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ACCESS TO THE REGION'S CORE
FINAL ENVIRONMENTAL IMPACT STATEMENT

Contaminated Materials Methodology Report

NJT Contract #03-118

May 2008

Submitted by:

Transit Link Consultants

A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

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FINAL

REPORT QUALITY CONTROL/QUALITY ASSURANCE

Prepared by: _____ **Date:** 05/08

Reviewed by: _____ **Date:** 05/08

Approved by: _____ **Date:** 05/08

1. DESCRIPTION AND OBJECTIVE

The purpose of this report is to summarize the methodology that will be used to investigate contaminated materials for the ARC FEIS long-term improvements. As the development of the long-term improvements progresses, this methodology may need to be adjusted or refined.

2. DATA REQUIREMENTS

Data requirements include information on existing or relevant historical site operations and uses and conditions or potential conditions of areas to be impacted by construction activities. Analytical data may also be needed to evaluate sites in the project area identified as potentially contaminated and determine their impact on construction activities. The following data elements will be required to apply this methodology.

ENVIRONMENTAL AGENCY RECORDS

The federal and state environmental agency records identified below will be obtained using a service that searches current federal and state agency databases. Environmental agency records will be searched for an area up to one mile from the center of the right-of-way in general accordance with the American Society for Testing and Materials (ASTM) Designation E 1527-05 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" (ASTM E1527-05). Unless otherwise noted, the database searches will address both New Jersey and New York State/New York City regulated sites.

Information/ Data Required	Description
Federal ASTM Standard Databases	
National Priority List (NPL)	Identifies site for priority cleanup under the Superfund Program.
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) List	Data on potentially hazardous waste sites that have been reported to the USEPA pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).
CERCLIS No Further Remedial Action Planned (CERC-NFRAP) List	CERCLIS sites that have been removed from CERCLIS.
Corrective Action Report (CORRACTS) List	Identifies hazardous waste handlers with Resource Conservation and Recovery Act (RCRA) corrective action activity.
Resource Conservation and Recovery Information System (RCRIS) List	Includes information on sites which generate, transport, treat and/or dispose of hazardous waste as defined by RCRA.
Emergency Response Notification System (ERNS) List	Data on reported releases of oil and hazardous substances.
State ASTM Standard Databases	
Known Contaminated Sites Administered by New Jersey Department of Environmental Protection (NJDEP) State Hazardous Waste Site SHWS)	Sites in New Jersey under the purview of the Site Remediation Program which have contamination levels greater than applicable cleanup criteria soil and/or groundwater standards.
SHWSs Administered by the NYSDEC	New York State Hazardous Waste Sites.
Solid Waste Facility Directory (SWF/LF)	Inventory of solid waste disposal facilities or landfills.
Leaking UST (LUST) List (NJDEP)	Inventory of reported leaking underground storage tank incidents.
Underground Storage Tank (UST) List (NJDEP)	Inventory of USTs regulated under Subtitle I of RCRA.

Information/ Data Required	Description
Petroleum Bulk Storage (PBS) UST List (NYSDEC)	Facilities that have petroleum storage capacities in excess of 1,100 gallons and less than 400,000 gallons.
Spills Information (LTANKS) List (NYSDEC)	Inventory of reported leaking aboveground or underground storage tank incidents from 4/1/86 to the present.
Chemical Bulk Storage (CBS UST) List (NYSDEC)	Facilities that store regulated hazardous substances in underground tanks of any size.
Major Oil Storage Facilities (MOSF UST) (NYSDEC)	Onshore facilities or vessels with petroleum storage capacities of 400,000 gallons or greater.
Voluntary Cleanup Agreements (VCP) (NYSDEC)	Inventory of contaminated sites to be remediated with private monies under the voluntary remedial program.
Registered Waste Tire Storage & Facility (SWTIRE) List (NYSDEC)	Inventory of registered waste tire storage facilities.
Federal ASTM Supplemental Databases	
CERCLA Consent Decrees (CONSENT)	Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites.
Records of Decision (ROD)	ROD documents mandate a permanent remedy at an NPL (Superfund) site.
De-Listed NPL	Sites deleted from the NPL in accordance with 40 CFR 300.425(e).
Facility Index System (FINDS)	Includes facility information and 'pointers' to other sources that contain more detail.
Hazardous Materials Information Reporting System (HMIRS)	Includes hazardous material spill incidents reported to the Department of Transportation.
Material Licensing Tracking System (MLTS)	Database of sites which possess or use radioactive materials and which are subject to Nuclear Regulatory Commission requirements.
Mines Master Index File (MINES)	Inventory of mines active or opened since 1971.
NPL Liens	Inventory of sites where the USEPA has filed liens against real property in order to recover remedial action expenditures.
PCB Activity Database System (PADS)	Inventory of generators, transporters, commercial storers and/or brokers and disposers of PCB's.
Department of Defense (DOD) Sites	Inventory of federally owned or administered lands, administered by the DOD, that have any area equal to or greater than 640 acres.
US Brownfields	Listing of brownfields properties addressed by Cooperative Agreement Recipients and brownfields addressed by Targeted Brownfields Assessments.
RCRA Administrative Action Tracking System (RAATS)	Includes data on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA.
Toxic Chemical Release Inventory System (TRIS)	Inventory of facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.
Toxic Substances Control Act (TSCA)	Manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list.
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)/Toxic Substances Control Act (TSCA) Tracking System (FTTS)	Data on administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act.

Information/ Data Required	Description
State or Local ASTM Supplemental Databases	
New Jersey Major Facilities	Facilities having total combined storage capacity of 20,000 gallons or more for hazardous substances other than petroleum or petroleum products, or 200,000 gallons or more of hazardous substances of all kinds.
New Jersey Spills	Initial notification information of hazardous material incidents.
New Jersey Release Database	Initial notification information reported to the NJDEP's Environmental Action Line.
Publicly-Funded Cleanups Site Status Report (NJDEP)	Includes information on publicly funded cleanups.
Chromate Chemical Production Waste Sites (NJDEP)	Inventory of known chromate chemical production waste sites.
New Jersey Pollutant Discharge Elimination System Dischargers (NJPDES)	Inventory of permitted NJPDES dischargers.
Former Manufactured Gas (Coal Gas) Sites	Inventory of former Manufactured Gas (Coal Gas) Sites.
Brownfields (NJDEP)	Former or current commercial or industrial use sites that are presently vacant or underutilized, on which there is suspected to be contamination to the soil or groundwater at concentrations greater than applicable cleanup criteria.
Sites with Closed Case(s) with Restrictions (NJDEP)	Sites with engineering and/or institutional controls that remain in place as part of a remedial action to address soil and/or groundwater contamination.
Hazardous Substance Waste Disposal Site (HSWDS) Inventory (NYSDEC)	Inventory of known or suspected hazardous substance waste disposal sites.
Petroleum Bulk Storage (AST) List (NYSDEC)	Registered aboveground storage tanks.
Chemical Bulk Storage Database (CBS AST) (NYSDEC)	Facilities that store regulated hazardous substances in aboveground tanks with capacities of 185 gallons or greater and/or in underground tanks of any size.
Major Oil Storage Facilities (MOSF AST) List (NYSDEC)	Onshore facilities or vessels with petroleum storage capacities of 400,000 gallons or greater.
New York Spills (NY Spills) Database (NYSDEC)	Data collected on spills reported to the NYSDEC.

HISTORICAL INFORMATION

All obvious uses of the properties within the project area (proposed property right-of-way and/or easements plus 250 feet on either side) will be identified from the present back to when each property was naturally vegetated. Site history information will be obtained from one or more of the following sources:

Information/ Data Required	Description
Sanborn Fire Insurance Maps	Initially produced by private companies for the insurance industry to provide information on fire risks to buildings or other structures. Serve as historical resource for evaluating the potential for site contamination based on history of past use. Coverage is comprehensive for major cities, but may be limited for rural areas and small towns.

