PEC **Pennjersey Environmental Consulting**

744 Milford Warren Glen Road, Milford, NJ 08848-1647
(908) 329-6060 *www.pennjerseyenv.com*

March 19, 2015

RECEIVED
MAR 23 2015
Pesticides & Toxic Substances Branch

Ms. Judith A. Enck
Administrator
United States Environmental Protection Agency
Region 2 – Main Regional Office
290 Broadway
New York, New York 10007-1866

RE: Remedial Investigation/Remedial Action Report/Remedial Action Workplan
Former Alcoa Building 12
660 River Road
Block 74, Lot 1.02B
Borough of Edgewater, Bergen County, New Jersey
USEPA ID NJD981559149

Dear Ms. Enck,

On behalf of the site owner, North River Mews Associates LLC, Pennjersey Environmental Consulting is submitting the Remedial Investigation/Remedial Action Report/Remedial Action Workplan for the former Alcoa Building 12 property located at 660 River Road in the Borough of Edgewater, Bergen County, New Jersey.

This report includes the site specific risk assessment to support the proposed use of engineering controls, as required by the Toxic Substances Control Act at 40 CFR 761.61(c), such that the contaminants do not pose an unreasonable risk of injury to health or the environment. We look forward to meeting with your staff at their earliest convenience to discuss the approval of the risk based cleanup.

Thank you for your attention to this matter. Should you have any questions or comments, please feel free to contact me at (908) 329-6060 or rferguson@pennjerseyenv.com.

Sincerely yours,
Pennjersey Environmental Consulting

Rodger A. Ferguson, Jr., LSRP
President
Licensed Site Remediation Professional No. 573794

Enc.

Cc: Mr. Fred Daibes
Mr. Berek Don
North Riverside Mews Associates, LLC

Mr. Patrick Papalia Esq. (Electronically)
Mrs. Debra S. Rosen, Esq. (Electronically)
Archer & Greiner, P.C.

Mr. John Gorman
USEPA Region II, Pesticides and Toxic Substances Branch

Mr. Kevin Schick
NJ Department of Environmental Protection, Site Remediation Program

Mrs. Nancy L. Mangieri, Director (Electronically)
Bergen County Department of Health Services

Remedial Investigation/Remedial Action Report/Remedial Action Workplan

For

Former Alcoa Building 12

**a.k.a. A.P. New Jersey, Inc.
660 River Road
Edgewater Borough, Bergen County
Block 74 Lot 1.02B Qualifier C000A
USEPA ID No. NJD981559149
NJDEP PI No. 023713 & 620276**

On Behalf of:

North River Mews Associates, LLC

**1000 Portside Drive
Edgewater, NJ 07020**

For Submission to:

US Environmental Protection Agency Region 2

**Regional Administrator
Main Region Office
290 Broadway
New York, New York 10007-1866**

&

NJ Department of Environmental Protection

**Bureau of Initial Notice and Case Assignment
401 East Main Street
Mail Stop 401-05H
Trenton, New Jersey 08625-0420**

Prepared By:

Pennjersey Environmental Consulting

**744 Milford Warren Glen Road
Milford, New Jersey 08848-1647
(908) 329-6060
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March 5, 2015

SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

Environmental professionals from Pennjersey Environmental Consulting completed this Remedial Investigation Report/Remedial Action Report/Remedial Action Workplan for the former American Aluminum Corporation of America (Alcoa) Building 12 facility located at 660 River Road, Edgewater Borough, Bergen County, New Jersey.

By signing this Report, we certify that this report followed PEC internal procedures for quality control and was prepared with good practices in accordance with the United States Environmental Protection Agency regulations at 40 CFR 761.61.

Prepared by:

Bradley D. Musser
Bradley D. Musser
Project Manager

3/9/15
Date

Reviewed by:

Suzanne Macaoay Ferguson
Suzanne Macaoay Ferguson, PG
Vice president

3/9/15
Date

Approved by:

Rodger A. Ferguson, Jr., LSRP
President
Licensed Site Remediation Professional 573794

3/13/15
Date

PLAN VERIFICATION

Pursuant to 40 CFR 761.61(a)(3)(i)(E), I hereby certify that all sampling plans, sample collection procedures, sample preparation procedures, extraction procedures and instrumental/chemical analysis procedures used to assess or characterize the PCB contamination and/or presence there of related to the investigation and cleanup activities specified herein will be maintained in the following location and accessible for inspection by the USEPA.

Property Owner's Representative Signature

3/12/15
Date

Fred A. Daibes
Property Owner's Representative Printed Name

Managing Member
Property Owner's Representative Title

Property Owner Address:

North River Mews Associates, LLC
Attn: Mr. Fred A. Daibes
1000 Portside Drive
Edgewater, NJ 07020

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The Figures, Tables, and Appendices can be reviewed by contacting the U.S. Environmental Protection Agency (EPA) at:

U.S. EPA Region 2
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679

Attention: James Haklar, Ph.D.
(732) 906-6817
haklar.james@epa.gov

1.0 Introduction

This Remedial Investigation (RI) / Remedial Action Report (RAR) / Remedial Action Workplan (RAW) has been prepared by Pennjersey Environmental Consulting, Inc. (PEC) on behalf of North River Mews Associates, LLC the current owner of the property, (the Client) to present to both the United States Environmental Protection Agency (USEPA) and the New Jersey Department of Environmental Protection Site Remediation Program (NJDEP) as documentation of the remedial activities conducted to date to address contamination at the former Aluminum Company of America (Alcoa) facility located in Borough of Edgewater, Bergen County, New Jersey (the Site) and to support the accompanying RAW for completion of the Site's remediation.

As documented further herein, most of the remaining former manufacturing building covering the Site was razed in 2013 to prepare the Site for commercial redevelopment. During this process, two unknown fuel oil underground storage tanks (USTs), presumably previously used during Alcoa's operations at the Site, were discovered within an enclosed vault buried beneath the former manufacturing building. Subsequent efforts made to address the unexpected presence of these USTs discovered that the residual fuel oil within both USTs was contaminated with polychlorinated biphenyls (PCBs) and that the vault contained evidence that a discharge had occurred prior to the Client's ownership from one or both of these USTs, i.e., the presence of PCB-contaminated heavy heating oil in soils surrounding the USTs.

At this time, all soils grossly contaminated by PCBs and fuel oil have been excavated and removed from the Site. Additional investigations have been performed to delineate the presence of soil contaminants associated with the historic manufacturing operations at the Site at concentrations in excess of NJDEP Direct Contact Soil Remediation Standards and/or Impact to Ground Water Soil Screening Levels, for particularly PCBs and, to a lesser extent, extractable petroleum hydrocarbons (EPH), polycyclic aromatic hydrocarbons (PAHs), and some heavy metals. It is noted that the contaminants of concern for this Site were not detected in Site groundwater at concentrations in excess of NJDEP Ground Water Quality Standards. The Remedial Investigation/Remedial Action section of this report documents the results of this investigation.

A site-specific risk assessment of the PCB impact was conducted in a manner consistent with USEPA guidance to estimate the risk associated with potentially completed exposure pathways conservatively. This risk assessment satisfies the USEPA requirements under TSCA so that PCB concentrations greater than the self-implemented remedy may remain on site. The risk estimates are based onsite-specific risk-based screening levels and take into consideration worst-case exposure scenarios and the default values specified by USEPA. Therefore, the risk estimates likely over estimate any potential risk that could occur at the Site in question. The Risk Assessment section of this report provides the basis and the results for the risk assessment process.

The Remedial Action Workplan section of the report includes a Remedial Action Selection to discuss the potential technologies that could be utilized to remediate the PCBs and PAH contaminated soils. This formalized process considers the protectiveness, implementability, permanence, and the cost. Of these, the costs of the remedies that were protective, implementable, and permanent were compared and the lower cost remedy selected. This remedy, the construction of an engineered cap using the six inch concrete slab in conjunction with the IRM already constructed along with institutional controls, i.e. a deed notice and a Remedial Action Permit for Soil, will be protective of human health and the environment and also meet the regulatory requirements of NJDEP and USEPA.

There may also be additional areas potentially impacted by the migration of soil contaminants from the Site e.g., a storm drain system located in Vreeland Terrace along the Site's southern boundary and the cemetery that comprises the Site's northern boundary. As discussed further in Section 5.1, it is not necessary to address these areas in this report because they do not affect the remedy for the Site, but will be addressed in an addendum to this report.

NJDEP's reporting forms and Case Information Document (CID) have been completed and are being submitted in conjunction with this report. Copies of the applicable NJDEP forms also have been included for reference in Appendix A.

2.0 Background

2.1 Site Location and Characteristics

Figure 1 depicts the location of the Site. The street address for the Site is 660 River Road (Bergen County Route 505), although it is noted that the property address is mistakenly given on some documentation as 555 River Road or 700 River Road.[1] The approximate center of the Site is located at 723,679.78 Northing and 639,118.63 Easting in New Jersey State Plane Coordinates.

The Site is identified by USEPA by the hazardous waste generator ID number NJD981559149 and by NJDEP by Program Interest numbers 023713 and 620276; as per NJDEP instruction, PI No. 023713 will be used going forward for all electronic NJDEP submissions.

The Site, currently described by Borough of Edgewater as Block 74 Lot 1.02B, has been subdivided from larger property on two occasions. Historically it was part of a much larger industrial facility operated by Alcoa, a manufacturer of aluminum products. In the late 1990's, the former Alcoa facility was being proposed for residential redevelopment. The exception to this was the property on which Building 12 was located, which was to be commercially redeveloped. Consequently, the property on which Building 12 was located was subdivided from the main Alcoa property on February 26, 1999, and re-designated as Block 74, Lot 1.02 (1.37 acres). It is noted that the footprint of Building 12 covered the entirety of this new lot. Block 74, Lot 1.02 was subsequently approved for further subdivision by the Borough of Edgewater on October 19, 2009. At this time the westernmost 0.374 acres of Lot 1.02 became the adjacent Lot 1.02A (a.k.a. the West Lot) while the easternmost 0.991 acres became Lot 1.02B (a.k.a. the East Lot). The "East Lot" comprises the Site (Figure 3). A discussion of the ownership and operational history has been included in Section 2.3, below.

The use for the Site is Commercial/Services.[2] A two-story manufacturing building with a partial basement, designated by Alcoa as Building 12, was constructed on the Site circa 1938. Prior to that time, the Site was reportedly part of a larger residential property. Building 12 was constructed utilizing a two-way system of flat slab construction supported on mushroom columns with dropped panels, similar to the construction of the other buildings on the larger former Alcoa site. The slabs consisted of reinforced concrete, typically twelve inches in thickness. Structural bays, as defined by the columns, measured 19 feet by 16 feet. The building sat vacant between 1978 and 2013, when a portion of the remnants of Building 12 on the Site were razed. Currently the Site is in the process of being redeveloped for commercial use as a spa facility.

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[1] The address 660 River Road was that for the former Alcoa Building 12 facility, of which the Site was once a part. The balance of the former Alcoa facility, which was subdivided and redeveloped separately in 1999, used the 700 River Road address. This address is now the Avalon Bay Edgewater apartment complex. The address 555 River Road is that for First Washington Realty property, located across River Road and is not applicable to the Site.

[2] NJDEP, GeoWeb, http://www.nj.gov/dep/gis/geowebsplash.htm.

The Site is located in a formerly industrial area of the Borough of Edgewater that is currently being redeveloped for commercial and residential use. It is bounded to the north by the Edgewater Cemetery; to the east by River Road, beyond which lies the Marketplace Shopping Center and part of the Hess Oil Terminal; and to the south by Vreeland Terrace, beyond which lies part of the Hess Oil Terminal. To the west the Site is bounded by Lot 1.02A (a portion of the original Building 12 property), recently redeveloped residentially. Less than 1,000 feet to the west, the Palisades Sill forms a steep cliff that towers over the Site. The Hudson River is located approximately 600 feet to the east.

2.2 Physical Setting

2.2.1 Topography / Hydrology

As noted above, the Site is located between the Palisades Sill and the Hudson River. The topography of the Site itself slopes to the east-southeast, an upper elevation of approximately 32 feet mean sea level (MSL) to a lower elevation of approximately 10 feet MSL. Surface water drainage in the area of the Site is generally anticipated to move towards the Hudson River; however, as is typical in urban areas, surface water flow is locally controlled by the municipal storm sewer system. No wetlands or open waters are located on the Site.

2.2.2 Soil

The Site soils are characterized on NJDEP GeoWeb as Urban Land (SSURGO).[3] These soils are generally described as areas where the surface is covered by pavement, concrete, buildings, and other structures underlain by disturbed and/or natural soil material. It is noted that NJDEP's historic fill map for the Central Park quadrangle indicates that the presence of historic fill materials is associated with the Hudson River shoreline, including areas of Edgewater Borough located to the east of River Road. Additionally, the presence of mapped Urban Land soils underlying the Site could be indicative of the presence of historic fill.

2.2.3 Geology

The surficial geology underlying the Site is mapped as the Rahway Till, Yellow Phase (Qty).[4] Derived from the diabase and weathered diabase of the Palisades ridge, this formation typically includes reddish-yellow fine sediments ranging from sandy silt to clayey silt and diabase clasts. Bedrock underlying the Site is the Stockton Formation (Trs). According to geological mapping for the area, the Stockton Formation is generally described as a thin to thick-bedded fine to coarse sandstone, typically light to

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[3] NJDEP, GeoWeb, http://www.nj.gov/dep/gis/geowebsplash.htm.

[4] Stanford, Scott D., 1993, *Surficial Geology of the Weehawken and Central Park Quadrangles, Bergen, Hudson and Passaic Counties, New Jersey*, Open File Map 13, New Jersey Geologic Survey, Division of Science and Research (OFM 13).

medium gray and light yellowish gray to pale-reddish-brown in color. Purplish siltstone occurs near the middle and top of this formation.[5]

A geotechnical investigation was performed by Hawke Geotechnical, LLC (Hawke), on behalf of the current re-developer of the Site for the purposes of building design. This investigation consisted of a total of 17 exploratory borings: ten installed to the top of the bedrock around the perimeter of Building 12 in August 2012 and an additional seven installed ten feet into the top of bedrock in the center of the Site in August 2013, after most of Building 12 had been removed. The report for this investigation reported encountering brown fine to coarse sands at variable depths until auger refusal on the underlying bedrock, a description consistent with that for the Rahway Till. Additionally, these borings reportedly encountered bedrock consisting of either purple to reddish-brown shale/siltstone, a description consistent with the mapped description of the top of the Stockton Formation, or white/light gray sandstone, a description consistent with the mapped description of the Stockton Formation in general. The bedrock surface was reported by Hawke at depths ranging from approximately 4 feet below ground surface (ft bgs) to approximately 20 ft bgs across the Site. A copy of the report of this geotechnical investigation is included in Appendix B.

Bedrock was encountered at similar depths during the June-July 2014 site-wide soil boring investigation performed as part of the remedial activities documented herein. The unconsolidated materials observed by PEC during this investigation were also generally consistent with the Rahway Till being present on the Site, and both the purplish shale/siltstone and white/light gray sandstone bedrock was observed by PEC.

2.2.4 Hydrogeology

Due to local variations in groundwater flow resulting from various natural and man-made factors, inferred groundwater flow at the Site and adjacent sites may vary, but based upon PEC's review of site conditions, topography and the presence of a nearby surface water body, i.e., the Hudson River situated about 600 feet to the east-southeast, it is inferred that the local groundwater flow direction is in an east-southeasterly direction toward River Road.

Subsurface investigations have been performed on several occasions, most recently the above-referenced August 2012/August 2013 site-wide geotechnical investigations performed on behalf of the current Site re-developer for the purposes of building design, and the June-July 2014 site-wide soil boring investigation performed as part of the remedial activities documented herein. The report of the geotechnical investigations specifically states that groundwater was not encountered. Similarly, a defined groundwater zone was not encountered during the June-July 2014 soil boring investigation at the Site, although in many cases soils were observed to be wet in thin zones, sometimes directly above the

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[5] Baskerville, Charles A., 1994, *Bedrock and Engineering Geologic Maps of New York County and Parts of Kings and Queens Counties, New York and Parts of Bergen and Hudson Counties, New Jersey*, United States Geological Survey Miscellaneous Investigations Series (I-2306).

bedrock and sometimes higher in the soil column. A saturated zone was encountered in only one of the June-July 2014 soil borings, and even for this boring (SB-018), the zone was thin (10.0 and 10.5 ft bgs) and soils between this zone and the top of bedrock (12 ft bgs) were dry. Additionally, soils were excavated to the top of the bedrock surface on the western portion of the Site during the remedial activities. The only water observed during these activities was an occasional accumulation of storm water. As detailed in Section 3.4.2 of this report, the quantity of groundwater in this and at least two other locations on the Site was sufficient to allow an evaluation of groundwater quality at the Site.

2.2.5 Ecological Resources

As observed at the Site and as reviewed on NJDEP's GeoWeb, no surface waters, wetlands or other such environmentally sensitive receptors are located on or adjacent to the Site. Additionally, according to NJDEP's Project Landscape data, as reviewed on NJDEP GeoWeb, the Site, as well as its surrounding area, is shown as part of the Piedmont Plains Landscape Region. No Landscape Project areas of threatened or endangered species were shown on or adjacent to the Site.[6]

2.3 Site History

2.3.1 Ownership

According to available historical documents reviewed by PEC, the Site was initially purchased by United States Aluminum Company, the predecessor to Alcoa, circa 1914 as part of a larger facility that ultimately stretched from Russell Avenue south to Vreeland Terrace and from Undercliff Avenue east to River Road surrounding the cemetery property (684 River Road, Block 72 Lot 2). The entirety of the former Alcoa facility is shown on Figure 2. In 1968 Alcoa sold the Edgewater plant, "as is," to Irving Maidman (who thereupon assigned his rights to Tri-Terminal Corporation), and that in 1983 (after two intervening owners), Amland Properties Corporation (Amland) acquired title to the property pursuant to an "as is" purchase agreement with Citibank.[7] The Alcoa-Amland litigation resulted in ownership of the former Alcoa facility reverting back to an Alcoa subsidiary, A.P. New Jersey, Inc.

North River Mews Associates, LLC purchased the Site from A.P. New Jersey in August 2007. The former Alcoa facility has been subdivided twice in the interim. Lots 1 and 3 were subdivided in 1999 to create lots 1.01 and 1.02. Lot 1.01 was sold to Avalonbay Communities, Inc. in March 1999. Lot 1.02, which initially consisted of the Building 12 footprint, was subdivided again in October 2009 into the current lots 1.02 A and B (Qualifiers C000A and C000B, a.k.a. the West and East Lots, respectively).

According to interviews with the Client, the deed filings transferring the Site to 38 COAH Urban Renewal Assoc. LLC following the subdivision of lot 1.02 into lots 1.02A and lot 1.02B were made in error. The Site

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[6] NJDEP, GeoWeb, http://www.nj.gov/dep/gis/geowebsplash.htm.

[7] Amland Properties Corp. v. Aluminum Co. of America, Civ. A. No. 86-1830, April 18, 1989. http://www.leagle.com/decision/19891495711fsupp784_11362.xml/amland%20properties%20corp.%20v.%20aluminum%20co.%20of%20america

(Lot 1.02B) was transferred back to North River Mews Associates, LLC on February 10, 2015 to correct this error. The ownership history assembled from prior reports[8] and property deeds dating to 1932 is as follows. Revised NJDEP and USEPA forms indicating the current ownership have been included in Appendix A.

Ownership History

Owner	From	To
Vreeland Family	ca. 1600s	ca. 1914
The United States Aluminum Company	ca. 1914	6/3/1932
Aluminum Company of America	6/3/1932	ca. 1968
Edith and Irving Maidman	ca. 1968	ca. 1974
Tri-Terminal Corporation	ca. 1974	ca. 1978
700 River Road Corporation	ca. 1978	ca. 1978
Edgewater Associates	ca. 1978	ca. 1980
700 River Road Corporation	ca. 1980	ca. 1983
American Landmark Properties Corporation	ca. 1983	
AP New Jersey, Inc.		8/25/1997
North River Mews Associates LLC	8/25/1997	5/22/2006
38 COAH Associates, LLC	5/22/2006	
38 COAH Urban Renewal Assoc. LLC		5/11/2012
38 COAH Associates, LLC	5/11/2012	2/10/2015
North River Mews Associates, LLC	2/10/2015	Present

2.3.2 Operations

It is reported that the Site was originally developed by Alcoa in 1938 as Building 12. Review of historic Sanborn Fire Insurance maps indicates that prior development by Alcoa, the use of the Site was residential, and the Site was the location of the parsonage for the adjoining Presbyterian Church of the Mediator and its cemetery. Copies of available Sanborn mapping (1908-1968) can be found in Appendix C. A series of aerial photographs (1954-2011) depicting Site conditions throughout the years can be found in Appendix D.

During its operation of the Edgewater facility, Alcoa manufactured aluminum products and developed fabrication techniques. A number of pioneering inventions are reported to have been developed at this facility, including the collapsible toothpaste tube, the 17S-alloy rod, and sheet metal for World War II aircraft. Alcoa developed the larger overall facility with a series of buildings that housed various functions, including manufacturing, machine shops, inspection, packing, shipping /receiving and office space. The primary use of Building 12 was reportedly for ingot milling, accomplished in conjunction with a continuous rolling mill that was located in Alcoa's Building 11, which abutted Building 12 on its western end. Some references have also referred to Building 12 as the powerhouse, although Alcoa was known to have

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[8] Enviro-Sciences of Delaware, Inc., *Phase I Environmental Site Assessment, Block 74, Lot 1.02, Qualifier C000B (West Lot)*, May 2011.

generated electricity at a facility across River Road to the north of the site at the intersection of River Road and Russell Avenue.

Alcoa reportedly ceased operations at its Edgewater facility, including Building 12, in 1965. Building 12 reportedly then sat vacant until 1971, when Metro-Modular, a fabricator of concrete plank flooring, leased the building. Specifics about the processes used by Metro-Modular in its manufacturing operations at the Site were not reported in the available documents reviewed by PEC in this matter. By 1975, all tenant operations in Building 12 had ceased, and Building 12 remained vacant until demolition of much of the remaining structure in 2013. The Site is currently being redeveloped as a spa by The Heaven, LLC, whom is leasing the property from the owner, North River Mews Associates, LLC. Recent activities on the Site include the demolition of all-existing structures, concrete crushing, and site grading. Currently, the construction of a new building on the Site has commenced.

Operational History

Owner	Operator	Site Use	Period
ALCOA	ALCOA	Aluminum Mfg.	1938-1965
Edith & Irving Maidman	Metro Modular	Modular Construction	1971-1974
Tri-Terminal Corporation	Tri-Terminal Corporation	Warehousing	1974-1978
700 River Road Corporation	Torway Warehouses/Rigid Frame Systems/Nekoosa Edwards Paper Co	Warehousing	1970-1978
American Landmark Properties Corporation	American Landmark Properties Corporation	Warehousing	1983-1990
American Landmark Properties Corporation	York Hunter	Warehousing	1989-1997
North River Mews Assoc. LLC	North River Mews Assoc. LLC	Vacant	1997-2006
38 COAH Associates, LLC	38 COAH Associates, LLC	Vacant	2006-2014
38 COAH Associates, LLC	The Heaven, LLC	Hotel/Spa (under Construction)	2014
North River Mews Assoc. LLC	The Heaven, LLC	Hotel/Spa (under Construction)	2014 - present

2.4 Prior Environmental Investigations

Prior environmental investigations had been performed on the Site, first on behalf of Alcoa and then on behalf of a subsequent property owner, North River Mews Associates, LLC. A summary of these remedial investigations/actions follows. Copies of the reports and correspondence referenced in the following discussion have been included for reference in Appendix E.

Based on the results of these investigations, summarized below, it is apparent that during Alcoa's operations, portions of its manufacturing buildings were contaminated with PCBs. The suspected sources of the PCBs were various fluids used on-site (i.e., hydraulic oils, lubricants, heat transfer fluids, and coolants) and on-site transformers and capacitors. Alcoa is reported to have made use of fire-resistant hydraulic fluids containing PCBs as part of its manufacturing processes. These hydraulic fluids, including Pydraul manufactured by Monsanto, were used in at least fourteen of the one hundred and twenty hydraulic systems that operated in its Edgewater facility, including in Building 12.[9] While not all Pydraul formulations used PCBs,[10] the use of at least one Pydraul formulation, F-9, composed with a significant PCB content, at the Edgewater plant has been documented.[11] Additionally, the use of PCBs, particularly Aroclor-1248, in hydraulic fluids for high temperature applications, including rolling mills operations (such as those conducted in Building 11 adjacent to the Site), has been documented.[12,& 13] The hydraulic oil Pydraul F-9 has been reported to contain Aroclor 1248.[14]

There are three Aroclor mixtures of PCBs reported in the soil contamination at the Site: primarily Aroclor 1248 with low concentrations of Aroclor 1254 and/or Aroclor 1260. While all three Aroclors were used in hydraulic oils,[15] the Aroclor 1254 and Aroclor 1260 found at the Site in association with demolition of the former Building 12 are thought to be the weathered by-products of Aroclor 1248. The weathering of Aroclor 1248 would have resulted from the volatilization of the lighter weight congeners due to the discharge of hot hydraulic oil during the operation of the facility and via evaporation in the intervening years since the discharge. As a result, the remaining PCB congeners found in Aroclor 1248 would take on the appearance of a heavier mixture, e.g., Aroclor 1254 or 1260.[16]

In 1997, as the Alcoa buildings were being scheduled for demolition, testing of the building materials was conducted to evaluate whether they could be used as clean fill. Contamination by PCBs was identified in concrete walls and/or floors of the buildings, including the floors of Building 12. The entire Alcoa facility was subject to cleanup oversight by NJDEP's Northern Bureau of Field Operations under a Memorandum of Agreement (MOA), dated June 10, 1997, Case No. 97-6-10-0037-28. All the former buildings except for Building 12, were demolished circa 1998, in compliance with NJDEP approved remediation documents. The MOA case for the entire Alcoa facility except Building 12 was issued an Unrestricted Use No Further Action Letter and Covenant Not to Sue by NJDEP on March 9, 1999. A housing development was subsequently constructed on this portion of the former Alcoa facility.

