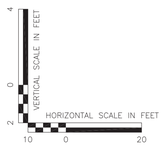
SECTION: A-A'



SECTION: B-B'

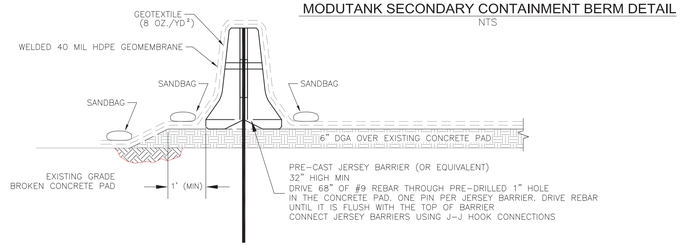


MODUTANK SECONDARY CONTAINMENT CROSS SECTIONS



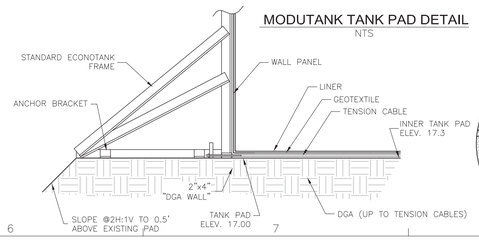
MODUTANK SECONDARY CONTAINMENT BERM DETAIL

NTS



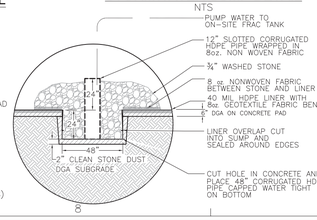
MODUTANK TANK PAD DETAIL

NTS



STORMWATER SUMP DETAIL

NTS



NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
C	R.M.T.	12/05/11	NJ DEP COMMENTS EDITS	C.W.M.	12/05/11	H.N.Q.	12/06/11
B	CCD	07/18/11	ISSUED FOR BID				
A	RCW	05/16/11	RAWP				

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PROJ. NO.: 60190341.500A DATE: 07/18/11

WATER TREATMENT SYSTEM
MODUTANK
SECONDARY CONTAINMENT

DRAWING NUMBER: 7-2

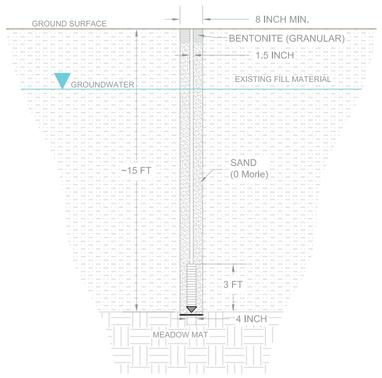
SHEET NUMBER: 2 of 2

REVISION C

LEGEND

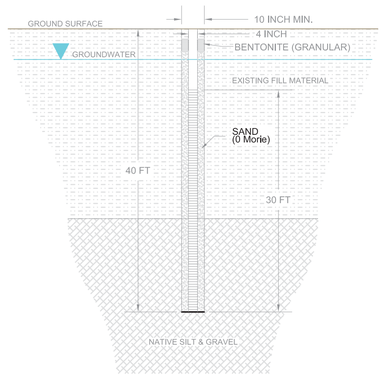
- EXCAVATION SHORING
- EXISTING EXCAVATION SHORING
- UTILITY POLE
- EOH — OVERHEAD WIRES
- PL — PROPERTY LINE
- EDGE OF PAVEMENT
- CURB
- DEPRESSED CURB
- FIRE HYDRANT
- CATCH BASIN INLET
- MANHOLE
- B — BOLLARD
- CHAIN LINK FENCE
- RAILROAD TRACKS
- EXISTING BUILDING
- SWB-1 — SHALLOW EXTRACTION WELL LOCATION
- CAN-1 — DEEP EXTRACTION WELL LOCATION
- REL-1 — RELIEF EXTRACTION WELL LOCATION
- MON-1 — MONITORING WELL LOCATION

TYPICAL SHALLOW/RELIEF EXTRACTION WELL DETAIL



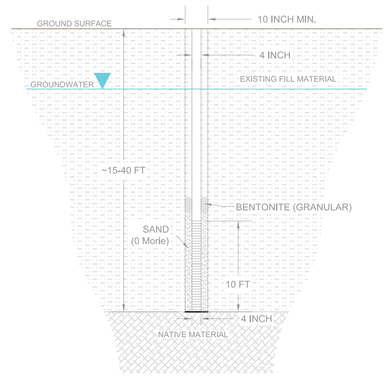
NOT TO SCALE

TYPICAL DEEP EXTRACTION WELL DETAIL



NOT TO SCALE

TYPICAL MONITORING WELL DETAIL



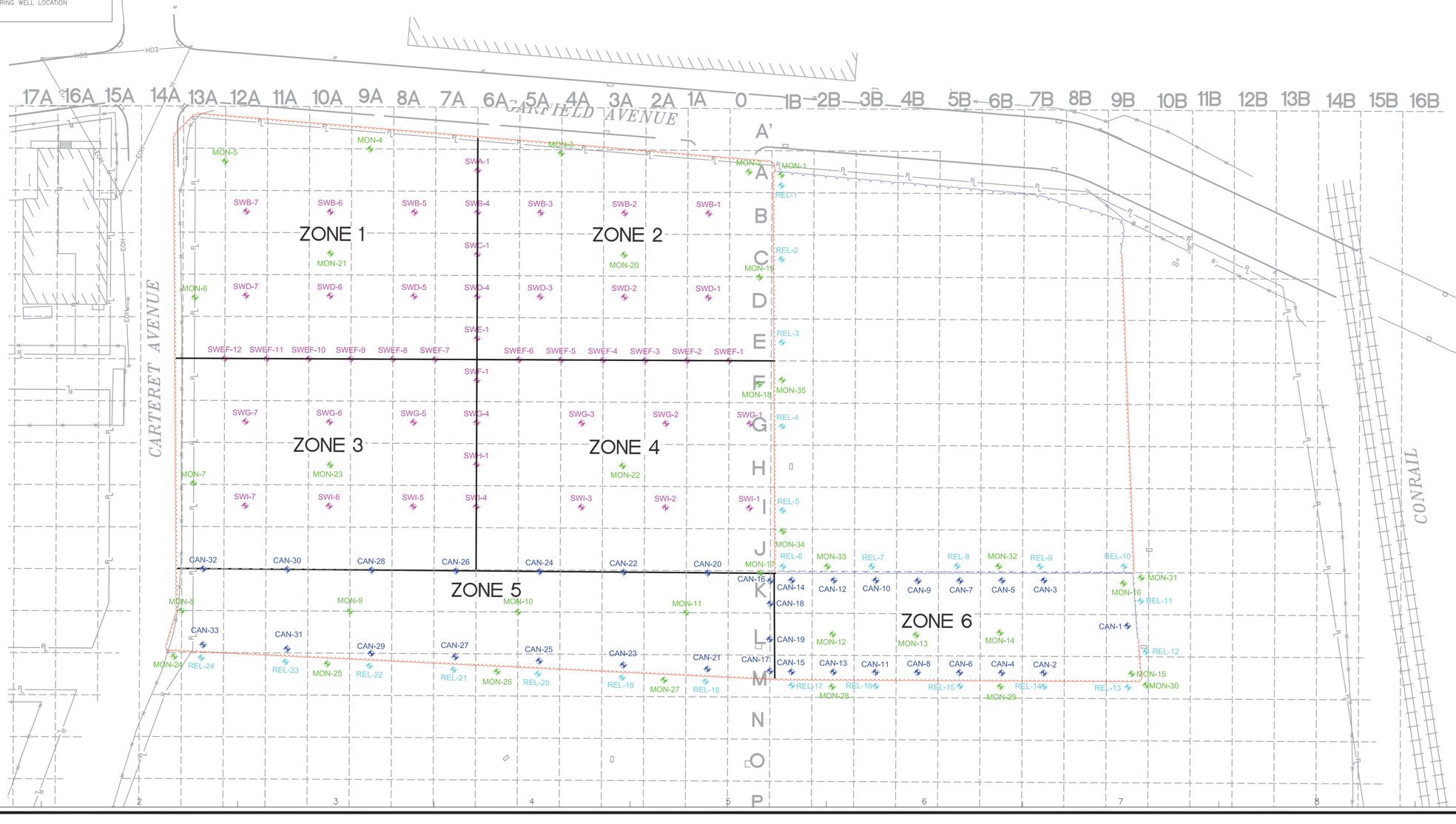
NOT TO SCALE

NORTH

NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83

20 0 40

SCALE IN FEET



NOT FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
B	R.M.T.	12/16/11	SHIFTED CAN WELL SOUTH 15'				
A	R.M.T.	12/06/11	TYPICAL DEWATERING PLAN				

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PROJ. NO.: 60190341.500A

DATE: 12/06/11

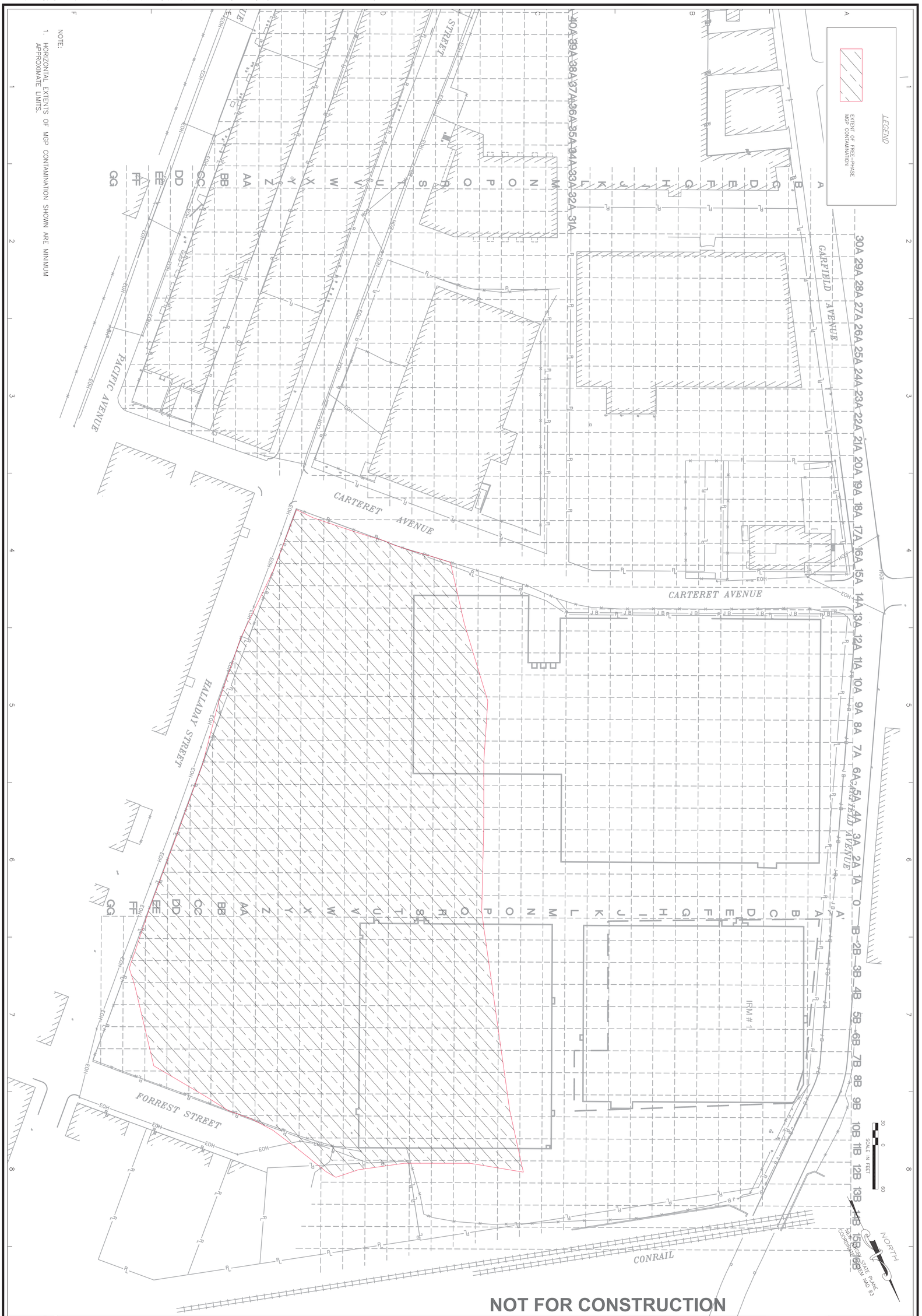
TYPICAL DEWATERING PLAN

REMEDIAL ACTION WORK PLAN

DRAWING NUMBER:
7-3

SHEET NUMBER:

REVISION A



NOT FOR CONSTRUCTION

EXTENT OF FREE-PHASE MGP CONTAMINATION

REMEDIAL ACTION WORK PLAN

PPG INDUSTRIES
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JERSEY CITY, HUDSON COUNTY, NEW JERSEY

PROJ. NO.: 60190341.500A | DATE: 05/16/11

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NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
A	RCW	05/16/11	RAWP				

DRAWING NUMBER: 8-1
SHEET NUMBER:
REVISION: A

2(H):1(V) slope from property line to elevation 15 (typ.)