Information/ Data Required	Description
Historical City and Local Street Directories	Serve as an historical resource by listing the name of a resident or the name and type of business at a particular address. Coverage is comprehensive for major cities, but may be limited for rural areas and small towns.
Historical Aerial Photographs	Serve as an historical resource by documenting past land use. Aerial photographic history will be obtained back to 1932 or earliest available photograph.
Historical Topographic Maps	Serve as an historical resource by documenting prior use of a property and its surrounding area.
Industrial Directories	Industrial Directories from 1901 to current maintained by the Trenton City Library and New Jersey State Library. Includes information on occupant, products and services, and SIC Codes.
Recorded Land Title Records	Records of fee ownership, leases, land contracts, easements, lines and other encumbrances.
Federal, State, County and Local Government Offices	Freedom of Information Act (FOIA) will be made for sites identified as contaminated or potential contaminated within the project area.
NJDEP and NYSDEC Geographic Information System	Location of groundwater contaminated areas, known contaminated sites and NJPDES dischargers (NJDEP). Location of NYSDEC Regulated Facilities including superfund sites, significant SPDES discharge facilities, facilities discharging certain types of wastes, and major electric generation facilities.
Site Plans and Facility As-Built Drawings	As available from property owners, occupants, and government agencies.
Property Tax Files	Includes records of past ownership, appraisals, maps, sketches, photographs or other information that is reasonably obtainable.
Interviews	▪ NJDEP, NYSDEC, NYCDEP or New York State Department of Health (NYSDOH) ▪ Local Officials ▪ Past owners, occupants and operators, key managers, former employees. ▪ Individuals who live(d) or work(ed) on property(s) in or near the project area.

ENVIRONMENTAL SITE INVESTIGATION

An Environmental Site Investigation (ESI) will be performed in general accordance with New Jersey Department of Environmental Protection's (NJDEP) TRSR, New York State Department of Environmental Conservation (NYSDEC) guidelines, and New York City requirements, as applicable. Potentially contaminated sites identified during the PESA will be further evaluated to determine if soil and/or groundwater analysis will be required to verify if there is subsurface contamination and that may impact proposed construction activities.

Information/ Data Required	Description
Soil Analytical Data	Collected in accordance with NJDEP and NYSDEC requirements and guidelines. Data compared to applicable state and federal criteria and/or standards.
Groundwater Analytical Data	Collected in accordance with NJDEP and NYSDEC requirements and guidelines. Data compared to applicable state and federal criteria and/or standards.

ASBESTOS AND LEAD-BASED PAINT SURVEYS

The performance of asbestos and lead-based paint (LBP) surveys will be needed in buildings proposed for demolition or renovation.

Information/ Data Required	Description
Location and quantity of asbestos containing materials	The requirements outlined in 40 CFR 763 (AHERA) and 12 NYCRR 56 (Industrial Code Rule 56) will be followed to determine specific data collection and analysis requirements for asbestos surveys.
Location and quantity of Lead-Based Paint (LBP)	Housing and Urban Development (HUD) Guidelines will be followed for determining specific data collection and analytical requirements for LBP surveys.

3. CITATIONS OF APPLICABLE GUIDELINES/REGULATIONS

The environmental investigations will be conducted consistent with industry standards, regulatory requirements, guidelines and rules, as follows:

Federal

- U.S. Environmental Protection Agency (EPA) – National Environmental Policy Act (NEPA), 42 U.S.C. s/s 4321 (1969)
- EPA - Clean Water Act (CWA), 33 U.S.C. s/s 1251 et seq. (1977)
- EPA - Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. s/s 9601 et seq. (1980)
- EPA - Resource Conservation and Recovery Act (RCRA), 42 U.S.C. s/s 321 et seq. (1976)
- EPA - Safe Drinking Water Act (SDWA), 42 U.S.C. s/s 300f et seq. (1974)
- EPA - 40 CFR Part 61 – National Emissions Standards for Hazardous Air Pollutants (NESHAPS)
- EPA - 40 CFR Parts 260, 261, 262, 263, 266, 268, and 280
- EPA – 40 CFR Part 763 – Asbestos Hazardous Emergency Response Act (AHERA)
- EPA - 40 CFR Part 745 – Lead: Requirements for Lead-Based Paint Activities in Target Housing and Child-Occupied Facilities; Final Rule
- U.S. Department of Labor (USDOL) OSHA – 29 CFR 1910.120, 1910.1001,1910.1101, 1926.62, and 1929.58
- U.S. Department of Housing and Urban Development (HUD) Guideline for the Evaluation and Control of Lead Based Paint Hazards in Housing pursuant to Title X of the Housing and Community Development Act of 1992
- Toxic Substances Control Act (TSCA), 15 U.S.C. s/s 2601 et seq. (1976)
- OSHA - 29 CFR 1926.62 – Lead: Occupational Health and Environmental Controls
- OSHA – 29 CFR 1926.1101 - Asbestos
- Federal Highway Administration, Technical Advisory T6640.8A (1987),
- Federal Highway Administration, Supplementary Hazardous Waste Guidance (1997)
- Federal Highway Administration, Hazardous Wastes in Highway Rights-of-Way (1994)
- Federal Highway Administration, Interim Guidance, Hazardous Waste Sites Affecting Highway Project Development (1988)
- Federal Highway Administration, Policy Revision to Support the Brownfields Economic Redevelopment Initiative (1998)

New York State

- NYS Department of Labor (NYSDOL) Industrial Code - Rule 56 – Asbestos Regulations
- NYS Public Health Law – Title 10, part 67
- NYS Environmental Conservation Law - Articles 12, 15 and 17
- New York State Department of Environmental Conservation (NYSDEC) – STARS (Spill Technology and Remediation Series) Memo No. 1, Petroleum Contaminated Soil Guidance Policy, prepared by the NYSDEC, Division of Construction Management, Bureau of Spill Prevention and Response, August, 1999
- NYSDEC - Draft DER-10, Technical Guidance for Site Investigation and Remediation, December 2002.
- NYSDEC - Cleanup Standards Task Force, Draft Cleanup Policy and Guidelines, October 1991
- NYSDEC - Sampling Guidelines and Protocols, Technological Background and Quality Control/Quality Assurance for NYSDEC Spill Response Program, March 1991
- NYSDEC - Spill Response Guidelines, Basic Procedures and Requirements for Responsible Parties in New York State, January 1991
- NYSDEC - Division of Water, Spill Response Guidance Manual, January 1990
- NYSDEC – Technical Administrative Guidance Memorandum (TAGM) #4046 – Soil Cleanup Objectives
- 6 NYCRR Part 613, Handling and Storage of Petroleum
- 6 NYCRR Part 364, Waste Transporter Permits
- 6 NYCRR Part 371, Identification and Listing of Hazardous Waste, July 14, 1985
- 6 NYCRR Part 372, Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities, July 1, 1986
- 6 NYCRR Part 360, Solid Waste Management Facilities
- 6 NYCRR Part 375, Inactive Hazardous Waste Disposal Sites
- 6 NYCRR Part 502, Floodplain Management Criteria for State Projects

New York City

- NYCDEP Sewer Use Regulations – RCNY Chapter 19
- New York City Environmental Quality Review Manual (Chapter 3J)

State of New Jersey

- NJDEP Technical Requirements for Site Remediation, (TRSR) N.J.A.C. 7:26E.
- NJDEP Soil Cleanup Criteria (May 1999)
- NJDEP Department Oversight of the Remediation of Contaminated Sites, N.J.A.C. 7:26C
- NJDEP Solid Waste Regulations, N.J.A.C. 7:26
- NJDEP Pollutant Discharge Elimination System, N.J.A.C. 7:14A
- NJDEP Hazardous Waste Regulations, N.J.A.C. 7:26G
- NJDEP Industrial Site Act Recovery Rules, N.J.A.C 7:26B
- NJDEP Discharge of Petroleum and Other Hazardous Substances, N.J.A.C 7:1E
- NJDEP Underground Storage Tanks, N.J.A.C. 7:14B
- NJDEP Surface Water Quality Standards, N.J.A.C. 7:9B
- NJDEP Ground Water Quality Standards, N.J.A.C. 7:9-6

ASTM Guidelines

- ASTM E1527-05 Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process

Agency Coordination
Agency coordination will include correspondence with and review of information obtained from federal, state and local government agencies as a result of Freedom of Information Act (FOIA) requests. Additional coordination will include obtaining various permits and approvals during subsurface investigation activities and mitigation activities.