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[9] Amland Properties Corp. v. Aluminum Co. of America, Civ. A. No. 86-1830, April 18, 1989. http://www.leagle.com/decision/19891495711fsupp784_11362.xml/amland%20properties%20corp.%20v.%20aluminum%20co.%20of%20america

[10] USEPA, Polychlorinated Biphenyl Inspection Manual, EPA-305-X-04-002, August 2004.

[11] Amland Properties Corp. v. Aluminum Co. of America, *CIV. A. NO. 86-1830,* April 18, 1989. http://www.leagle.com/decision/19891495711fsupp784_11362.xml/amland%20properties%20corp.%20v.%20aluminum%20co.%20of%20america

[12] Personal communication, Dr. James Smith, Trillium, Inc.

[13] Mitchell D. Erickson and Robert G. Kaley II, "Applications of Polychlorinated Biphenyls," *Environ Sci Pollution Res* (2011), 18:135-151.

[14] William Sonzogni and Margaret M. David, "PCB Contamination in the Sheboygan River, Wisconsin," *Biological Remediation of Contaminated Sediments with Special Emphasis on the Great Lakes: Report of a Workshop*, Manitowoc, WI, July 17-19, 1990, Ed. Chad T. Jafvert and John E. Rogers, USEPA 600/9-91/001, page 75.

[15] USEPA, *U.S. EPA Region 4 Technical Services Section Issue Paper for Polychlorinated Biphenyl Characterization at Region 4 Superfund and RCRA Sites*, Table 2, February 28, 2013, http://www.epa.gov/region4/superfund/images/allprogrammedia/pdfs/riskassesspcbpaper05152013.pdf.

[16] Glenn W. Johnson, et al., "Polychlorinated Biphenyls,*" Environmental Forensics: Contaminant Specific Guide*, Ed. Robert D. Morrison and Brian L. Murphy, Elsevier Press, 2006 pg. 202-205.

As discussed previously, the property on which Building 12 was located was subdivided from the main Alcoa property on February 26, 1999, and re-designated as Block 74, Lot 1.02. This lot was then bifurcated from the larger Alcoa case and handled under separate NJDEP review. A remedial action was performed to address the elevated concentrations of PCBs detected in the concrete comprising the floors of Building 12 in 1999. Those portions of concrete flooring which had been found to contain PCBs in excess of 0.49 milligrams per kilogram (mg/kg or parts per million) were removed and transported off-site for disposal.[17]

Further, in the absence of cleanup standards for building interiors, NJDEP used the RDC SCC of 0.49 ppm in effect at the time as the cleanup criteria for the remaining PCB concentrations in the building walls. Subsequent investigation of Building 12 as part of its proposed redevelopment included the collection of ten concrete core samples from the facilities walls in accordance with a sampling plan approved by both the USEPA and NJDEP on July 30, 1999 and August 5, 1999, respectively. These data indicated concentrations of PCBs ≤ 1 mg/kg were present in the concrete comprising Building 12's walls. According to the Remedial Action Report submitted to NJDEP at that time, residual levels of PCBs detected at concentrations greater than 0.49 mg/kg were addressed by washing the walls and then sealing them with two coats of an epoxy coating.[18]

The remediation of Building 12 was reportedly completed by the establishment of a Deed Notice addressing PCBs remaining in the walls of Building 12 at concentrations in excess of 0.49 mg/kg. On November 20, 2002, NJDEP approved closure of the case by approving the Deed Notice for Building 12, which was then recorded by the Bergen County Clerk's office on January 14, 2003. NJDEP issued a Restricted Use No Further Action Letter and Covenant Not to Sue for Building 12 on February 12, 2003.

A subdivision of the former Building 12 property, Block 74, Lot 1.02, into the Site (Lot 1.02B, a.k.a. the East Lot) and an adjacent property (1.02A, a.k.a. the West Lot) was approved by the Borough of Edgewater on October 19, 2009. The West Lot was subsequently residentially redeveloped.

While conducting structural related tests for the redevelopment of the Site, certain areas of the exterior walls on the West Lot became unstable and fell. The owners of the property at that time informed NJDEP's Bureau of Maintenance and Monitoring, by letter dated April 28, 2010, that the collapsed wall material was collected and stored on a tarp inside Building 12. The material was reported by ESI to have been sampled in April 2011, and then was reported to have been transported off-site for disposal. ESI did not, however, provide any additional information regarding the disposition of these wastes.[19]

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[17] ESI, *Remedial Action Report*, February 18, 1999

[18] ESI, *Remedial Action Report*, October 28, 2002.

[19] ESI, *Phase I Environmental Site Assessment, Vreeland Terrace, Block 74 Lot 1.02, Qualifier C000B (West Lot)*, May 2011.

The Licensed Site Remediation Professional (LSRP) of record for the Site at that time, Mr. John Gear, of ESI, reported that NJDEP regulations specifically exclude the investigation/remediation of building interiors unless it effects the exterior environment, or if contamination on the exterior of the building affects the interior of the building. This was not the case with Building 12, as soil samples were reported to have been collected from beneath the concrete floor by Enviro Techniques, Inc. (Paterson, NJ) in 1998 that had not exhibited any measurable levels of PCBs.[20] Enviro Techniques stated that the "Soil sampling program was performed *following* [emphasis added] the removal of the concrete building sections that contained PCBs in excess of 50 PPM to make sure that remedial work done properly." While their report did not contain specific details regarding the sampling event, the chain of custody included did reference the Building 12 basement. The data was later reported by ESI as being "not detected;" though trace levels of PCBs were reported in the samples collected by Enviro Techniques in ranging from 0.055 – 0.060 mg/kg Aroclor 1254,, below the then applicable 0.49 mg/kg NJDEP RDC Soil Cleanup Criteria (SCC) and current 0.2 mg/kg RDC SRS.[21]

Mr. Gear stated that NJDEP regulations currently allow for the establishment of a Deed Notice for soil contamination in excess of NJDEP SRS and that although NJDEP had used its authority in the past to place Deed Notice restrictions on building interiors, this is no longer the case. In addition, an LSRP does not have the regulatory authority to establish a Deed Notice on a building interior.

Following consultation with various NJDEP Site Remediation Program representatives for guidance including Ms. Kirstin Hahn, Manager of Bureau of Case Assignment and Initial Notice, Dr. Barry Frasco, Manager of Hazardous Site Science and Mr. Wayne Howitz, Manager of Remedial Management and Operations, all NJDEP representatives concurred that the Deed Notice should be terminated. On August 30, 2010, a letter including a copy of the Draft Termination of Deed Notice for Building 12 was sent to NJDEP. NJDEP responded in a September 17, 2010 letter addressed to Daibes Brothers, Inc. approving the document with instructions to file the Termination of Deed Notice with Bergen County Clerk. In addition, NJDEP indicated that a Response Action Outcome (RAO) document that included NJDEP's standard "Building Interiors Not Addressed" language, should be filed by an LSRP. The Termination of Deed Notice was recorded by the Bergen County Clerk on October 19, 2010. Mr. Gear, as the LSRP of record for this case, issued the entire site, unrestricted use RAO for the Site on October 27, 2010.

The current owner reasonably relied upon this data and the entire site, unrestricted use RAO issued on October 27, 2010 by Mr. Gear and NJDEP's termination of the deed notice in concluding that there were no known issues with contamination at the Site, including the building itself. In terminating the deed notice and issuing the entire site, unrestricted use RAO, the LSRP and NJDEP effectively gave the building a clean bill of health.

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[20] ESI, *Follow Up Information – Remedial Action Report*, November 7, 2002.

[21] Enviro Techniques, Inc., *Soil Sampling Report on Phase-I and Phase-II PCB Contaminated Concrete Remediation Project at Alcoa Facility*, July 2, 1998.

More recently, however, two previously undocumented 20,000-gallon USTs were revealed on the Site during the demolition of the remnants of Building 12. Upon the discovery of these USTS and associated soil contamination by fuel oil and PCBs, discussed further below, NJDEP requested that the October 27, 2010 RAO be amended to change its scope from an entire site RAO to an "area of concern specific" RAO addressing the administrative termination of the deed notice only. This revised document was filed by Mr. Gear on February 24, 2014. The revised RAO has been included in Appendix E.

3.0 Remedial Investigation / Remedial Action

3.1 Technical Overview

3.1.1 Overall Nature of Contamination

The primary constituents of concern (COCs) at the Site are PCBs, particularly Aroclor-1248 and fuel oil associated with a discharge from one or both of the two 20,000 USTs recently discovered on the Site. It is these COCs that were the primary target of the removal action detailed herein (Section 3.1.2). At this time, all soils contaminated by evidence of gross fuel oil contamination have been excavated and removed from the Site.

Additional investigations have been performed to delineate the presence of site-wide soil contaminants associated with the historic manufacturing operations at the Site at concentrations in excess of the applicable remediation standards discussed below, particularly PCBs, mainly Aroclor-1248, and including lower levels of Aroclor 1254 and Aroclor 1260, and, to a lesser extent, EPH, PAHs and some heavy metals. It is these COCs that were the primary target of the groundwater investigation (Section 3.4) and Interim Remedial Measure (IRM) implemented upon completion of the above-referenced removal action (Section 3.5). It is noted that the contaminants of concern for this Site were not detected in Site groundwater at concentrations in excess of NJDEP Ground Water Quality Standards.

3.1.2 Relevant Rules, Regulations and Guidance

This RI/RAR/RAW has been prepared in accordance with NJDEP and USEPA regulations and guidance, including those listed below:

- NJDEP, *Underground Storage of Hazardous Substances Rules* (UST Rules), N.J.A.C. 7:14B;
- NJDEP, *Administrative Requirements for the Remediation of Contaminated Sites* (ARRCS), N.J.A.C. 7:26C;
- NJDEP, *Remediation Standards*, N.J.A.C. 7:26D;
- NJDEP, *Technical Requirements for Site Remediation* (TRSR), N.J.A.C. 7:26E;
- NJDEP, *Ground Water Quality Standards*, N.J.A.C. 7:9C;
- NJDEP, *Field Sampling Procedures Manual* (FSPM), 3rd Edition, August 2005;
- NJDEP, *Coordination of NJDEP and USEPA PCB Remediation Policies Guidance*, March 1, 2013;
- NJDEP, *Soil Investigation Technical Guidance: Site Investigation/Remedial Investigation/ Remedial Action (SI/RI/Risk Assessment)*, February 21, 2012;
- NJDEP, *Ground Water Technical Guidance: Site Investigation, Remedial Investigation, Remedial Action Performance Monitoring*, April 3, 2012;
- NJDEP, *Technical Guidance for the Attainment of Remedial Standards and Site Specific Criteria*, version 1.0, September 24, 2012;

- NJDEP, *Technical Guidance for Preparation and Submission of a Conceptual Site Model*, version 1.0, December 16, 2011.
- NJDEP, *Alternative and Clean Fill Guidance for SRP Sites*, version 2.0, December 29, 2011;
- USEPA, *Toxic Substances Control Act, Polychlorinated (PCBs) Manufacturing, Processing, Distribution in Commerce and Use Prohibitions*, Subpart D – Storage and Disposal (PCB remediation waste), 40 CFR 761.61;
- USEPA, *Polychlorinated Biphenyl (PCB) Site Revitalization Guidance Under the Toxic Substances Control Act (TSCA)*, November 2005;
- USEPA*, Integrated Risk Information System*, www.epa.gov/iris/;
- USEPA, *Risk Assessment Guidance for Superfund*, Parts A-F; and
- USEPA, *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*, December 2002.

3.1.3 Planning Documents

All soils and groundwater samples were collected by PEC under a Remedial Investigation Workplan (RIW) / Quality Assurance Project Plan (QAPP) prepared in accordance with NJDEP's guidance documents. Additionally, site-specific health and safety plans (HASPs) were prepared pursuant to the Occupational Safety and Health Administration regulations (29 CFR 1910.120) and implemented for PEC's staff during all site investigation/remediation activities at the Site for which they were present. A separate HASP has been developed and implemented for the redeveloper's contractor. A copy of these documents can be found in Appendix F.

3.1.4 Applicable Remedial Standards

The applicable soil remediation standards for the Site are New Jersey's Residential Direct Contact (RDC) and Non-Residential Direct Contact (NRDC) Soil Remediation Standards (SRS), as last revised in June 2008 and Default Impact to Groundwater Soil Screening Levels (DIGW SSL) and SPLP Screening Levels (SPLP SL), as last revised in November 2013. The applicable groundwater remediation standards are the Class II-A Groundwater Quality Standards (GWQS), as last revised on November 7, 2005.

It is noted that the results for some soil samples analyzed as part of this effort were found to be in exceedance of the IGW SSLs for aluminum and manganese. The aluminum and manganese limits are secondary (aesthetic) standards and, as large components of the earth's crust, they are frequently found in excess of the IGW SSLs in unaffected soil. Consistent with NJDEP's policy regarding these aesthetic standards,[22] manganese is not considered to be a parameter of concern for the Site and its presence on the Site is not discussed further in this report. However, because of the Site's history as part of a larger

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[22] NJDEP, *Frequently Asked Questions for the Impact to Ground Water Pathway in Soil Remediation Standards*, version 2.0, March 24, 2014.

aluminum manufacturing facility, aluminum is a potential concern for the Site and its presence on the Site has been evaluated as part of this effort.

USEPA standards for the investigation and remediation of PCB bulk remediation waste, i.e. contaminated soils, are triggered by the presence of 1 mg/kg total PCBs that will not be remediated. This value is also NJDEP's NRDC SRS. TSCA does not regulate PCBs at concentrations less than 1 mg/kg. Above 1 mg/kg PCBs, USEPA TSCA regulations stipulate a range of self-implementing cleanup levels based upon future high and low occupancy scenarios identified in 40 CFR 761.61(a)4. These self-implementing remediation scenarios fall within PCB soil contamination ranges from 1 to 100 mg/kg. Where concentrations above 100 mg/kg are present or where the occupational use requirements will not be met, risk-based disposal approval proposals must be submitted to the USEPA and a written response must be received before proceeding with the proposed remedial action.[23]

The relevant standards and screening levels for each of the identified COCs are listed on each of the data summary tables included as attachments to this report.

3.1.5 Reliability of Analytical Data

As noted above, a RIW/QAPP was prepared by PEC for this project. As stated in the QAPP, the data quality objective (DQO) of the sampling activities was to obtain data that is precise, accurate, and representative of potential site contamination. This was performed by using sampling methods and procedures that are set forth in NJDEP's TRSR and FSPM, and delivering the properly preserved samples to a NJDEP-certified laboratory for analysis within acceptable holding times.

All environmental sampling, except as noted herein, was performed in accordance with the protocols outlined in the QAPP prepared for this project. A listing of analytical samples for this RI/risk assessment, including soil, groundwater, waste classification, fill characterization, and QA/QC data, is provided on Table 1. Table 2 shows the applicable sample methodology, container, preservation, and holding time for the samples collected as part of the RI/risk assessment documented herein. A summary of the changes made to the PCB data reporting based on the de Maxis Data Management Solutions (ddms, Clinton, NJ) data validation, discussed below, is provided in Table 3. Summaries of the analytical results for these samples are provided as Table 4 through Table 12 of this Report.

Upon collection, all samples were placed in a chilled cooler submitted to NJDEP certified laboratories for analysis under proper chain of custody procedures. One field blank and site-specific quality assurance samples (e.g., duplicates, and matrix spikes) were collected for each day of sampling and for each individual matrix and analyzed in accordance with the corresponding environmental samples. Standard chain of custody procedures were implemented to track the samples.

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[23] NJDEP, *Coordination of NJDEP and USEPA PCB Remediation Policies Guidance*, March 1, 2013.

Laboratories utilized for this project were TestAmerica, Inc. of Edison, NJ (NJDEP certification 12028) and Buffalo, NY (NJDEP certification NY455) and Accutest Laboratories, Inc., of Dayton, NJ (NJDEP certification 12028) and Marlboro, MA (NJDEP certification MA926). All preliminary sample results were received in electronic form for immediate review. Laboratory data for the sampling events presented herein were reported by the laboratories in the full deliverables format (non-Contract Laboratory Program), to allow for a more robust QA/QC data validation. Copies of the full laboratory deliverables are included in Appendix K. Electronic HAZSITE electronic data deliverables (EDDs) have been submitted to NJDEP and the confirmations can also be found in Appendix K.

Upon receipt from the laboratory, all analytical data were validated by an independent third party, ddms to assure the usability, reliability, and defensibility of the laboratory deliverables. The Data of Known Quality (DKQP) protocol for the laboratory analyses established by NJDEP guidance had been incorporated, and modified in some cases, into the RIW/QAPP; each laboratory was provided a copy for comment and concurrence in advance of the field activities. The data were validated against the DKQP in the QAPP and the USEPA "National Functional Guidelines for Organic Data Review" (Rev. 10/99) were also used in the validation effort, and professional judgment was applied as necessary and appropriate. Where discrepancies were found, the specifications of the analytical method took precedence. Data qualifiers have been utilized consistent with the USEPA Region 2 Guidelines.[24] Copies of each data validation report are included along with the relevant laboratory data packages in Appendix K. The data qualifies used by ddms have been summarized in Table 2.

3.1.5.1 TestAmerica Data Validation

A number of significant data quality issues were identified by ddms during their validation of the sample results received from TestAmerica regarding the analysis of PCBs. In correspondence received from ddms on February 14, 2014, they concluded:

> "After several communications with the laboratory, data quality concerns remain. Sound laboratory practices have not been instituted as evidenced by the Field Blank preparation. Misidentification of aroclor-specific peaks due to substantial RT shifts may have resulted in the misidentification of aroclors present on the Site and/or inaccurate concentrations reported. Inconsistent units were documented for the reactive cyanide and reactive sulfide analysis results. Overall, the laboratory has been non-responsive. Integrity of the data is questionable. Based on the data provided in the revised data packages as well as the responses from the laboratory, it is the opinion of the ddms data validator that the PCB data as reported are not defensible data."

Because the laboratory could not, or would not, correct the numerous deficiencies identified by ddms, the data for those samples analyzed by TestAmerica, i.e., the post-excavation soil samples collected from the

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[24] For example, USEPA Region 2, Hazardous Waste Support Section, SOP NO. HW-37 Revision 3, "Polychlorinated Biphenyl (PCB) Aroclor Data Validation," May 2013. These references are cited in the ddms reports.

Site in November and December 2013, were determined to be unreliable and were rejected in their entirety after a significant effort to make as much data usable as possible. The rejection of these data also rendered the associated data for EPH and contingent data for Target Compound List (TAL) volatile organic compounds (VOCs), TCL semi-volatile organic compounds (SVOCs), and Target Analyte List (TAL) metals unreliable because other data was no longer usable. The additional delineation of the PCB discharge, the collection of additional post excavation samples, and the contingent sample analyses were based on the presumption that the preliminary PCB data was reliable.

Because TestAmerica did not correct their deficiencies, ddms did not complete their formal validation. TestAmerica did not submit the last laboratory deliverables report for their sample delivery group 460-68218-1; the chain of custody for these samples has been included in Appendix K. The ddms correspondence regarding this issue has been included with the data deliverables from TestAmerica in Appendix K. NJDEP HAZSITE EDDs were not completed for this data.

3.1.5.2 Accutest Data Validation

The full laboratory deliverables from Accutest were also validated by ddms on receipt. The ddms' data validation reports have been included with Accutest's full laboratory deliverables in Appendix K. While ddms found some QA/QC issues with the Accutest data, these data were generally deemed completely usable with the qualifiers added by ddms as a result of their validation. The DQO for completeness established in the QAPP, 90% of all measurements, was met. All revisions to the Accutest data, including the numerical values and/or qualifiers as discussed below, have been incorporated into the data tables and NJDEP HAZSITE EDDs.

PCB data was the subject of adjustment in the concentration in a number of samples. In nearly every case, ddms increased the Aroclor mixture concentration as a result of their validation of the sample gas chromatography data. Generally, ddms' reported the higher of the two on-column concentrations[25] for consistently conservative data. Thus, the PCB results reported by ddms were consistently more conservative than reported by Accutest. A summary of the changes made to the PCB data reporting based on the ddms data validation is provided in Table 3.

Data for EPH were adjusted by ddms for several samples following validation as follows. While EPH is a parameter of concern at the Site, these data have not affected the remedial decision-making for the purpose of determining the remedy.

- Samples PE-074 through -078: qualifier changed from none detected to rejected in 5 samples
- Sample PE-024: the reporting limit for the none detected result was changed to 12.2 mg/kg, and the J qualifier added; and

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[25] USEPA Method 8082 utilizes gas chromatography (GC) with two parrallel columns and electron capture detectors. The laboratory data includes results from both column and detector pairs. Both column and detector pairs are calibrated and provide an identification and quantification of the PCB congeners.

- Sample PS-001: the results for the C16-21 aromatics were changed from 22.6 mg/kg to none detected and the results for the C21-C40 aliphatics were changed from 39.9 m/kg to none detected. This resulted in the total EPH result being reported as 53.7 mg/kg (instead of the original 116 mg/kg).

A limited number of VOC and SVOC data points were rejected by ddms. The compounds associated with these data were not considered contaminants of concern at the Site. These data have been summarized as follows:

- 2-butanone: qualifier changed from none detected to rejected in 20 samples;
- Acetone: qualifier changed from none detected to rejected in 8 samples;
- 4,6-dinitor-o-cresol: qualifier changed from none detected to rejected in 4 samples;
- 4-nitroanaline: qualifier changed from none detected to rejected in 3 samples;
- Caprolactam: qualifier changed from none detected to rejected in 2 samples;
- Hexachlorocyclopentadiene: qualifier changed from none detected to rejected in in 2 samples;
- 2,3,4,6,-tetrachlorophenol: qualifier changed from none detected to rejected in 1 sample;
- benzaldehyde: qualifier changed from none detected to rejected in 1 sample; and
- 1,2,4,5-tetrachlorobenzene: qualifier changed from none detected to rejected in 1 sample.

Data for reactive cyanide was also rejected in eight samples, as follows. Cyanide is not a compound of concern at the Site.

- Samples Disposal-001 through -005, Dup-002, and FB-002 (SDG JB60598): qualifier changed from none detected to rejected; and
- Sample FB-017 (SDG JB66409): qualifier changed from none detected to rejected.
- These data; however, were accepted by the TSCA disposal facility, Chemical Waste Management; Model City, NY.

VOC sample results validated by ddms were adjusted as follows. These compounds are not compounds of concern at the Site.

- SampleSB-005A: naphthalene results were adjusted from 0.216 B mg/kg to 0.216 UJ (none detected).
- Sample PE-049: total xylene concentration were adjusted from 0.0064 mg/kg to 0.00023 J- mg/kg. This location was subsequently re-excavated.
- Sample PE-053: methylene chloride concentration was adjusted from 0.032 mg/kg to none detected with a J qualifier.
- Sample Dup-003 (from source sample PE-053): toluene concentration as adjusted from 0.00019 mg/kg to none detected and 1,2,4-trichlorobenzene concentration was adjusted from 0.0039 mg/kg to none detected; and
- Sample Disposal-002: chlorobenzene concentration was adjusted from 0.0038 mg/kg to none detected.

The validation of the data resulted in the qualification of much of the laboratory data to indicate a potential bias in the data. The J+ qualifier, indicating a high bias, and the J- qualifier, indicating a low bias, was applied by ddms to the Accutest data.

3.1.6 Notification and Public Outreach

Public notification was made as required by NJDEP regulation by placing a sign at the Site. This sign was constructed so that it is clearly visible to the public and includes the telephone numbers for the person responsible for conducting the remediation and the LSRP. The Public Notification and Outreach form was submitted to NJDEP on May 14, 2014. A copy of this form is also included for reference in Appendix A.

3.1.7 Conceptual Site Model and Receptor Evaluation

An conceptual site model (CSM) and initial receptor evaluation (IRE) has been performed for the Site. A copy of the NJDEP forms have been included in Appendix A. The results of the CSM and IRE have been based upon the results of the remedial investigation and risk assessment that may be summarized as follows:

- As detailed in Section 3.5, an IRM was constructed consisting of a geotextile membrane and six inches of quarry stone to prevent direct contact with COCs present in Site soils.
- The groundwater quality evaluation performed as part of this RI/risk assessment/RAW (Section 3.4) did not reveal any COCs above the Class II-A GWQS. As such, it is evident that COCs present in site soils are not migrating from the Site via a groundwater pathway.
- As reported by NJDEP's GeoWeb application,[26] the Site is included in a water purveyor area and is not within a Well Head Protection Area. Thus, the groundwater pathway would not be connected. The site is serviced by municipal sewer.
- Additionally, because groundwater contamination was not identified for this Site, there is no trigger for a vapor intrusion evaluation. The vapor intrusion pathway is not a concern for the Site.
- There are no wetlands, open waters or other such sensitive ecological receptors on the Site or on properties adjacent to the Site.
- Soil at the Site has been delineated, with one exception, to the applicable NJDEP RDC SRS, to the extent practical to within the site boundaries. The adjoining cemetery has not been evaluated because of accessibility, but will be addressed consistent with Section 5.1.2 in an addendum to this report.
- The risk assessment, as discussed in Section 4.0, has indicated that while there may have existed a potentially elevated exposure to the construction workers during the remediation and construction of the IRM, these workers were OSHA HAZWOPER trained and worked using an air monitoring program monitoring respirable dusts and PCBs, and used modified Level D PPE.