Top of Berm
Elev: 15
Width: 5-ft

Slope = 1%

12-in HDPE Pipe
L = 10-ft

MANHOLE (MH-1)
RIM: 12.2
INV. IN: 7.8
INV. OUT: 7.7
EASTING 611167.18
NORTHING 683522.28
(NJ STATE PLANE COORDINATES)

CATCHBASIN (CB-1)
RIM: 11.3
INV. OUT: 7.9
(CORNER OF CAPPED AREA)

12-in HDPE Pipe
L = 85-ft

12-in HDPE Pipe
L = 5-ft

Catchbasin (CB-1)
Rim: 11.0
Inv Out: 6.9

Manhole (MH-2)
Rim: 11.0
Inv In: 6.8
Inv Out: 6.7

12-in HDPE Pipe
L = 25-ft

Manhole (MH-5)
Rim: 13.2
Inv In: 5.3
Inv Out: 5.2

Manhole (MH-3)
Rim: 11.0
Inv In: 6.5
Inv Out: 6.4

18-in HDPE
L = 220-ft

18-in HDPE
L = 220-ft

Keep existing tie-in to municipal combined sewer
Inv In: 2.4

Catchbasin (CB-2)
Rim: 11.0
Inv Out: 6.9

12-in HDPE Pipe
L = 45-ft

Manhole (MH-4)
Rim: 11.0
Inv In: 6.8
Inv Out: 6.7

12-in HDPE Pipe
L = 5-ft

18-in HDPE Pipe
L = 20-ft

Manhole (MH-6)
Rim: 12.3
Inv In: 4.1
Inv Out: 4.0

12-in HDPE Pipe
L = 70-ft

Catchbasin (CB-3)
Rim: 11.0
Inv Out: 7.2

Checkvalve
(Installed on outlet pipe to prevent backflow into site)

CARTERET AVENUE

CARFIELD AVENUE

CONRAIL

HALLADAY STREET

FORREST STREET

LEGEND

- FENCE LINE
- PROPERTY LINE
- RAILROAD TRACKS
- EXISTING GROUND SURFACE CONTOURS (5' INDEX)
- RESTORED GROUND SURFACE CONTOURS (5' INDEX)
- CATCHBASIN
- MANHOLE
- PIPE

0 25 50 100
SCALE IN FEET

NOT FOR CONSTRUCTION

NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
5	R.M.T.	11/29/11	NJ DEP COMMENT EDITS	C.M.	12/01/11	C.M.	06/01/11
4	RRL	05/16/11	RAWP	R.M.T.	05/17/11		

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JERSEY CITY, HUDSON COUNTY, NEW JERSEY

PROJ. NO.: 60190134.500A DATE: 05/16/11

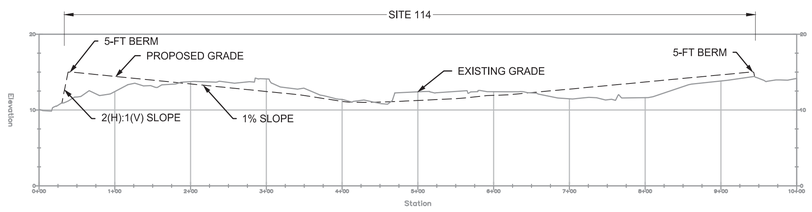
STORMWATER RESTORATION AND FINAL GRADING PLAN

REMEDIAL ACTION WORK PLAN

DRAWING NUMBER: 11-1

SHEET NUMBER: 1

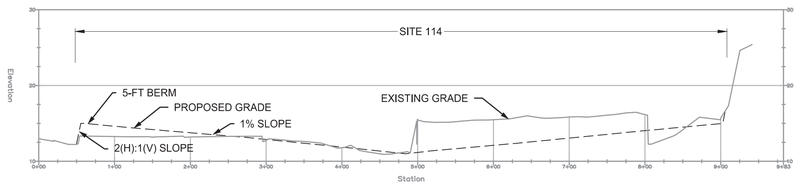
REVISION B



Cross Section A-A'

Horz: 1" = 100'
Vert: 1" = 10'

A–A' 11–1

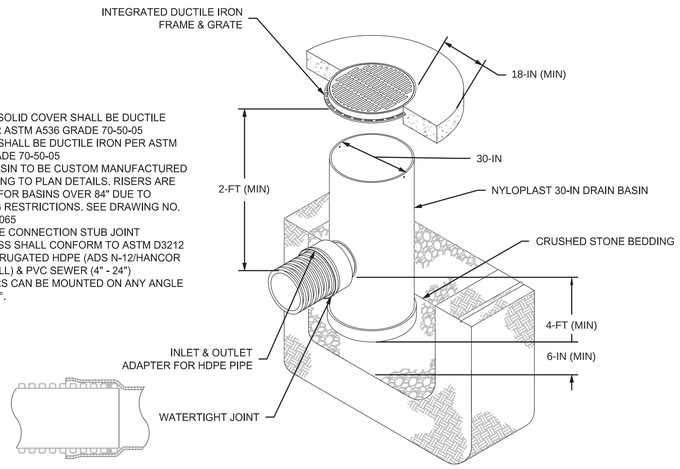


Cross Section B-B'

Horz: 1" = 100'
Vert: 1" = 10'

B–B' 11–1

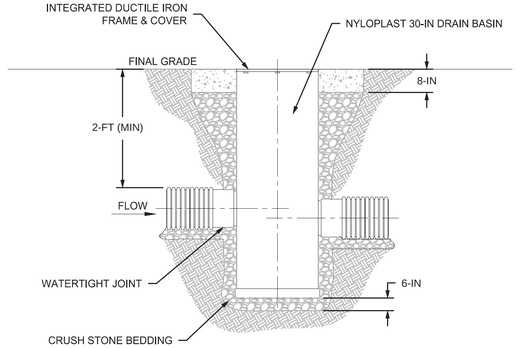
1. GRATES/SOLID COVER SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
2. FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
3. DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS. RISERS ARE NEEDED FOR BASINS OVER 84" DUE TO SHIPPING RESTRICTIONS. SEE DRAWING NO. 7001-110-065
4. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12/HANCOR DUAL WALL) & PVC SEWER (4" - 24")
5. ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°.



CATCH BASIN

Not to Scale

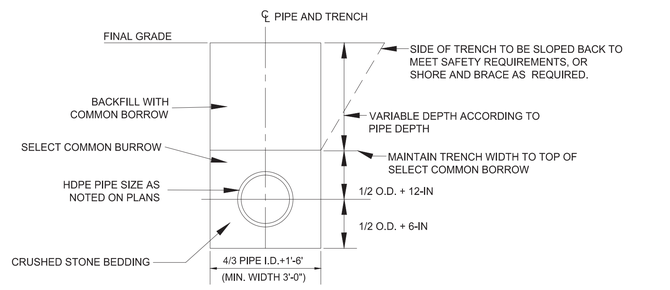
1 11–1



MANHOLE

Not to Scale

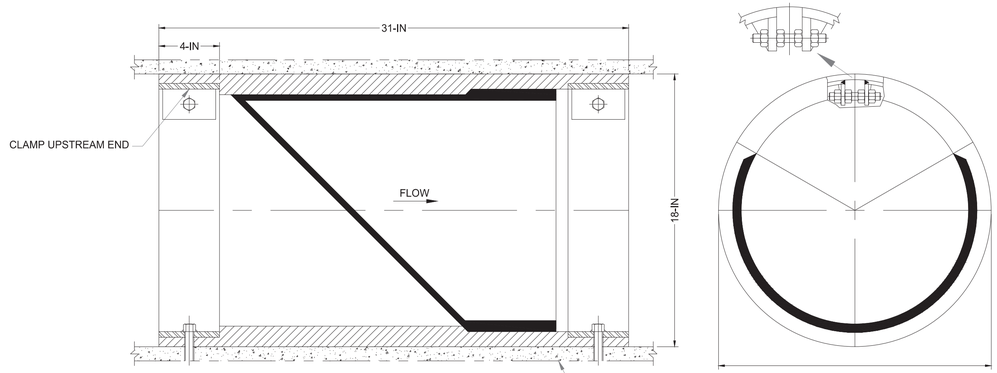
2 11–1



PIPE TRENCH

Not to Scale

4 11–1



NOTES:
1. CHECK VALVE SHALL BE TIBEFLEX CHECK MATE OR APPROVED EQUAL.
2. MAXIMUM ALLOWABLE BACK PRESSURE - 20.0 FEET

CHECK VALVE

Not to Scale

3 11–1

NOT FOR CONSTRUCTION

NO	DRWN	DATE	REVISION	CHKD	DATE	APPV	DATE
A	RRL	05/11/11	RAWP				

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PROJ. NO.: 60190134.500A DATE: 05/16/11

RESTORATION DETAILS

REMEDIAL ACTION WORK PLAN

DRAWING NUMBER: 11-2

SHEET NUMBER:

REVISION | A

GENERAL

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
2	RCW	10/10/14	REVISED FINAL RAWP EDITS	HNQ	05/06/14	AF	05/06/14
1	RMT	05/06/14	FINAL RAWP EDITS				

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PROJ. NO.: 60190341.500A | DATE: 10/10/14