4. PROPOSED VARIATIONS FROM FEDERAL TRANSIT ADMINISTRATION GUIDANCE

The methodology presented in this document is consistent with the Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) requirements and guidelines for the investigation of hazardous materials.

5. KEY ASSUMPTIONS

The following key assumptions apply to the methodology described herein that will be used to investigate hazardous materials for the ARC FEIS Build Alternative:

- Access will be available for affected properties located in the proposed right-of-way to conduct PESA site reconnaissance activities, potential Environmental Investigation activities, and asbestos, LBP and PCB contaminated equipment surveys.

- Access to relevant federal, state, and local files will be afforded in a timely fashion for inclusion in the FEIS.

6. METHODOLOGY APPROACH

The following assessment methodology considers a future analysis year of 2025.

STEP 1: PRELIMINARY ENVIRONMENTAL SITE ASSESSMENT

A Preliminary Environmental Site Assessment (PESA) will be conducted along the right-of-way and at properties and buildings that are anticipated to be acquired or impacted as part of this project. This would include existing buildings to be demolished or renovated, or vacant properties to be acquired as part of the construction of the tunnels, tracks, and maintenance yards or the construction of ancillary support structures such as transformer stations, ventilation buildings, or platforms.

The PESA will be conducted in accordance with ASTM 1527-05, NJDEP, NYSDEC and NYCDEP regulations and requirements for performing environmental assessments. Data collection under these requirements is accomplished through records review, site reconnaissance, and interviews.

The purpose of the Phase I ESA will be to identify RECs and develop a plan for a Phase II Site Investigation in accordance with the NJDEP, NYSDEC, and New York City requirements for characterization of the site soil and groundwater conditions. The focus of the investigation process will be to determine the past and current usage of the site as related to hazardous materials usage and potential subsurface contaminants. Initially, the investigation will include a review of federal and state environmental agency records obtained using a service that searches current federal and state agency

databases. Records will be searched for an area up to one mile from the center of the right-of-way designation in accordance with ASTM E1527-05.

After review of the environmental agency database, FOIA requests will be made to review readily available NJDEP, NYSDEC, New York City Department of Environmental Protection (NYCDEP), United States Environmental Protection Agency (USEPA) and applicable local agency files for sites identified as contaminated or potentially contaminated within the project area consisting of the proposed right-of-way and/or easements plus 250 feet on either side. Information obtained during these file review will include:

- Enforcement Activities
- Confirmed or suspected contaminated media
- Confirmed or suspected contaminants
- Depth to groundwater and groundwater flow direction
- Cleanup Status

In addition, historical sources such as Sanborn Fire Insurance Maps, historical city directories and aerial photographs will be reviewed for properties within the project area to identify RECs and AOCs. Site inspections and interviews with available persons knowledgeable with regard to individual properties in the project area will assist in identifying potential RECs and AOCs.

A site reconnaissance will be performed to obtain information indicating the likelihood of identifying sites of concern within the project area. Observations with regard to potential for contamination on adjacent properties will be made, to the extent possible, from publicly accessible area, unless access is specifically obtained, by others, for the individual properties.

During the investigation, particular attention will be paid to the following potential RECs and AOCs:

- Underground storage tanks
- Aboveground storage tanks
- Transformers and PCB light fixtures and other electrical equipment
- Hazardous and non-hazardous materials storage and staging areas
- Mechanical/work rooms, stained soil
- Building areas
- Dump and disposal sites
- Current and former industrial activities
- Boiler rooms
- Sewage systems
- Maintenance and repair areas
- Drainage and piping systems
- Material handling/manufacturing areas

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In addition to the requirements for conducting a Phase I ESA under ASTM E1527-05 NJDEP TRSR, N.J.A.C. 7:26E, includes minimum requirements for completing PAs for sites that that will undergo NJDEP review, including those sites and activities subject to:

1. The Industrial Site Recovery Act (ISRA);
2. The New Jersey Underground Storage of Hazardous Substances Act (UST);
3. The Spill Compensation and Control Act;

4. The Solid Waste Management Control Act;
5. The Water Pollution Control Act;
6. The Resource Conservation and Recovery Act (RCRA);
7. CERCLA of 1980, as amended by Superfund Amendments and Reauthorization Act of 1986 (42 USC § 9601 et seq.); and
8. The Brownfield and Contaminated Site Remediation Act.

Data collection for sites located in New Jersey will satisfy both the Phase I ESA requirements under ASTM E1527-05 and the PA requirements under NJDEP's TRSR. Data collection efforts for sites located in New York will satisfy both the Phase I ESA requirements under ASTM E1527-05, the NYSDEC Records Search Requirements included in Appendix 3A of Draft DER-10, Technical Guidance for Site Investigation and Remediation, and New York City's Environmental Quality Review Manual (Chapter 3J). Draft DER-10 and New York City's Environmental Quality Review Manual provides guidance on the investigation and remediation of potentially contaminated sites in New York.

The findings of the PESA and the review of existing documentation regarding environmental conditions at the potentially impacted properties will be incorporated into the FEIS. A matrix will be prepared for the purpose of ranking the sites with regard to the level of potential for contamination, and the potential for impact to the project based on known contamination. The matrix will also identify those areas where additional investigation is needed to fully characterize the areas and media to be impacted.

STEP 2: PHASE II ENVIRONMENTAL INVESTIGATION

To supplement analytical data obtained from public records compiled as part of the PESA, an Environmental Site Investigation (SI) may be conducted at specific potentially contaminated sites or locations along the right-of-way based upon the results of the PESA and/or based on the proposed design alternatives to characterize the soil, groundwater, ballast, timber ties, sediment, surface water and standing water from drainage structures within the project alignment, tunnels, and yards. The characterization will provide the horizontal and vertical extent of clean-up or mitigation required prior to or during construction, development of special testing, handling and disposal requirements during construction and implementation of special health and safety procedures during construction. Where feasible, this work could occur concurrently with geotechnical investigations, to minimize the impacts on cost and schedule.

The SI would be performed in general conformance with NJDEP TRSR, NYSDEC guidelines, and New York City requirements, as applicable. Each AOC identified during the PESA that will be impacted as part of the proposed project will be further investigated, and it will be determined if soil and/or groundwater analysis will be required to determine if the AOC has resulted in subsurface contamination. A draft SI scope of work and sampling plan will be prepared for review prior to the implementation of the SI program. The number of borings and soil and/or groundwater samples to be collected during the SI program will be based on the results of the PESA. Following completion of the SI, a report will be prepared which incorporates the findings of the SI and includes recommendations for mitigation, if necessary, to complete proposed construction activities.

STEP 3: ASBESTOS, LEAD-BASED PAINT (LBP) AND POLYCHLORINATED BIPHYENYLS (PCB) CONTAMINATED EQUIPMENT SURVEYS

The performance of asbestos, LBP and PCB Contaminated Equipment Surveys will be required in buildings that are proposed for demolition or renovation, including: areas that will be impacted as part of the relocation of equipment and other areas where the construction of rail lines, pedestrian passageways or other accesses are planned through existing structures.

Asbestos and LBP surveys will be conducted in accordance with applicable regulations. The asbestos survey will be conducted by certified EPA/AHERA/New York City and State Asbestos Inspectors in accordance with the standard procedures outlines in 40 CFR 763 (AHERA). Prior to the survey, available previous asbestos and LBP survey reports, as-built drawings, and other available construction documents for the facilities will be reviewed.

The survey will include the collection of bulk asbestos samples of suspect asbestos containing materials (ACM) within each individual building and impacted site area. All samples will be analyzed for asbestos content using Polarized Light Microscopy (PLM). Non-friable organically bound materials that are determined to contain less than one percent asbestos through PLM analysis, such as caulks, floor tiles, mastics, built-up roofing, and roof flashing, will be analyzed for asbestos content using Transmission Electron Microscopy (TEM). All samples will be analyzed by an independent laboratory certified by the American Industrial Hygiene Association (AIHA) and the National Voluntary Laboratory Accreditation Program (NVLAP).