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[26] NJDEP, GeoWeb, http://njwebmap.state.nj.us/NJGeoWeb/

- The risk assessment included an evaluation of the potential inhalation risk to off-site residents during the remediation and construction of the IRM. The calculated risk for this potential exposure pathway was well below the acceptable levels.

3.1.8 Ecological Evaluation

As reported by GeoWeb, the Site lies within an urban area of Bergen County and is mapped with 100% impervious cover. It was with the demolition of the former Building 12 that the ground surface has been exposed, and the site has been undergoing construction and/or remediation related activities since, culminating with the installation of the IRM.

None of the following potential sensitive ecological receptors exists on or adjacent to the Site:

- Streams,
- Waterbodies,
- Wetlands,
- Canals,
- Category One Waters, and
- Threatened or endangered species.

The Hudson River, located approximately 620 feet to the southeast, is identified as potential state endangered/Federal Listed habitat in the Piedmont Plains layer of Project Landscape.

While Contaminants of Potential Environmental Concern (COPECS) exist at the site, there is no evidence at present to indicate that that a discharge has occurred that may have affected an ecologically sensitive receptor. Further investigation of the storm water system has been proposed in discussed Section 5.1.1 of this report.

3.2 Investigation / Remediation of Fuel Oil USTs (AOC-1)

As documented further herein, the former manufacturing building covering the Site was razed, beginning in September 2013, to prepare the Site for commercial redevelopment. During this process, two previously unknown underground storage tanks (USTs) were discovered within a massive subterranean concrete vault/bunker enclosure with walls four to five feet thick buried beneath the former manufacturing building at the western end of the Site. According to the demolition crew, the USTs were discovered under two distinct floor slabs. The second, more recent, of these two floors had been constructed in such a way that it had covered the access manways for the USTs, hiding them from view until this floor was removed during demolition. Figure 3 illustrates the locations of the two USTs.

The USTs were initially estimated to be 6,700-gallons in capacity, based on the approximate size 27 feet long by 6.5 feet in diameter estimated before the USTs were completely uncovered. Upon further investigation, however, the USTs were found to measure 10 feet in diameter and 34 feet long each, measurements consistent with 20,000-gallon tanks. The USTs were not described in any available previous report of environmental investigations at the Site, nor were they shown on historic Sanborn fire insurance maps. Given their size, their use is presumed to have been the storage of fuel for use in industrial boilers located in Building 12.

Subsequent efforts made to address the unexpected presence of these USTs, identified for the purposes of these remedial activities as AOC-1, discovered that the remnant fuel oil within both USTs was contaminated with PCBs and that the vault contained evidence that a discharge had occurred from one or both of these USTs, i.e., the presence of PCB-contaminated fuel oil in soils surrounding the USTs. The source of the PCBs in the remnants of fuel oil left in these in the USTs, however, remains unknown at this time. It is possible that the presence of the PCBs may have been attributable to the historic use of PCB-containing oils on interior electrical equipment in the power plant; however, it is uncertain how or why such materials would have been introduced into fuel oil storage tanks.

The efforts to investigate/remediate AOC-1 took place in several phases; the following discussions detail each phase of these efforts chronologically and provide comparisons of the analytical results for the investigation/remediation of AOC-1 relative to the applicable remedial standards. A total of 101 post-remedial soil and concrete samples were collected and analyzed as part of the investigation/remediation of AOC-1. The results of some of these analyses were subsequently rejected and deemed unusable, as detailed in Section 3.1.5. The results for all remaining analyses for AOC-1 are summarized on Table 4 (post-excavation concrete sample results), Table 5 (post-excavation soil sample results), and Table 6 (piping investigation results). Figure 4 provides a key detailing the locations of the various sampling events around the Site. In addition, Figure 5 (November-December 2013 remedial activities), Figure 6 (February 2014 remedial activities), Figure 7 (concrete remedial activities), Figure 8 (March 2014 remedial activities) and Figure 9 (May 2014 remedial activities) depict the extent of the various phases of excavation and the locations of all post-excavation soil and concrete samples.

The field elevations for the excavation and soil sampling were based on a common vertical benchmark in the upper driveway of the Site. These data have been converted to feet Mean Sea Level (ft MSL) based on the benchmark elevation of 37 ft MSL based in a property survey prepared as part of the Site redevelopment process (see Figure 3).

3.2.1 September-October 2013 UST Closure

3.2.1.1 September 2013 Initial UST Evaluation

According to information provided to PEC by the demolition contractor, Waterside Construction, LLC. (Waterside), the two USTs were encountered following the demolition of the first floor of the former Building 12 in the area to the northwest of the basement. The two USTs were located on bare earth in a concrete vault enclosure that was approximately 4-5 feet thick and were reported to have been beneath two concrete floor slabs. The USTs were previously unknown and had not been registered with NJDEP during prior investigations of the site.

The USTs were initially accessed and a load of fuel oil was removed for disposal on September 7, 2013. Waterside contracted for a liquid vacuum truck to remove the fuel oil; however, the fuel oil was rejected for disposal by Lorco Petroleum Services (Lorco) of Elizabeth, NJ because it contained PCBs. The UST contents were transferred to Clean Harbors Environmental Services (Clean Harbors) of Elizabeth, NJ, who also cleaned the Lorco vacuum truck. A total of 31,100 pounds of PCB contaminated oil was disposed of at an appropriate facility, Clean Harbors Deer Park, LLC in Deer Park, TX. (See Section 3.6.2 and Appendix R).

Three samples, one of soil and two of concrete demolition debris, were reportedly collected from the vicinity of the newly discovered USTs.[27] These samples were transmitted by Waterside to S&S Environmental Sciences, Inc. (S&S) of Cedar Grove, NJ, who, in turn, transmitted them to Integrated Analytical Laboratories (IAL) of Randolph, NJ (NJDEP Laboratory ID # 14751) to be analyzed for PCBs, PAHs, and EPH. In addition, one sample of the UST contents was collected and analyzed by IAL for GC-Fingerprint, PCBs and flash point. The sampling of the UST contents performed by the contractor indicated the presence of PCBs, again specifically Aroclor-1248, at a concentration of 819 mg/kg. The GC fingerprint analysis of this material "...shows the sample has some type of petroleum product but it does not match any of our standard petroleum products (e.g. fuel oils, gasolines, lubricating oils) in our library."

All three solid samples exhibited PCBs, specifically Aroclor-1248: 10.7 mg/kg and 1.07 in the concrete debris samples, and 77.8 mg/kg in the soil sample. Total EPH concentrations for the two concrete samples were reported to be 59.4 mg/kg and 285 mg/kg, while the soil sample was 1,200 mg/kg. Additionally, the results reported for the soil and one of the two concrete debris samples revealed elevated concentrations of PAHs, with higher concentrations reported in the soil sample. The second concrete debris sample also exhibited PAHs but none exceeding soil remediation standards. Laboratory deliverables were not provided with these results; as a result, the data has not been validated. The S&S report has been included as Appendix H and the data have been included in Appendix K.

PEC collected a sample of the UST contents for characterization analysis on October 29, 2013. This sample was transported to TestAmerica for PCB and GC Fingerprint analysis. The PCB data, as discussed in Section 3.1.5.1, were rejected because of QA/QC deficiencies and TestAmerica's lack of responsiveness. These data have been included electronically in Appendix K for reference. TestAmerica

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[27] The precise location of these samples was not reported in the limited documentation provided to PEC by Waterside regarding their collection and analysis. It should also be noted that the information provided to PEC did not include any supporting QA/QC documentation; consequently, these data have not been validated as part of these effort and is being provided for informational use only.

concluded that the fuel oil sample "...contained a petroleum product which most closely resembles #4 fuel oil."

3.2.1.2 UST Registration/Notice of Intent to Close

Available documents reviewed by PEC indicated that the USTs had not been registered with NJDEP at any previous point in time. Consequently, the USTs were registered with NJDEP, initially on-line on October 11, 2013 then via NJDEP's UST facility registration questionnaire, filed on November 11, 2013. The USTs were assigned facility ID# 620276 by NJDEP. A notice of intent to close the USTs was filed with NJDEP on October 15, 2013 and TMS# N13-9376 was assigned by NJDEP.

Although it is believed that the use of these USTs had been for the storage of fuel oil, the tanks were registered as waste oil USTs because the presence of significant concentrations of PCBs in the residual oil indicated the possibility that some additional material had historically been added to the USTs besides fuel oil. Copy of the UST registration and facility questionnaire is included in Appendix H.

3.2.1.3 October 2013 Discharge Notification

No obvious petroleum discharge was identified by the demolition crew at the time the tanks were initially uncovered. However, during subsequent efforts to uncover the USTs it became apparent that the soil and concrete comprising the basement UST vault had been impacted by PCB-contaminated fuel oil from one or both of the USTs. Consequently, notification was made to NJDEP's Discharge Notification Hotline on October 10, 2013. This incident was assigned number 13-10-10-1558-57 by NJDEP. A copy of NJDEP's Confirmed Discharge Notification Form for this event is included in Appendix J.

3.2.1.4 October 2013 Tank Closure Activities

Environmental Waste Minimization, Inc. (EWMI) of Northampton, PA was contracted by the client to conduct the tank cleaning activities. Upon mobilization to the Site on October 28, 2014, EWMI ventilated the USTs, and once the tanks were ventilated, access holes were cut into the eastern end of each tank to gain access. At the start of closure activities, UST-1 was found to contain approximately six inches of oil/sludge, and UST-2 contained approximately eleven inches of oil/sludge. In an attempt to reduce the viscosity of the oil for cleaning/removal, approximately 100 gallons of diesel fuel was added into UST-1 and 200 gallons of diesel fuel was added into UST-2. Once the diesel fuel was added to the USTs, EWMI mixed the diesel fuel with the oil sludge to reduce the viscosity of the oil and allowing for easier cleaning/removal. The Site was secured for the day as the oil and diesel fuel were allowed to sit overnight until the cleaning activities commenced the following day.

PEC and EWMI returned to the Site on October 29, 2013 to continue the UST cleaning. EWMI began using a power washer to clean UST-1. The power washer wastes were collected by the vacuum truck and containerized for disposal. The cleaning of the USTs continued throughout the day, as the oil was very slow to move and was difficult to clean off the sides of the tank. The cleaning of UST-2 commenced with pressure washing being conducted at the same time as the vacuuming of UST-1.

EWMI and the vacuum truck moved to the Waterside Construction, LLC yard on November 1, 2013 to vacuum out the containers containing PCB contaminated oil that had been inadvertently removed from the Site. Two 250-gallon polyethylene totes containing PCB contaminated No. 4 fuel oil had been filled from the USTs at the Site. These polyethylene totes were emptied and cleaned in a similar manner to the UST shells. The remaining sludge and other liquids were removed from the USTs and placed into drums for transportation and disposal rather than bulk tanker truck because of the high viscosity of the liquid.

PEC and EWMI were on-site on November 7, 2013 to oversee the removal of the drums of waste liquids and sludge/solids generated during these UST cleaning activities. The USTs were cut-up to be disposed of off-site by Waterside as scrap. The disposition of the waste material from the USTs and the USTs themselves is discussed in Section 3.6.1.

3.2.2 November-December 2013 Soil Excavation

3.2.2.1 Summary of Field Investigation

PEC returned to the Site on November 11, 2013 to oversee the excavation of the fuel oil/PCB-impacted soils around the two USTs.. The excavation began in the area of UST-2, with the objective of removing all soils where gross contamination was evident. The excavated soils were placed onto polyethylene sheeting for temporary storage prior to characterization and disposal.

PEC personnel performed air quality field screening in accordance with its site-specific HASP for the potential presence of volatile organic compounds and respirable dust using a dust meter (MIE, pDR-100 DataRam) and VOCs using a photoionization detector (PID, MiniRAE 3000). Each day that excavation activities took place, a series of monitoring locations were established around the area being excavated, and air quality readings were collected every hour. No field screening readings that were significantly elevated above background concentrations were observed during this excavation event.

As the excavation activities continued, a massive concrete foundational structure was encountered approximately four feet below ground surface (bgs) at a location abutting the eastern end of the UST vault. This structure, believed to have been a subsurface structural grade beam for Building 12, was measured to be approximately 11 feet wide by 150 feet long by 4 feet thick (top to bottom), essentially bisecting the Site from Vreeland Terrace to the Site's northern boundary. The structure was observed to be in good condition, i.e. undamaged by demolition, but was visibly stained by the UST release and gross contamination was present on top of the structure in some locations. Areas found to exhibit gross contamination or staining were scarified until no signs of contamination were visible. In addition, a small area of soil was excavated from the far (eastern) side of the structure from the UST vault.

Following the demolition of the building, the western edge of the Site had been excavated by the redeveloper's contractor, Schulman Industries, to attain the final grade depth required for the new building being constructed. During the subsequent excavation of soils from the UST area, this resulted in a potentially hazardous situation because the back wall of the excavation had not been sloped or shored by the redeveloper's contractor in accord with OSHA excavation safety standards.[28] To correct this, the redeveloper's contractor subsequently constructed a concrete wall at the western edge of the Site, at the rear of the UST excavation. Two post-excavation soils samples (PE-001 and -002) were collected at a depth of 10.0 - 10.5 feet bgs at locations along the western-most sidewall of the UST excavation (see Figure 5) before this concrete wall was installed. The void space behind the concrete wall was backfilled with native soils from the Site.[29] These samples were submitted to TestAmerica (Edison, NJ and Buffalo, NY) for analysis for PCBs and EPH. Because it appeared possible that materials other than fuel oil were present in the USTs, contingent analyses were requested in accordance with NJDEP's requirements for the evaluation of waste oil USTs, specifically Target Compound List (TCL) VOCs, TCL base/neutral organics (BN) +15 and TAL Metals analyses to be performed on the samples exhibiting the highest 25% of the detected EPH results.

PEC returned to the Site on November 12 to continue the excavation of contamination noted along the concrete foundational structure. The contaminated soils were again placed onto polyethylene sheeting to prevent cross-contamination with underlying soils. The excavation was extended north along the concrete foundation structure until there were no further signs of gross contamination.

A total of 16 additional post-excavation soil samples were collected (PE-003 through -018) from the area ranging in depths from 13.5 - 20.0 feet (see Figure 5). The soils samples were submitted to TestAmerica to be analyzed for PCBs and EPH, with contingent TCL VO, TCL BN, and TAL Metals.

PEC returned to the Site on December 11 and 12, 2013 to conduct additional soil excavation and sampling. Based on the analytical results for the post-excavation samples collected in November, the excavation was expanded - primarily to the north but also to some extent to the south and on the far side of the foundational structure (see Figure 5), locations where exceedances of the RDC SRS of 0.2 mg/kg for PCBs were reported in the November 2013 post-excavation soil samples. On December 12, 2013, 18 additional post-excavation soil samples (PE-021 through -38) were collected from newly excavated areas at depths ranging from 17.5 - 20.0 feet bgs. As before, the post-excavation soil samples were submitted to TestAmerica to be analyzed for PCBs and EPH, with contingent VO+10, BN+15 and TAL Metals. In addition, three composite (USTComp-001 through -003) and three grab (USTGrab-001 through -003) samples were collected from the stockpiled soils to characterize these materials for disposal (see Figure

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[28] USEPA, 29 CFR 1926.650-652

[29] As discussed in 3.3.2, it was subsequently determined that site-wide soils were also impacted by PCBs, consequently, the native soils placed behind this retaining wall were specifically targeted for evaluation as part of the site-wide soil boring investigation conducted in June and July 2014.

11). The composite samples were analyzed for PCBs, total SVOCs, TCLP metals, and RCRA characteristics, while the grab samples were analyzed for total VOCs.

3.2.2.2 Summary of Results

After receipt of the results for samples PE-001 thru -038 from TestAmerica, the lab results and associated data were sent to a third party, ddms, for data validation. As discussed previously (see Section 3.1.5), a number of significant data quality issues were identified by ddms during their validation of the data from Test America. Ultimately, because the laboratory could not, or would not, correct the numerous deficiencies identified during the initial QA review, the data for all post-excavation soil samples collected from the Site in November and December 2013 were determined to be unreliable and were rejected after a significant effort to make as much data usable as possible.

Copies of the laboratory data deliverables received from TestAmerica and the data review reports from ddms are included in Appendix K.

3.2.3 February 2014 Soil Excavation

3.2.3.1 Summary of Field Investigation

PEC returned to the Site between February 24 and February 26, 2014 to conduct further soil excavation and collect additional post-excavation soil samples. By that time, a large portion of the previous UST excavation had been backfilled by the redeveloper's construction contractor in order to stabilize a steep side slope during the construction of a retaining wall along the western property line. It is noted that based on the results of the initial post-excavation samples, it had been thought that the extent of excavation required in this area was essentially complete; however, it was subsequently determined that these data were not reliable and they were rejected (see Section 3.1.5.1).

In this process of backfilling the tank excavation during the retaining wall construction, the redeveloper's contractor inadvertently utilized the contaminated soil stockpile from the UST excavation as backfill for the excavation while PEC was not present at the Site. Again, as the analytical data from the initial post-excavation samples were rejected, as discussed above, it proved impossible to state accurately the total PCB concentration of these backfill materials. Consequently, the UST area was re-excavated, removing all materials inadvertently used as backfill, during the February soil excavation activities and the excavated materials placed onto the contaminated soil stockpile.

While the western edge of the new excavation was limited by the newly installed concrete block retaining wall, its northern edge was extended another ten feet farther than the December-November 2013 extent and the southern edge of the new excavation was extended closer to Vreeland Terrace.. The secondary excavation on the eastern side of the concrete foundational structure was also expanded somewhat. The depth of these soil excavations ranged from 15.5 to 20.0 ft bgs.

Additionally at this time, petroleum staining was observed on three areas of the subsurface concrete foundational structure. Each of these areas was scarified using a handheld chipping gun to remove the contaminated concrete surfaces. The contaminated concrete debris removed in this manner was placed onto polyethylene sheeting and covered with polyethylene sheeting for disposal.

During these excavation activities, PEC personnel performed air quality field screening in accordance with the site-specific HASP using a dust meter and a PID for VOCs. Each day that excavation activities took place, a series of monitoring locations were established around the area being excavated, and air quality readings were collected every hour. No field screening readings significantly elevated above background concentrations were observed during this excavation event.

The stockpiles of excavated soil were initially placed along the southern portion of the Site along Vreeland Terrace, staged on top of polyethylene sheeting pending characterization and disposal.

On February 25, 2014, PEC personnel collected three samples (CS-001 thru -003) from scarified concrete surfaces to determine if additional concrete removal was necessary. These samples were transported to Accutest to be analyzed for PCBs. In addition, a total of 20 post-excavation soil samples (PE-040 through -59) were collected from the main and eastern excavations. These samples were transported to Accutest to be analyzed for PCBs and EPH, with contingent TCL VO+10, TCL BN+15 and TAL Metals.

Sometime after the February 2014 excavation effort was completed, the excavations began filling with water. The source of this was determined to be a broken storm water pipe in the UST excavation. The redeveloper's contractor had started to drain water accumulating in the excavations back into the storm drain on Vreeland Avenue. PEC was not present on Site at this time and after arriving at the Site later in the day, requested that this effort stop. As a petroleum-like sheen could be observed on the surface of the water collected within the eastern excavation, PEC placed oil-absorbent pads onto the water surface in an attempt to collect as much product as possible. After the drain line was repaired, and the excavation dried out, these PCB/fuel oil contaminated adsorbent pads were placed into the soil stockpile for subsequent disposal. Because this storm water system could have received contaminants from the water from the excavation, it has been identified as an area of concern (AOC-3) and will be addressed in an addendum to this report.

3.2.3.2 Summary of Results

Table 4 details the concrete sample laboratory data; Figure 7 depicts the locations of the post-remedial concrete samples. The three concrete samples were found to have relatively low total PCB concentrations, 12.0 mg/kg in CS-001, 12.3 mg/kg in CS-002, and 0.70 mg/kg in CS-003.

The complete summary of post-excavation soil sampling is attached as Table 5. Figure 6 depicts the extent of the February 2014 soil excavations, as well as the locations from which the post-excavation soil samples were collected. As presented in Table 4, total PCB results ranged from 5.5 mg/kg to 434 mg/kg in these samples. Total EPH concentrations ranged from ND to 4,470 mg/kg in PE-059.

The contingent analyses were performed on six of the 19 post-excavation soil samples (32%). Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were reported at concentrations exceeding the RDC SRS, the NRDC SRS and/or the DIGW SSL in all but one of the six contingent analysis samples. Low levels of VOCs were reported in some samples, but none exceeded any applicable SRS/SSL. Additionally, although typically reported at concentrations about an order of magnitude below its established RDC SRS, aluminum was reported at concentrations exceeding the DIGW SSL in many samples.

3.2.4 February 2014 Investigation of Piping Runs

During the course of the November 2013 excavation, four steel pipes were discovered extending through the dirt wall comprising the western edge of the UST excavation. These included two 2-inch diameter pipes that appeared to be the UST vents, and two 4-inch diameter pipes that appear to have been product supply lines.

3.2.4.1 Geophysical Survey

To determine the horizontal extent of the two apparent product supply lines, a geophysical investigation was conducted on February 24, 2014 by Hager-Richter Geoscience, Inc. of Fords, N.J. (H-R), to trace the lines. H-R traced the lines electromagnetically by direct connection to the exposed terminus of each of the product supply lines. As defined by the geophysical investigation, the two former product supply lines were found to extend across the western boundary of the Site and onto the adjacent property (Lot 1.02A, formerly also part of Building 12). The southernmost line extended straight across the parking garage under the building on Lot 1.02A for a distance of about 39 feet. The northernmost of the two lines followed an "L"-shaped path, turning north at a point just past the property boundary. This pipe was traced for a distance of 26 feet along the edge of the building on Lot 1.02A. The locations of both lines, as determined by the EM survey, were marked. H-R also performed a GPR survey to verify that the two vent pipes did not extend onto the neighboring property as well. Based on the results of this survey, it appears they do not. A copy of the geophysical report can be found in Appendix L.

3.2.4.2 Collection/Analysis of Soil Samples

On February 26, 2014, PEC personnel collected samples from immediately beneath the two sets of piping where they extended through the western sidewall of the UST excavation. Two soil samples (PS-001 and -002) were collected from the six-inch depth interval directly below the visible piping and analyzed by Accutest for PCBs and EPH, with contingent TCL VO, TCL BN and TAL Metals.

Figure 6 shows the location of the piping samples. As reported on Table 5, a total PCB concentration of 1,122.2 mg/kg was reported for sample PS-001, although it is noted that the duplicate of this sample (DUP-004) was reported to have a result of 304 mg/kg. A total PCB concentration of 836 mg/kg was reported for PS-002. EPH concentrations of 53.7 mg/kg and 159 mg/kg were reported for PS-001 and PS-002, respectively. Because the total EPH results were well below the results for other samples collected from the UST excavation area at the same time, the contingent analyses were not run on these samples.

3.2.4.3 Closure of Piping Runs

Further investigation of the piping was deferred pending completion of the on-site activities, including the stabilization of steep slopes along the western property boundary, including the one through which the piping extended and the construction by the redeveloper of a retaining wall to stabilize the excavation along the western property line. In the meantime, both sets of piping were drained of a small quantity of liquids using adsorbent pads and crimped close. It is noted that the soils from which these samples were collected were subsequently excavated as part of the remedial activities at the Site.

3.2.5 March 2014 Soil Excavation & Concrete Foundation Remediation

3.2.5.1 Summary of Field Investigation

Based on the elevated total PCB results for some the February 2014 post-excavation soil samples, PEC returned to the Site on March 18, 2018 to expand the vertical extent of the UST excavation. As before, PEC personnel performed air quality field screening in accordance with the site-specific HASP using a dust meter and a PID for VOCs. Each day that excavation activities took place, a series of monitoring locations were established around the area being excavated, and air quality readings were collected every hour. No field screening readings significantly elevated above background concentrations were observed during this excavation event.

The horizontal extent of the excavation was extended approximately five feet towards the north, then the depth of the excavation was advanced until excavator refusal was encountered on the bedrock surface, a depth of approximately 20 to 21 feet bgs. As part of this process, the locations of post-excavation soil samples PE-040 through PE-056 and the locations of piping samples PS-001 and PS-002 were further excavated.

No indications of residual petroleum product were observed on the bedrock. However, in the process of remediating the main excavation, additional petroleum-like staining was noticed on the side of the concrete foundational structure. Upon further investigation, a thin band of gross contamination was noted in some areas underneath the subsurface concrete foundational structure. This material was absorbed using absorbent pads, which were then placed on the soil stockpile for disposal.

PEC returned to the Site between March 25 and March 27, 2014 to further address the additional evidence of product observed in some locations beneath the concrete foundational structure. In an attempt to remove this contamination, a concrete hammer was utilized to scarify any areas of the concrete where the staining was present. Polyethylene sheeting was placed under any location where the concrete was contaminated to prevent cross contamination of the soils beneath the concrete.