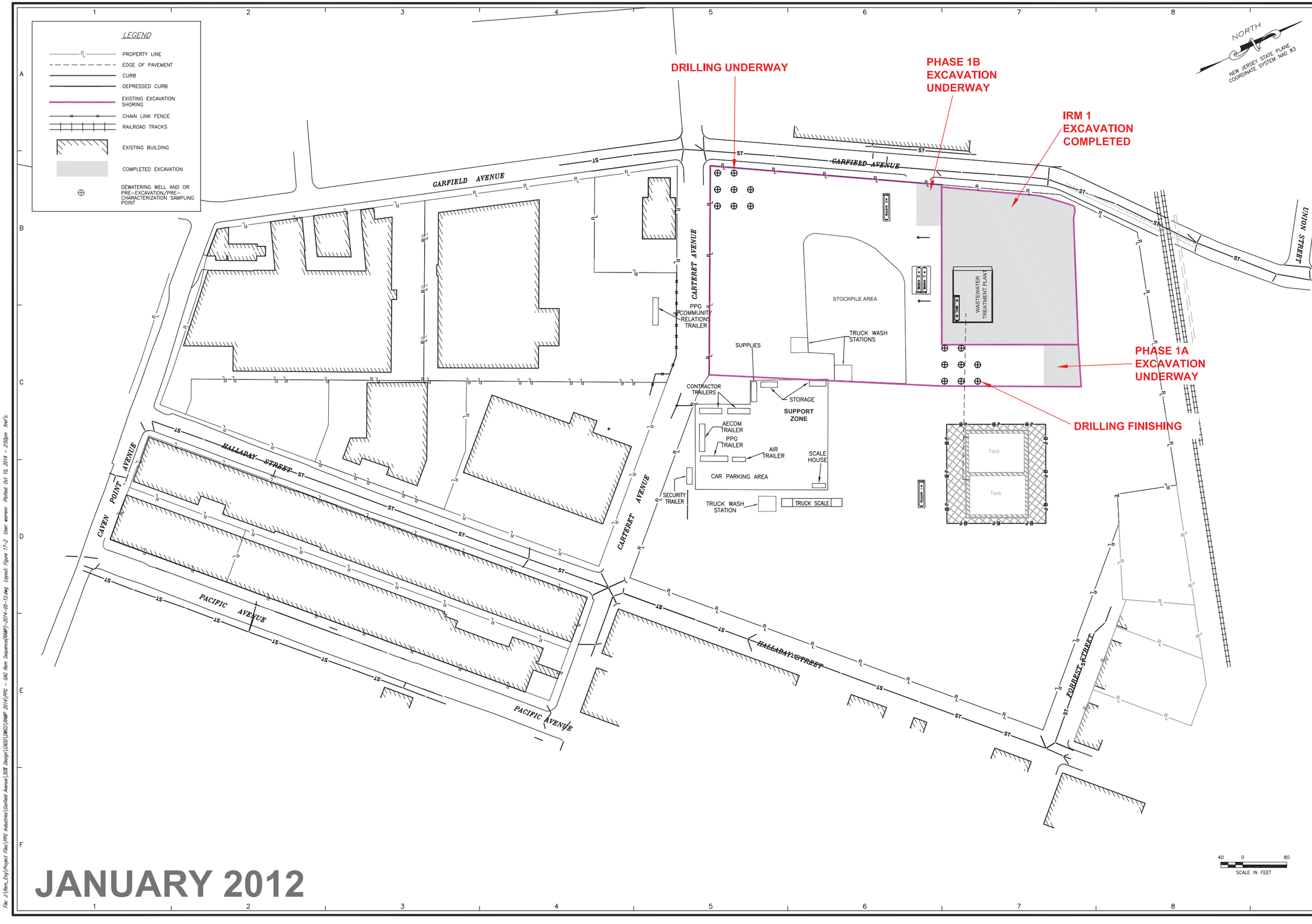
GARFIELD AVENUE GROUP
REMEDIAL PROGRESS PLAN

REMEDIAL ACTION WORK PLAN

FIGURE NUMBER: 17-1

SHEET NUMBER:

REVISION 2



JANUARY 2012

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
2	RCW	10/10/14	REVISED FINAL RAWP EDITS	HNQ	05/06/14	AF	05/06/14
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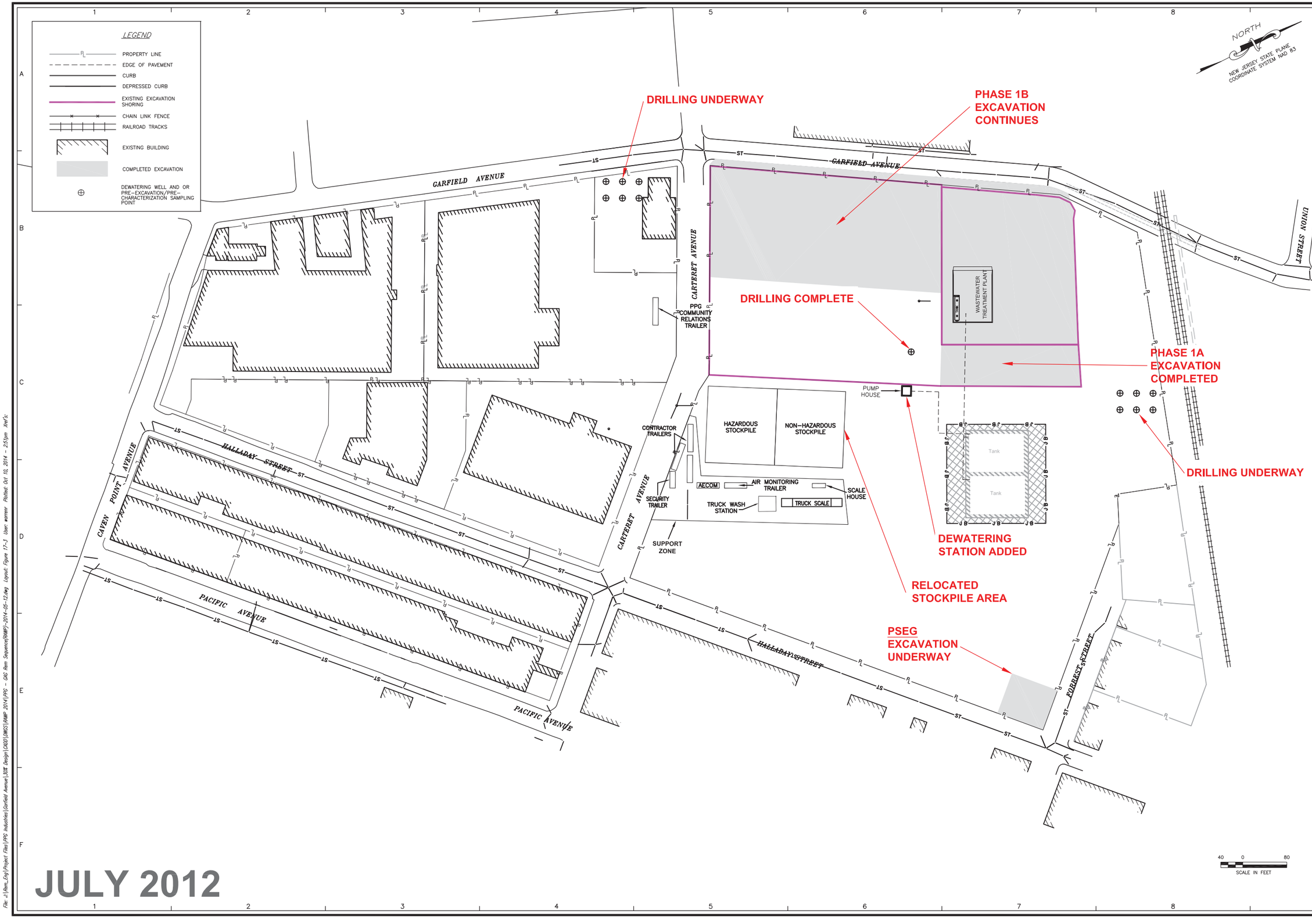
GARFIELD AVENUE GROUP
REMEDIAL PROGRESS PLAN

REMEDIAL ACTION WORK PLAN

FIGURE NUMBER:
17-2

SHEET NUMBER:

REVISION 2



JULY 2012

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
2	RCW	10/10/14	REVISED FINAL RAWP EDITS	HNQ	05/06/14	AF	05/06/14
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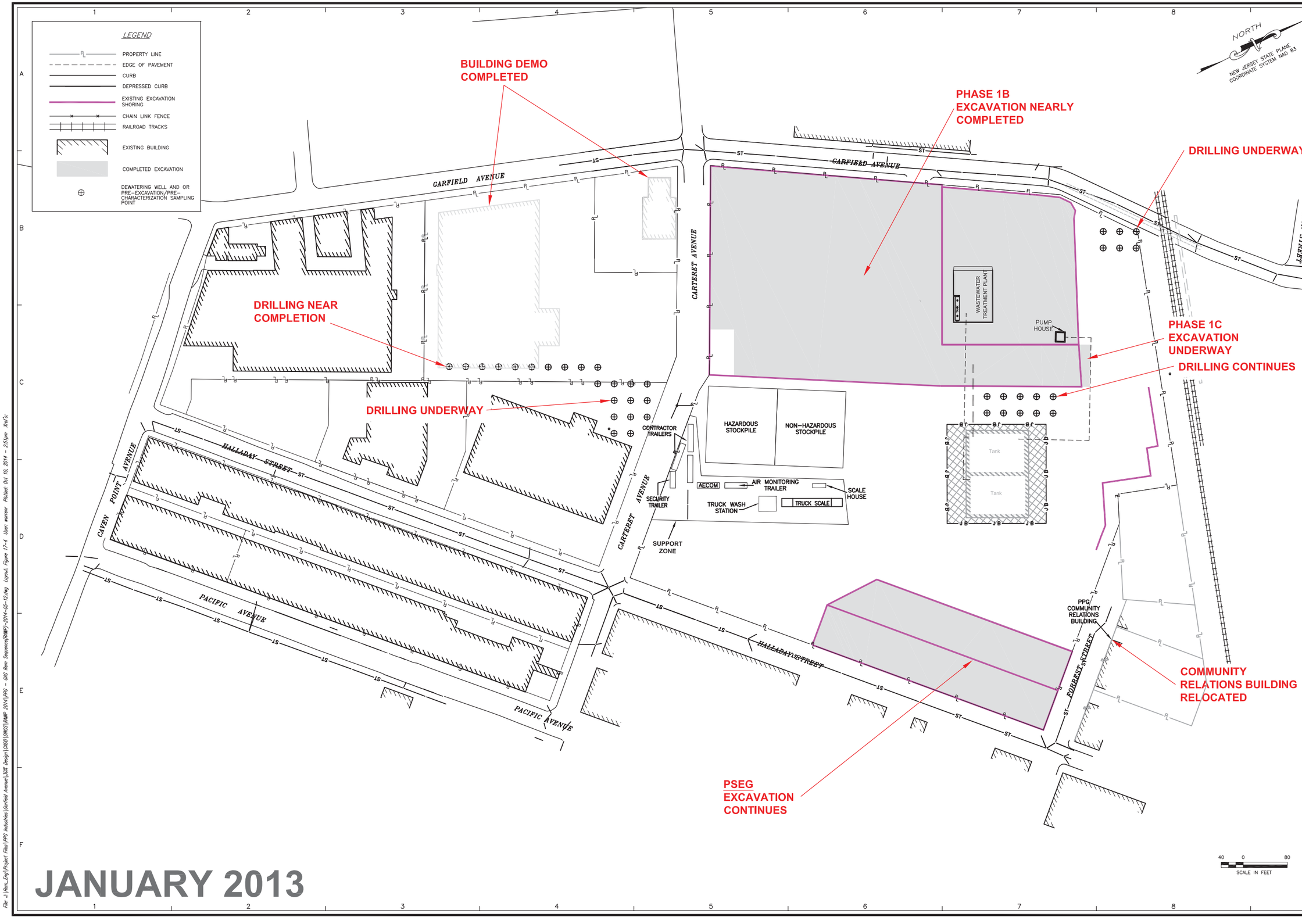
GARFIELD AVENUE GROUP REMEDIAL PROGRESS PLAN

REMEDIAL ACTION WORK PLAN

FIGURE NUMBER: 17-3

SHEET NUMBER:

REVISION 2



JANUARY 2013

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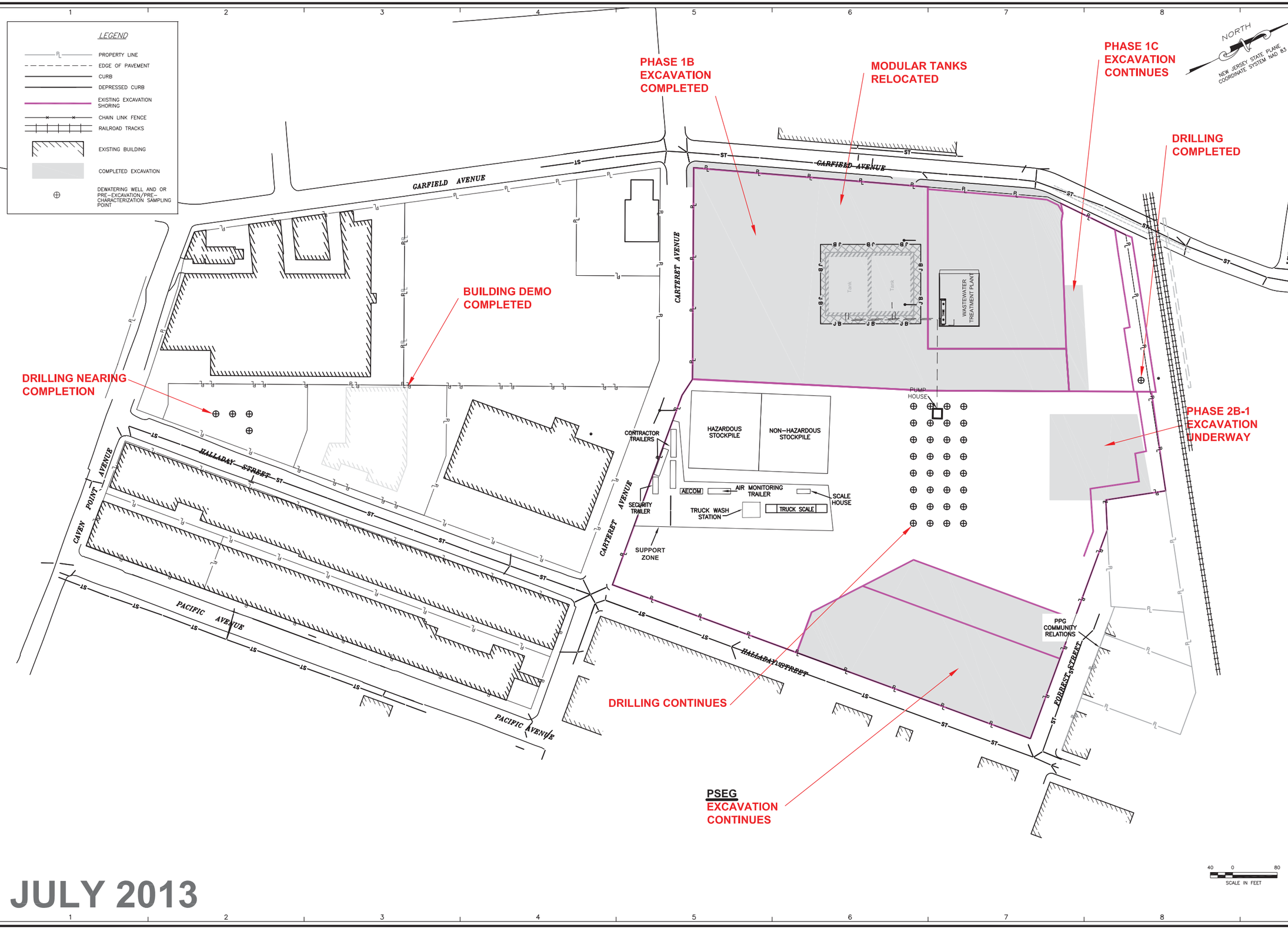
GARFIELD AVENUE GROUP
REMEDIAL PROGRESS PLAN

REMEDIAL ACTION WORK PLAN

FIGURE NUMBER:
17-4

SHEET NUMBER:

REVISION 2



JULY 2013

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
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GARFIELD AVENUE GROUP
REMEDIAL PROGRESS PLAN

REMEDIAL ACTION WORK PLAN

FIGURE NUMBER:
17-5

SHEET NUMBER:

REVISION 2

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LEGEND

- PROPERTY LINE
- EDGE OF PAVEMENT
- CURB
- DEPRESSED CURB
- EXISTING EXCAVATION SHORING
- CHAIN LINK FENCE
- RAILROAD TRACKS
- EXISTING BUILDING
- COMPLETED EXCAVATION
- DEWATERING WELL AND OR PRE-EXCAVATION/PRE-CHARACTERIZATION SAMPLING POINT

NORTH
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SUPPORT AREA RELOCATED

PHASE 1C EXCAVATION CONTINUES

GROUNDWATER PILOT STUDY UNDERWAY

DRILLING NEARING COMPLETION

PHASE 2B EXCAVATION CONTINUES

PHASE 2A EXCAVATION COMPLETED

GARFIELD AVENUE
CARTERET AVENUE
UNION STREET
HALLADAY STREET
PACIFIC AVENUE
CAVEN POINT AVENUE
FORREST STREET

CONTRACTOR TRAILERS
WCD TRAILER
SUPPORT ZONE
SCALE HOUSE
TRUCK SCALE
AECOM TRAILER
AECOM
AECOM
SUPPORT ZONE
WASTEWATER TREATMENT PLANT
GROUNDWATER PILOT STUDY
TRUCK WASH STATION
PUMP HOUSE
SECURITY/WESTON TRAILER
PPG COMMUNITY RELATIONS

JANUARY 2014

40 0 80
SCALE IN FEET

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
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DATE: 10/10/14

PROJ. NO.: 60190341.500A

GARFIELD AVENUE GROUP
REMEDIAL PROGRESS PLAN

REMEDIAL ACTION WORK PLAN

FIGURE NUMBER:
17-6

SHEET NUMBER:

REVISION 2

File: J:\Rem_Eng\Project Files\PPG Industries\Garfield Avenue\SITE Design\(JOB)\(MXD)\RAWP 2014\PPG - GAG Rem Sequence(RAWP)-2014-05-12.dwg Layout: Figure 17-6 User: wwmmr Plotted: Oct 10, 2014 - 2:53pm XrefS:

LEGEND

- PROPERTY LINE
- EDGE OF PAVEMENT
- CURB
- DEPRESSED CURB
- EXISTING EXCAVATION SHORING
- CHAIN LINK FENCE
- RAILROAD TRACKS
- EXISTING BUILDING
- COMPLETED EXCAVATION
- DEWATERING WELL AND OR PRE-EXCAVATION/PRE-CHARACTERIZATION SAMPLING POINT

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NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83

PHASE 1C EXCAVATION NEARING COMPLETION

PHASE 3A EXCAVATION UNDERWAY

BUILDING DEMO COMPLETED

PHASE 2 EXCAVATION CONTINUES

GARFIELD AVENUE
CARTERET AVENUE
UNION STREET
HALLADAY STREET
FORREST STREET
CAVEN POINT AVENUE
PACIFIC AVENUE

CONTRACTOR TRAILERS
WCD TRAILER
SUPPORT ZONE
PUMP HOUSE
AECOM TRAILER
AECOM
AECOM
SUPPORT ZONE
WASTEWATER TREATMENT PLANT
SECURITY/WESTON TRAILER
PPG COMMUNITY RELATIONS

40 0 80
SCALE IN FEET

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PROJ. NO.: 60190341.500A DATE: 10/10/14

GARFIELD AVENUE GROUP
REMEDIAL PROGRESS PLAN

REMEDIAL ACTION WORK PLAN

FIGURE NUMBER: 17-7

SHEET NUMBER:

REVISION 2

File: c:\Rem_Eng\Project Files\PPG Industries\Garfield Avenue\SITE Design\CAD\GIS\RAWP 2014\PPG - GAG Item Sequence(RAWP)-2014-05-12.dwg Layout: Figure 17-7 User: wwreer Plotted: Oct 10, 2014 - 2:52pm XrefS:

LEGEND

- PROPERTY LINE
- EDGE OF PAVEMENT
- CURB
- DEPRESSED CURB
- SHORING TO REMAIN IN-PLACE
- CHAIN LINK FENCE
- RAILROAD TRACKS
- EXISTING BUILDING
- COMPLETED EXCAVATION

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NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83

PHASE 3A EXCAVATION COMPLETED

SIDEWALK RESTORATION COMPLETED

PHASE 1C EXCAVATION COMPLETED

PUMP HOUSE RELOCATED

PHASE 3B EXCAVATION UNDERWAY

BUILDING DEMO COMPLETED

BUILDING DEMO COMPLETED

PHASE 2 EXCAVATION CONTINUES

GARFIELD AVENUE
CARTERET AVENUE
UNION STREET
HALLADAY STREET
FORREST STREET
CAVEN POINT AVENUE
PACIFIC AVENUE
PUMP HOUSE
CONTRACTOR TRAILERS
WCD TRAILER
SUPPORT ZONE
AECOM TRAILER
AECOM
AECOM
SUPPORT ZONE
WASTEWATER TREATMENT PLANT
SECURITY/WESTON TRAILER
PPG COMMUNITY RELATIONS

40 0 80
SCALE IN FEET

JANUARY 2015

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GARFIELD AVENUE GROUP
REMEDIAL PROGRESS PLAN

REMEDIAL ACTION WORK PLAN

FIGURE NUMBER:
17-8

SHEET NUMBER:

REVISION 2

LEGEND

- PROPERTY LINE
- EDGE OF PAVEMENT
- CURB
- DEPRESSED CURB
- SHORING TO REMAIN IN-PLACE
- CHAIN LINK FENCE
- RAILROAD TRACKS
- EXISTING BUILDING
- COMPLETED EXCAVATION

NORTH
NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD 83

PHASE 3B EXCAVATION NEARING COMPLETION

PUMP STATION RELOCATED

PHASE 3C EXCAVATION NEARING COMPLETION

GARFIELD AVENUE
CARTERET AVENUE
UNION STREET
HALLADAY STREET
PACIFIC AVENUE
CAVEN POINT AVENUE
FORREST STREET
CONTRACTOR TRAILERS
WCD TRAILER
SUPPORT ZONE
AECOM TRAILER
AECOM
AECOM
SUPPORT ZONE
WASTEWATER TREATMENT PLANT
PUMP HOUSE
SECURITY/WESTON TRAILER
PPG COMMUNITY RELATIONS

40 0 80
SCALE IN FEET

JULY 2015

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
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PROJ. NO.: 60190341.500A DATE: 10/10/14

GARFIELD AVENUE GROUP
REMEDIAL PROGRESS PLAN

REMEDIAL ACTION WORK PLAN

FIGURE NUMBER: 17-9

SHEET NUMBER:

REVISION 2

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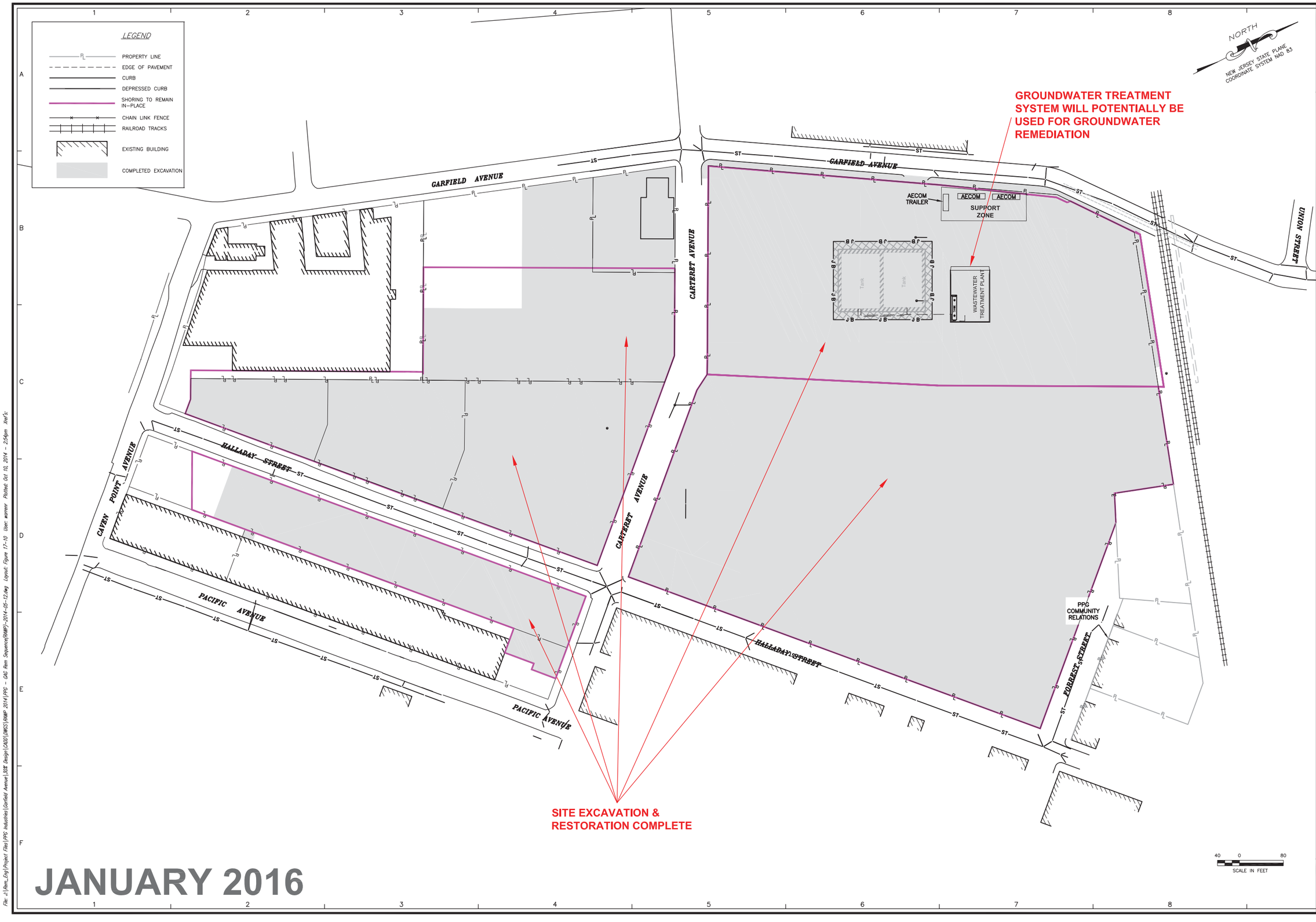

JANUARY 2016

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
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GARFIELD AVENUE GROUP
REMEDIAL PROGRESS PLAN

REMEDIAL ACTION WORK PLAN

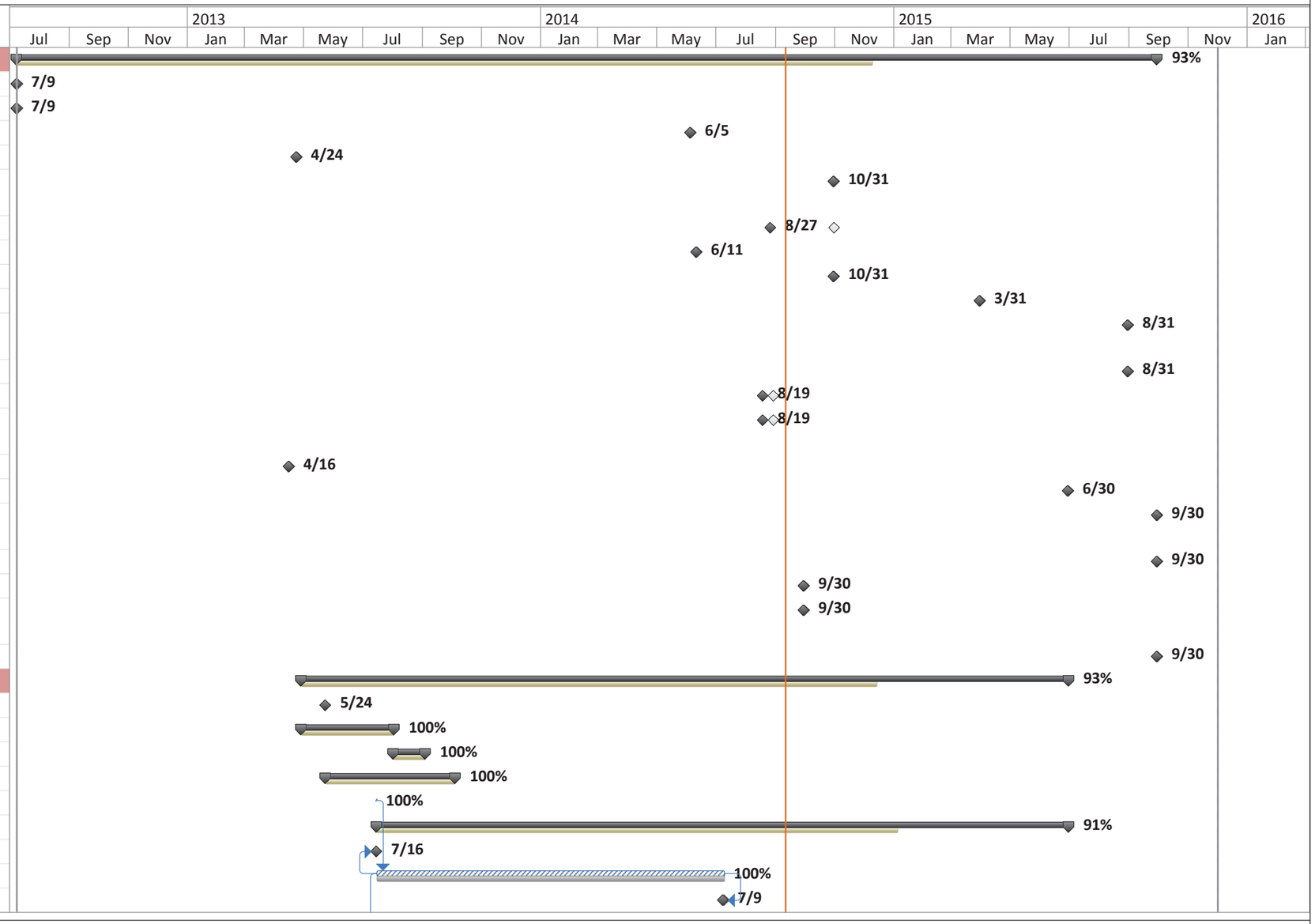
FIGURE NUMBER:
17-10

SHEET NUMBER:

REVISION 2

Figure 17-11
Master Schedule Summary
Garfield Avenue Group Soil Remediation

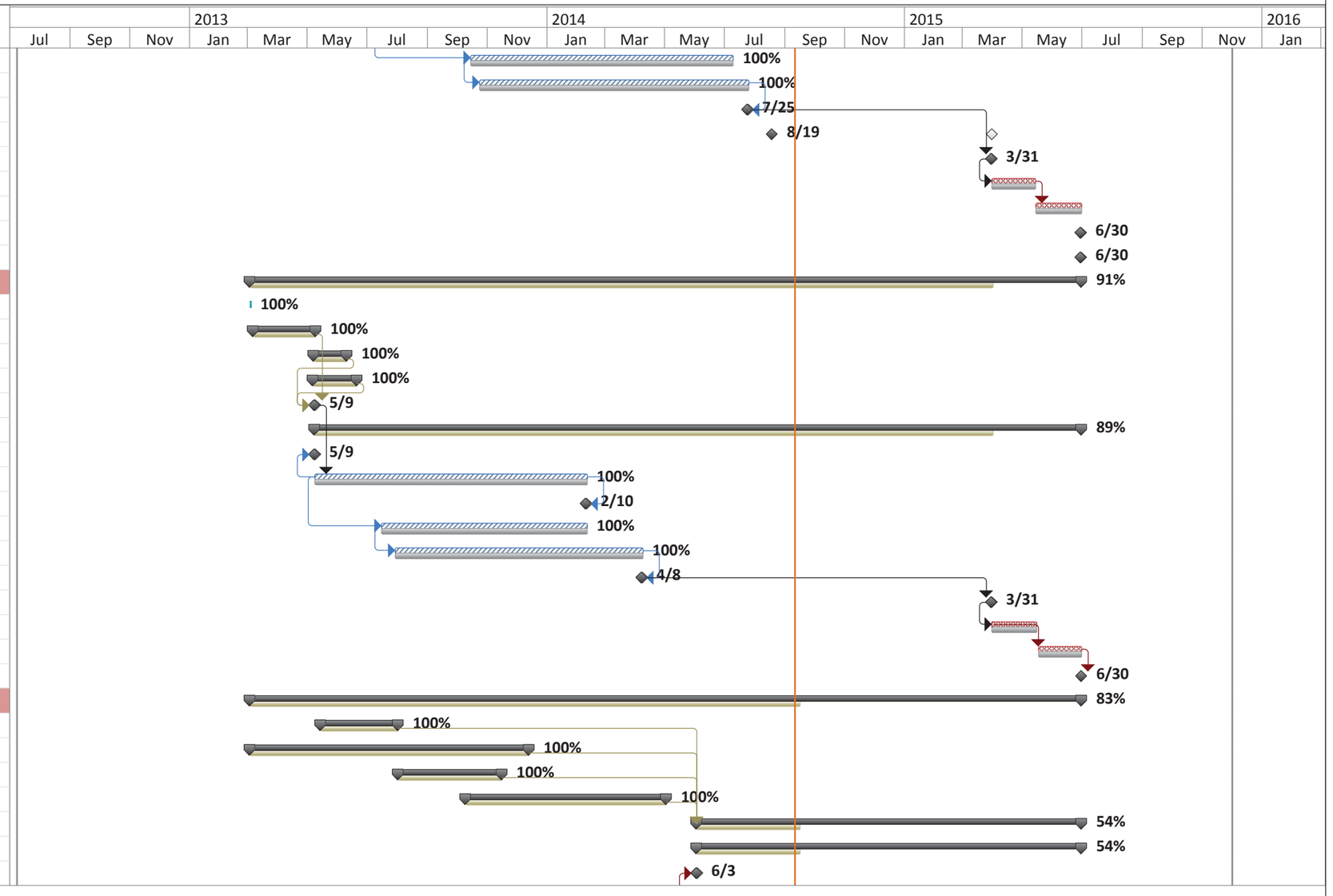
ID	Task Name	Predecessors
1	**Phase 1B**	
2	Ready for Excavation	
3	Excavation Start	
4	Excavation Complete	
5	Backfill Complete: A'13A	
6	Backfill Complete: 2B-3 Excavation Support Area (Deadmen)	
7	Backfill Complete: PCB Backfill Grids	
8	Backfill Complete: Western Sliver	
9	Backfill Complete	
10	Restoration Start: A'13A (RS-2)	
11	Restoration Start: 2B-3 Excavation Support Area (Deadmen) (RS-3)	
12	Restoration Start: PCB Backfill Grids (RS-3)	
13	Restoration Start: Western Sliver (RS-1)	
14	Restoration Start: Phase 1 Garfield Avenue Sidewalk (RS-1)	
15	Restoration Start	
16	Restoration Complete: A'13A (RS-2)	
17	Restoration Complete: 2B-3 Excavation Support Area (Deadmen) (RS-3)	
18	Restoration Complete: PCB Backfill Grids (RS-3)	
19	Restoration Complete: Western Sliver (RS-1)	
20	Restoration Complete: Phase 1 Garfield Avenue Sidewalk (RS-1)	
21	Restoration Complete	
22	**Phase 1C**	
23	**Site Access**	
24	**Design & Approvals**	
35	**Procurement**	
37	**Site Work**	
42	Ready for Excavation	27,38,39
43	**Excavation & Restoration**	
44	Excavation Start	45SS
45	Excavation	42
46	Excavation Complete	45FF