A LBP inventory survey will be conducted to identify painted surfaces containing LBP that will be impacted during the proposed project. The survey will be conducted by a certified Lead Inspector/Risk Assessor. The survey will be conducted in accordance with the procedures outlined in the HUD Guidelines. The HUD Guidelines are considered to be the state-of-the-art guidelines for identifying lead hazards in building structures. LBP is identified as having greater than or equal to 0.5% lead.

Suspect LBP surfaces will be analyzed for lead content using X-Ray Florescence (XRF) field analysis technology. Surfaces resulting in an inconclusive reading will have bulk samples collected and analyzed for lead content using Flame Atomic Absorption (FAA). Surfaces identified as LBP will have representative bulk samples analyzed for lead using the Toxic Characteristic Leaching Procedure (TCLP). The TCLP analysis will be used to determine if the LBP would be classified as a hazardous waste.

In addition to asbestos and LBP surveys, accessible facility structures will be investigated to determine if equipment, transformers, or light fixture ballasts contain polychlorinated biphenyls (PCBs). This will be accomplished by reading equipment tags and contacting manufacturers for information on their construction. Many transformers and fixtures are clearly identified whether they contain PCBs either directly or based on the product serial number or model number. Typically ten percent of light fixtures are opened to read tags on the ballast enclosures. An inventory of PCBs will be prepared based on the findings of the investigation.

Following the asbestos, LBP and PCB contaminated equipment surveys, a report will be prepared which incorporates the findings of the investigation and includes recommendations, if necessary, for mitigation to complete proposed construction activities.

STEP 4: MITIGATION

The environmental data generated during the PESA and SI and Asbestos, LBP and PCB Contaminated Equipment Surveys would be used to determine if mitigation would be required prior to proposed construction activities. Mitigation requirements would be outlined in the Construction Environmental Control Plan (CECP) to be prepared as part of the Final Environmental Impact Statement (FEIS). The CECP contains general procedures and requirements for the construction contractor to manage contaminated soil, sediment, ballast, concrete, timber ties, groundwater (as well as any standing water from drainage structures), construction debris or other material that will be encountered or exposed during construction activities. The CECP will quantify and delineate impacted materials (contaminated soil, ballast, concrete, track drain sediments, timber ties, groundwater and construction debris), and will direct the proper testing, handling, containment, reuse, and remediation (transportation and disposal and/or recycling) required during the proposed construction activities.

Contaminated (non-hazardous and hazardous) materials can include excavated ballast, concrete, track drain sediments, soil, timber ties, groundwater (as well as any standing water from drainage structures) and construction debris, which includes ACMs, LBP, and PCB contaminated equipment generated by demolition and construction activities. Proper management of such materials includes excavation, waste characterization, handling, transportation, staging, erosion and dust controls, temporary storage, re-use and disposal, and abatement. The CECP will address appropriate guidelines for the preliminary design, installation, maintenance, and operation of any temporary water storage and treatment systems for dewatering operations during construction. Such systems would be used to reduce the potential for migration of any existing contaminant plumes, reduce the volume of water generated and treat contaminant concentrations to acceptable levels as specified in discharge permits.

In addition to the CECP, Remedial Action Work Plans (RAWP) will be prepared for contaminated sites in the project area that will be impacted by construction activities.

STEP 5: DOCUMENTATION

Results of the PESA and SI will be incorporated into the FEIS and a separate Technical Report.

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Kearny Yard
Supplemental Information

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REPORT QUALITY CONTROL/QUALITY ASSURANCE

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Reviewed by: William Redl **Date: 4/08**

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1.0 INTRODUCTION

A NJ TRANSIT Rail Yard is proposed for the former Koppers Seaboard Site located in Kearny, Hudson County, New Jersey. The site is situated on a peninsula along the Hackensack River and across from the PSE&G Hudson Generating Station. The Koppers Seaboard Site is located adjacent to additional contaminated sites, Standard Chlorine Chemical Company, Inc. (SCCC) and Diamond Shamrock. These additional sites may be used to construct a track connection to the Northeast Corridor as part of the Portal Bridge Enhancement Project. As part of the Access to the Regions Core (ARC) Draft Environmental Impact Statement (DEIS), an Open Public Records Act (OPRA) request was submitted to the New Jersey Department of Environmental Protection (NJDEP) to access records. File reviews were conducted at NJDEP on November 9, 2004, November 28, 2004, December 21, 2004 and March 29, 2005.

1.1 FORMER KOPPERS SEABOARD SITE

1.1.1 Background Information

1.1.1.1 Site Description

The former Koppers Seaboard Site (a.k.a. Koppers Coke) was a coke plant/coal tar processing facility. The coke operation ceased in 1971 and associated buildings were demolished in 1974, while tar processing operations continued until 1979 when demolition of the tar plant began. During its peak, the facility processed 1.5 million tons of coal per year. Major processes at the facility included:

- Coke Production
- Gas Conditioning and Chemical Recovery
- Coal Tar Refining
- Sulfuric Acid Production
- Cyanide Production

The site is currently owned by Hudson County Improvement Authority (HCIA). The site encompasses approximately 155 upland and riparian acres, and is bound to the north and east by the Hackensack River, to the west by the SCCC property and to the south by the NJ TRANSIT rail line. A small portion of the site lies south of the NJ TRANSIT rail line. HCIA has acquired several rights-of-ways and small adjoining parcels, bringing the total acreage to 175 acres. The site is located in the jurisdiction of the Hackensack Meadowlands Development Commission (HMDC) and is zoned heavy industrial. Currently, the only permanent structure on-site is associated with the Interim Remedial Measure (IRM) Dense Non-Aqueous Phase Liquid (DNAPL) collection system.

Beazer East, Inc. (Beazer) is responsible for remediation of the site, pursuant to a March 1986 Administrative Consent Order (ACO) entered into between Koppers Company, Inc. (now known as Beazer) and NJDEP. In 1997, a Memorandum of Understanding (MOU) was entered into between Beazer, NJDEP and HCIA. Safety Kleen Services East L.C. (SK), Beazer and HCIA entered into a Three Party Agreement in 1997, under which SK was to complete remediation of the Site. In accordance with the MOU, processed dredged material (PDM) originating from the New York/New Jersey Harbor was to be used as structural fill and an engineering control to eliminate exposure to site-related contaminants. Due to SK's bankruptcy and the inability to secure dredging contracts and fill permits from the Army Corps of Engineers (USACE), remediation work at the site has not been completed. This situation lead to HCIA terminating the Third Party Agreement. As of April 2004, SK, Beazer, American Home Assurance Group and HMDC executed a Settlement Agreement and Release, whereby Beazer will complete the remedial requirements for the site, and HCIA will be responsible for redevelopment work.

As a result of observed discharges to the Hackensack River in 1980, NJDEP required Koppers to investigate contamination at the site. Soil samples collected during several episodes showed high

concentrations of aliphatic and aromatic byproducts of coke productions at the site. In 1981, as a result of oil seepage into the Hackensack River, NJDEP required removal of products from the site. In 1986, Koppers entered into an ACO with NJDEP.

A Phase I and Phase II Remedial Investigation/Feasibility Study (RI/FS) was completed in 1988. Subsequently, a free product removal system was installed in the Eastern Area (combined northeastern and southeastern areas), which was the main source of contamination to the Hackensack River. Investigations of the Central Area in the late 1980s showed that groundwater was not adversely impacted by the contaminated soils, but these soils were found to pose a direct contact risk because of elevated levels of polynuclear aromatic hydrocarbons (PAHs). Subsequent investigations in 1997 showed that pockets of product are present in discrete parts of the Central Area. An interim remediation was completed for the Central Area in 1990 in anticipation of the construction of a Resource Recovery Facility, and consisted of 12 inches of gravel cover and a ground water monitoring system.

An April 1998 RAWP for the site presented detailed plans for integrated remediation and redevelopment of the site. The remedial objectives in the RAWP included capping the site with PDM from the New York-New Jersey Harbor; and constructing a steel sheet pile/slurry wall barrier along the northern and eastern boundaries of the site adjacent to the Hackensack River. The RAWP was conditionally approved by NJDEP on May 7, 1998.