As part of this effort, two distinct areas on the eastern side of the concrete foundational structure were remediated. The northernmost area exhibited the largest area of staining. An attempt was made to make a wedge in the area of the contamination, to facilitate the removal of the oil. The contamination was found to follow a seam between two concrete sections, located just beneath the concrete and on top of the soil beneath the concrete, creating a band of contamination approximately two feet wide through to the other side of the concrete structure. This contamination was removed through to the western side of the concrete structure, carving a gap approximately two feet wide through the concrete from one side to the other. Any location where contamination was observed was removed and placed onto the polyethylene sheeting.

On March 26, 2014, PEC again returned to the Site to continue the concrete remediation. Work was begun on that part of the eastern wall of the concrete foundational structure located closest to Vreeland Terrace. There was an area of petroleum-like staining visible on the concrete structure itself. An area approximately five feet wide and two feet deep was chipped out of the concrete structure, until no more oil was visible. Once remediation of this area was completed, the concrete removal continued at the northern section along the eastern wall side of the structure. Stained concrete surfaces were scarified/chipped using the concrete hammer and contaminated soils were removed from underneath the concrete slab. These materials were added to the contaminated concrete and soil stockpiles and covered while awaiting disposal.

On March 21, 2014, 12 post-excavation soil samples (PE-060 thru -071) were collected from 20.0-20.5 feet below ground surface and analyzed for EPH, PCBs and contingent TCL VO, TCL BN and TAL Metals by Accutest.

On March 27, 2014, additional post-remedial concrete and soil samples were collected: six concrete samples (CS-004 thru -009) were collected from the scarified/chipped locations and sent to Accutest for Total PCB analysis, and seven additional post-excavation soil samples (PE-072 thru -078) were collected from the bedrock surface, at depths of 20.0-20.5 ft bgs on March 27, 2014. These samples were analyzed by Accutest for EPH, PCBs, and contingent TCL VO, TCL BN and TAL Metals.

Because of space constraints and a need to facilitate the continued construction of footings for the new building, the contaminated soil stockpile was relocated. The new stockpile location, on an easement area of the cemetery property adjacent in the northeastern corner of the Site, was lined and covered with 6 mm thick polyethylene sheeting. This stockpile consists of approximately 1,500 cubic yards of PCBs impacted soils and concrete debris.

3.2.5.2 Summary of Results

Figure 7 depicts the locations of the concrete removal and subsequent sampling. Table 4 summarizes the laboratory data for the aforementioned concrete samples. The sample results ranged from 0.28 mg/kg in CS-009 to 16.6 mg/kg in CS-004.

Figure 8 depicts the locations of the post-excavation samples collected. The complete analytical sampling results can be found in Table 5. With one exception, total PCB results ranged from 42.1 mg/kg in PE-065 to 735 mg/kg in PE-063. The exception is sample PE-060, where the total PCB result was reported to be 27,160 mg/kg. Total EPH concentrations ranged from 261 mg/kg in PE-067 to 3,990 mg/kg in PE-070. The contingent analyses were performed on four of the 12 post-excavation soil samples (33%). Benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene were reported at concentrations exceeding the RDC SRS, the NRDC SRS, and/or the DIGW SSL in one of the four contingent analysis samples (PE-066). Benzo(a)pyrene were reported at concentrations exceeding the RDC SRS, the NRDC SRS, and/or the DIGW SSL in PE-060 and PE-066. No PAHs exceeded applicable SRS/SSL in the fourth sample, PE-065. Low levels of VOCs were reported in some samples, but none exceeded any applicable SRS/SSL.

3.2.6 May 2014 Soil Excavation

3.2.6.1 Summary of Field Investigation

PEC returned to the Site on May 7, 2014 to oversee the removal of impacted soils in the southeast corner of the main excavation, adjacent to Vreeland Terrace, specifically the location of post-excavation soil sample PE-060. Based on the Total PCB result of 27,160 mg/kg reported for this sample, the highest PCB levels of the remaining sample locations, it was determined that additional remediation of this area was warranted. Again, PEC personnel monitored air quality using a dust meter and VOCs using a PID. Each day that excavation activities took place, a series of monitoring locations were established around the area being excavated, and air quality readings were collected every hour. No field screening readings significantly elevated above background concentrations were observed.

To allow access to this area, which had become limited by the on-going Site redevelopment activities, a soil ramp was constructed on the northern portion of the Site, over the concrete retaining wall installed by the on-site developer. The excavator was then able to reach the southern-most area of the main excavation and remove the soils from the southeast corner. An additional 5 to 10 cubic yards of soil were removed from this location and placed onto polyethylene sheeting on the eastern side of the concrete structure. As part of this process, the location of post-excavation soil samples PE-060 was further remediated.

During the course of the excavation activities, an irregular shaped concrete structure was discovered in the southeast portion of the UST excavation. The concrete was attached to the known concrete foundation structure, along with the existing concrete walls along Vreeland Terrace. The concrete was cleaned as much as possible and the resulting soils were placed onto the existing stockpiled soils. No additional soil samples were collected from this excavation location since all soils had been removed down to bedrock and between the concrete structures. The excavated soils were added to the existing soil stockpile.

3.2.6.2 Summary of Results

The total PCB results ranged from 0.125 mg/kg in PE-078 to 0.9 mg/kg in PE-075. Total EPH was only detected in three of the six samples, at concentrations ranging from 17.9 mg/kg to 77.1 mg/kg. The contingent analyses were performed on one of the two post-excavation soil samples (29%). Benzo(a)pyrene was reported at concentrations exceeding its RDC SRS/NRDC SRS/DIG SSL in one of the two contingent samples, PE-073. No PAHs were detected in the second sample, PE-072. Low levels of VOCs were reported in one of the two samples, did not exceed any applicable SRS/SSL. Additionally, although typically reported at concentrations about an order of magnitude below its established RDC SRS, aluminum was reported at concentrations exceeding the DIGW SSL in many samples. Beryllium was detected in one sample (PE-073) at a concentration well below its respective RDC SRS, but slightly exceeding its DIGW SSL.

3.2.7 June 2014 Investigation of Piping Runs

3.2.7.1 Summary of Field Investigation

As defined by the geophysical investigation completed by Hager-Richter on February 24, 2014, four former pipes associated with the two USTs were found to extend across the western boundary of the Site and onto the adjacent property (Lot 1.02A, formerly also part of Building 12). In order to ensure proper closure of the UST system, an investigation was performed along the known extent of these pipes to determine if a release had occurred.

PEC mobilized to the Site on June 26, 2014 to oversee the installation of the soil borings adjacent to the product piping runs. Using a direct push drill rig, the borings were installed by Environmental Management Consultants, LLC (EMC) of Rockaway, NJ, a NJDEP licensed soil boring firm, until refusal was encountered on the underlying bedrock. Soil boring logs were prepared for each of locations during installation (Appendix M). In addition, each boring was scanned, both visually for evidence of contamination and by PID to evaluate the subsurface soils for the presence of VOCs and any observations were noted on the log. Figure 10 depicts the locations of the soil borings in relation to the UST piping, as traced by the geophysical investigation.

Two samples were collected from each of these soil boring locations: one from a depth thought to be at the invert of the piping runs and a second at the bedrock surface. The samples were submitted to Accutest to be analyzed for PAHs and PCBs.

3.2.7.2 Summary of Results

As reported on Table 6, PCBs were detected in only one of the 12 soil samples collected along the two product supply piping runs. This result, 0.729 mg/kg in sample USTPS-004A, collected at the depth of the piping invert, is slightly over the RDC SRS/DIGW SSL of 0.2 mg/kg for PCBs, but well below the NRDC SRS of 1 mg/kg. PAHs were detected in three of the piping run soil samples (two shallow and one deep), but the reported concentrations did not exceed any applicable SRS/SSL.

It is noted that when the samples are averaged together in accordance with NJDEP guidance,[30] the above-referenced total PCB results are below the RDC SRS/DIGW SSL; therefore no further action is required to address the piping runs at this location.

The UST product piping cannot be removed further because it extends under the adjoining building. The UST product piping was emptied and crimped closed; however, the lines cannot be removed or abandoned as required by N.J.A.C. 7:14B-9.2€2-4, which requires the cleaning, inspection and filling of abandoned UST systems, including the piping, with sand, cement or an inert material. Because the soil borings installed to investigate this piping did not reveal any evidence of a discharge, a variance from the above-referenced requirement to remove or abandon these pipes is protective of human health and the environment.

3.3 Investigation of Site Wide Soil Impacts (AOC-2)

On March 17, 2014, 38 COAH Associates authorized the collection of soil samples to document existing soil conditions following demolition/grading-related operations associated with the on-going Site redevelopment activities. As noted previously, until its recent demolition, Building 12 had covered the entirety of the Site. During the implementation of this initial site-wide soil characterization, contaminants, particularly PCBs and PAHs, were identified in the surficial soils across the site at levels exceeding the RDC/NRDC SRS and/or the DIGW SSL. Based on these data, a new AOC, AOC-2, was identified and reported to NJDEP accordingly.

The remedial investigation of AOC-2 took place in two phases, the first of which was the above-referenced site-wide characterization of surficial soil quality. A subsurface soil investigation was then performed in AOC-2 with the objective of determining the vertical and horizontal extent of the PCB and PAH contamination associated with AOC-2, consistent with NJDEP and USEPA requirements. A total of

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[30] NJDEP, *Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria*, version 1.0, September 24, 2012.

66 surface and subsurface soil samples were collected and analyzed as part of the investigation of AOC-2. The results of these analyses are summarized on Table 7. Figure 9 (surface soil investigation) and Figure 10 (subsurface soil investigation) depict the relevant sample locations. The following discussions detail each phase chronologically and provide comparisons of the analytical results to the applicable remedial standards.

3.3.1 March 2014 Site-Wide Surface Soil Sampling

3.3.1.1 Summary of Field Investigation

As illustrated on Figure 9, the Site was divided into fifteen grid sections of relatively equal size (approximately 54 by 45 foot or 2,430 square feet each) covering the Site from the location of the concrete foundational structure encountered during the AOC-1 soil excavation activities to its easternmost boundary, along River Road. AOC-1, the UST excavation area, was specifically excluded from this investigation, as the portion of the Site containing this AOC had already been sampled independently.

On March 27, 2014, PEC mobilized to the Site. Sampling locations were marked in areas free of concrete foundations, equipment, soil stockpiles, or other obstructions. With the exception of grid section #11, one exploratory test pit was excavated to a depth of one foot below existing surface grade within each grid section and one soil sample (SS-001 to -010, and SS-012 to -015) was collected from each of these grids at a depth of 0.5 to 1.0 ft bgs.

Due to on-going site redevelopment activities, targeted grid section #11 could not be accessed. Therefore, the last sample (SS-011) was collected from a new location: a sixteenth grid section established in the northernmost corner of the Site. This grid section encompassed the area between the concrete foundational structure and the western property boundary and between the northern-most extent of the UST excavation and the northern property boundary (Figure 9).

All fifteen surface soil samples were analyzed by Accutest for PCBs, PAHs, and TAL Metals. Additional parameters for this event had been reduced to those specific compounds of concern that exceeded the RDC SRS and/or DIGW SSL.

3.3.1.2 Summary of Results

As presented in Table 7, total PCB results ranged from 5.5 mg/kg to 433.6 mg/kg. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were also reported at concentrations exceeding the RDC SRS, the NRDC SRS and/or the DIGW SSL in all fifteen samples. It is noted that the highest concentrations of PAHs were reported in the same sample (SS-010) as the highest concentrations of PCBs.

Additionally, although typically reported at concentrations about an order of magnitude below its established RDC SRS, aluminum was reported at concentrations exceeding the DIGW SSL in all but two samples. Similarly, lead and beryllium were detected at concentrations well below their respective RDC SRS, but exceeding the DIGW SSL in four and two samples, respectively. The maximum reported concentrations of aluminum, beryllium, and lead were all reported in the same sample (SS-009).

Based on these data, a subsurface investigation to evaluate the vertical extent of site-wide PCBs and PAHs in soil was proposed. Additionally, samples SS-002, SS-004, SS-008, and SS-009 were chosen for supplementary analysis via SPLP to evaluate the impact to groundwater pathway, as discussed in Section 3.4.1.2.

3.3.1.3 April 2014 Discharge Notification

Upon review of the results for the above-referenced surface soil samples, it became apparent that impacts to the Site by PCBs associated with the Site's former industrial use were not limited to the area of the USTs. Consequently, notification was made to NJDEP's Discharge Notification Hotline on April 4, 2014. Incident number 14-04-04-1604-09 was assigned by NJDEP for this notification. A copy of NJDEP's Confirmed Discharge Notification Form for this event is included in Appendix J.

3.3.2 June-July 2014 Subsurface Site-Wide Soil Sampling

3.3.2.1 Summary of Field Investigation

PEC mobilized to the Site June 23, 2014 through June 27, 2014 and July 7, 2014 to oversee the installation of soil borings and to collect soil samples from the subsurface of the Site. The locations of each of these soil borings is depicted on Figure 10. Using a direct push drill rig, the borings were installed by EMC until refusal was encountered on the underlying bedrock. Soil boring logs were prepared for each of the locations during installation (Appendix M). In addition, each boring was scanned, both visually for evidence of contamination and by PID to evaluate the subsurface soils for the presence of VOCs and any observations were noted on the log.

Consistent with NJDEP and USEPA requirements, the primary objective of this second phase of the investigation of AOC-2 was to determine the vertical extent of the above-referenced site-wide PCBs and PAHs surface soil impacts. To accomplish this, a series of soil borings were installed utilizing the same five by three-grid pattern as the March 2014 surface soil sampling event. One soil boring (SB-001 to SB-015) was installed at a location as close to each of the 15 surface sampling locations as possible. A sixteenth soil boring (SB-016) was installed in the grid section originally designated as #11.

As planned, this investigation anticipated the collection and analysis of two soil samples from each of these soil borings: one from near the top of the soil column to provide delineation of the surface soil sampling results, and the second at the bedrock surface. The collection of two samples as planned was accomplished in 13 of the 16 sample locations. The exceptions were SB-011, SB-013, and SB-014. Only one subsurface sample was collected at SB-011, and no subsurface samples were collected at either SB-013 or SB-014 as a result of encountering bedrock at a very shallow depth.

An additional 12 sample locations were also included in the subsurface investigation. Two soil borings (SB-017 and SB-018) were installed in locations between the concrete block retaining wall constructed along the westernmost property boundary by the re-developer's contractor to prevent cave-in from the parking lot adjacent to the Site and the second retaining was subsequently constructed alongside the concrete foundational structure. The first of these borings (SB-017) was intended to evaluate the quality of soils between the foot of the western-most retaining wall and the western end of the former USTs; the second (SB-018) was intended to provide delineation of the elevated contaminant concentrations detected in previous post-excavation soil sample PE-060. One soil sample was collected from the top of the bedrock at each of these locations.

Three more soil borings (SB-019 to SB-021) were installed in the area between the western-most retaining wall and the western property boundary to evaluate the quality of site soils that had been used to backfill the retaining wall prior to the determination that soil contamination was present site-wide. One surface soil sample and two subsurface soil samples were collected from two of these locations (SB-020 and SB-021), while one surface soil sample and three subsurface soil samples were collected from the third (SB-019).

Finally, seven (SB-022 to -028) were installed in the sidewalk of Vreeland Terrace, along the southern boundary of the Site. Two soil samples were collected from five of these locations (SB-022 to -026): one from near the top of the soil column and a second at the bedrock surface. As a result of encountering bedrock at very shallow depths, only one sample was collected from the last two of these soil boring locations (SB-027 and SB-028)

3.3.2.2 Summary of Results

A total of 51 samples were collected as part of this phase of the remedial investigation for AOC-2 and analyzed by Accutest for PAHs and PCBs. The results of these analyses are summarized in Table 7.

Elevated total concentrations of PCBs were detected in most grid section soil boring samples (SB-001 to SB-015), with reported concentrations ranging from 0.05 mg/kg in deep sample SB-006B to 341 mg/kg reported in deep sample SB-001B. In most cases, the more elevated concentrations were found in the shallower soil samples, and significant decreases are seen with depth. Exceptions to this are locations such as SB-001, where it is noted fill materials were observed throughout the entire soil column. It is also noted that the location at which the highest PCB concentration was reported was one of the three chosen for the installation of a temporary well point and collection groundwater for analyses and, as detailed in Section 3.4.2, no impacts to groundwater quality were detected. PAHs were also reported in all samples from the grid section soil borings. The highest concentrations were reported in shallow sample SB-005A, although obvious fill materials were not reported in this location. In most cases, PAH concentrations detected in samples collected at the bedrock surface did not exceed any applicable SRS/SSL.

A relatively low concentration (12.8 mg/kg) of total PCBs was reported in the sample collected at the bedrock surface in soil boring SB-017, intended to evaluate the quality of soils between the foot of the western-most retaining wall and the western end of the former USTs. PAHs were detected in this sample; however, only benzo(a)pyrene was detected at a concentration exceeding the NRDC SRS.

A low concentration (2.97 mg/kg) of total PCBs was reported in the sample collected at the bedrock surface in soil boring SB-018, intended to provide delineation of the elevated contaminant concentrations detected in previous post-excavation soil sample PE-060. PAHs were detected in this sample; however, none exceeded applicable SRS/SSL.

Elevated concentrations of PCBs were reported in the surface soil samples designated as SB-019C (66.1 mg/kg), SB-020C (151.9 mg/kg), and SB-021 (90.8 mg/kg). However, significant decreases in PCB concentrations are seen with increasing depth in all three locations – with no PCBs detected in the samples collected at the bedrock surface in soil borings SB-019 and SB-020.

A total of 12 soil samples were collected from the seven soil borings installed in the sidewalk along Vreeland Terrace. PCBs were detected in only two of these samples; the reported concentrations in both of these samples (0.1 mg/kg and 0.04 mg/kg) are below both the RDC SRS and the DIGW SSL for total PCBs. PAHs were detected seven of the 12 samples. With two exceptions, the reported concentrations for these samples were below all applicable remediation standards. In both exceptions (SB-025A and SB-026A), the samples were collected from apparent fill materials at depths immediately below the sidewalk; consequently, it appears that these sample results are reflective of the quality of materials used for the construction of the sidewalk/roadbed rather than Site soils.

Additionally, samples SB-005A, SB-007A, SB-010A, SB-019B, and SB-020C were chosen for supplementary analysis via SPLP to evaluate the impact to groundwater pathway, as discussed in Section 3.4.1.2.

3.4 Groundwater Investigation (AOC-1 & AOC-2)

The effort to evaluate potential impacts to groundwater quality at the Site took place in several phases; the following discussions detail each phase of this effort chronologically and provide comparisons of the analytical results for the groundwater investigation relative to the applicable remedial standards. A total of 19 soil and groundwater samples were analyzed as part of this investigation. The results of these analyses are summarized on Table 8 (SPLP evaluation results) and Table 9 (groundwater sample results). Sample locations are illustrated on Figure 8, Figure 9, and Figure 10.

3.4.1 Evaluation of Potential to Impacts to Groundwater

3.4.1.1 Evaluation Using Immobile Chemical Guidance

Due to the fact that PCBs and PAHs were identified at concentrations in excess of NJDEP's DIGW SSL, further evaluation of the groundwater pathway was warranted in accordance with NJDEP regulations. PEC considered the Immobile Chemical Guidance[31] to determine if further investigation was needed in regards to PCBs. As per this Guidance, there are procedures for the evaluation of immobile chemicals. No remediation is required if the following stipulations can be met:

1. The contaminant is an immobile chemical listed in the Guidance;
2. There is a clean zone of at least 2 feet between the soil contamination and the ground water. Sampling must be conducted to demonstrate that contamination is not present above the default impact to ground water soil remediation standard within 2 feet of the water table; and
3. Site conditions can affect the ability of the immobile contaminants to migrate to ground water are not present. Per the Guidance, a contaminant will not be considered an immobile contaminant when any of the following conditions exist at a subject site:
    a) The contaminant was discharged as part of a mixture that could affect the mobility of the contaminant;
    b) A co-solvent is present that could affect the mobility of the contaminant;
    c) Soil texture at the site is more coarse than a sandy loam, e.g. classified as sands, or if fill material at the site is more coarse than sandy loam,
    d) Soil pH has been altered by the discharge of acids or bases; or
    e) The contaminant of concern is present at levels associated with free or residual product.

When comparing the conditions at the Site to the Guidance document, it is apparent that stipulation #1 is satisfied, as PCBs are listed as an immobile contaminant. However, stipulation #2 cannot be met: the site-wide soil investigation did detect some contaminants at concentrations greater than the DIGW SSL within two feet of the zone in which groundwater was encountered. Likewise, stipulation #3 cannot be met: PCBs were released in association with fuel oil, a mixture that could affect the mobility of the PCBs. Due to these factors, NJDEP's Immobile Chemicals Guidance is not applicable to this Site.

3.4.1.2 Evaluation Using SPLP

To evaluate the impact to groundwater pathway further, the Synthetic Leachate Precipitation Procedure (SPLP) was used to determine whether a COC would be likely to leach from the Site's soils and potentially contaminate the on-site groundwater. The process is generally as follow: samples exhibiting contaminant concentrations above the DIGW SSL were selected for additional analyses using the SPLP procedure. The result from these analysis were then compared to NJDEP's Default SPLP criteria to determine whether the sample was above the standard and, hence, had the potential to leach in

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[31] NJDEP, *Guidance for the Evaluation of Immobile Chemicals for the Impact to Ground Water Pathway*; June 2, 2008.

groundwater. In the event that a result was found to be above the Default SPLP screening value, it was placed into NJDEP's SPLP Spreadsheet, which calculated a new site-specific Kd value. The new Kd value for each of the samples was then used to calculate a new, site-specific, IGW SSL for the Site. If the calculated site-specific standard was a value less than NJDEP's SSL, then NJDEP's default value would remain as the applicable IGW SSL. However, in the event that the calculated site-specific value was above NJDEP's D IGW SSL, the site-specific value would become the new IGW SSL for the Site.

For this Site, a total of eleven contaminants were detected in one or more soil samples at concentrations exceeding the DIGW SSL (except manganese, as discussed in Section 3.1.4) and were thus targeted for analysis via SPLP: total PCBs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, 2-methylnaphthalene, aluminum, beryllium and lead. A total of nineteen soil samples in which one or more of these parameters were present at concentrations greater than the DIGW SSL were chosen for analysis using the SPLP leachate procedure: eight in AOC-1 (PE-060, PE-061, PE-062, PE-063, PE-065, PE-066 and PE-071) and 11 in AOC-2 (SS-002, SS-004, SS-008, SS-013, SS-009, SS-010, SS-013, SB-005A, SB-007A, SB-010A, SB-019B and SB-020C).

Of these eleven compounds tested, only PCBs, benzo(a)anthracene, naphthalene, and aluminum were detected in any SPLP extract:

- PCBs were detected in all nine samples for which that parameter was analyzed using the SPLP leachate procedure. The detected concentrations ranged from 5.83 µg/l to 189 µg/l, all well above the Default SPLP screening value for total PCBs of 0.5 µg/l;
- Benzo(a)anthracene was detected in only one of the eight samples for which it was analyzed, at a concentration (1.4 µg/l in PE-062) equivalent to its Default SPLP screening value for benzo(a)anthracene of 1 µg/l;
- Naphthalene was detected in all three samples for which it was analyzed. The detected concentrations ranged from 0.22 µg/l to 63.4 µg/l; however, NJDEP has not established a Default SPLP screening value for naphthalene; and
- Aluminum was detected in both samples for which it was analyzed, however, the detected concentrations (1,670 µg/l in SS-008 and 490 µg/l in SS-009) were well below the Default SPLP screening value for aluminum of 6,000 µg/l.

Based on these results, the detected concentrations of total PCBs, benzo(a)anthracene, and naphthalene were further evaluated using NJDEP's SPLP spreadsheet. In this manner, a new remediation standard of 0.4 mg/kg was calculated for total PCBs; however, as reported on Tables 5 and 7, a large percentage of the samples collected from both AOC-1 and AOC-2 are still above this newly calculated site-specific remediation standard. Additionally, the SPLP spreadsheets calculated new remediation standards of 0.2

mg/kg for benzo(a)anthracene and 18 mg/kg for naphthalene; however, as both of these values are less than the DIGW SSL, the DIGW SSL of 0.8 mg/kg and 25 mg/kg remain the applicable screening level for benzo(a)anthracene and naphthalene, respectively. The SLPL analysis data are summarized in Table 8. Copies of NJDEP SPLP Spreadsheets can be found in Appendix N.

3.4.2 Collection and Analysis of Groundwater Samples

Because PCBs and PAHs exceed NJDEP's IGW SSL, and the analysis of PCBs via the Synthetic Leachate Precipitation Procedure (SPLP) exceeded the default SPLP criteria the collection and analysis of groundwater samples from the Site was warranted in accordance with NJDEP regulations.

3.4.2.1 Summary of Field Investigation

During the June 2014 soil boring investigation (see Section 3.3.2), PEC also oversaw the installation of three temporary well points (TWP-001, -002 and -003) for the purpose of evaluating the quality of groundwater Site-wide. As seen on Figure 10, the location of these well points were co-located with soil borings SB-001, SB-018, and SB-003. TWP-002 was installed with SB-018 in the approximate location of post-excavation sample PE-060 in AOC-1, the sample exhibiting the highest PCB concentration detected in site soils. Well points TWP-001 and TWP-003 were installed with soil borings SB-001 and SB-003, respectively, at locations close to River Road, on what is presumed to be the downgradient end of the Site (based on topography and the nearby location of the Hudson River). Additionally, it is noted that the soil sample with the greatest PCB concentration reported in the subsurface of AOC-2 (341 mg/kg) was collected from SB-001 at approximately the same depth as that where the saturated zone was observed at this location. Soil boring logs for each of these locations can be found in Appendix M.