Project Status Date: 9/10/14	Critical Progress	Start-only	Late	Summary Progress	External Milestone	Slippage
	Task	Finish-only	Baseline	Summary	Inactive Task	Slack
	Split	Duration-only	Baseline Split	Manual Summary	Inactive Milestone	
	Task Progress	Critical	Baseline Milestone	Project Summary	Inactive Summary	
	Manual Task	Critical Split	Milestone	External Tasks	Deadline	

Figure 17-11
Master Schedule Summary
Garfield Avenue Group Soil Remediation

ID	Task Name	Predecessors
47	Post Excavation Sampling for Remaining Grids	45SS+2 wks
48	Backfilling	47SS
49	Backfill Complete	48FF
50	Restoration Start: NW Grid Cells (RS-2)	
51	Restoration Start (RS-2)	49
52	Capillary Break Installation	51SS
53	Final Grading	52
54	Restoration Complete: NW Grid Cells (RS-2)	
55	Restoration Complete (RS-2)	
56	**Phase 2B-1 (Temporary Wall)**	
57	**Site Access**	
58	**Design & Approvals**	
62	**Procurement**	
65	**Site Work (Temporary Wall)**	
74	Ready for Excavation (Temporary Wall)	65,62,58
75	**Excavation & Restoration (Temporary Wall)**	
76	Excavation Start (Temporary Wall)	77SS
77	Excavation with Temporary Wall	74
78	Excavation Complete (Temporary Wall)	77FF
79	Post-Excavation Sampling of Remaining Grids	77SS+2 wks
80	Backfilling	79SS
81	Backfill Complete	80FF
82	Restoration Start (RS-2)	81
83	Install Capillary Break	82SS
84	Final Grading	83
85	Restoration Complete (Temporary Wall) (RS-2)	84
86	**Phase 2B-1 (Final Wall)**	
87	**Site Access (Final Wall)**	
91	**Design & Approvals (Final Wall)**	
98	**Procurement (Final Wall)**	
101	**Site Work (Final Wall)**	
107	Ready for Excavation (Final Wall)	101,98,91,87
108	**Excavation & Restoration (Final Wall)**	
109	Excavation Start (Final Wall)	110SS



Project Status Date: 9/10/14

Critical Progress		Start-only		Late		Summary Progress		External Milestone	
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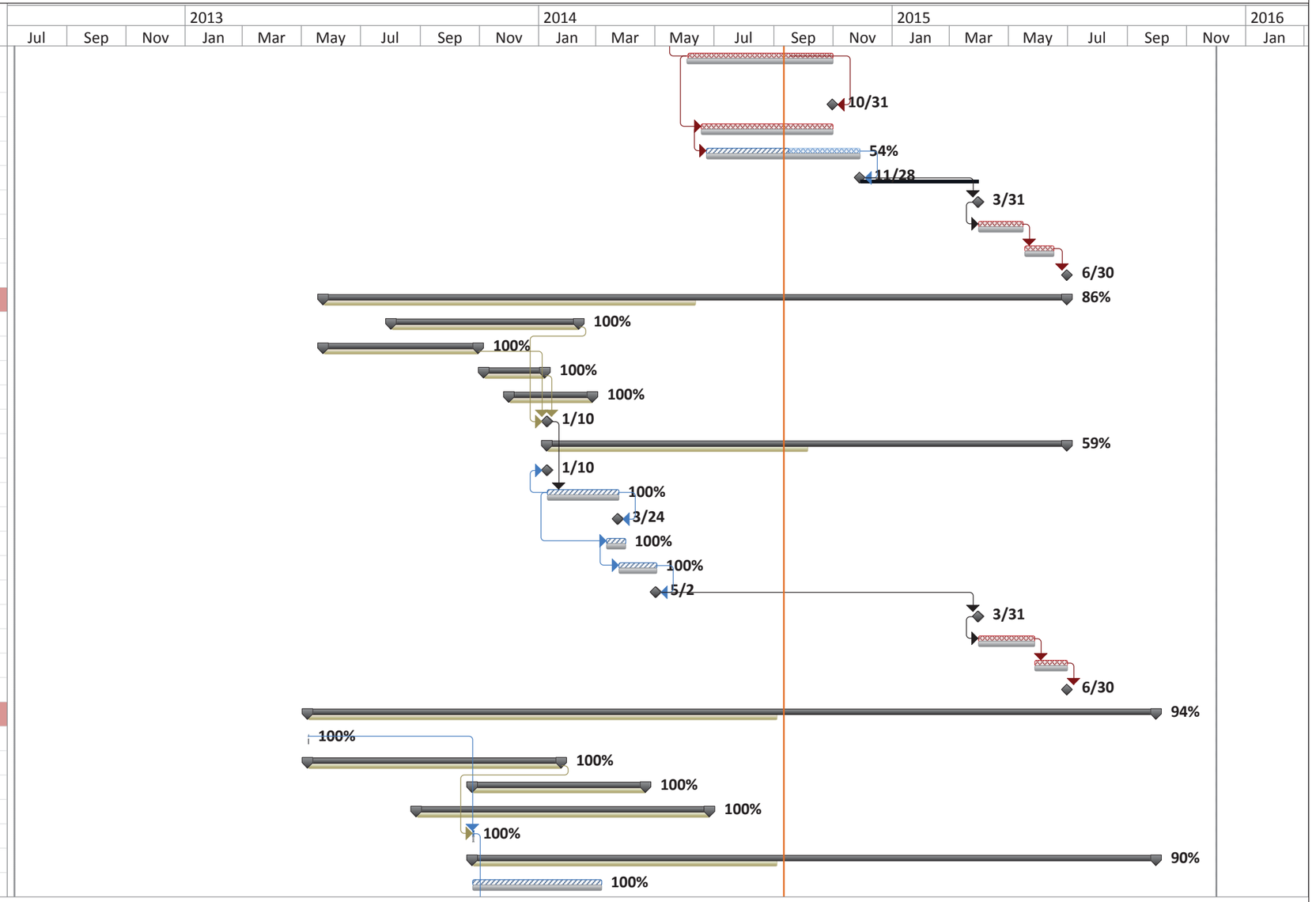
Split		Duration-only		Baseline Split		Manual Summary		Inactive Milestone	
Task Progress		Critical		Baseline Milestone		Project Summary		Inactive Summary	
Manual Task		Critical Split		Milestone		External Tasks		Deadline	

Slippage	
Slack	

Figure 17-11
Master Schedule Summary
Garfield Avenue Group Soil Remediation

ID	Task Name	Predecessors
110	Initial Excavation, Installation of Bracing, and Final Excavation between Temporary and Final Walls	
111	Excavation Complete (Final Wall)	110FF
112	Post-Excavation Sampling of Remaining Grids	110SS+2 wks
113	Backfilling	112SS
114	Backfill Complete	113FF
115	Restoration Start (RS-2)	114
116	Install Capillary Break	115SS
117	Final Grading	116
118	Restoration Complete (Final Wall) (RS-2)	117FS+2 wks
119	**Phase 2B-2**	
120	**Site Access**	
123	**Design & Approvals**	
131	**Procurement**	
134	**Site Work**	
140	Ready for Excavation	131,123,120
141	**Excavation & Restoration**	
142	Excavation Start	143SS
143	Excavation	140
144	Excavation Complete	143FF
145	Post-Excavation Sampling of Remaining Grids	143SS+2 wks
146	Backfilling	145SS
147	Backfill Complete	146FF
148	Restoration Start (RS-2)	147
149	Install Capillary Break	148SS
150	Final Grading	149
151	Restoration Complete (RS-2)	150
152	**Phase 2B-3**	
153	**Site Access**	
154	**Design & Approvals**	
165	**Procurement**	
168	**Site Work**	
175	Ready for Excavation Date	154,153
176	**Excavation & Restoration**	
177	Early Excavation as Part of Phase 2B-1 Work	

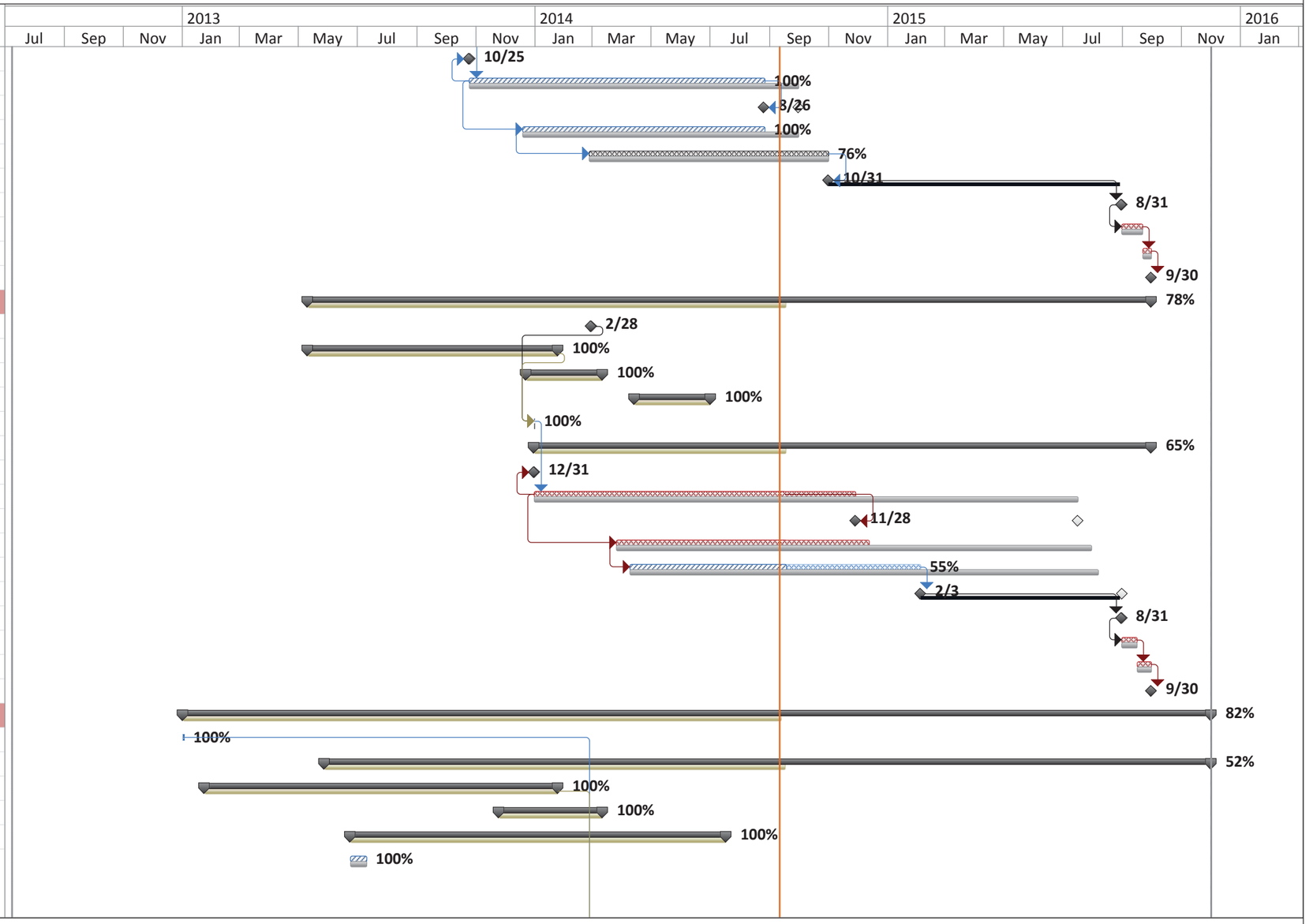


Project Status Date: 9/10/14

Critical Progress	Start-only	Late	Summary Progress	External Milestone	Slippage
Task	Finish-only	Baseline	Summary	Inactive Task	Slack
Split	Duration-only	Baseline Split	Manual Summary	Inactive Milestone	
Task Progress	Critical	Baseline Milestone	Project Summary	Inactive Summary	
Manual Task	Critical Split	Milestone	External Tasks	Deadline	