1.1.1.2 Geology/Hydrogeology

Information regarding geologic and hydrogeologic conditions at the site is presented below. This information was summarized from the April 1998 RAWP.

1.1.1.2.1 Geology

The Koppers Seaboard Site is located over marshland that has been built up through industrial development. From top to bottom, a typical lithological sequence includes the following units:

- Granular fill, a significant portion of which are derived from plant processes (cinders, slag, coal and coke fragments) and building debris (brick and concrete rubble)
- Peat and/or organic-rich silty clay ("Meadow Mat"), not laterally extensive in the Eastern Area
- Sand with variable amounts of silt, laterally extensive across the Central and Western Areas of the site and absent in the Eastern Area
- Clayey silt to silty clay in the Eastern Area, where sand is not present
- Varved clay and silt
- Glacial till
- Brunswick formation

Fill material ranges from four to 21 feet in thickness. Beneath the fill, at most locations, is a continuous layer of peat ("Meadow Mat"), with a thickness typically ranging between three and six feet. Where present, the Meadow Mat serves as a low permeable semi-confining unit, which limits the hydraulic connection between the fill and underlying units.

Within the easternmost portion of the site, the peat is absent at most locations, and is replaced by an organic-rich silty clay/clayey silt unit, with variable amounts of fine sand. This unit is believed to be of alluvial origin, and can reach a thickness of up to 45 feet. In general, the amount of natural organic material decreases with depth, while the amount of sand increases with depth. This unit, like the Meadow Mat, also serves as a low permeability semi-confining unit, which limits hydraulic connection between

the fill and the underlying units. The surface of the Meadow Mat or silty clay layer is uneven, and in localized areas within the northeastern portion of the site, DNAPLs have accumulated on top of the Meadow Mat or silty clay layer. The Meadow Mat/silty clay layer acts as vertical barrier to DNAPL migration.

Beneath the peat and/or organic-rich silty clay is a fine- to medium-grained sand unit with variable amounts of silt. This unit has a maximum thickness of 20 feet in the Central Area of the site. This unit is generally less than three feet thick in the eastern portion of the site, where it is found at depths greater than 50 feet. With a few exceptions in the northern and eastern sections of the site, the sand unit is laterally continuous. In the eastern section of the site, this unit is replaced by a silt to silty clay unit.

Immediately below the sand unit is a red to brown, varved clay and silt unit that has a maximum thickness of approximately 60 feet at the western end of the site. The varved clay and silt layer is continuous, except for a limited number of boreholes near the eastern boundary of the site, where this unit has not been observed.

Glacial till composed of varying amounts of boulders, cobble, gravel and sand within a silt and clay matrix underlies the varved clay and silt unit. The glacial till ranges between 5 and 26 feet in thickness, and is characteristically dense to very dense.

The depth to bedrock at the site is interpreted as approximately 58 feet in the western section, to more than 102 feet in the eastern section of the site. Core samples recovered from the upper ten feet of bedrock at three locations indicate that bedrock beneath the site consists of gray, fine to medium-grained sandstone. At two of the three locations where bedrock was cored, the top of bedrock was observed to be fractured extensively.

1.1.1.2.2 Hydrogeology

Groundwater is present at the site under water table conditions in the fill unit, and semi-confined conditions in the water-bearing units underlying the Meadow Mat/silty clay layer and varved clay. Groundwater levels in the fill unit are only slightly influenced by tidal variations of the Hackensack River.

Because the site essentially forms a peninsula, horizontal groundwater flow from adjacent locations is limited and infiltration from precipitation events provides the main source of groundwater in the fill unit. Infiltration of precipitation events provides the main source of groundwater in the fill unit. Infiltration of precipitation is permitted by the granular nature of the shallow fill unit and level surface topography. The Meadow Mat and/or silty clay units further isolate the groundwater system in the fill by minimizing the flow between the fill unit and deeper lithologic units. The water table has been observed to mound in the center of the site where recharge occurs, and to be lowest at the periphery (i.e., at the Hackensack River), where groundwater discharges.

The principal component of groundwater flow in the Central and Western Areas of the site is in a north-northwest direction, toward the Hackensack River. Groundwater flow in the eastern portion of the site is influenced by the presence of a potentiometric mound. The potentiometric mound is oriented northeast to southwest, and extends from the former coal tar plant area in the northeast to the vicinity of the entrance tunnel to the Site. Groundwater west of the mound flows in a northwest direction to the Hackensack River. Groundwater east of the mound flows eastward toward the Hackensack River. The horizontal hydraulic gradient across the Central Area is approximately 0.001 ft/ft. The gradient increases slightly to 0.002 ft/ft in the Western Area.

The direction of groundwater flow in the silty sand unit is to the west-northwest. The horizontal gradient in this unit is less than 0.002 ft/ft.

A slight potentiometric mound in the glacial till unit is present in the northeast portion of the site. Groundwater flows radially from this mound to the east, south and west, under relatively small hydraulic gradients.

Based on potentiometric head differences in monitoring well nests, the water level in the fill unit monitoring wells are approximately one foot higher than the water level in the silty sand or glacial till monitoring well. This suggests the presence of a slight downward vertical hydraulic gradient under current static conditions.

1.1.2 Areas of Concern

Areas of Concern (AOCs) on the site consist of surface soils (Eastern, Western and Central Areas), surficial wastes, DNAPL, and groundwater (shallow fill unit and glacial till unit groundwater). This section provides a summary of the nature and extent of contamination associated with each AOC.

1.1.2.1 Surface Soils

The Eastern Area includes the former coal tar processing plant in the northeast portion, the former coke plant and light oil refining plant in the southeast portion, the former coal/coke storage area in the western portion, and the former parking lot area in the southern portion. The constituents of interest (COIs) identified in the surface soils within the Eastern Area include benzene, toluene, ethylbenzene and xylene (BTEX), non-carcinogenic and potentially carcinogenic PAHs, and total cyanide. In general, the higher relative concentrations of PAHs were identified in the former coal tar processing plant areas, whereas, the higher relative concentrations of BTEX and total cyanide were identified in the former coke and light oil refining plant areas.

The Western Area includes the former light oil residue area, the former spent oxide deposit area, and the western portion of the former coke/coal storage area. The COIs identified in surface soils with the Western Area include non-carcinogenic and potentially carcinogenic PAHs and total cyanide.

As indicated above, soils within the Central Area were previously remediated in 1990 by covering the area with 12 inches of gravel.

1.1.2.2 Surface Waste

Various investigations have been performed on the site to evaluate the nature and extent, and classification of surficial waste materials at the site. Specifically, these waste materials included the existing dike, surficial waste materials, waste piles, coal tar deposits in the western portion of the site, and potential chromium containing fill.

1.1.2.2.1 Dike

The existing dike was reportedly constructed of approximately 38,000 cubic yards of various materials. Approximately 2,000 cubic yards of "pliable" coal tar material in the dike was estimated. The extension of coal tar-related material into the Hackensack River channel was visually observed during low tide, mostly on the Western portion of the site. Approximately 2,700 cubic yards of coal-tar related material extending in the river was estimated.

1.1.2.2.2 Surficial Waste Materials

The Western Area of the site was investigated for the presence of potential surfical wastes. The surface waste areas included areas of visually stained material. Approximately 3,700 cubic yards of surficial

waste materials were identified in this area. Approximately 2,700 cubic yards of this material exceeded RCRA Hazardous Waste Criteria as a result of analysis by toxicity characteristic leaching procedure (TCLP).

1.1.2.2.3 Waste Piles

Approximately 8,800 cubic yards of material in 14 identified waste piles located on the Western portion of the site were delineated, characterized and classified. Approximately 2,400 cubic yards of this material was determined to be potential hazardous waste. The remaining materials were classified as either ID-13 (Bulky) or ID-27 (Industrial) waste.

1.1.2.2.4 Coal-Tar Deposits

Additional investigation activities were conducted in 1995 to delineate the extent of surficial coal tar-related material and debris/fill on the Western Area of the site. The total volume of surficial coal-tar related material was estimated at about 4,300 cubic yards. In addition, during another investigation, approximately 2,500 cubic yards of surficial coal-tar material was identified in the Eastern portion of the site.