As discussed in Sections 2.2.4 and 3.3.2, very little groundwater is present on the Site. Because of this lack of groundwater at the Site, each well point was constructed with screen intervals extending the full depth of the boring. In spite of this, initial attempts to purge the well points using a peristaltic pump were unsuccessful, as the volume of water available was insufficient for even low flow sampling procedures. Due to the minimal groundwater encountered within the well points, the sampling of the temporary well points varied from NJDEP Field Sampling Manual,[32] and USEPA Groundwater Sampling Procedure,[33, & 34] in that one sample was collected from each well point directly without prior purging using a ¾" diameter disposable LDPE single check valve bailer. The limited volume of water available caused the samples to be turbid; therefore, all three well point samples were field filtered using a 0.45-micron Quick Filter manufactured by QED Environmental Systems of Dexter, MI. The groundwater samples were submitted to Accutest for analysis of PCBs and PAHs.

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[32] NJDEP, *Field Sampling Procedures Manual*; April 11, 2011, http://www.nj.gov/dep/srp/guidance/fspm/

[33] USEPA, Groundwater Sampling and Monitoring Well with Direct Push Technologies, EPA 540/R-04/005, August 2005, http://www.clu-in.org/download/char/540r04005.pdf.

[34] USEPA Region 4, Science and Ecosystem Support Division; Operating Procedure: Groundwater Sampling, March 6, 2013, http://www.epa.gov/region4/sesd/fbqstp/Groundwater-Sampling.pdf

3.4.2.2 Summary of Results

As summarized on Table 9, PCBs were not detected in any groundwater sample. The PAHs acenaphthene, anthracene, and fluorine were detected in well points TWP-001 and TWP-003, but all reported values were two orders of magnitude or more less than the Class II-A GWQS. No PAHs were detected in well point TWP-002. It is noted that neither PCBs nor any of the seven PAHs reported in site soils at concentrations exceeding the DIGW SSL were detected in any of the three temporary well points installed at the Site, even though the high turbidity of the samples would have been expected to bias the results for both PCBs and PAHs high. No further evaluation of the IGW pathway is required.

3.5 Interim Remedial Measures

3.5.1 Construction Activities

A total of 450 cubic yards (30 truckloads at 15 cubic yards each) of clean fill material was brought on-site by Waterside to backfill the UST excavation and the area located between the western sidewall of the building and the previously encountered concrete foundational structure encountered on the eastern side of the UST vault. The source of this material, the former United Embroidery facility in North Bergen, New Jersey, had been investigated and issued an Unrestricted Use RAO on July 10, 2013. Prior to its use on the Site, the quality of the soil from this site was tested in accordance with NJDEP's Clean Fill Guidance by the collection of four samples on April 28, 2014: two grab and two composite. These samples were analyzed for TCL VO+10, TCL BNA+20, Total Cyanide, TAL Metals, TCL Pesticides, TCL PCBs, Mercury, Fractionated EPH, and PAHs. All detected parameters were found to be below all the applicable NJDEP standards and was, therefore, approved for use on the Site. These data are summarized in Table 10 and a copy of the laboratory report can be found in Appendix K

After the site had been brought up to a relatively level grade, an IRM has been implemented in order to prevent the possible migration of fugitive dust during subsequent construction activities at the Site and minimize the need for modified Level D personal protective equipment during these activities. This consists of a nonwoven, needle-punched, orange warning barrier / contamination barrier geotextile fabric (US 16 0 NW-HVO) that overlays all Site surface soil. The barrier material was been installed according to the manufacturer's instructions, with the additional precaution of using landscape staples on the overlaps to prevent movement and slippage of the fabric. The specification sheet for the geotextile fabric, the installation instructions, and a summary report documenting the installation have been included in Appendix P.

Once emplaced, the geotextile was covered by approximately six inches of crushed stone obtained from a virgin quarry source in Hamburg, NJ owned by Wantage Stone, LLC. A total of approximately 608 tons of stone were brought to the Site for this purpose. Copies of the source documentation and delivery tickets are included in Appendix O.

3.5.2 Air Monitoring

During the field activities of the IRM construction effort, Environmental Consulting, Inc. of Hillside, NJ and Emilcott, Inc. of Morristown, NJ were retained by the redeveloper to implement the contractor's air monitoring program and document the construction of the IRM. The individual and perimeter dust monitoring data indicated that the site-specific action levels specified in the contractors HASP were not exceeded. Emilcott also collected PCB samples from the HAZWOPER trained workers' breathing zones on May 2 and 12, 2014. The PCB results did not exceed the NIOSH 0.001/mg/m^3 10-hour Time Weighted Average (the Recommended Exposure Level). Copies of the air monitoring data have been included in Appendix Q.

Following completion of construction of the IRM on September 12, 2014, a punch list inspection was conducted by PEC and ECI. The Site was released to general construction on September 17, 2014, following correction of items identified during the punch list inspection. Copies of this correspondence have been included in Appendix P.

The IRM for the Site will eventually become a permanent part of the final concrete cap and will sit immediately below the concrete. It will not be removed unless additional remediation is required.

3.6 Waste Disposal

PCB contaminated wastes have been summarized in the generation log, included as Table R-1, of Appendix R.

3.6.1 Recycling of USTs

As discussed in Section 3.2.1, the two 20,000 USTs discovered under Building 12 during its demolition in 2013 were ultimately cut up for scrap by Waterside on November 7, 2013. The remnants were then transported off-site by Jersey Shore Recycling, LLC of Toms River, New Jersey and delivered to AMG Resources, Inc. in Newark, New Jersey to be recycled. Copies of the scrap metal receipts have been included in Appendix R.

3.6.2 Disposal of UST Contents

3.6.2.1 Waste Characterization Sampling

Sampling of the UST contents prior to the September 7, 2013 load being rejected by Lorco, as discussed in Section 3.2.1.1, above. Following this, S&S and Waterside collected a sample of the UST contents on September 19, 2013 and submitted the fuel oil sample to IAL for analysis of PCBs, flash point, and GC fingerprint. These results were provided to the UST cleaning contractor, EWMI, for review and to secure approval from an appropriately permitted disposal facility. These data, available in summary format only, have been included in Appendix H.

PEC collected a sample of the UST contents for characterization analysis on October 29, 2013. This sample was transported to TestAmerica for PCB and GC Fingerprint analysis. The PCB data, as discussed in Section 3.1.5.1, were rejected because of QA/QC deficiencies; the data have been included electronically in Appendix K for reference. TestAmerica concluded that the fuel oil sample "contained a petroleum product which most closely resembles #4 fuel oil." These data were also provided to EWMI

Additional oil samples were analyzed by the receiving facility, Veolia ES Technical Solutions (Veolia) in Port Arthur, Texas and by Accutest, on behalf of the UST cleaning and disposal contractor, EWMI, to confirm the viscosity of the contaminated fuel oil. These data, and a copy of the waste profile form for this material sent to Veolia have been included in Appendix R.

3.6.2.2 Transportation and Off-Site Disposal of Waste Material

As discussed above, Waterside contracted for a liquid vacuum truck to remove the fuel oil; however, the fuel oil was initially rejected for disposal by because it contained PCBs. The UST contents were then transferred to Clean Harbors, who also cleaned the Lorco vacuum truck. A total 31,100 pounds, 15.88 tons, of PCB contaminated oil, including the wastes resulting from the washout of the Lorco vacuum truck, was disposed at an appropriate facility, Clean Harbors Deer Park, LLC in Deer Park, TX. The waste disposal manifest and associated documents have been included in Appendix R. Table R-2 in Appendix R, summarizes the manifests and waste quantities.

Following the subsequent cleanout of the two 20,000 gallon fuel oil USTs by EWMI, three shipments of PCB-impacted fuel oil/diesel fuel residues (liquids and oil sludges/solids) were removed for off-site disposal by EWMI. EWMI's cleanout of the USTs resulted in the generation of PCB contaminated liquids and sludge, consisting of 118 55-gallon drums of waste, 21.06 tons,[35] that were transported by S.J. Trucking, a NJDEP Division of Solid and Hazardous Waste Management (DSHWM) A-901 registered hauler (03217) and USEPA hazardous waste transporter (NJD071629976). The drums were transported initially to Veolia in Flanders, New Jersey, for staging and were subsequently transported for incineration at Veolia's Port Arthur, Texas TSCA permitted facility. As confirmed with Mr. James Haklar, USEPA Region 2, the disposal of the UST contents was not included in 40 CFR 761.205(c)(2) because the materials were being disposed at a TSCA permitted facility (Veolia), and therefore, did not require a 30 day notice of PCB activity.[36]

Copies of the manifests were received from EWMI when the wastes were transported off-site, and EWMI subsequently received signed copies of the manifests from Veolia upon disposal of the UST waste materials at Veolia's facility. However, as a result of a contractual dispute between the EWMI and the generator, final manifests and certificates of destruction were not received by the generator. On April 9

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[35] Weight of PCB wastes was calculated based on the manifested quantity as reported in kilograms for consistency.
[36] Personal communication, October 28, 2013.

and April 10, 2014, PEC attempted to contact Veolia directly to document receipt per 40 CFR 262.42 and to confirm ultimate destruction of these wastes via incineration on behalf of the Client. PEC spoke with Ms. Lori Erd and Mr. Kurt Scott of Veolia on April 10, 2014 and was informed verbally that these PCB waste were in fact incinerated in Port Arthur, Texas and that the final manifests and certificates of destruction had been forwarded to EWMI. Consequently, since the generator had verbal but no written confirmation of delivery for final disposal/incineration, PEC submitted a PCB Waste Exception Report with the USEPA on April 18, 2014 documenting this issue.[37] The manifests were subsequently received directly from Veolia on September 25, 2014.

As reported on the manifests, there was approximately 1,730 gallons of PCB contaminated oil, 21.06 tons, removed by EWMI during the work. Copies of documentation regarding the disposal of the PCB-impacted fuel oil remediation waste are included in Appendix R and have been summarized in Table R-2.

3.6.3 Disposal of Contaminated Soils

3.6.3.1 Waste Characterization Sampling

PCB and/or oil contaminated soils were generated for disposal. These soils were classified as PCB bulk remediation waste. These soils included crushed concrete from the demolition of the former Building 12 that had been moved into the original UST excavation by the redeveloper's contractor as discussed in Section 3.2.3.

Disposal characterization samples were initially collected in November 2013. The waste generation log indicating the dates the materials were excavated, i.e., excavated, has been included in Appendix R. The UST Comp samples were analyzed for PCBs, TCLP Metals, Total SVOCs, and RCRA Characteristics, while the grab samples were analyzed for Total VOCs. The samples were sent to TestAmerica for analysis. Upon receipt of the sample results, they were forwarded to ddms for data validation. All of the samples were found to be outside of acceptable quality control standards; therefore, the data was deemed unusable. The sample results were all rejected based upon ddms' findings. Accordingly, this data cannot be relied upon and has not been included in this report. Figure 11 details the locations of the aforementioned disposal samples. The TestAmerica data has been included electronically in Appendix K.

Subsequently, on February 26, 2014, soil samples were re-collected from the soil stockpile. Five composite soil samples (Disposal-001 through -005) were collected and analyzed by Accutest for PCBs, total VO+10 and Resource Conservation and Recovery Act (RCRA) characteristics. Samples Disposal-002 and -004 were also analyzed for total SVOCs and TCLP metals. The selection of analytical parameters was based upon preliminary discussions with contractors and prospective disposal facilities in

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[37] The PCB Waste Exception Report was initially submitted to the USEPA on April 14, 2014, and was revised on April 18, 2014 to correct an errant regulatory citation in the original.

order to obtain a valid price quotation. It is understood that TSCA requirements for disposal are based on in-situ contamination of PCBs; however, the following rationale was utilized for the sampling protocol:

- facility permit acceptance requirements require composite samples,
- the materials had already been excavated from the UST excavation area and stockpiled in November 2013,
- the characterization that the entire stockpile exceeded the ≥ 50 mg/kg threshold and is therefore a TSCA regulated bulk remediation waste and was not intended to suggest that the stockpiles could be segregated into different disposal options; and
- composite samples of the stockpile were collected to certify that the contents were not also RCRA hazardous waste as required at 40 CFR 261, and to meet the permit requirements of the TSCA and/or RCRA based disposal facilities.

Figure 12 depicts the locations of the disposal samples from the February sampling event. The disposal sample results have been summarized in Table 10. The Accutest data and ddms' data validation reports have been included electronically in Appendix K.

Additional soil samples were collected for disposal characterization on May 7, 2014. The soil stockpile was divided into five equal sections and a series of test pits were installed using the excavator. Five locations were excavated within each section and one five-point composite soil sample was collected from each section. The samples were analyzed for TCLP VOC, TCLP SVOC, TCLP Herbicides, Reactive Cyanide, Reactive Sulfide, and Paint Filter Liquids. The data for the waste characterization has also been summarized in Table 10. Figure 13 depicts the location of the samples collected. The Accutest data and ddms' data validation reports for these data have been included electronically in Appendix K.

3.6.3.2 Transportation and Off-Site Disposal of Waste Material

As noted above, the composite PCB samples from the soil stockpiles were under the 50 mg/kg threshold; however, the in-situ soil samples exceeded the TSCA threshold. As a result, the entire stockpile was assumed to be impacted ≥ 50 mg/kg PCBs and was handled as TSCA bulk remediation waste.

Prior to initiating the disposal of the PCB bulk remediation wastes, an updated RCRA Subtitle C Site identification form was filed with USEPA that updated the facility ownership information for the existing generator ID, NJD981559149. A 30-day notice was filed with USEPA Region 2 on June 2, 2014. These documents have been included electronically in Appendix R.

The Client contracted with AWT Environmental Services, Inc. (AWT, Sayerville, NJ) to arrange for the disposal of the soil stockpile as a PCB bulk remediation waste. An approval was obtained from CWM Chemical Services, LLC (CWM, Model City NY), a TSCA permitted facility. The waste profile sheet, facility approval letter, and a copy of the facility permit have been included electronically in Appendix R.

The PCB bulk remediation waste was loaded and transported to CWM on August 11 through 27, 2014. Transportation was provided to the approved disposal facility by Horwith Trucks, LLC (Northampton, PA), a NJDEP DSWHM A-901 registered hauler (07110) and USEPA hazardous waste transporter (NJD14614878). 1,415.08 tons of PCB bulk remediation waste were transported, received, and certified to have been disposed at CWM. The manifest report from CWM has been included electronically in Appendix R.

3.6.4 Disposal of Contaminated Concrete

3.6.4.1 Waste Characterization Sampling

PCB and/or oil contaminated-concrete were also generated during the remediation of the Site. To characterize these materials for disposal, one additional composite concrete sample (Stockpile-001) was collected from the stockpiled concrete on July 16, 2014 to characterize the material for disposal purposes. The sampling was performed under the same rationale discussed in Section 3.6.3.1, above. The sample was submitted to Accutest for analysis for TCLP metals, total VOCs, total SVOCs, RCRA characteristics and PCBs. The sample parameters were determined following discussion with AWT and potential disposal facilities to secure their approval. The data for the concrete waste characterization has been summarized in Table 12. The Accutest data and ddms data validation report for these data have been included electronically in Appendix K.

3.6.4.2 Transportation and Off-Site Disposal of Waste Material

The Client contracted with AWT to arrange for the disposal of the concrete stockpile as a PCB bulk remediation waste. An approval was obtained from Wayne Disposal, Inc. (WDI, Bellville, MI), a TSCA permitted facility. The waste profile sheet, facility approval letter, and a copy of the facility permit have been included electronically in Appendix R.

The PCB bulk remediation waste was loaded and transported to WDI on August 19 through 27, 2014. Transportation was provided to the approved disposal facility by Horwith. 202.59 tons of PCB bulk remediation waste were transported, received, and certified to have been disposed at WDI. The manifests have been summarized on Table R-2, and the manifest report from WDI has been included electronically in Appendix R.

4.0 PCB Risk Assessment

4.1 Introduction

The purpose of this PCB risk assessment is to seek USEPA approval of an application for risk-based cleanup and disposal plan for PCBs that is being submitted for the Site. In accordance with TSCA regulations under Section 761.61(c)(2), USEPA will approve an application for risk-based cleanup and disposal if "...it finds that the method will not pose an unreasonable risk of injury to health or the environment." This section will document the development of a site-specific remedial goal and the protectiveness of the proposed redevelopment as an engineering control for the remaining PCB contaminated soils.[38]

This risk assessment evaluates the potential risk to human health of PCB soil contamination. Specifically, this risk assessment aims to assess the risk due to PCB contamination in the soil during the remediation of the soil, the construction of the IRM, and the occupancy of the building currently under construction. In accordance with TSCA regulations, total PCB concentration is used to determine exposure concentrations at the Site. Using the 95th percentile upper confidence limit of the mean (95% UCL) of remaining surface and sub-surface soil PCB results, the exposure point concentration (EPC) of PCBs in the soil at the Site, was calculated to be 180 mg/kg.

This risk assessment's primary purpose is to evaluate any current or future risk from the PCB contamination in the soil during the remediation and construction of the IRM, following the demolition of Building 12.[39] Five risk scenarios are evaluated in this risk assessment. The potential risk under current conditions, to a construction worker, outdoor worker, off-site resident fugitive dust, and trespasser (adult and child) from exposure to soil concentration of 180 mg/kg of PCBs during the remediation through the construction of the IRM is assessed. The future potential risk to a utility worker, under a cap disruption scenario after the construction of the building is also evaluated. Both carcinogenic and non-carcinogenic risk from sub-surface and surface soil contamination, via ingestion, dermal and inhalation routes are evaluated for all scenarios presented, with the exception of the off-site resident.

Risk estimates are calculated using, USEPA Region 3 Mid-Atlantic Risk Assessment – Regional Screening Level (RSL) equations and methodology.[40] The USEPA screening-level approach uses the most conservative data and assumptions to determine upper range risk levels. In this risk estimate, the

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[38] The use of engineering controls for PAHs, and metals, as discussed in Section 5.2.3, is permitted by NJDEP pursuant to N.J.A.C 7:26C and N.J.A.C. 7:26E and is outside of USEPA jurisdiction. A risk assessment for the PAHs and metals is neither required or necessary to demonstrate the protectiveness of the remedy.

[39] The potential risk evaluated for all the exposure scenarios presented in this risk assessment does not cover the demolition of the building or crushing of the concrete. Sufficient reliable laboratory data about the building at the time of its demolition does not exist for the evaluation of this scenario.

[40] USEPA Region 3, Mid-Atlantic Risk Assessment – Regional Screening Table, http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/

screening level approach is modified to be site-specific to reflect the worst-case situations that may occur at the Site.

The results of each risk-based calculation are discussed in Section 4.5, below. References used for the Risk Assessment can be found in Appendix S. The ProUCL calculations have been included in Appendix U, and the risk equation and outputs have been included in Appendix T.

4.2 Hazard Evaluation

The primary contaminant of concern, and the subject of the risk assessment, at the Site are PCBs in the soil. The source of the PCBs, Aroclor 1248 containing hydraulic fluids used in the manufacturing and milling of the aluminum ingots, is discussed in Section 2.4 of this report. The hydraulic oil Pydraul F9 contained Aroclor 1248.[41] There are three Aroclor mixtures of PCBs reported in the soil contamination at the Site: primarily Aroclor 1248 with low concentrations of Aroclor 1254 and/or Aroclor 1260 as the result of weathering.

4.2.1 PCB Toxicity Profile

PCBs are synthetic chemicals that belong to a class of chemicals known as chlorinated hydrocarbons. PCBs were manufactured in the US from 1929 until 1979, when they were then banned by TSCA. PCBs were used in many industrial and chemical products due to their non-flammability, chemical stability, high boiling point and electrical insulating properties. PCB mixtures have been used in electrical equipment (transformer and capacitors), heat transfer, and hydraulic equipment; as plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper; and many other industrial applications.

The PCBs used in these products were chemical mixtures made up of a variety of 209 individual chlorinated biphenyl compounds, known as congeners. PCBs were sold and used, however, as a mixture of many congeners. Most commercial PCB mixtures are known in the United States by their industrial trade names. The most common trade name is Aroclor, produced from approximately 1930 to 1979. There are many types of Aroclors and each has a distinguishing suffix number that indicates the degree of chlorination. The numbering convention for the different Aroclor mixtures is as follows. The first two digits generally refer to the number of carbon atoms in the two biphenyl rings (for PCBs this is 12), the second two numbers indicate the percentage of chlorine by mass in the mixture. For example, Aroclor 1248 mixture contains 48% chlorine by weight, 1254 contains approximately 54% chlorine by weight, and 1260 would contain 60% chlorine by weight. Aroclor 1016, a replacement for Aroclor 1242 produced after 1972, is an exception to this naming convention.

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[41] William Sonzogni and Margaret M./ David, "PCB Contamination in the Sheboygan River, Wisconsin," *Biological Remediation of Contaminated Sediments with Special Emphasis on the Great Lakes: Report of a Workshop, Manitowoc, WI, July 17-19, 1990*, Ed. Chad T. Jafvert and John E. Rogers, USEPA 600/9-91/001, page 75.

PCBs vary in their range of toxicity and the degree of toxicity depends on the type and concentration of the congeners present. Increased chlorine concentration usually is associated with an increase in toxicity. In addition, the environmental media (soil, water, air) and the exposure pathway (ingestion, dermal, inhalation) will also determine the type and severity of the potential health effects.

Water-solubility of the PCBs is driven by the degree of chlorination, and the less chlorinated congeners are more soluble. Potable water at and around the site is supplied by the municipality. Subsequent groundwater sampling and analysis, as discussed in Section 3.4.2, has indicated that the surficial groundwater samples were all reported as none detected for the individual Aroclor mixtures. Therefore, ingestion of potentially contaminated groundwater is not a completed pathway and does not require further analysis.

Exposure to PCBs have shown adverse health effects, both carcinogenic and non-carcinogenic have been demonstrated. In general, high-risk exposure to PCBs is thought to be associated with ingestion of food and or soil. Although PCBs are generally considered non-volatile, they do have a measurable vapor pressure. Vapor inhalation is associated with lower risk as the more volatile PCBs are the less chlorinated congeners and have lower toxicity.

Exposure via inhalation of particulates in air, i.e. fugitive dust, is not considered to be a significant pathway because the particulate emission factor (PEF) and the soil-to air volatilization factor (VF), are not applicable for the Site. The PEF for soil does not affect most screening levels except for certain heavy metals, and the soil-air VF does not apply for compounds with a Henry's Law constant of 1×10^{-5} atm-m^3/mole or greater and molecular weight of greater than 200 g/mole.[42] The physical properties, including the water solubility, Henry's Law constant, and molecular weights for the three Aroclors of concern are shown below.[43] In addition, USEPA believes that since the ingestion route should always be considered in screening decisions for surface soils, and ingestion Soil Screening Levels (SSLs) appear to be adequately protective for inhalation exposures to fugitive dusts for semi-volatile compounds, the fugitive dust exposure route need not be routinely considered for semi-volatile organic chemicals in surface soils.[44] However, USEPA advises that under the construction scenario, fugitive dust emission may be a concern to construction workers and off-site residents, and therefore under these conditions, warrants evaluation.[45]

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[42] USEPA, *Supplemental Guidance for Developing Soil Screening Levels at Superfund Sites*, December 2002, http://www.epa.gov/superfund/health/conmedia/soil/pdfs/ssg_main.pdf.

[43] USEPA Region 3, *Regional Screening Level (RSL) Chemical-specific Parameters Supporting Table,* January 2015, http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/params_sl_table_run_JAN2015.pdf.

[44] USEPA, *Soil Screening Guidance, Users Guide*, July 1996, http://www.epa.gov/superfund/health/conmedia/soil/pdfs/ssg496.pdf.

[45] USEPA, *Supplemental Guidance for Developing Soil Screening Levels at Superfund Sites*, December 2002, http://www.epa.gov/superfund/health/conmedia/soil/pdfs/ssg_main.pdf.

PCB Physical Properties

Aroclor	CAS No.	Water Solubility	Henry's Law Const.	Molecular Weight
		mg/l	atm-m^3/mole	g/mole
Aroclor 1248	12672-29-6	1.0×10^{-1}	4.4×10^{-4}	290
Aroclor 1254	11097-69-1	4.3×10^{-2}	2.8×10^{-4}	330
Aroclor 1260	11096-82-5	1.4×10^{-2}	3.4×10^{-4}	400

4.2.2 Data Set Analysis and Usability

Both surface and sub-surface soil samples were collected in AOC-1 and AOC-2. To determine appropriate exposure point concentration (EPC), the PCB soil sample data was entered in USEPA's ProUCL[46] software, to determine the 95% UCL. The calculation of the 95% UCL included the potential uncertainty from the inclusion of none-detected data. Consistent with the instructions, the laboratory reporting limit was included for all data reported a none-detected; however, other data validation qualifiers indicating potential bias were not included. As discussed below, two potential EPCs were calculated.