Figure 17-11
Master Schedule Summary
Garfield Avenue Group Soil Remediation

ID	Task Name	Predecessors
178	Excavation Start	179SS
179	Excavation	175
180	Excavation Complete	179FF
181	Post-Excavation Sampling of Remaining Grids	179SS+2 wks
182	Backfilling	181SS
183	Backfill Complete	182FF
184	Restoration Start (RS-3)	183
185	Install Capillary Break	184SS
186	Final Grading	185
187	Restoration Complete (RS-3)	186
188	**Phase 2B-4**	
189	**Site Access**	
191	**Design & Approvals**	
202	**Procurement**	
205	**Site Work**	
210	Ready for Excavation	189,191
211	**Excavation & Restoration**	
212	Excavation Start	213SS
213	Excavation	210
214	Excavation Complete	213FF
215	Post-Excavation Sampling of Remaining Grids	213SS+2 wks
216	Backfilling	215SS
217	Backfill Complete	216
218	Restoration Start (RS-3)	217
219	Install Capillary Break	218SS
220	Final Grading	219
221	Restoration Complete (RS-3)	220
222	**Phase 3A**	
223	**Site Access**	
224	**Street Closures**	
227	**Design & Approvals**	
249	**Procurement**	
252	**Site Work**	
253	Pre-Demolition Activities (including asbestos abatement, utility disconnects, etc.) are Conducted and Demolition Permit Submitted	

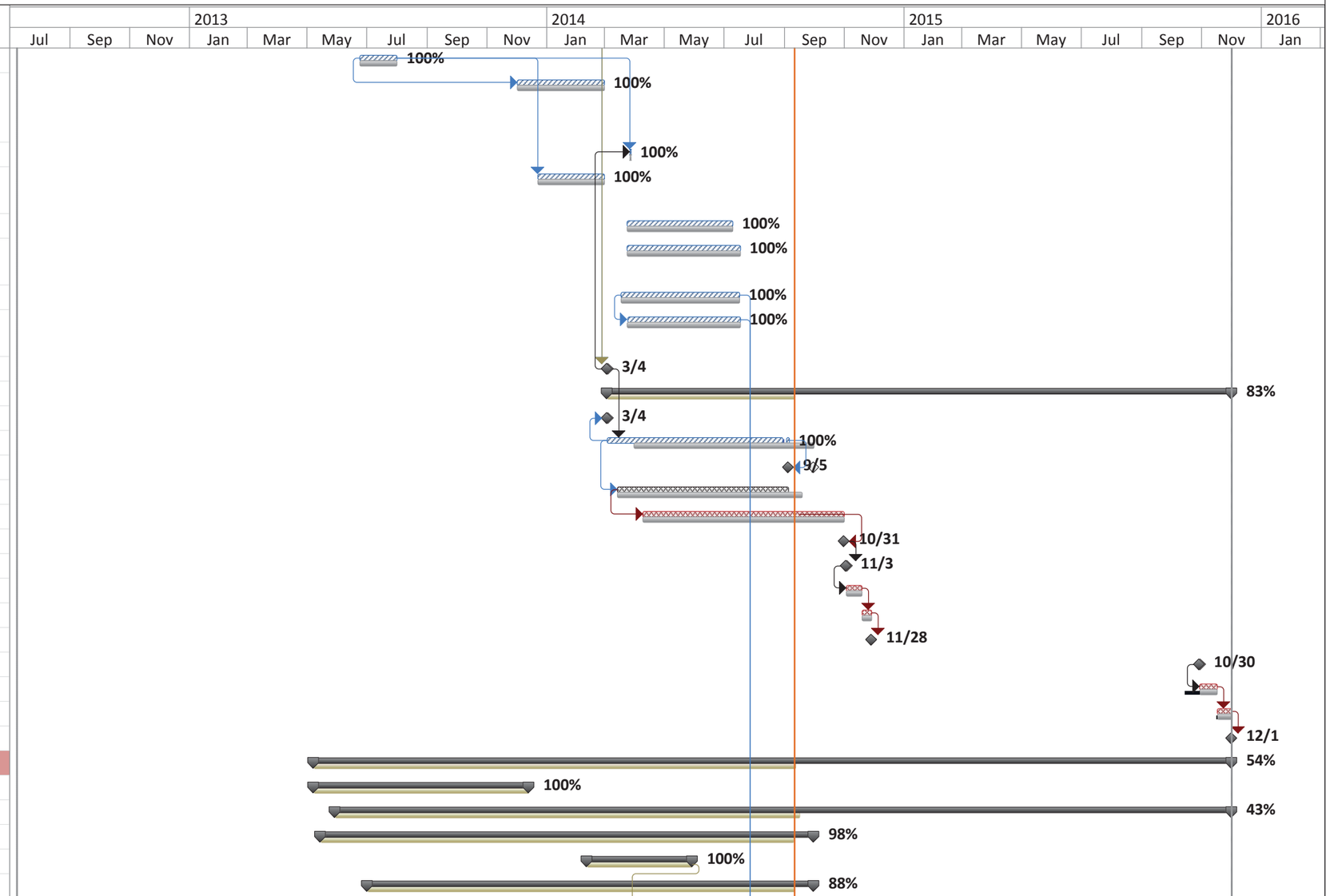


Project Status Date: 9/10/14

Critical Progress	Start-only	Late	Summary Progress	External Milestone	Slippage
Task	Finish-only	Baseline	Summary	Inactive Task	Slack
Split	Duration-only	Baseline Split	Manual Summary	Inactive Milestone	
Task Progress	Critical	Baseline Milestone	Project Summary	Inactive Summary	
Manual Task	Critical Split	Milestone	External Tasks	Deadline	

Figure 17-11
Master Schedule Summary
Garfield Avenue Group Soil Remediation

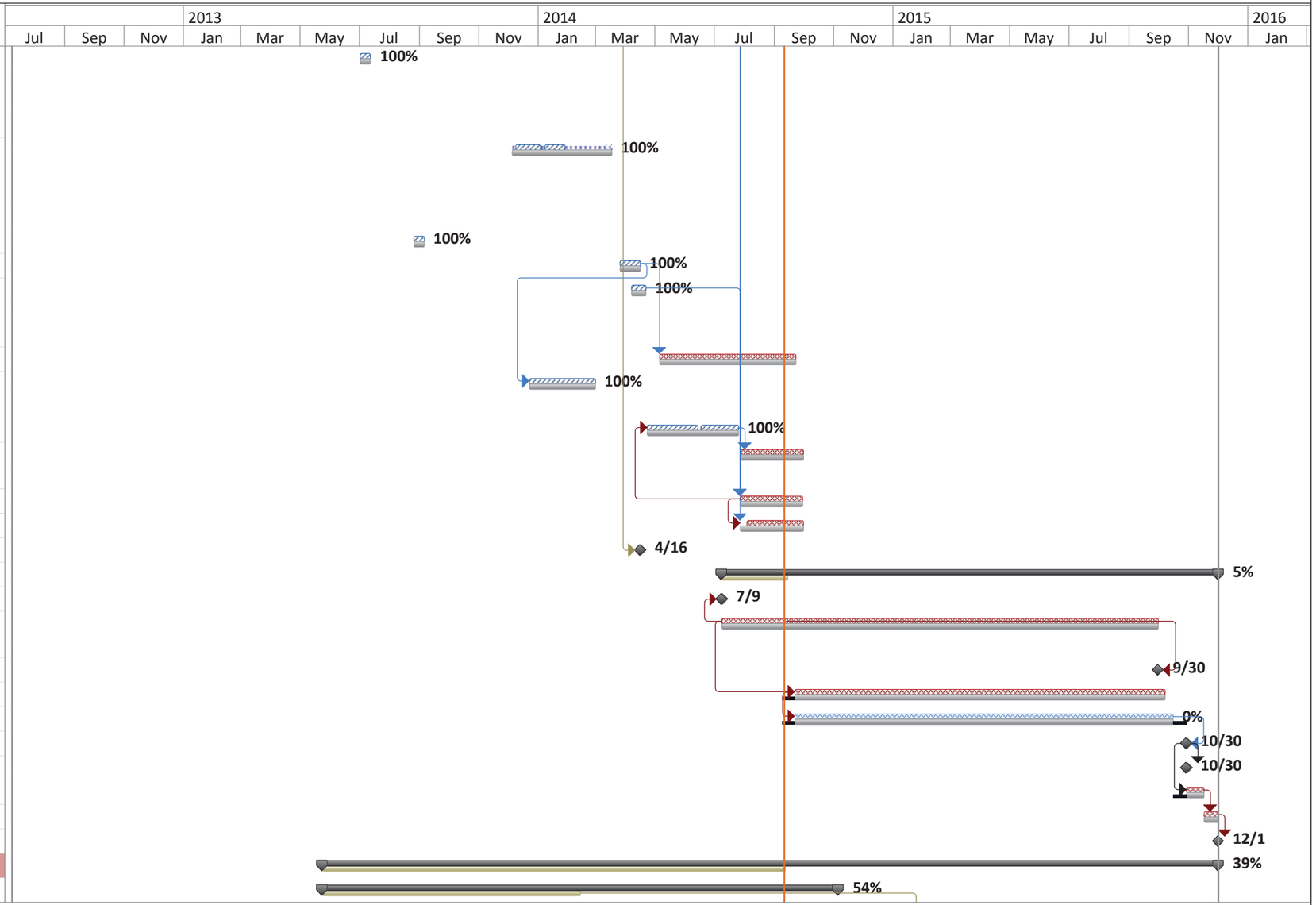
ID	Task Name	Predecessors
254	Building Demolition	248
255	Construct Site Support Facilities (haul roads, decontamination areas, loading areas, soil stockpiles, and trailers)	254SS
256	Install Dewatering System	254,262SS
257	Install Storage Tanks and Transfer Line for Water Treatment	254
258	Baseline Vibration and Settlement Monitoring	
259	Vibration and Settlement Monitoring for Sheet Pile Installation	
260	Pre-Trenching for Sheet Piles	
261	Install Sheet Piles	251,260SS+1 wk,209FF+7 days
262	Ready for Excavation	223,227
263	**Excavation & Restoration**	
264	Excavation Start	265SS
265	Excavation	262
266	Excavation Complete	265FF
267	Post-Excavation Sampling of Remaining Grids	265SS+2 wks
268	Backfilling	267SS
269	Backfill Complete	268FF
270	Restoration Start (RS-4)	269
271	Install Capillary Break	270SS
272	Final Grading	271
273	Restoration Complete (RS-4)	272
274	Restoration Start (RS-5)	
275	Install Capillary Break	274SS
276	Final Grading	275
277	Restoration Complete (RS-5)	276
278	**Phase 3B**	
279	**Site Access**	
289	**Street Closures**	
293	**Design & Approvals**	
320	**Procurement**	
323	**Site Work**	



Project Status Date: 9/10/14	Critical Progress		Start-only		Late		Summary Progress		External Milestone		Slippage	
	Task		Finish-only		Baseline		Summary		Inactive Task		Slack	
	Split		Duration-only		Baseline Split		Manual Summary		Inactive Milestone	
	Task Progress		Critical		Baseline Milestone		Project Summary		Inactive Summary	
	Manual Task		Critical Split		Milestone		External Tasks		Deadline	