1.1.2.2.5 Chromium Fill

The areal extent of potential chromium-containing fill on the Eastern and Western portions of the site was determined through a site reconnaissance and sampling. Approximately 460 cubic yards of surficial chromium was identified on the site. Approximately 49 cubic yards of this material was determined to be hazardous waste, based on TCLP analysis for chromium.

1.1.2.2.6 Surficial Waste Summary

Table 1 from the April 1998 Draft RAWP summarizes the quantities of surfical waste materials identified on the site.

TABLE 1
SURFICIAL WASTE SUMMARY: FORMER KOPPERS SEABOARD SITE

Surficial Waste Area	Potentially Hazardous (yd^3)	Non-Hazardous Industrial (yd^3)	Bulky Waste (yd^3)	Total (yd^3)
Western Area Surficial Wastes	2,700	1,600	-	4,300
Western Area Waste Piles	2,400	4,000	2,400	8,800
Dike Surficial Tar Material	-	2,000	-	2,000
Dike Extension	-	2,700	-	2,700
Eastern Area Surficial Tars	-	2,500	-	2,500
Surficial Chromium Areas	50	410	-	460
TOTALS	5,150	13,210	2,400	20,760

1.1.2.3 DNAPL

Free-phase DNAPL has only been observed in shallow wells located within the Eastern Area of the site. The location of the former coal tar plant is the general area where the majority of the DNAPL has been measured, and is the area where the IRM system is currently operating. As indicated in the most recent Groundwater Monitoring and Progress Report dated August 2005, DNAPL was identified in four of the shallow-unit groundwater monitoring wells. DNAPL thickness in these areas ranged from 4.78 to 7.99 feet. It should be noted that installation of the barrier wall system has altered the groundwater flow. Groundwater flow to the Hackensack River has been cut off. Groundwater flow in the Eastern Area is directed to the south and groundwater flow in the Central and Western Areas have been directed to the west.

1.1.2.4 Groundwater

1.1.2.4.1 Shallow Fill Groundwater Unit

Groundwater goals established for the shallow fill groundwater unit at the site are the New Jersey Surface Water Quality Criteria (SWQC) for Class SE2 Waters (N.J.A.C. 7:9b-1.14(c)) adopted on December 6, 1993. Significant decreases in concentrations of the more mobile and prevalent constituents, naphthalene and benzene, were observed with distance from the former coal tar plant areas. Groundwater in the Central Area is impacted with benzene at one location (MW-110). However, benzene has not been detected downgradient of this location and concentrations in this well are not increasing. The presence of benzene, chlorobenzene and/or dichlorbenzene in samples from well MW-108 and MW-109, located along the western site boundary, is potentially attributable to an off-site source (i.e., SCCC).

Eight shallow fill groundwater unit compliance wells are monitored. During the most recent monitoring event, arsenic was detected above the Class SE2 SWQC at four of the compliance monitoring wells. Manganese was also detected above the SWQC in 7 compliance wells.

1.1.2.4.2 Glacial Till Unit Groundwater

Groundwater goals established for the glacial till unit groundwater at the site are the New Jersey Class IIA Groundwater Quality Standards (GWQS). According to the August 2005 Groundwater Monitoring and Progress Report, several inorganic parameters (metals) exceeded the GWQS. The report indicated that these exceedances may be reflective of background and/or brackish conditions and not related to site conditions.

1.1.2.4.3 Bedrock Aquifer

A 450-foot-deep bedrock well was installed on-site, and samples were collected at various intervals. No groundwater impacts were reportedly observed.

1.1.3 Proposed Investigation and Remedial Activities

Remediation of the site has been conducted under a 1986 ACO and an April 1998 RAWP. The March 1998 RAWP was conditionally approved by NJDEP in a letter dated May 7, 1998. The Proposed Remedial Action Objectives (RAOs) for the site, as outlined in the RAWP, include:

- Soil – Prevent potential exposure to surface soils
- Groundwater – Mitigate potential migration of dissolved-phase constituents of interest to the Hackensack River
- DNAPL – Prevent potential DNAPL migration to the Hackensack River

A comparison of site soil data to soil cleanup criteria indicated that the majority of surface soils at the site exceeded the Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC). Based on the planned future industrial development for the site, the proposed RAO for soils on the site consisted of the placement of two feet or more of low permeability structural fill, and execution of institutional controls (i.e., Deed Notice).

Based on site groundwater results, exceedances for both background and site-related COIs exist. A Classification Exception Area (CEA) was proposed to achieve a portion of the RAOs for groundwater at the site. In addition to a CEA, the RAWP also proposed achieving the RAO for groundwater through the following:

- A physical hydraulic barrier to be constructed along the site perimeter with the Hackensack River, to mitigate potential dissolved phase constituent migration. A redundant barrier would be constructed

consisting of PDM Key (i.e., PDM of 10^{-6} cm/sec maximum permeability keyed into the confining layer and/or meadow mat layer).

- Natural attenuation of dissolved phase constituents in groundwater in the shallow zone promoted through placement of a low permeability structural fill over the entire site and installation of the hydraulic barrier along the site perimeter with the Hackensack River, which will act to greatly reduce constituent migration rates.

Similar to the remediation of dissolved phase groundwater contamination, the proposed remediation of DNAPL at the site involved the physical hydraulic barrier constructed around the site and natural attention of any dissolved constituents derived from the DNAPL.

Additional proposed remedial actions included the following:

- Excavation of target sediments (i.e., sediments in the Eastern Section of the Site) visually determined to contain tar-like materials from the outboard side of the sheet pile wall up to a maximum distance of 50 feet, and to a depth of two or three feet based on excavation equipment.
- Removal of existing above-ground storage tank and existing buildings. Buildings to be demolished and the construction material recycled/reused on the site to enhance the roadways or as structural fill.
- Continue of operation of the DNAPL recovery system.
- Upgrade of surface cover in Central Area.
- Assessment of the potential presence of former deep production wells.
- Removal of surficial waste from Western Area. Waste materials, excluding some bulky items to be disposed off-site), to be incorporated into the cover/cap material.
- Potential extension of tidal wetlands adjacent to the Western portion of the site.
- Sentinel monitoring of groundwater to evaluate compliance with remediation standards.

In response to an October 2003 Remedial Action Plan and Progress Report (RAPR) submitted by Beazer, NJDEP prepared a February 10, 2004 letter summarizing the current status of the site relating to the conditionally approved April 1998 RAWP. In the letter, NJDEP indicated that since the approval of the RAWP, additional information has been obtained that will impact aspects of the remediation. NJDEP's letter clarified and modified certain aspects of the conditional approval based on current information. The letter also required the submittal of a RAWP Addendum. Specific outstanding remedial items identified in NJDEP's letter included the following:

- The 1998 RAWP stipulated that a redundant barrier consisting of a "PDM Key" (i.e., PDM of 10^{-6} cm/sec maximum permeability keyed into a confining layer and/or Meadow Mat layer) be emplaced at the site. During implementation of the remedial action, installation of the PDM Key in the designated areas became problematic. Low permeability clay was substituted for PDM for portion of the PDM Key. Additionally, portions of the PDM Key were not completed and a portion did not meet the 10^{-6} permeability requirements and must be repaired. NJDEP required that impermeable clay be used for any additional installation or re-installation of redundant surface key structures installed at the site.
- The 1998 RAWP did not adequately address the contaminated swale on the Western Area, which represents a source of contaminant discharge both to the Hackensack River, as well as the Western Area wetlands on the Koppers Seaboard Site. This discharge occurs both from contaminated stormwater runoff as well as from scouring of contaminated sediments from the swale into the

Hackensack River during a storm event. While the contaminated sediment runoff from the adjacent SCCC Site that potentially impacts this swale must be addressed under a future SCCC remediation plan, NJDEP indicated that contaminated sediment within this swale should be addressed as part of the Koppers Seaboard Site remedial action. NJDEP required that the outfall be excavated and managed within the Area of Contamination designated within the western portion of the Koppers Seaboard Site. In addition, NJDEP required that the sheet pile wall and redundant clay barrier and/or slurry wall keyed into a confining layer be installed from the current terminus of the sheetpile wall to the beginning of the swale. Impermeable clay must be used for the extension of the PDM Key in this area.