The surface soil sample results representing the combination of the surface soil samples including the final post excavation following the closure of the 20,000 gallon USTs (AOC 1) and the surface soil samples collected form the site wide sampling grid (AOC 2). Within the data set collected, one outlier value was observed. Soil sample PE-060 was reported to contain 26,750 mg/kg total PCBs. While this soil location was subsequently excavated for disposal, as discussed in Section 3.2.5, a post excavation soil sample could not be collected safely because of the presence of an overlying concrete mass in the subsurface, and the result was included in the initial evaluation of the data set. This result, 26,750 mg/kg, however, was determined to be a statistical outlier using Rosner's Test in ProUCL, therefore is not used in the calculation for risk assessment. The outlier calculations have also been included in Appendix B. This is further evidenced by the results for soil sample location PE-40, approximately 5 feet to the south, which had a reported result of 364.5 mg/kg PCBs and also was subsequently removed. The remaining data, based on 33 observations, were used to calculate the 95% UCL. Using ProUCL, the best fit 95% UCL is the 95% Adjusted Gamma UCL for < 40 samples, 330 mg/kg PCBs.[47]

A second data set was evaluated that included all of the remaining soil on the Site, including subsurface data collected during the remedial investigation of AOC 2, and as discussed in Section 3.3.2. As with the data set discussed above, the soil sample result for location PE-60 was statistically excluded as an outlier. Using these 84 observations, ProUCL recommended the 95% KM (Chebyshev) UCL, 180 mg/kg PCBs.

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[46] USEPA, ProUCL, version 4.1, http://www.epa.gov/osp/hstl/tsc/software.htm.

[47] ProUCL and risk calculations are reported only to two significant digits based on the laboratory data. The lowest number of significant digits in the laboratory data are two.

While the use of only the surface soil sample data set to calculate the 95% UCL would appear to be a more conservative estimation of the potential exposure, i.e. the result is higher, this evaluation would not take the movement of soil via excavation, installation of building footers, and the re-grading into consideration. These general construction activities occurred throughout the remedial investigation and continued until the construction of the IRM discussed in Section 3.5. The use of the complete soil sample data set also better accounts for the heterogeneity of the soils mixed with the recycled concrete from the demolition of the building. As a result, the inclusion of all the soil sample locations, and not just the surface sample locations, is a more representative EPC, and 180 mg/kg PCBs should be used to calculate potential risk in the exposure scenarios have been included in the following discussion. The ProUCL outputs are attached in Appendix T.

4.3 Exposure Assessment

There are five different types of exposure scenarios possible at the Site, via surface and sub-surface soil contamination through ingestion, dermal and inhalation exposure pathways. Site-Specific parameters and USEPA Region 3 Mid-Atlantic Risk Assessment, suggested default parameters are used in the assessments.

Under current conditions, with the construction of the IRM, the potential for direct contact with the contaminated soil has been eliminated. The risk assessment for the Site has been conservatively calculated using the assumption that there is on-going potential direct contact with the contaminated soils. For this purpose, the Site is a construction-site; primary exposure targets are on-site construction workers and on-site outdoor workers. The off-site resident population may also be at risk due to fugitive dust emissions during the construction phase of the IRM, following the demolition of Building 12. In the unlikely event that a trespasser enters the Site, trespasser exposure is also possible.

The last scenario assumes that once the final engineered cap (consisting of 6 inches of concrete as required by TSCA) has been constructed, utility work may be needed, and the cap thereby may be disrupted, and thus leading to potential exposure.

4.3.1 Construction Worker

On-site construction workers can be exposed to the contamination either through “standard vehicle traffic” or through “other than standard vehicle traffic” (excavating, dozing, grading, excavation, and wind). Construction worker scenario is applicable for a short-term adult receptor that is exposed to soil contaminants during the workday for the duration of a single construction project (typically a year or less). The activities of this receptor typically involve substantial on-site exposures to surface and subsurface soils. The construction worker is expected to have very high soil ingestion rate and is assumed to have exposure to contaminants via direct and indirect pathways: incidental soil ingestion, dermal absorption, inhalation of volatiles outdoors, and inhalation of fugitive dusts.

The construction worker is assumed to be on-site 8 hours/day, 5 days per week, for a 1-year period. Therefore, based on USEPA Region 3, Mid-Atlantic Risk Assessment suggested values, exposure frequency (EF) of 250 days/year, exposure duration (ED) of 1 year, and exposure time (ET) of 8 hours/day is assumed for the risk assessment.

4.3.2 On-site Worker and Outdoor Worker

The outdoor worker, as defined by USEPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, is a long-term receptor exposed during the workday conducting maintenance activities outdoors. The activities for this receptor include moderate digging and landscaping, typically involving on-site exposures to surface and shallow sub-surface soils at depths of zero to two feet. Exposure scenarios include ingestion of soil, dermal absorption of contaminants from soil, inhalation of fugitive dust, inhalation for volatiles outdoors, and ingestion of ground water contaminated by leachate.

The outdoor worker is expected to be the most highly exposed receptor in the outdoor environment under commercial and industrial conditions. Thus, the SSLs and risk estimates for this receptor are considered protective of other reasonable anticipated outdoor activities at commercial/industrial facilities.[48]

Using the USEPA suggested default values, the on-site/ outdoor worker is assumed to have exposure duration of 1 year, exposure frequency of 250 days/year, and exposure time of 225 days/year.

4.3.3 Off-site Resident

The off-site resident is a receptor located at the site-boundary. USEPA defines the off-site resident as having the potential to be exposed to contaminants both during and after construction for a total of 30 years. USEPA categorizes this receptor as having no direct contact with on-site soils, and therefore ingestion and dermal exposure routes do not have to be evaluated.

USEPA, after analysis using conservative, health protective assumptions to model emissions and transport of vapors and particulates to an off-site receptors indicates that for most contaminants, including PCBs, SSLs calculated for on-site receptors would be protective of indirect exposures (i.e., outdoor exposure to soil vapors and to particulates due to wind erosion) to off-site residents. Under this framework, the only exposure pathway evaluated for this receptor is inhalation of fugitive dust, which is likely to be exacerbated during construction as result of dust generated by truck traffic on unpaved roads. In addition, under the conservative assumptions of the simple site-specific approach, SSLs for volatiles

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[48] USEPA, *Supplemental Guidance for Developing Soil Screening Levels at Superfund Sites*, December 2002, http://www.epa.gov/superfund/health/conmedia/soil/pdfs/ssg_main.pdf.

developed for the outdoor worker receptor under the commercial/industrial scenario should be protective of the off-site resident under construction worker scenario.[49]

Therefore, due to the potential for fugitive dust exposure prior to the construction of the IRM, off-site resident fugitive dust risk is evaluated. The risk estimate generated is specifically for during the remediation of the USTs and contaminated soil, as well as the construction phase of the IRM, and does not take into consideration the demolition of the building or the crushing of the concrete phase.

Site-specific off-site resident fugitive dust risk was calculated. Appendix U, which details the methodology and equations, default and site-specific vales used to generate a site-specific off-site fugitive dust risk estimate. The USEPA Region 3 Mid-Atlantic Risk Assessment online calculator, however, does not calculate SSL or risk estimates for off-site resident fugitive dust and therefore this calculation was done manually using equations and methodology based on the USEPA, Supplemental Guidance for Developing Soil Screening Levels at Superfund Sites.

An exposure frequency (EF) of 350 days and exposure time (ET) of 24 hours per day was assumed. An exposure duration (ED) of 1 year was assumed in the derivation of the risk estimate, rather than the standard off-site ED of 30 years. The exposure duration is consistent with the other scenarios evaluated during construction, because construction period is only one year and at the close of the construction period, the IRM is currently in place. Therefore, under normal construction scenario, it is assumed the off-site residents will be exposed during construction and after construction is complete. During construction, it is assumed the residents could have been exposed to fugitive dust emissions from site traffic on temporary unpaved roads and due to emissions from wind erosion for one year. The IRM has since capped the site, however, and off-site residents will not be exposed longer to emissions.

4.3.4 Trespass Scenario

As the Site is fenced off, it is not anticipated that a trespass scenario will be an issue at the Site. However, under a worst-case scenario, if a trespass situation were to occur, under present conditions of PCB soil concentration, risk has been assessed.

Exposure Duration of 1 year, exposure frequency of 1 day/year and exposure time of 8 hour/event, are considered as the worst-case scenario conditions.

4.3.5 Cap Disruption Scenario

A cap failure scenario is evaluated with worst case exposure frequency (EF) inputs for the temporary disruption of the cap due to utility work. Risk estimates are generated for EF for 5 days/year, exposure time of 8 hour/24 hour and exposure duration of 25 years.

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[49] USEPA, *Supplemental Guidance for Developing Soil Screening Levels at Superfund Sites*, December 2002, http://www.epa.gov/superfund/health/conmedia/soil/pdfs/ssg_main.pdf.

Screening Levels and risk estimates are calculated assuming worst-case cap disruption of 0.1 acres. It is assumed that if utility work will be required, no more than 0.1 acres of land will be disturbed on site. The 0.1 acres risk estimates are scaled down estimates from a worst-case scenario of 0.5 acres. USEPA Region 3 Mid-Atlantic online risk calculator will not allow for inputs of acres less than 0.5 acres. SSL and risk estimates outputs generated for 0.5 acres is presented in Appendix C.

4.4 Risk Assessment Assumptions and Toxicity Factors

Scenarios presented in this risk estimate consider worst-case possibilities, with the assumption that there is no clean soil on top of contaminated soil. As discussed above, there is no potential contaminant migration to groundwater at the Site based on the results of the groundwater sampling. It is noted that the construction of the IRM, as discussed in June-July 2014, see Section 3.5.1, has precluded the completion of the exposure pathways from that point forward with the exception of the cap disruption pathway. A combination of site-specific and default values are used in the equations. Inputs and exposure scenarios are presented in the risk estimate spreadsheet included in Appendix C.

Site-specific SLs and Risk Estimates generated use the PCB "highest risk" category to determine toxicity factors, where possible. As reference doses are not available for High Risk PCB non-carcinogenic risk estimates, the Aroclor 1254 reference dose is used in derivation of PCB non-carcinogenic risk. Chemical parameters for High Risk PCB that are used in the calculations are those suggested by EPA Region 3.

As required by USEPA's *Polychlorinated Biphenyl (PCB) Site Revitalization Guidance under the Toxic Substances Control Act (TSCA)*, risk due to total PCB concentrations is evaluated, even though Site is contaminated primarily by Aroclor 1248, with lower concentrations of Aroclor 1254 and 1260. The use of these toxicity factors was confirmed through discussion with USEPA Region 2 and confirmed by USEPA headquarters.[50]

Based on Site sampling evaluations, total PCBs concentration of 180 mg/kg (the 95% UCL) is used as the exposure concentration in the risk estimates.

Toxicity factors values that are used to assess carcinogenic risk and non-carcinogenic risk are based on USEPA Integrated Risk Information System (IRIS) recommended toxicity factors.[51] High Risk PCB toxicity factors are used to evaluate ingestion, dermal, inhalation carcinogenic risk. High Risk PCB Oral Slope Factor (SFo) is used to assess ingestion and dermal carcinogenic risk. High Risk PCB Inhalation Unit Risk Factor (IUR) is used to assess carcinogenic inhalation risk.

However, as a reference dose (RfD) value is not available at present for High Risk total PCBs, the RfDs corresponding to Aroclor 1254 are used to assess non-carcinogenic risk present at the Site. The sub-

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[50] Personal Communication, Marion Olsen, USEPA Region 2, November 26, 2014.
[51] USEPA, *Integrated Risk Information System*, January 2015, http://www.epa.gov/iris/.

chronic RfDsc is used to assess non-carcinogenic risk, when exposure duration is not more than one year in duration; construction worker, outdoor worker, and trespass scenarios. The chronic RfD is used to assess non-carcinogenic risk when exposure duration will be over 1 year, with a maximum duration of 25 years; cap disruption/utility worker scenarios. Carcinogenic Target Risk (TR) is set to 1.00 x 10^{-6} and the non-carcinogenic Hazard Quotient (HQ) is set equal to 1.

PCB Toxicity Factors

Toxicity Factor	Value (Units)	Risk Estimate	Reference
High Risk PCB Cancer Oral Slope Factor – CSFo	2.00 $(mg/kg\text{-}day)^{-1}$	Carcinogenic	IRIS
High Risk PCB Inhalation Unit Risk – IUR	5.72 x 10^{-4} $(\mu g/m^3)^{-1}$	Carcinogenic	IRIS
Aroclor 1254 Oral Reference Dose - RfDo	2.00 x 10^{-5} (mg/kg-day)	Non-Carcinogenic	IRIS
Aroclor 1254 Sub-chronic Reference Dose - RfDsc	3.00 x 10^{-5} (mg/kg-day)	Non-Carcinogenic	IRIS

4.5 Risk Characterization

Risk Characterization integrates toxicity and exposure data to provide quantitative estimates of carcinogenic risk and systemic hazards. Carcinogenic risks represent the incremental probability that an individual will develop cancer over a lifetime as a result of exposure to a chemical compound. USEPA usually assumes a non-threshold dose-response for carcinogens (i.e., there is some finite risk no matter how small the dose). Target risk levels of 10^{-6} indicates that an additional cancer case due to exposure is projected to occur in no more than 1 out of a million individuals exposed to this dose over a lifetime. As specified in USEPA's National Oil and Hazardous Substances Pollution Contingency Plan, Final Rule,[52] a risk management range of 10^{-4} to 10^{-6} is generally considered to be acceptable. For non-cancer hazard estimates a Hazard Quotient (HQ) of 1 or less is generally considered safe.[53] A HQ ratio greater than 1 suggests further evaluation. With that said, the selection of an appropriate level of risk is often based on the site and population-specific factors.

4.5.1 Methodology

Based on the USEPA Mid-Atlantic Risk Assessment Regional Screening Levels methodology and equations, see Appendix U, Soil Screening Levels (SSLs) and Risk Levels (RL) were calculated using USEPA- RSL online calculator for worst-case scenarios that may exist at the Site. RSL screening-level assessments were refined, to adjust for site-specific assumptions, and risk estimates were calculated based on the conservative, site-specific SSLs. Ingestion, dermal, inhalation, and total combined risk from all three routes, ingestion, dermal and inhalation are calculated for five different scenarios. Target Risk

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[52] USEPA, 40 CFR 300.430(e)(A)(2).

[53] Consistent with NJDEP regulation and policy, contaminated soils that remain on site and exceed 10^{-6} risk, or a HQ > 1, would require an engineering and institutional control in a residential scenario.

level (TR) is assumed to be carcinogenic risk of 10^{-6} and non-carcinogenic Hazard Quotient (HQ) is set to equal 1.

The screening levels (SLs) presented in USEPA RSL tables and equations were developed using risk assessment guidance from the USEPA Superfund program and can be used for CERCLA and TSCA sites. They are risk-based concentrations derived from standardized equations combining exposure information assumptions with USEPA toxicity data. SLs are considered by the USEPA to be protective for humans (including sensitive groups) over a lifetime.

SLs are chemical concentrations that correspond to fixed levels of risk (i.e., either a one-in-one million [10^{-6}] carcinogenic risk or a non-carcinogenic hazard quotient of 1) in soil, air, and water. In most cases, where a substance causes both carcinogenic and non-carcinogenic (systemic) effects, the 10^{-6} carcinogenic risk will result in a more stringent criteria. Risk estimates based on SLs are similarly compared to the 10^{-6} target carcinogenic risk, and can be considered a conservative estimate of risk. However, for certain contaminants of concern, the non-carcinogenic risk estimate can be the more stringent standard and thus be the SL to be used. In general, the lower of the two SLs, is set to be the criteria to be used, when setting site-specific SLs. The equations for risk-based SLs and Risk Estimates are presented in Appendix U.

4.5.2 Carcinogenic and Non-carcinogenic Risk Estimates

In order to calculate carcinogenic risk, the site-specific concentration 95% UCL was divided by the SL concentrations that are designated for cancer evaluation. This ratio is then multiplied by 10^{-6} to estimate chemical-specific risk for a reasonable maximum exposure (RME).

$$\textbf{Risk} = [\textbf{Concentration of Contaminant} \div \textbf{Screening Level Concentration}] \times (10^{-6})$$

Non-carcinogenic risk is evaluated using Aroclor 1254 reference dose, as reference dose values are not available for the high risk PCB category. For non-cancer hazard estimates, the concentration of the contaminant is divided by the non-cancer site-specific SL.

$$\textbf{Non-cancer Hazard Quotient} = [\textbf{Concentration of Contaminant} \div \textbf{Non-carcinogenic Screening Level Concentration}]$$

Carcinogenic Target Risk (TR) is set to 1.00 x 10^{-6} and the Non-Carcinogenic Hazard Quotient (HQ) is set equal to 1.

4.5.3 Summary of Risk Estimates

The attached excel spreadsheet provides risk estimates for the Site, for construction worker, outdoor worker, trespass off-site resident, and utility worker scenarios. The table below summarizes the exposure scenario assumptions.

Exposure Scenarios

Scenario	Exposure Duration (ED)	Exposure Frequency (EF)	Exposure Time (ET)
Construction Worker	1 year	250 days/year	8 hours/24 hours
Outdoor Worker	1 year	225 days/year	8 hour/24 hours
Off-site resident - fugitive dust	1 year	350 days/year	24 hours/24 hours
Trespass (adult and child)	1 year	1 day/year	8 hours/event
Utility Worker – Cap Disruption	25 year	5 days/year	8 hours/24 hours

Tables U-1, 2, 3, 4, 5 and 6 in the attached in Appendix U, summarize risk levels for each of the scenarios presented above. The variables and value inputs for each of scenarios are presented in the tables as well.

4.5.4 Construction Worker Scenario

Two sets of risk estimates were calculated with the construction worker scenario, assessing the potential exposure to construction worker from standard vehicle traffic and from non-standard vehicle traffic (grading, tilling, excavating, dozing, and wind).

The construction workers during the construction of the IRM were trained according to the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120. The construction workers HASP has been included in 3.1.3. Air monitoring prior to and during the construction of the IRM was conducted as part of their site specific HASP. Construction and monitoring activities during this phase were completed using modified Level D personal protective equipment (PPE), consisting of protective suits, gloves, and foot coverings to prevent dermal and incidental ingestion. The results of the air monitoring, as discussed in Section 3.5.2 and included in Appendix Q, indicated that the total respirable dust and PCB data were less than the site-specific action level, the OSHA Permissible Exposure Limit (PEL), and National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Level (REL).

The risk levels generated for construction worker scenario, under present conditions are very conservative levels, as it does not take into consideration the IRM consisting of the geotextile and six inches of crushed stone that is on top of the contaminated soil at the Site. With the construction of the IRM, direct contact and surface soil migration due to wind erosion and fugitive dust, has been eliminated and be protective of potential receptors.

4.5.4.1 Carcinogenic Risk

Ingestion, dermal and total risk estimates for construction worker, under standard vehicle traffic (SVT) and under other than standard traffic (OTSVT) scenario are slightly above the target risk range of 10^{-6} but within USEPA management range of 10^{-4} to 10^{-6}. Inhalation carcinogenic risk is well below USEPA established 10^{-6} cancer target risks levels. Inhalation risk levels generated are between 10^{-8} to 10^{-9}.

4.5.4.2 Non-Carcinogenic Risk

Non-carcinogenic Hazard Quotient (HQ) generated for the construction worker scenario, indicate further evaluation is required and that non-carcinogenic risk does exist at the Site, under current conditions. Hazard Quotient levels generated are above HQ of 1. Ingestion HQ is 17.8 dermal HQ is 7.85 and total non-carcinogenic risk is 25.6. In order to calculate non-carcinogenic inhalation risk, reference concentrations are required to generate a HQ. Inhalation HQ cannot be evaluated, because reference concentrations are not available for High Risk PCB or for Aroclor 1254. As noted above, the dermal and ingestion exposures pathways would have been mitigated in the HAZWOPER trained construction workers and site staff through the use of modified Level D.

4.5.5 Off-site Resident Exposure to Fugitive Dust

The construction worker would be the most exposed to dust generated at the Site and exposure to the contaminant, as inhalation carcinogenic risk and is below the target risk level, the actual measured PCB levels were below the applicable OSHA PEL, it is assumed that the off-site resident population would be less exposed and therefore it is assumed off-site residents are not at risk from construction work generating fugitive dust.

However, as USEPA advises that the fugitive dust pathway for off-site residents be evaluated, during construction phase, off-site fugitive risk was evaluated. Off-site residents would only be exposed to fugitive dust exposure and therefore dermal and ingestion pathways, and the risks levels thereto, do not apply to that population.

4.5.5.1 Carcinogenic Risk

Carcinogenic off-site resident fugitive dust risk levels generated indicate that risk levels are below target risk level. The risk estimate generated is in the range of 10^{-8}.

4.5.5.2 Non-Carcinogenic Risk

Non-Carcinogenic Risk cannot be evaluated, because reference concentrations are not available for Aroclor 1254 or for High Risk total PCB category.

4.5.6 Outdoor Worker Scenario

This scenario assumes present conditions of 180 mg/kg of PCB contamination, with no vegetative cover, but does not take into consideration the six inches of crushed stone above the geotextile membrane (the IRM) constructed at the Site; an exposure duration of 1 year is assumed. It also is assumed that there is no groundwater contamination as evidenced by the previous investigation (Section 3.4.2). The outdoor worker exposure scenario presented in this estimate would be the worst-case scenario. Based on USEPA's *Supplemental Soil Screening Guidance*, it is assumed that risk estimates for the outdoor worker scenario would be protective of off-site receptors, when no construction activities are in place.

The risk levels generated for this outdoor worker scenario, under present conditions are very conservative levels, as it does not take into consideration the IRM consisting of the geotextile and six inches of crushed stone that is on top of the contaminated soil at the Site. With the construction of the IRM, direct contact and surface soil migration due to wind erosion and fugitive dust, will have been eliminated and be protective of potential receptors.

4.5.6.1 Carcinogenic Risk

Ingestion and dermal risk estimates for outdoor worker scenario, e.g. prior to the construction of the IRM, are above the target risk range of 10^{-6} but within USEPA management range of 10^{-4} to 10^{-6}. Total risk levels are slightly above target risk levels, but within the USEPA management range. Inhalation carcinogenic risk is well below USEPA established 10^{-6} cancer target risks levels.

4.5.6.2 Non-Carcinogenic Risk

The non-carcinogenic Hazard Quotient (HQ) generated for the outdoor worker scenario, indicate further evaluation is required and that non-carcinogenic risk existed at the Site, prior to the construction of the IRM. Hazard Quotient levels generated are above HQ of 1: ingestion HQ is 4.6 , dermal HQ is 2.7 and total non-carcinogenic risk is 7.4. In order to assess non-cancer inhalation risk, references concentrations are required. Inhalation HQ cannot be evaluated, as reference concentrations are not available for High Risk total PCBs or for Aroclor 1254.

4.5.7 Trespasser Scenario

This scenario assumes that a trespasser wandered on to the Site, under present conditions of 180 mg/kg of PCB in soil without the construction of the IRM for 1 day/year for 8 hours/day.

4.5.7.1 Carcinogenic Risk

For this scenario, ingestion, dermal, inhalation and total risk levels calculated were found to be well below target risk levels of 10^{-6}.

4.5.7.2 Non-Carcinogenic Risk

Non-carcinogenic HQ generated for the trespasser scenario, indicate no further evaluation is required and that no non-carcinogenic risk exists at the Site, under current conditions. HQ generated for the trespass scenario, for both adult and child, is under HQ of 1. In addition, taking into consideration, that at the Site IRM consisting of the geotextile and six inches of crushed stone has been placed over the contaminated soil, and the Site is fenced off from trespasser, exposure via ingestion, dermal, and inhalation routes should not be an issue for both cancer and non-carcinogenic risk.

4.5.8 Cap Disruption Scenario

A cap failure scenario is evaluated at worst-case exposure frequency (EF) for utility work of 5 days/year. SLs and risk estimates were calculated assuming worst-case disruption area of 0.1 acres (4,356 square feet). Although the utilities will be constructed in clean envelope, this scenario conservatively assumes that the contaminated soil will be contacted during the work.

4.5.8.1 Carcinogenic Risk

The ingestion, dermal, inhalation, and total risk are below target risk level of 1×10^{-6}. The risk range was between 10^{-7} to 10^{-11}.

4.5.8.2 Non-Carcinogenic Risk

Non-carcinogenic Hazard Quotient (HQ), indicate no further evaluation is required and that no non-carcinogenic risk exists for this scenario. HQ generated for the cap disruption scenario is under HQ of 1.

4.5.9 Uncertainty Evaluation

In order to assess risk, a series of parameters and assumptions are used in the risk evaluation process. For each scenario applicable to a given site, a different set of parameters and assumptions can be used. As a result of this, a degree of uncertainty is introduced in the overall process of quantifying a given risk at an AOC.

4.5.9.1 PCB Analyses

In accordance with TSCA regulations under Section 761.61(c)(2), total PCB data was used in the risk assessment. However, there are three Aroclor mixtures found on the Site, Aroclor 1248, 1254, and 1260. Aroclor 1254 and 1260 are thought to be weathered by-products of Aroclor 1248. Due to the lack of toxicity data for Total PCBs, toxicity data for Aroclor 1254 is used to assess non-carcinogenic risk and the High Risk PCB category toxicity data is used to assess carcinogenic risk. Non-carcinogenic toxicity data is not available for total PCBs and therefore toxicity data for Aroclor 1254 is EPAs recommended factor to use. Aroclor 1254 is only a minor component of the PCBs present on the Site.

Therefore, as a result of the toxicity data used in the risk assessment, there could be an overestimate of risk at the Site.