Figure 17-11
Master Schedule Summary
Garfield Avenue Group Soil Remediation

ID	Task Name	Predecessors
324	Pre-Demolition Activities (including asbestos abatement, utility disconnects, etc.) are Conducted and Demolition Permit Submitted for Site 137B	288
325	Pre-Demolition Activities (including asbestos abatement, utility disconnects, etc.) are Conducted and Demolition Permit Submitted for Site 137A	288
326	Building Demolition for Site 137B	318
327	Building Demolition for Site 137A	319
328	Construct Site Support Facilities (haul roads, decontamination areas, loading areas, soil stockpiles, and trailers)	319SS-2 wks
329	Install Dewatering System	327,321,304
330	Install Storage Tanks and Transfer Line for Water Treatment	327
331	Baseline Vibration and Settlement Monitoring	333SS-37 days
332	Vibration and Settlement Monitoring for Sheet Pile Installation	331
333	Pre-Trenching for Sheet Pile	328,260
334	Install Sheet Pile	333SS+1 wk,322,261
335	Ready for Excavation	320,288
336	**Excavation & Restoration**	
337	Excavation Start	338SS
338	Excavation (If 45 Halladay is not available, start excavation in south at 15/25 Halladay)	
339	Excavation Complete	338FF
340	Post-Excavation Sampling of Remaining Grids	338SS+2 wks
341	Backfilling and Ferroblack Application	340SS
342	Backfill Complete	341FF
343	Restoration Start (RS-5)	342
344	Install Capillary Break	342SS
345	Final Grading	344
346	Restoration Complete (RS-5)	345
347	**Phase 3C**	
348	**Site Access**	

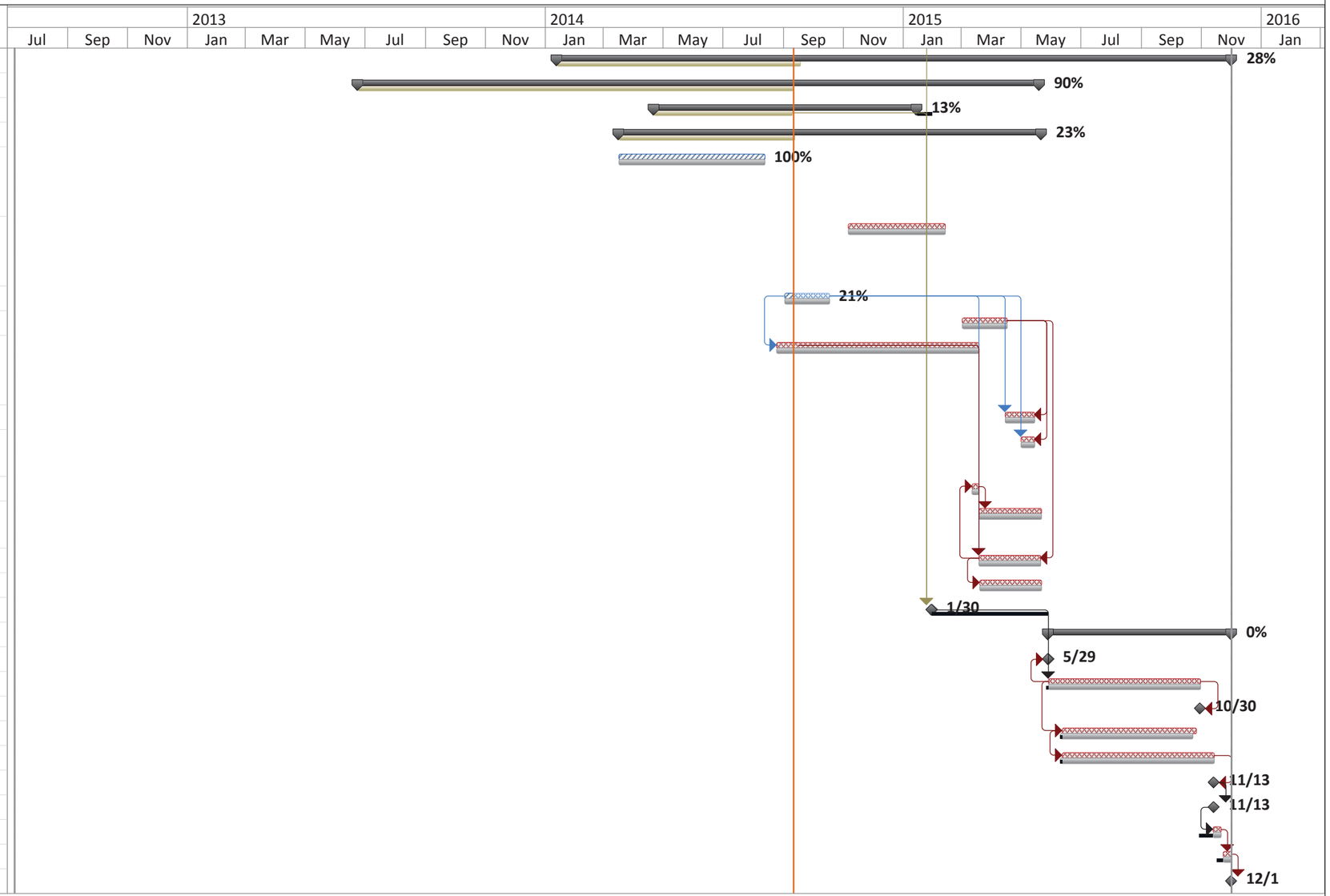


Project Status Date: 9/10/14

Critical Progress	Start-only	Late	Summary Progress	External Milestone	Slippage
Task	Finish-only	Baseline	Summary	Inactive Task	Slack
Split	Duration-only	Baseline Split	Manual Summary	Inactive Milestone	
Task Progress	Critical	Baseline Milestone	Project Summary	Inactive Summary	
Manual Task	Critical Split	Milestone	External Tasks	Deadline	

Figure 17-11
Master Schedule Summary
Garfield Avenue Group Soil Remediation

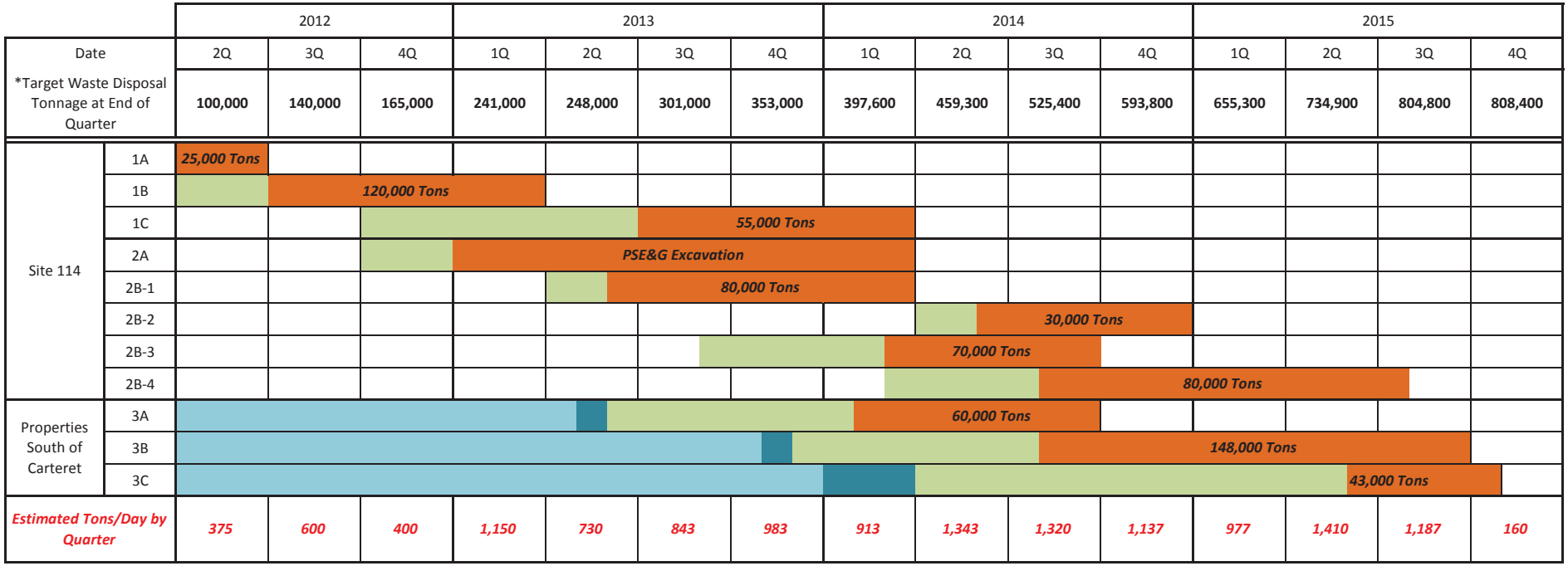
ID	Task Name	Predecessors
355	**Street Closures**	
358	**Design & Approvals**	
387	**Procurement**	
390	**Site Work**	
391	Ross Wax Pre-Demolition Activities (Including Asbestos Abatement, Utility Disconnects, etc.) are Conducted and Demolition Permit Submitted	352
392	Vitarroz Pre-Demolition Activities (Including Asbestos Abatement, Utility Disconnects, etc.) are Conducted and Demolition Permit Submitted	354
393	Building Demolition for Ross Wax Property	384
394	Building Demolition for Vitarroz Property	385
395	Construct Site Support Facilities (hauls roads, decontamination areas, loading areas, soil stockpiles, and trailers)	393SS
396	Install Dewatering System	394FF+4 wks,393
397	Install Storage Tanks and Transfer Line for Water Treatment	394FF+4 wks,393
398	Baseline Vibration and Settlement Monitoring	400SS-5 days
399	Vibration and Settlement Monitoring for Sheet Pile Installation	398
400	Pre-Trenching for Sheet Piles	395,394FF+4 wks,393
401	Install Sheet Piles	400SS+1 day
402	Ready for Excavation	387,348
403	**Excavation & Restoration**	
404	Excavation Start	405SS
405	Excavation	402
406	Excavation Complete	405FF
407	Post-Excavation Sampling of Remaining Grids	405SS+2 wks
408	Backfilling	407SS
409	Backfill Complete	408FF
410	Restoration Start (RS-6)	409
411	Install Capillary Break	410SS
412	Final Grading	411
413	Restoration Complete (RS-6)	412



Project Status Date: 9/10/14

Critical Progress	Start-only	Late	Summary Progress	External Milestone	Slippage
Task	Finish-only	Baseline	Summary	Inactive Task	Slack
Split	Duration-only	Baseline Split	Manual Summary	Inactive Milestone	
Task Progress	Critical	Baseline Milestone	Project Summary	Inactive Summary	
Manual Task	Critical Split	Milestone	External Tasks	Deadline	

Figure 17-12
PPG New Jersey Chrome- GA Group
Excavation Sequence



* Target Waste Disposal Volumes prior to Q2 2013 were based on the original project schedule. Target Waste Disposal Volumes from Q2 2013 are based on the Excavation Sequence (Exhibit 1) dated June 13, 2013 and submitted to the Court on June 14, 2013. The target tonnage was adjusted to capture tonnage for the for GA Group only. Last updated January 2014.

Appendix A – Air Monitoring Plan

Available in zipfile

Appendix B – Dust Control Plan

Available in zipfile

Appendix C- Traffic Safety & Control Plan

Available in zipfile

Appendix D – Soil & Stockpile Management Plan

Available in zipfile

Appendix E – Health & Safety Plan (HASP)

Available in zipfile

Appendix F – Exhibit A – Excavation Plan

Available in zipfile

Appendix G – Example Draft Deed Notice

Available in zipfile

Appendix H – Receptor Evaluation

Available in zipfile

Appendix I – Level 3 Survey Performed By Enviroscan

Available in zipfile

Appendix J – Copy of Approved Permits

Available in zipfile

Appendix K –Contingency & Communications Plan

Available in zipfile

Appendix L – Capillary Break Design Report

Available in zipfile