- To date, portions of the site have not been covered with PDM as per the requirements of the 1998 RAWP. In addition, testing subsequent to the implementation of the remedial action has indicated that the PDM is more permeable than 10^{-6} in some areas. PDM installed on-site cannot contain levels of contamination that exceed NJDEP's NRDCSCC. NJDEP indicated that they may require re-sampling in areas where the quality of the material cannot be established.
- NJDEP required that sediment remediation be conducted in accordance with the limits outlined in the May 1998 conditional approval letter. NJDEP also required post-excavation analysis for Dioxin, PCBs, pesticides and USEPA target analyte list (TAL) compounds and waste characterization.
- NJDEP required that the IRM system for removal of DNAPL be continued, and that Beazer develop an IRM system Optimization Plan that will explore appropriate modifications and/or enhancements to the system that maximizes product recovery.
- The placement of PDM will occur on approximately 3.6 acres of wetlands and waters of the state to facilitate placement of a cap over the entire site. Proposed wetland replacement requirements include both on-site and off-site mitigation. NJDEP required that Beazer further investigate various mitigation issues to ensure that an appropriate wetland remediation plan can be developed.
- Future completion of the surface cover component must be effectively coordinated with HCIA, the current property owner, since redevelopment of the site consistent with the implementation of a protective remedy is a primary goal.
- NJDEP indicates that combining the completion of the Koppers Seaboard Site with the SCCC and Diamond Shamrock sites would be "ill-advised," and could unnecessarily delay the completion of the remediation at the Koppers Seaboard Site.

In response to NJDEP's February 10, 2004 letter, Beazer provided the following specific comments and modifications that were included in the April 2004 RAWP Addendum:

- Change in the permeability of the PDM surface cover from 1×10^{-6} centimeters per second (cm/sec) to 1×10^{-5} cm/sec. The average permeability of PDM currently on-site is 5.4×10^{-5}.
- Barrier Wall – For the remaining sections of the barrier wall where a "PDM Key" has not been installed, a soil and bentonite slurry wall is proposed. This type of wall was successfully installed in the Eastern Area of the Site.
- The existing stockpile of PDM on-site will be used for the surface cover portion of the RAWP. The quality of PDM will be established once final site grades are reached.
- Beazer indicates that swale contaminants are from the SCCC Site, and a significant portion of the swale and its outfall to the Hackensack River are on SCCC property. In addition, without first addressing impacted stormwater runoff and groundwater from the SCCC Site, recontamination of the swale is likely to occur.

- The current IRM system will be evaluated to determine if operation can be improved and/or modified for better collection efficiency.
- Beazer requested clarification regarding the requirement to analyze river sediments for contaminants not associated with the Koppers Seaboard Site (dioxin, PCBs and pesticides).
- A revised schedule indicates completion of remedial activities by May 26, 2006.

In December 2005, Beazer submitted a RAWP Addendum (RAWPA) to address outstanding RAWP remediation components for the site, and plans for the design, permitting and construction necessary to complete them. The RAWPA included the following additional proposed remedial activities for the site:

- Requested that the amount of PDM be substantially reduced below the original 4.5 million cubic yards to approximately 1.5 million cubic yards (material remaining on-site plus 400,000 cubic yards to be brought on-site).

- Consistent with the previous RAWPA, proposed reducing the permeability of PDM to 1 x 10^{-5} cm/sec. To support the request for increased permeability, an extension of the IRM through the installation of additional recovery wells and a reactive treatment barrier was proposed.

The project schedule included in the RAWPA indicates that remedial activities on the site will be completed by March 19, 2008.

Based on their July 11, 2006 letter, the NJDEP conditionally approved the December 2005 RAWPA, but requested additional information and clarification regarding the proposed surface cover for the site. The NJDEP also required that Beazer obtain concurrence from the USEPA to allow contaminated materials to be placed under a cap in accordance with the National Contingency Plan (55 FR 8758-8760, March 8, 1998). In addition, the NJDEP required that Beazer provide a permanent remedy for groundwater contaminated with dissolved organic compounds, submit a soil reuse plan, and characterize Hackensack River sediments prior to proposed excavation activities.

On November 21, 2006, the NJDEP issued a Notice of Deficiency (NOD) pertaining to the RAWPA pursuant to NJDEP's recently promulgated "Grace Period" rules. The NOD provided specific comments and requirements to be addressed in the final RAWPA. On March 1, 2007, Beazer East submitted a Final RAWPA to address the November 21, 2006 NOD. The final RAWPA included the following information regarding proposed remedial activities for the site:

- Proposal for the consolidation and placement of contaminated materials under a cap
- Plans for soil erosion, sediment control and air monitoring during remediation activities
- Plans for final surface cover
- Plans for the use of the eastern part of the site by Great Lakes Dredge and Dock Company (GLDD) to process dredge spoils
- A revised treatment system ("funnel and gate" remedy) for dissolved contaminants in the groundwater to serve as a permanent remedy for groundwater contamination
- Plans for the characterization of sediments prior to and following removal of contaminated sediments from the Hackensack River
- Plans for the installation of additional DNAPL recovery wells on the eastern portion of the site

The final RAWPA was approved by the NJDEP on August 10, 2007. According to the final RAWPA, remedial activities at the site are scheduled for completion in February 2009.

On December 20, 2007, a combined application for a Waterfront Development Permit, Flood Hazard Permit and Freshwater General Permit No. 4 was submitted by Key Environmental, Inc. (for Beazer East) to NJDEP to obtain permits for remediation of the Koppers Coke Site in accordance with the NJDEP-approved RAWPA.

A Division of Land Use Regulation combined permit application for the remediation was originally submitted in November 2007. Revisions to the combined permit application were necessitated by the publication of the Flood Hazard Control Act Rules N.J.A.C. 7:13, revisions of the Land Use Regulation Program Form and the requirement to complete a Flood Hazard Area Individual Permit Checklist.

Remedial elements that are the subject of this application include: sediment removal from the Hackensack River; excavation of dike materials and sediments on the upland portion of the site; consolidation of waste piles on the site and associated disturbance of wetlands; installation of a slurry wall to contain contaminants; regrading the existing stockpile of processed dredged material and construction of four stormwater management basins with three of them having outlets to the Hackensack River; installation of four DNAPL wells and an in-situ treatment system for groundwater collection and conveyance.

During 2004, the HCIA entered into a lease agreement with the Great Lakes Dock and Dredge Company (GLDD) for a 20 acre area located in the easterly section of the Site adjacent to the Hackensack River. Under the terms of the lease, GLDD would install a PDM processing facility to process dredged materials from GLDD's New York Harbor contracts. The lease has a term of three years with two, one year options at the discretion of the HCIA. The lease provides that GLDD will supply, place and compact up to 400,000 cubic yards of PDM to HCIA's use on the site. GLDD's on-site processing facility is anticipated to be in operation during the first quarter of 2006.

According to the December 2005 RAWP Addendum, the following permits and approvals would be required to implement the remaining remedial activities at the site:

- Stream Encroachment Permit (SEP) – issued by NJDEP Land Use Regulatory Program (LURP) for regulated activities above the mean high water line within the flood hazard areas. The permit would be required for waste pile stabilization and consolidation, soil/bentonite slurry wall construction, and PDM surface cover.
- Waterfront Development Permit (WDP) – issued by NJDEP LURP for regulated activities conducted below the mean high water line. This permit would be required for Hackensack River sediment removal. A shallow mitigation and wetland mitigation plan (for jurisdictional wetlands disturbed during sediment remediation) will be required as a condition of this permit.
- Acceptable Use Determination (AUD) – issued by NJDEP LURP for processing and disposal or reuse of dredge sediments. An AUD would be necessary for importing/processing and placement of new PDM on-site.
- Department of Army Permit – USACE individual or nationwide permit for activities associated with work below the mean high water line and for regulated wetland disturbance and associated mitigation. A Department of the Army Permit No. 1998-02120 was issued to the HCIA. The HCIA recently requested an extension to the permit which was to expire in November 2005. The permit authorized the placement of approximately 1.1 million cubic yards of processed dredged material into approximately 3.6 acres of wetlands and waters of the United States to facilitate placement of a cap

over the site, for excavation of approximately 35,000 to 40,000 cubic yards of contaminated sediment for disturbance of approximately 1.87 acres of tidal emergent wetlands. The permit requires areas disturbed by sediment and tidal wetland excavation to be restored by sediment and tidal wetland excavation to be restored in accordance with a Wetland Mitigation Plan to be submitted to the ACOE for approval.