4.5.9.2 Exposure Assumptions

The exposure assumptions and equations used in the risk assessment are based on USEPA, Mid-Atlantic Region 3 risk assessment methodology and considers worst-case scenarios. The risk assessment assumes the entire area of the AOC can be a point of potential exposure to PCBs. The risk assessment process considers worst-case scenarios at the Site and does not take into consideration the IRM consisting of the geotextile and six inches of crushed stone that has been placed on top of the contaminated soil. In addition, the proposed structure will add an additional six inches of concrete, as required by TSCA, on top of the IRM, further preventing completion of the exposure pathways.

USEPA recommended default values and parameters along with site-specific parameters are used to derive risk to human health. USEPA default values and assumptions are the most stringent and most protective of human health. The risk estimates presented in the risk assessment are based on the risk-based screening levels, and therefore are the most conservative.

As a result of these assumptions, there is an over-estimate of risk at the Site.

4.6 Conclusions

Risk based calculations were performed under the worst-case conditions of EPC of 180 mg/kg of total PCBs in soil, without a vegetative cover or taking into consideration the construction of the IRM consisting of the geotextile and six inches of crushed stone and the proposed construction of the structure that will add an additional six inches of concrete.

Total Risk Summary

Scenario	Carcinogenic	Non-Carcinogenic
Target Risk	10^{-6}	1
Construction Worker	2.2×10^{-5}	26
Outdoor Worker	6.3×10^{-6}	7.4
Off-site resident –Fugitive Dust	5.4×10^{-8}	NA
Trespasser	5.8×10^{-7}	0.30 (child) 0.033 (adult)
Cap Disruption	7.0×10^{-7}	0.049

In evaluating the carcinogenic risk, the generated risk values are compared to Target Risk number for carcinogenic risk, 10^{-6}. Target Risk levels of 10^{-6} indicates that an excess cancer case is projected to occur in no more than 1 out of a million individuals exposed to this dose over a lifetime. If risk is below the target risk level of 10^{-6}, it is generally assumed risk is under control. If values are above the target risk level of 10^{-6}, but within the USEPA management range of 10^{-4} to 10^{-6}, risk is considered to be within the

USEPA acceptable range. In the evaluation, of non-carcinogenic risk, a Hazard Quotient (HQ) of above 1, indicates further investigation and that non-cancer risk may be present. A HQ below 1, indicates no further evaluation is required. However, the selection of an appropriate level of risk is often based on the site and population-specific factors.

Total carcinogenic risk at the Site for construction worker resulted in a total carcinogenic risk above the USEPA target level of 10^{-6}, but within USEPA management range of 10^{-4} to 10^{-6}. The total non-carcinogenic risk is above the USEPA HQ of 1. Outdoor worker total risk resulted in risk levels above the USEPA target level of 10^{-6}, and but within the USEPA management range of 10^{-4} to 10^{-6} range. The construction workers, however, were monitored prior to and during the IRM construction, and the actual exposure to total respirable dust and PCBs was below the applicable OSHA PEL and the NIOSH REL. Potential exposure of the current and future construction and outdoor workers would be eliminated by the IRM.

Given the actual dust monitoring data, it is assumed that the off-site resident population would be less exposed, and therefore it is assumed off-site residents are not at risk from construction work generating fugitive dust. Off-site residents would have been exposed to fugitive dust exposure and therefore dermal and ingestion risks levels do not apply to that population.

Trespasser carcinogenic total risk is below target risk level. Non-carcinogenic HQ for both adult and child scenarios are below HQ of 1, and therefore no further evaluation is needed, as site-specific risk is below the HQ of 1. The risk evaluated for the trespass scenario considers worst-case for both adult and child exposures, and does not take into consideration the IRM consisting of the geotextile and six inches of crushed stone. In addition, the Site has a fence around the property to prevent trespassers. Therefore, if the fence and IRM consisting of the geotextile and six inches of crushed stone is taken into the risk evaluation, trespasser risk is further reduced. The construction of the final structure with six inches of concrete above the IRM further precludes the completion of the exposure pathway.

Cap Disruption scenario, the area of cap disruption of the engineered cap for utility work should be in general no more than 0.1 acres and at most for 5 days/year, under these exposure frequencies and area of disruption scenarios, Total carcinogenic risk is below Target Risk level of 10^{-6}. Total non-carcinogenic risk is well below HQ of 1, and therefore non-carcinogenic risk does not exist.

Risk estimates presented in this risk assessment take into consideration likely worst-case scenarios and the most reasonably stringent variables and default values available. Risk estimates are based on-site-specific risk-based screening levels. Therefore, risk estimates presented in this report are likely over estimates of potential risk that would likely occur at the Site in question.

5.0 Remedial Alternatives / Remedial Action Workplan

5.1 Proposed Additional Remedial Investigation Tasks

The following additional Remedial Investigation tasks were identified previously. These tasks are related to the investigation of potential off-site impacts resulting from former site operations, the demolition of the Former Building 12, and/or the construction of the current structure by others. An updated Remedial Investigation Workplan / Quality Assurance Procedures Plan will be prepared for the sampling events discussed below. Each of the three sampling events will be completed and summarized in a Remedial Investigation Addendum to this report.

5.1.1 Storm Water System Investigation

A storm water system runs under Vreeland Terrace, parallel to the Site and connects to the publically owned treatment works main located in River Road. The storm sewer locations are shown in Figure 3. During site work operations, potentially contaminated surface water had been discharged to the storm sewers via the use of a submersible pump by the redeveloper's contractor. The water had been in contact with the PCB contaminated soil in AOC 1 and not been analyzed prior to its discharge from the Site. PEC proposes to clean out the two affected storm drains, along with a manway at the bottom of Vreeland Terrace closest to River Road. Any storm sewer conveyances that emanate from the Site will be sealed with hydraulic cement. These locations will be cleaned out using a vacuum truck and samples will be collected and analyzed for PAHs and PCBs.

1. The samples will be submitted to Accutest, a NJDEP certified laboratory, under chain of custody. Each sample will be analyzed for PCBs. One field blank and site-specific quality assurance samples (e.g., duplicates and matrix spikes) will be collected for each day of sampling (1 set anticipated). Because of the fire on January 21, 2015, however, the sediment samples will not be analyzed for PAHs and metals.
2. The sample results will be reported in the full deliverables format along with HAZSITE electronic data deliverables (EDDs). Consistent with previous work on this project, the laboratory data will be validated by an independent third party, ddms to assure the usability, reliability, and defensibility of the laboratory deliverables.

5.1.2 Cemetery Soil Investigation

In order to delineate the extent of the known contaminants to the north of the Site, PEC proposes to collect six soil samples along the northern Site boundary within the cemetery footprint. These borings will be installed to coincide with the previously established 50-foot grid pattern across the Site. Specifically, the following is proposed:

1. One surface soil sample will be collected from proposed each location using hand auger/hand trowel soil sample collection methods for subsequent laboratory analysis. The soil samples will be collected at a depth of 0 to 0.5 feet bgs.
2. The samples will be submitted to Accutest under chain of custody. Each sample will be analyzed for PCBs. The collection of one field blank and site specific quality assurance samples (e.g., duplicates and matrix spikes) will be collected for each day of sampling (1 set anticipated). Because of the fire on January 21, 2015, however, the soil samples will not be analyzed for PAHs and metals.
3. The sample results will be reported in the full deliverables format along with HAZSITE EDDs. Consistent with previous work on this project, the laboratory data will be validated by an independent third party, ddms, to assure the usability, reliability, and defensibility of the laboratory deliverables.

5.1.3 Former Building Wall Concrete Investigation

Historic PCB data collected prior to case closure by NJDEP, including the concrete wall samples that were reported < 1 mg/kg total Aroclor 1254 has previously been collected by ESI and submitted to the EPA and NJDEP. While some of these samples exceeded NJDEP 0.49 mg/kg RDC SCC, data from the Site soils after the demolition of the building were often far in excess of 100 mg/kg total PCBs. Given that the data collected form the recycled concrete generated by the demolition of Building 12, and that structural elements of the foundations walls remain, i.e. the retaining wall adjoining the cemetery, 38 COAH recommends further sampling. If the results exceed the applicable NJDEP or USEPA standards, then the engineering controls and intuitional controls discussed in Section 5.3.9 and 5.3.10 will be implemented.

1. Collect a series of twelve discreet, in-situ chip samples from the remaining concrete walls and foundation element areas on each side of the site. Chip/core samples will be no deeper than 1 inch unless staining or discoloration indicates that contamination is below that depth. Sampling logs shall record the depth of core samples. The in-situ sampling of the remaining concrete walls and foundation elements will be biased toward visible staining or other indication of potential contamination: such as the source of the material, coloration, or odor.
2. The concrete chip samples will be submitted to Accutest for analysis. Due to the imminent construction operations, the samples will be submitted for analysis on an expedited turnaround time of 3 business days.
3. Samples will be submitted to Accutest, under chain of custody. Each sample will be analyzed for PCBs. One field blank and site-specific quality assurance samples (e.g., duplicates and matrix spikes) will be collected for each day of sampling (1 set anticipated).

4. The sample results will be reported in the full deliverables format along with HAZSITE EDDs. Data will be validated by an independent third party, ddms, to assure the usability, reliability, and defensibility of the laboratory deliverables.

5.2 Remedial Alternatives Analysis

The purpose of a Remedial Alternatives Analysis (RAA) is to present the detailed analysis of alternatives is to provide decision makers with adequate information to permit selection of a protective and appropriate remedy for a contaminated site or operable unit. The volume of PCB, PAH, and PCB contaminated soils was estimated based on the grid sampling conducted during the remedial investigation. Approximately 24,000 tons of PCB and PAH contaminated soils exceed NJDEP RDC SRS. The calculation of the volume estimate has been included in Table 13.

The evaluation criteria used for this RAA include the following:

- Ability of the alternative to protect public health and safety and the environment, including:
  - technical ability to effectively treat the contaminants;
  - reliability of the alternative for treating contaminants;
  - the degree to which the alternative reduces the toxicity, mobility, or volume of the contaminants; and
  - the degree to which short-term and long-term impacts are minimized.
- Implementability of the alternative, including:
  - technical feasibility and availability of the technologies; and
  - timeframe required to complete remediation.
- Permanence; and
- Cost.

5.2.1 Remedial Action Goals

Remedial action goals are medium-specific objectives for the protection of public health and the environment and are developed based on contaminant-specific standards, criteria, and guidance established by USEPA and/or NJDEP. As referenced above, the goals for contaminated soil in this RAA & RAWP are:

- Goals for Public Health Protection
  - Prevent ingestion/direct contact with contaminated soil; and
  - Prevent inhalation of fugitive dust from the contaminated.
- Goals for Environmental Protection
  - Prevent migration of contaminants that would result in groundwater or surface water contamination; and

- Prevent impacts to biota from ingestion/direct contact with contaminated soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

- Goals for Regulatory Compliance
  - Meet the requirements of NJDEP regulations at N.J.A.C. 7:26C, 7:26D, and 7:26E; and
  - Meet the requirements of USEPA TSCA regulations at 40 CFR 761.61.

5.2.2 Overview of Remedial Technologies

The following alternatives were considered due to their ability by themselves or in combination to meet one or more of the remedial objectives established for the PCB contaminated soils remaining on site.

5.2.3 Alternative 1 – Engineered Cap

This scenario is essentially an engineered cap remedy and would utilize the six-inch thick slab of the building currently being constructed to serve as an engineering control. TSCA requires a minimum of six inches of concrete for use in an engineering control at 40 CFR 761.61(a)(7). Further, if soil quality remains above NJDEP Soil Remediation Standards, NJDEP requires engineered capping systems to be accompanied by an institutional control, e.g. a deed notice per N.J.A.C. 7:26E-5.2 and 7:26C-7.2. Limited additional excavation and off-site disposal of PCB contaminated soils would be necessary to construct the utilities and construct the driveway along the Lot 1 easement. NJDEP presumptive remedies at N.J.A.C. 7:26E-5.3, however, do not apply in this case because the proposed redevelopment is not Residential Type I property as defined at N.J.A.C. 7:26E-1.8.

An institutional control would accompany the engineered cap to ensure the protectiveness of the remedy. The existing building slab on grade would effectively eliminate all routes of exposure to the underlying PCBs, PAHs, and metals detected in the soil, and will prevent the infiltration of rainwater into the material. Therefore, this is a simple and viable remedial alternative that is logical to evaluate as a part of this RAA.

Engineered capping systems are common engineering controls used throughout the State of New Jersey, and are designed to eliminate exposure to materials that may have constituents present in excess of NJDEP's direct contact SRS. Aside from eliminating exposure, the engineered cap will prevent erosion and mitigate migration of constituents detected in the soil. Engineered capping systems are designed to eliminate all possible routes of exposure, thereby resulting in zero human health risk. Engineered caps also serve as a barrier to rain water infiltration, thereby preventing migration of soil contaminants to groundwater through percolation.

Engineered capping systems require long-term monitoring and maintenance to ensure that they remain intact and continue to serve as an effective engineering control.

5.2.3.1 Protection of Public Health and the Environment

This alternative will provide reliable, long-term protection of public health and the environment by using the existing slab to eliminate all exposure to impacted materials resulting in zero risk to human health. The slab and contaminated soil will remain in place, precluding short-term worker exposure risks. The slab capping system will eliminate direct contact exposure and any possible airborne migration. The slab and future building will inhibit the potential for vertical or lateral migration of constituents detected in the contaminated soil. Although this cap does not prevent groundwater from flowing through the contaminated soil, the low levels of PCBs and PAHs are relatively insoluble in water, and as a result will not likely impact groundwater quality. The installation of a cap is not required to protect groundwater, however, NJDEP has recently published guidance on the subject because impervious engineered caps will eliminate percolation and increase the groundwater Dilution Attenuation Factor.

Institutional controls (e.g., deed restriction, NJDEP Remedial Action Permit for Soils) will be required for this remedy if it is to be used solely by itself as a permanent solution.

5.2.3.2 Implementability

This alternative can be successfully implemented because the IRM is already in place. The remaining area of building where a slab is not constructed would require slab placement per the original architectural plans. No additional construction or remediation activities would be necessary for the material under the slab to satisfy the remediation objectives. A deed notice would be executed to document the impacted contaminated soil material and the as-built dimensions of the slab.

5.2.3.3 Reliability and Effectiveness

The engineered cap will reliably protect human health through the elimination of potential exposure pathways resulting in zero risk provided the engineered cap remains intact. Subsurface contaminant migration will be prevented by negating potential soil erosion and eliminating percolation of vadose zone contaminants into groundwater. This alternative would not prevent migration of saturated zone contaminants with groundwater flow. However, the low solubility of the PAH contaminants will preclude significant impacts to groundwater quality. Periodic cap inspections and biennial reporting requirements are designed to ensure the continued effectiveness of the engineered cap. Even in the event the cap is breached, any potential exposure to the contaminated soil would not cause an unacceptable human health risk.

5.2.3.4 Permanence

This alternative is considered permanent as long as the engineered cap system remains in place and intact, which in this case is at least 30 years. The engineered cap system must be maintained as long as contaminated soil material is found to contain constituents in excess of NJDEP RDC SRS. The biennial reporting and institutional control are designed to ensure the permanence of the engineered cap.

5.2.3.5 Opinion of Probable Costs

A preliminary opinion of probable cost[54] was prepared in September 2014 for the completion of the project. The preliminary opinion of probable cost was estimated as $171,505, and has been included in Appendix V.

5.2.4 Alternative 2 – Thermally Enhanced Soil Vapor Extraction (SVE)

This physical/chemical treatment technology functions by assisting in the degradation and removal of volatile and semi-volatile contaminants in soil. Extraction wells are installed into the affected vadose zone and a vacuum is applied to the wells to create a negative pressure head. This pressure differential draws air through the soil matrix while VOCs and SVOCs, including PAHs and PCBs, are stripped from the soil through volatilization into the air stream. In addition, aeration of the soil facilitates biodegradation of sorbed organic contaminants by naturally occurring aerobic bacteria. Collected air is piped to an on-site treatment unit before being discharged to the atmosphere. For treatment of PAHs and PCBs, SVE soil treatment can be thermally enhanced to increase contaminant volatilization and desorption. This treatment alternative would not be effective for metals.

This alternative involves the installation of an in situ SVE system to desorb PCBs and PAHs from the contaminated soil. Extraction wells would be installed below the existing IRM. Piping would be installed to connect the extraction wells to a blower and treatment unit. If necessary, extracted air could be treated using granular activated carbon (GAC) prior to being discharged to the atmosphere.

Thermal enhancements would increase the rate of PCB and PAH desorption and volatilization, thereby increasing contaminant removal efficiency and reducing the operating time required to attain NJDEP RDC SRS. Thermal enhancements can also achieve in-situ thermal destruction of contaminants. Examples of thermal enhancements are steam injection, radio frequency (RF) heating, and conduction heating. Steam injection would require injection points spaced throughout the impacted area and an aboveground steam generator. RF heating would require a well grid throughout the impacted area to house antenna and an aboveground RF generator. Conduction heating would also require a well grid to house the conduction source. Pilot testing would determine the effectiveness of this alternative, while providing information necessary for final system design.

This alternative would be operated to achieve contaminant levels consistent with the remedial goals, and would eliminate the need for an institutional control for PCBs and PAHs in the contaminated soil remaining below the building; however, this would not address any metals and therefore, would necessitate engineering controls and a deed notice after completion.

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[54] The term "opinion of probable cost" refers to the preparation of an estimate by PEC using a cost guide such as Means or a preliminary vendor quotation. Since PEC is not a contractor, the actual cost that a contractor may bid for the work may differ from the estimate or opinion of probable cost provided herein.

5.2.4.1 Protection of Public Health and the Environment

This alternative will provide reliable, long-term protection of public health and the environment by remediating PCBs and PAHs through destruction and removal. The building slab will effectually serve as a cap to protect against exposure and migration of potentially untreated portions of the contaminated soil. Short-term risks involve operational risks from the thermal enhancement technologies. Stream injection requires aboveground steam generation and pressurized injection, representing potential burn hazards. Proper installation and operation of these technologies by experienced firms would reduce the likely hood of accidents resulting from these hazards. Other short-term risks are worker exposure to airborne contaminated soil during extraction/injection well installation. Minimal migration of airborne particles is expected during extraction well drilling and installation of trenching. Extracted air is treated prior to discharge and does not represent a health hazard. PCBs and PAHs will be concentrated on the GAC, which then must be transported off-site for disposal or regeneration. This technology does not address metals: engineering controls and a deed notice would still be required.

5.2.4.2 Implementability

SVE system installation would be complicated by the presence of the building structure. Extraction and injection wells would need to be installed through the IRM and the structure may present overhead clearance problems for well drilling equipment. Piping connecting the extraction wells to the blower and treatment system would need to be laid on the slab surface, or installed in trenches within the slab. The blower and treatment unit would require a temporary housing structure or a trailer-mounted mobile unit. The shallow bedrock would likely preclude the installation of the required extraction and injection wells in some areas.

Thermal enhancements would require well grids for steam injection, RF antenna array deployment, or conduction element deployment. These enhancements would also require piping or wiring to connect them with the steam or energy source, which would also require a temporary housing structure on-site. This system would be difficult to implement during installation and operation because of the ongoing construction of the building.

Completion time is highly dependent of the effectiveness of the SVE system, which can be better estimated following pilot testing. Assuming one month of installation and optimization, and 12 months of operation this alternative would take approximately 13 months to complete and delaying the construction of the building. Incomplete contaminant removal would require longer SVE operating times that would further delay use of the project site. The total project timing and cost could be impacted by accessibility to certain areas of the building. The alternative would not address the metals, or any remnant PCBs and PAHs without a deed notice and engineering controls. As a result, this alternative is not practicably implementable.

5.2.4.3 Reliability and Effectiveness

Thermally enhanced SVE is generally considered a reliable technology for PCBs and PAHs in soil, but not metals. However, the effectiveness of this alternative depends upon the ability of the SVE to draw air through the contaminated soil, as well as the contaminants volatilization and desorption rates. The permeability of the contaminated soil material is within the lower limit considered effective by the U.S. Army Corps of Engineers (USACE). This may lead to channeling of air through more permeable strata, thereby reducing the effectiveness of PCB and PAH removal from the less permeable contaminated soil. This may also result in longer operating times to complete the remediation. Thermal enhancements can effectively increase desorption and volatilization rates. Steam injection may be less reliable at effecting the low-permeable contaminated soil. A pilot study would need to be performed to determine the system's effectiveness at PCB and PAH removal and radius of influence of the extraction wells. The IRM and building slab would provide effective protection for any contaminants that may be untreated or in areas not influenced by the SVE system, and an engineering control and institutional control would be required to ensure that the remedy protective.

This system may not be completely reliable in terms of effectively removing the contaminants of concern from the subsurface because of the limitations caused by the presence of the existing structure and the relative impermeability of the contaminated soil. Further, metals are not remediated by the SVE process. Incomplete removal of the contaminants, and the continued presence of metals, would result in the necessity to implement an engineering control and deed restriction. As a result, the remedy is not practicably implementable.

5.2.4.4 Permanence

This alternative permanently removes or degrades PCBs and PAHs to concentrations below NJDEP RDC SRS, but does not address metals. Subsequent to remediation, the SVE system can be disassembled, and the injection/extraction wells abandoned.

5.2.4.5 Opinion of Probable Cost

This alternative is not practicably implementable nor is it fully protective without the construction of the engineering controls and institutional control to address the metals. An opinion of probable cost has not been prepared.

5.2.5 Alternative 3 – In Situ Thermal Destruction

In-situ thermal destruction (ISTD) technologies may prove successful in meeting the remedial goals for the site, yet maintain the structural integrity of the partially constructed building. A number of vendors have recently demonstrated the effectiveness of in-situ thermal treatment in remediation of PCBs and PAHs. This process, however, would not address the remaining metals.

ISTD is a patented process that applies thermal conduction heating (THC) and vacuum technology to remediate soils impacted by a wide range of organic compounds, including PCBs and PAHs. Heat and vacuum are applied simultaneously to the impacted soils with an array of vertical or horizontal heaters under vacuum. Heat flows through the soil by thermal conduction from a network of electrically powered heating elements. Because the heater well temperature is easily controlled, the wells can operate at any desired temperature between ambient and approximately 1,500 degrees Fahrenheit. Most contaminants will be destroyed by the ISRD process within the subsurface soil. Using this technology, head and a vacuum are applied continuously to the impacted soils with an array of vertical or horizontal heaters under an imposed vacuum. As the soil is heated, volatile organic compounds and semivolatile organic compounds in the soil are vaporized and/or destroyed by: (1) evaporation into the subsurface air stream; (2) steam distillation; (3) boiling; (4) hydrolysis; (5) oxidation; and (6) pyrolysis (thermochemical decomposition in the absence of oxygen). The vaporized water and contaminants are drawn counter-current to the heat flow into the vacuum extraction wells. ISTD technology has been proven highly effective in treating a variety of SVOCs that are at least as recalcitrant as PCBs and PAHs. Pilot testing would determine the effectiveness of this alternative, while providing information necessary for final system design.

The ISTD process would be designed to achieve the remedial goals and preclude the need to deed restrict the contaminated soil material remaining below the slab. An engineering control and deed notice would still be required for the remaining metals above NJDEP RDC SRS.

5.2.5.1 Protection of Public Health and the Environment

This alternative will provide reliable, long-term protection of public health and the environment by remediating PCBs and PAHs through destruction and removal. Short-term risks involve operational risks from the thermal enhancement technologies. RF heating also requires proper operation and shielding to prevent worker/public exposure to RF energy. Conductive heating requires substantial electric power source or generation that could possibly represent an electrocution or shock hazard. Proper installation and operation of these technologies by experienced firms would reduce the likely hood of accidents resulting from these hazards. Other short-term risks are worker exposure to airborne contaminated soil during well installation. Minimal migration of airborne particles is expected during extraction well drilling and installation of trenching. An engineering control and deed notice would still be required for the remaining metals above NJDEP RDC SRS.

5.2.5.2 Implementability

In-situ thermal destruction would be complicated by the presence of the partially constructed building structure, however, the ISTD process is capable of destroying a variety of contaminants in place under existing foundations, eliminating the need to demolish structures to gain access for soil excavation. Completion time is dependent on the results of bench scale and field scale treatability studies, further delaying the completion of the building. Assuming one month of installation and optimization, and 12 months of operation this alternative would take approximately 13 months to complete and delaying the construction of the building. Incomplete contaminant removal would require longer ITSTD operating times that would further delay use of the project site. The total project timing and cost could be impacted by accessibility to certain areas of the building. The alternative would not address the metals, or any remnant PCBs and PAHs without a deed notice and engineering controls. Additionally, the shallow bedrock would likely preclude installation of the RF heating system in some areas. As a result, this alternative is not practicably implementable.

5.2.5.3 Reliability and Effectiveness

In-situ thermal destruction is generally considered a reliable technology for the remediation of PAHs in soil. ISTD system installation would be complicated by the presence of the building structure. Thermal enhancements RF antenna array deployment or conduction element deployment would also require piping or wiring to connect them with the steam or energy source, which would also require a temporary housing structure on-site. An ISTD remedy would present significant design challenges, and would require bench and pilot testing to design an effective system. Even if pilot testing demonstrates that ISTD is an appropriate technology to the meet the remedial goals for PCBs and PAHs, then engineering control and institutional control would be necessary to address the metals.

Completion time is highly dependent of the effectiveness of the ITSD system, which can be better estimated following pilot testing. Assuming two months of installation and optimization, and six months of operation, this alternative would take approximately seven months to complete. However, incomplete contaminant removal would require longer operating times that would further delay the completion of the building.

5.2.5.4 Permanence

In-situ thermal destruction is generally considered a reliable technology for the remediation of PCBs and PAHs in soil. An ISTD remedy would present significant design challenges, and would require bench and pilot testing to design an effective system. If pilot testing demonstrates that ISTD is an appropriate technology to the meet the remedial goals, then an institutional control may not be required under the current ownership of the property. The ISTD remedy would not address the metals in the soil that exceed NJDEP RDC SRS; as a result, an engineering and institutional control would still be required.

5.2.5.5 Opinion of Probable Cost

This alternative is not practicably implementable nor is it fully protective without the construction of the engineering controls and institutional control to address the metals. An opinion of probable cost has not been prepared.

5.2.6 Alternative 4 – In-Situ Chemical Oxidation

This type of treatment technology employs oxidation/reduction (redox) reactions to convert contaminants to compounds that are non-hazardous, less toxic, less soluble, and/or inert. The redox reactions transfer electrons between compounds, leaving one reactant oxidized, and one reactant reduced, with both reactants transformed in the process. Chemical oxidizing agents are typically introduced into the subsurface through injection points, wells, or infiltration galleries. Typical chemical reactants include hydrogen peroxide, hypochlorites, potassium permanganate, sodium persulfate, ozone, chlorine, and chlorine dioxide. The technology may be applied in-situ to treat both soil and groundwater.

This alternative would involve the injection and/or infiltration of a chemical oxidant to degrade contaminated soil PAH contamination to achieve NJDEP RDC SRS. Temporary injection points and/or infiltration trenches would be installed beneath the existing slab. The chemical oxidant would be introduced into the contaminated soil material through these injection wells or infiltration trenches. Under the basic pH conditions of the contaminated soil, the oxidants most likely to be effective are persulfate, permanganate, and ozone. Preliminary bench and pilot tests would be performed to identify the most effective oxidant recipe and delivery method.

The ISCO would be designed to achieve NJDEP RDC SRS for the PCBs and PAHs, but would not reduce the metals concentration. ISCO could, however, mobilize metals in the subsurface because of the inherent change in the geochemistry.

5.2.6.1 Protection of Public Health and the Environment

This alternative will provide reliable, long-term protection of public health and the environment by remediating PCBs and PAHs through chemical degradation. The building slab will effectually serve as a cap to protect against exposure and migration of potentially untreated portions of the contaminated soil. Short-term risks are associated with the transportation and handling of the oxidants. Oxidants may require high injection pressures to infiltrate the low-permeability contaminated soil material. Oxidant handling and injection should be performed by a firm experienced in the use of the oxidants. Other short term risks are worker exposure to airborne contaminants during injection well or infiltration trench installation. Minimal migration of airborne particles is expected during these activities. Following the ISCO application(s), the presence of remnant PCBs, PAHs, and metals above NJDEP RDC SRS, would require the implementation of an engineering control and institutional control to ensure the protectiveness of the remedy.

5.2.6.2 Implementability

Chemical oxidant injection can be implemented by installation of well points through standard direct-push technology or installation of infiltration trenches. Well points are closed following each injection and there is no equipment on-site between injections. Trenches are finished with PVC piping surrounded by a gravel bed and backfilled to grade. This alternative will take approximately five months to complete, assuming one oxidant application is sufficient to reduce contaminant concentrations below NJDEP RDC SRS. The total project timing and cost could be impacted by accessibility to certain areas of the building. This system would be difficult to implement because of the existing building and the low permeability of the contaminated soil. The ISCO process would not remove metals form the soil, and could, mobilize metals increasing their potential impact to groundwater. The alternative would not address the metals, or any remnant PCBs and PAHs without a deed notice and engineering controls. Additionally, the shallow bedrock precludes injection at the Site. As a result, this alternative is not practicably implementable.

5.2.6.3 Reliability and Effectiveness

The effectiveness of ISCO is dependent upon the ability to bring the oxidant in contact with the contaminant. ISCO is primarily a groundwater remedy; however, groundwater is only minimally present at the Site, if at all, immediately above the bedrock. Direct contact with the contaminants in solution is necessary to affect the remedy. The low-permeability of the contaminated soil may create problems in dispersing the oxidant throughout, possibly leaving behind unremediated pockets of material, which would necessitate an engineering control and an intuitional control. Pressurized injection can force the oxidant into the formation, but will preferentially fill more permeable zones. Infiltration galleries will allow the oxidant to flow into the formation under the force of gravity. The oxidant will follow the paths of least resistance and, therefore, will not effectively contact all of the impacted contaminated soil below the slab. Chemical oxidants have a limited reactive life span within the subsurface due to reactions with organic and inorganic soil components. Multiple applications could be required to treat the sub-slab contaminated soil effectively. MnO_2 precipitation during permanganate use could further reduce the contaminated soil permeability. Bench scale and pilot testing would determine the effectiveness of different oxidants recipes and delivery mechanisms. Incomplete contaminant destruction could require additional oxidant applications to meet NJDEP RDC SRS and delay use of the project site. The building slab would provide effective protection for pockets of PCBs, PAHs, and metals that may remain unaffected by the oxidant. An ISCO alternative would present significant design challenges to deliver the oxidant to the contaminated soil due to the lack of sufficient groundwater sufficient to provide contact.

5.2.6.4 Permanence

This alternative is permanent. No permanent equipment is required and injection points can be backfilled and sealed subsequent to oxidant application.

5.2.6.5 Opinion of Probable Cost

This alternative is not practicably implementable because of the lack of sufficient groundwater to support the oxidation of the PCBs and PAHs, nor is it fully protective without the construction of the engineering controls and institutional control to address the metals. An opinion of probable cost has not been prepared.

5.2.7 Alternative 5 – Demolition, Excavation, and On-Site Treatment

Physical excavation and off-site disposal is a response action that would satisfy the remediation objectives and is a common remedial activity for contaminated soils. Affected soils are removed from the subsurface for disposal, reuse, or treatment. Excavation can be performed in the vadose zone and below the water table through use of dewatering methods. The use of excavation may be limited by the need for soil stabilization efforts to protect foundations and the integrity of adjacent structures. Excavation is often used when complete removal is practical. Important considerations are costs for transportation, disposal, and backfill material.

This alternative involves demolition of the existing IRM, foundations, and steel superstructure, followed by the removal of 24,000 tons of contaminated soil material from beneath the existing IRM, treating the contaminated soil on-site, and then reusing the cleaned material for backfill. The calculated excavation volume in each grid is presented in Table 13. Once excavated, the material would be treated on-site using ex-situ techniques that allow for greater control of the remediation process. contaminated soil treatment would likely be performed by soil washing with surfactants. This alternative would be designed to achieve NJDEP RDC SRS, allow for contaminated soil reuse as backfill, and preclude the need to deed restrict the contaminated soil material remaining below the slab. Contaminant removal rates generally range from 85% to 99% per batch. Multiple washing events would be necessary, to reduce the PCB and PAH levels to NJDEP RDC SRS.

5.2.7.1 Protection of Public Health and the Environment

This alternative will provide reliable, long-term protection of public health and the environment by excavating the impacted contaminated soil and treating it ex-situ to meet the remedial goals. Potential short-term fugitive dust risks may be associated with public/worker exposure to airborne contaminants during building demolition and contaminated soil excavation. However, this may be managed with the implementation of an effective dust suppression system. If the contaminant levels are not reduced below NJDEP RDC SRS, the implementation of an engineering control and an institutional control will be required to assure the protectiveness of the remedy.

5.2.7.2 Implementability

Implementation of this alternative requires demolition of the existing structure and foundation to access the sub-slab contaminated soil material. A pilot study would be necessary to evaluate potential washing processes, which would further delay construction of the building. Separate washings regimes may be necessary to address the PCBs, PAHs, and metals sequentially. The contaminated soil will require additional handling as it is treated on-site via soil washing. The treatment operation and contaminated soil staging area will require a large amount of space that would restrict its implementation. Multiple soil washing and analysis cycles will be necessary to reduce the PCB and PAH concentrations to levels below NJDEP RDC SRS. Following backfilling of the cleaned material, the entire foundation, slab, and structure will need to be rebuilt.

Given the elevated levels of PCBs and PAHs, this alternative would not be effective in reducing the concentrations below NJDEP RDC SRS, and the resulting soil would still require a deed notice and engineering controls. As a result, this alternative is not practicably implementable.

5.2.7.3 Reliability and Effectiveness

The effectiveness of the soil washing depends on the ability of the surfactants to contact the contaminants and desorb them from the soil particles. As with ISCO, this is hindered by the low permeability of the material, but can be better controlled during ex-situ application. Incomplete removal of the PCBs, PAHs, and metals would result in non-attainment of the remedial goals, require additional washing, and delay use of the project site.

5.2.7.4 Permanence

PCB and PAH removed during ex-situ soil washing is permanent. The treated soil may not, however, meet the remedial goals and be used for backfill.

5.2.7.5 Opinion of Probable Cost

This alternative is not practicably implementable nor is it fully protective without the construction of the engineering controls and institutional control to address the metals. An opinion of probable cost has not been prepared.

5.2.8 Alternative 6 – Demolition, Excavation, and Off-Site Disposal

Physical excavation and off-site disposal is a response action that would satisfy the remediation objectives and is a common remedial activity for contaminated soils. Affected soils are removed from the subsurface for disposal, reuse, or treatment. The use of excavation may be limited by the need for soil stabilization efforts to protect foundations and the integrity of adjacent structures. Excavation is often used when complete removal is practical. Important considerations are costs for transportation, disposal, and backfill material.

This alternative involves demolition of the existing structure, foundations, and IRM, removing 24,000 tons of contaminated soil material from beneath the existing IRM, disposing the contaminated soil off-site, and importing clean material for backfill. The impacted contaminated soil would be transported to an appropriate disposal facility or soil reuse project. Clean backfill that meets the geotechnical requirements for foundation support would be required.

This alternative would achieve the remedial goals by removing impacted materials, and preclude the need to deed restrict the contaminated soil material remaining below the slab.

5.2.8.1 Protection of Public Health and the Environment

This alternative will provide reliable, long-term protection of public health and the environment by removing the impacted contaminated soil from the Site. Potential short-term risks may be associated with public/worker exposure to dust generated during building demolition, contaminated soil excavation, and transportation. Construction and hauling activities can create significant noise and traffic concerns in the area. Discharges of diesel particulate from the estimated 1,920 trucks (assuming 25 tons per truck trip) entering and leaving the site may present a potential human health exposure.

5.2.8.2 Implementability

Implementation of this alternative requires demolition of the existing structure, retaining walls, and foundation to access the sub-slab contaminated soil material. Following excavation, the contaminated soil must be transported to either an appropriate disposal facility or reuse project, such as landfill cover material or road base material. Hauling operations can create traffic complaints in the local neighborhood, and diesel particulate may present an unacceptable exposure to the community.

5.2.8.3 Reliability and Effectiveness

This alternative is highly reliable and effective.

5.2.8.4 Permanence

Off-site disposal is permanent.

5.2.8.5 Opinion of Probable Cost

The cost for implementing this alternative involves building demolition, contaminated soil excavation, transportation, tipping fees, procurement of suitable clean backfill, and building foundation/structure reconstruction. This cost does not, however, include the value of the construction already in place that will be rebuilt. Even without that added value, this remedy is nearly 66 times more than Alternative 1. As a result, this alternative is impractical to provide the same degree of protectiveness.

Demolition, Excavation, and Off-Site Disposal Opinion of Probable Costs

ITEM	COST
Demolition	$100,000
Excavation	$267,000
Transportation & Disposal	$5,400,000
Backfill & Compaction	$399,000
Reconstruction	$1,000,000
Subtotal	**$7,166,000**
Engineering (20%)	$2,054,000

ITEM	COST
Contingency (20%)	$2,054,000
ESTIMATED TOTAL	**$11,274,000**

5.2.9 Alternative 7 – Underpinning Building Foundation, Excavation, and Off-Site Disposal

Physical excavation and off-site disposal is a response action that would satisfy the remediation objectives and is a common remedial activity for contaminated soils. Affected soils are removed from the subsurface for disposal, reuse, or treatment. The use of excavation may be limited by the need for soil stabilization efforts to protect foundations and the integrity of adjacent structures. Excavation is often used when complete removal is practical. Important considerations are costs for transportation, disposal, and backfill material.

This alternative involves underpinning the existing structure foundation (wall footings and column footings) to support the structure as contaminated soil is excavated from beneath the building footprint, disposing the 24,000 tons of contaminated soil off-site, and importing clean material for backfill. Retaining walls, however, would likely require demolition and reconstruction to implement this alternative. The impacted contaminated soil would be transported to an appropriate disposal facility or soil reuse project. Clean backfill material would be required to backfill the excavated areas and support the newly constructed floor slab on grade.

This alternative would achieve the remedial goals by removing impacted contaminated soil materials, and preclude the need for an institutional control for the contaminated soil material remaining below the slab.

5.2.9.1 Protection of Public Health and the Environment

This alternative will provide reliable, long-term protection of public health and the environment by excavating the impacted contaminated soil and treating it ex-situ to meet the remedial goals. Potential short-term risks are associated with public/worker exposure to dust generated during building partial demolition and contaminated soil excavation. Discharges of diesel particulate from the estimated 1,920 trucks (assuming 25 tons per truck trip) entering and leaving the site may present a potential human health exposure.

5.2.9.2 Implementability

Implementation of this alternative requires demolition of the IRM to allow the excavation equipment to operate from inside the building and to access the sub-slab contaminated soil material.

Prior to the excavation of the contaminated soil from under the building footprint, the building foundation must be supported by underpinning. This procedure involves excavating under the building foundation down to the bottom of the contaminated soil, and the placement of concrete to replace the excavated soil in supporting the existing footings. The excavation under the existing footings must be performed in stages not exceeding 3-foot wide under strip/wall footings and more than one quarter of a column footing, at a time. This procedure might be difficult to implement in areas where it is required to excavate up to 36 feet below grade as the contaminated soil material might cave in from under the footing thus resulting in a loss of support. In addition, the implementation of this procedure will require an extended period of time. After the completion of the underpinning, excavation of the remaining contaminated soil from under the building footprint must be completed. Excavation time will be hindered due to the necessity to work inside the building in a confined area, further delaying completion of the project.

Following excavation, the contaminated soil must be transported to an appropriate disposal facility or reuse project. Hauling operations can create traffic complaints in the local neighborhood, and excessive diesel particulate may present an exposure to the community. While this alternative is possible in the theoretical sense, it is unlikely that even a thorough engineering analysis would produce a predictable and controllable cost estimate and time schedule to execute. As such, it is considered unimplementable.

5.2.9.3 Reliability and Effectiveness

The feasibility of implementing this alternative is highly questionable as it might affect the integrity of different structural elements even with stringent engineering. However, this alternative is potentially reliable and effective at removing the contaminated material. Finally, this option, if feasible from a construction perspective (which has not yet been established) may be potentially unsafe for the employees performing the work.

5.2.9.4 Permanence

Off-site disposal is permanent. However, this alternative will require significant engineering design and planning, and it is unknown whether a remediation contractor would assume the risks and liability associated with potential damage to the partially constructed building.

5.2.9.5 Opinion of Probable Cost

This alternative is not practicably implementable. An opinion of probable cost has not been prepared.

5.3 Remedial Action Workplan

5.3.1 Selected Remedy

As discussed in Section 5.2, above, the selected remedy for the Site is the construction of the proposed building using the six-inch thick concrete slab as the final engineered cap and including limited excavation of PCBs, PAHs, and metal contaminated soils in AOC 1 and/or AOC 2. The six-inch concrete engineered cap will be constructed above the existing IRM, increasing the total thickness to at least twelve inches when including the crushed stone and the poured concrete. Limited excavation, as discussed below, will be necessary to complete the construction of the building and engineered cap.

This remedy is protective of human health and the environment because it prevent the direct contact with the contaminated soils, and it is compliant with the applicable USEPA and NJDEP requirements.

5.3.2 Limited Excavation

Limited excavation in AOC 1 and/or AOC 2 will be performed as needed to facilitate the construction of the utility connections (approximately 20 cubic yards) and to construct the driveway along River Road (approximately 120 cubic yards) located in the easement of Lot 1 to its final grade. Remnant contaminated soil shall be left in place and will be subjected to the engineering and institutional controls described below in Section 5.3.9.

Open-cut excavation is the recommended method of excavation. The easement area of AOC 2 will not likely involve the removal of material more than two feet bgs; however, the utility excavation depths are unknown. In the event that deeper excavation is necessary, will be performed in compliance with the "Excavating and Trenching Operations" manual issued by the OSHA Trenching and Excavation regulations at 29 CFR 1926, Subpart P.

Excavated soils will not be stockpiled adjacent to the sides of the excavation to avoid the imposition of additional loads, unless these loads are considered in the design/stability of the side slopes. Stockpiles will be placed at least ten feet away from the side slopes. All excavated material will be staged for off-site disposal as discussed in Section 5.3.8, below.

5.3.3 Concrete Encapsulation

Structural concrete elements from the former Building 12 will be sampled for total PCBs. Those structures remaining on site, e.g. the retaining wall of the adjoining cemetery, that exceed the applicable USEPA or NJDEP standards for total PCBs will require the implementation of an engineering control and institutional control consistent with USEPA requirements. These are the same steps proposed in the October 3, 2000 amendment to the ESI Remedial Action Workplan and reported in the August 2002 ESI Remedial Action Report that preceded the February 13, 2003 restricted use No Further Action. The following process will be utilized:

- The concrete walls will be pressure washed with a biodegradable solvent to provide an adequate surface for the encapsulating agent. This will be done in accordance with the encapsulation sealant manufacturer's instructions. All wash water will be collected, containerized, sampled, and transported for disposal at an appropriately permitted facility.
- Two coats of epoxy sealant will be applied to the concrete walls. The epoxy coating will be allowed to dry between each application MAB Ply-Mastic Epoxy Coating, or its equivalent will be used. The

product data and material safety data sheets have been included in Appendix W.

- The application will be included in the Deed Notice and filed with the Bergen County Clerk within 60 days of completion of the construction of all engineering controls. This requirement of USEPA TSCA at 40 CFR 761.61(a)(8); however, a specific format if not required. A draft of NJDEP Model Deed Notice that includes language about the encapsulation of concrete has been included in Appendix X.

5.3.4 Dust Control

During the excavation activities discussed above, or in the event of repairs to the subsurface that breach the cap, the contractor will conduct operations and maintain the area of activities so as to minimize the creation and dispersion of dust. The contractor will use potable water as necessary to control dust in access roads and construction areas. Soil moisture in areas under immediate construction (including access roads and other affected areas) will be maintained to minimize the generation of dust. In addition, these areas should be wet down during non-working hours as often as required to keep the dust under control.

5.3.5 Air Monitoring Program

During invasive activities, including the removal of the contaminated soils in the easement area of Lot 1 and future activities that would disrupt the contaminated soils beneath the engineered cap and IRM, an air monitoring program shall be implemented to measure respirable dust in the work area and, if necessary, implement dust control measures specified in the contractor's HASP (see Appendix F). Based on previous measurements reported in Appendix Q, total respirable dust measurements may be used a surrogate to ensure that the workers are not exposed in excess of applicable standards. In addition, continuous air monitoring for total respirable dust will be performed immediately downwind of the excavation or engineered cap breach to ensure that contaminated dust does not adversely impact the surrounding area.

5.3.6 Post-Excavation Sampling

Consistent with USEPA TSCA requirements, in-situ PCB sampling results will be utilized to characterize the disposal prior to excavating this area to the final grade. Additional samples of the excavated soils will be necessary to satisfy the acceptance criteria of the proposed disposal facilities. Post excavation samples for PCBs, PAHs, and TAL metals will be collected in this area. Five samples at the base of the excavation, consistent with NJDEP guidance, will be collected in accordance with the revised QAPP to determine compliance with NJDEP RDC SRS. If the results exceed NJDEP RDC SRS, the easement area will be included in the engineering controls and deed notice.

5.3.7 Controlled Structural Fill

The clean fill soil or quarry stone used for backfilling the limited excavated area(s) will be suitable for unrestricted residential use and shall be sampled in accordance with NJDEP guidance. The contractor will be required to provide written certification from the supplier documenting that the quality of any imported fill to be used in this project is in accordance with NJDEP's guidance.

5.3.8 Solid Waste Disposal

PCB remediation wastes, if identified during the sampling of the easement area of Lot 1 or as previous identified in the other areas of the Site, will be transported to a TSCA permitted disposal facility. If the soils in the easement area of Lot 1 are below the 50 mg/kg TSCA threshold, then the material may be disposed or beneficially reused at a non-TSCA permitted facility, provided that the facility may accept the material under the terms of its permit. Waste characterization samples will be collected according to the facility requirements and submitted to the facility in advance.

5.3.9 Engineered Caps

Engineered capping systems are common engineering controls used throughout the State of New Jersey, and are designed to eliminate exposure to materials that may have constituents present in excess of NJDEP's RDC SRS. Aside from eliminating exposure, the engineered cap will prevent erosion and mitigate migration of constituents detected in the soil. Engineered capping systems are designed to eliminate all possible direct contact routes of exposure, thereby preventing completion of the potential exposure pathway – eliminating potential human health risk. Engineered caps also serve as a barrier to rain water infiltration, thereby preventing migration of soil contaminants to groundwater through percolation. Engineered capping systems require long-term monitoring and maintenance to ensure that they remain intact and continue to serve as an effective engineering control.

The construction of the proposed building and the reinforced concrete floor of the first parking area level will serve as the engineering control for the property. The entire property will be capped by the proposed construction. As specified by 40 CFR 761.61(a)(7), the reinforced concrete will be at least six inches thick, and is consistent with the proposed redevelopment plan. The concrete will overlay the existing IRM, and modify the depth of the crushed stone bed as necessary to achieve the final grade.

Utility trenches, if needed, will be over-excavated, lined with geotextile fabric, and backfilled with certified clean fill material. Prior to the emplacement of the concrete engineered cap, in the driveway area, the area will be graded and prepared with a geotextile barrier, a sub-base of six inches compacted stone, and six inches of concrete.

5.3.10 Institutional Controls

If soil quality remains above NJDEP direct contact Soil Remediation Standards, but not the Impact to Groundwater Soil Screening Levels, NJDEP requires engineered capping systems to be accompanied by an institutional control, e.g. a deed notice per N.J.A.C. 7:26E-5.2 and 7:26C-7.2. A deed notice is also required by USEPA for the PCB remediation waste as specified by 40 CFR 761.61(a)(8). A copy of the model deed notice has been included as Appendix X.

Upon completion of construction, a deed notice consistent with NJDEP and USEPA will be filed with the Bergen County Clerk. The deed notice will show the aerial extent of the contaminants in Exhibit B-2 as well as the as-built cross sections of the engineering controls. Once filed, the deed notice will be submitted to NJDEP with the Remedial Action Permit for Soil application. A copy of the executed and filed deed notice will be submitted to USEPA.

5.3.11 Required Permits

The following permits may be required to execute the construction of the engineered cap. It will be the responsibility of the contractor(s) to obtain all necessary permits as part of their submission of an approvable work plan.

- The proposed remedy does not change the footprint of the proposed building, both will encompass the entire property. Because the Site activities will cover an approximate 43,168 square feet, the existing Soil Erosion and Sediment Control (SESC) Permit may need to be amended. The construction contractor and civil engineer of record are responsible for the SESC.
- A Remedial Action Permit for Soil will be required by NJDEP to document the construction of the Deed Notice.

5.3.12 Health and Safety Plan

PEC's site specific HASP, as required by 29 CFR 1910.120(b), is included as Appendix F. The excavation contractor's site specific HASP also has been included as Appendix F.

5.3.13 Remedial Action Schedule

Since this remedy includes the construction of an engineering control to eliminate direct contact exposure, certain elements of the remediation will be conducted prior to, concurrent with, and upon completion the building construction. The construction schedule is estimated at 12 months from the submission of this document. Once the construction has been completed, the deed notice shall be filed with the Bergen County Clerk within 60 days of completion of construction of the engineered cap, and the executed deed notice will be submitted to the Bergen County Clerk. The Remedial Action Permit for Soil application will be submitted to NJDEP within 30 days thereafter. Upon receipt of the approved Remedial

Action Permit for Soil from NDJEP, the Remedial Action Report will be prepared and submitted to USEPA and NJDEP within 60 days.

5.3.14 Remedial Action Report

The Remedial Action Report, as required at N.J.A.C. 7:26E-5.7, will be prepared for submission to NJDEP and USEPA. The risk assessment Report will also include:

- Summary of each area of concern remediated;
- Detailed description of site restoration activities;
- Laboratory deliverables and HAZSITE electronic deliverables for any post excavation sampling;
- As built drawings site conditions and indicating sampling locations;
- Waste manifests and summary of volumes;
- Receipts for clean fill materials; and
- A revised Financial Assurance cost estimate to maintain engineering and/or institutional controls, where applicable.

5.3.15 Remedial Action Effectiveness Monitoring

In order to affirm the integrity of the engineered cap and the protectiveness of the remedy, the engineered cap will be inspected periodically. If necessary at the direction of the LSRP of record, the engineered cap will be repaired. The protectiveness of the remedy will be evaluated biennially and reported to NJDEP. Copies of the biennial certification will also be provided to USEPA.

As required by NJDEP at N.J.A.C. 7:26C-5.2 et seq., a Financial Assurance mechanism will emplaced following the approval of the Remedial Action Permit for Soil. The Financial Assurance, to extend for thirty years from the implementation of the permit, has been estimated to be approximately, as shown in Appendix X.