- NJPDES Permit to Discharge to Groundwater – The operation of the IRM system is authorized by a NJPDES-DGW Permit No. 0077577. The Permit is required for discharge of treated groundwater recovered during collection of DNAPL. Modification of the permit will be required to address additional groundwater extraction and discharge associated with the expansion of the existing IRM system.
- NJPDES Permit to Discharge Stormwater – NJDEP Stormwater requirements associated with the construction of the surface cover.
- Certification of Soil and Erosion Sedimentation Control Plan (SCD) – issued by the local Soil Conservation District for any land disturbance greater than 5,000 square feet in area.
- Zoning Certificate (NJMC) – local zoning regulates construction activities within the New Jersey Meadowlands Commission district.
- Classification Exception Area/Well Restriction Area (CEA/WRA) – required by NJDEP at the site due to groundwater contamination that exceeds applicable groundwater quality standards.
- Deed Restriction – NJDEP-required property title restriction where the owner chooses to implement institutional and engineering controls for areas of a site exceeding NJDEP unrestricted use soil cleanup standards. A deed restriction will be required on-site for both existing on-site soils and the PDM surface cover.
- Town of Kearny Construction Permit – required for construction activities.

1.2 STANDARD CHLORINE CHEMICAL COMPANY, INC.

1.2.1 Background Information

1.2.1.1 Site Description

The Standard Chlorine Chemical Company, Inc. (SCCC) is located adjacent to the Koppers Seaboard Site. The site is approximately 25 acres in area. The White Tar Company refined crude naphthalene at the site until 1942. In 1942, Koppers Company acquired the site and continued similar manufacturing activities at the property, producing naphthalene products and creosote disinfectants. In addition, Koppers also stored and packaged paradichlorobenzene moth preventatives and deodorizers at the site.

SCCC operated at the site from 1963 to 1993. Operations included the manufacture of moth crystals and flakes from dichlorobenzene. In addition, Chloroben Chemical Corporation, a subsidiary of SCCC, manufactured various drain cleaner products commercially known as "chloroben" at the site. Chemicals utilized in the production of chloroben included orthodichlorobenzene, hydrochloric acid, sulfuric acid and methyl benzoate.

Between 1983 and 1987, the NJDEP identified several areas of concern at the site. Waste residue from various manufacturing operations discharged to the on-site lagoons, which consisted of an approximately 33,000-square-foot excavated area. The on-site lagoons are located on the easternmost portion of the site, which was the former production area adjacent to the Hackensack River. The lagoon area is unpaved and isolated from the rest of the site by a chain link fence. Diamond Shamrock operated a chromium processing facility on the neighboring property to the north, and two to ten feet of chromium ore processing residue underlies approximately 85 % of the SCCC Site. As part of a chromium IRM, the

remainder of the site is either paved or capped with geotextile overlain by a gravel layer. Other areas of concern on the site include soil contaminated with dioxins, volatile organic compounds, and semi-volatile organic compounds, contaminated concrete in the vicinity of the former transformer area, groundwater contamination with DNAPL in the shallow historical fill aquifer and deep sand aquifer, contaminated drainage ditch surface water and sediments and ongoing contamination of the Hackensack River surface water and sediments.

In 1989, an ACO was entered into between NJDEP and SCCC. The ACO required SCCC to plan and implement several interim remedial measures, a remedial investigation of the site and an evaluation and selection of an appropriate remedial action. In addition, the ACO required SCCC to implement any remedial actions determined to be necessary to protect human health and the environment. On April 17, 1990, a separate ACO was executed by NJDEP with Occidental Chemical (responsible party for the adjacent Diamond Shamrock Site) to address the chrome ore processing waste that had been utilized as fill on the SCCC Site.

SCCC reportedly failed to comply with the ACO, and the site was instead recommended for listing on the U.S. Environmental Protection Agency's (EPA) National Priority List (NPL) on April 10, 2003. In a letter dated October 17, 2003 NJDEP requested that EPA defer listing the SCCC Site on the NPL, pending remediation under New Jersey State Law.

Investigations conducted at the SCCC are summarized in Table 2 below.

TABLE 2
SUMMARY OF INVESTIGATIONS – STANDARD CHLORINE CHEMICAL COMPANY, INC.

Date	Investigation	Completed by	Report
1983-1984	Hydrogeologic Investigation	SCCC	*Hydrogeoloic Investigation, Standard Chlorine Chemical Company, Kearny, New Jersey* (Roy F. Weston, Inc., January 1984)
1985	Phase II Dioxin Investigation	NJDEP	*Phase II Dioxin Investigation, Final Report* (E.C. Jordan, Inc. 1985)
1985-1988	Stage 1, 2 and 3 Dioxin Investigations	SCCC	*Sampling and Analysis of Potentially Dioxin-Contaminated Materials in Waste Lagoons, Stage I Analysis Report (Roy F. Weston, Inc., 1987); and Sampling and Analysis of Potentially Dioxin-Contaminated Materials in Waste Lagoons, Stage II and III* (Roy F. Weston, Inc., 1988)
1991	IRM Work Plan	Maxus Energy Corporation (Maxus)	*Interim Remedial Measures Work Plan* (French and Parrello, 1991)
1990-1993	Remedial Investigation	SCCC	*Draft Remedial Investigation for the Standard Chlorine Chemical Company, Inc. and the Standard Naphthalene Products Inc. Properties, Kearny, New Jersey (Roy F. Weston, Inc., 1993)*
1996-1997	Focused Remedial Investigation	SCCC	*Focused Remedial Investigation (FRI) Report, Standard Chlorine Chemical Company, Inc. and Standard Naphthalene Products, Inc. Site, Kearny, New Jersey* (Environmental Resources Management, Inc., 1997)
1997-1999	Supplemental Remedial Investigation	SCCC	*Supplemental Remedial Investigation Report, Standard Chlorine Chemical Company, Kearny, New Jersey* (Key Environmental, Inc., 1999)
2000	Soil/Sediment Sampling and Analysis	SCCC	*Enviro-Sciences, Inc., October 23, 2000 Letter to Maria Franco-Spera* (NJDEP)

Date	Investigation	Completed by	Report
2000	Baseline Ecological Evaluation	SCCC	*Remedial Action Workplan, Standard Chlorine Chemical Company, Inc., Kearny, New Jersey* (Enviro-Sciences, Inc. 2000)
2000	Characterization of Containerized Materials	SCCC	*Enviro-Sciences, Inc., October 23, 2000 Letter to Maria Franco-Spera* (NJDEP)
2001	Remedial Investigation	Chemical Land Holdings, Inc.	*Remedial Investigation Report, Site 113 (Diamond Site),* (Brown and Caldwell, April 2001)
2002	Surface Water and Sediment Sampling	EPA	*Sampling Report for the Standard Chlorine Site* (EPA, 2002)

1.2.1.2 Topography and Site Drainage

The ground surface at the SCCC Site is relatively flat, primarily ranging in elevation from 3 to 8 feet above mean sea level (ft-msl). The highest ground surface elevation, approximately 10 ft-msl, exists in the southeast corner of the site. The eastern and western portions of the site generally slope to a central drainage swale. This swale directs surface water to the south and then to the east along the southern property boundary, for discharge to the Hackensack River via the south outfall. In addition to on-site drainage, this ditch receives some sheet flow run-off from off-site commercial and industrial properties, to west and south of the site. The south outfall is equipped with a tide gate to prevent backflow from the Hackensack River during high tide.

A 48-inch diameter underground concrete stormwater pipe is present along the northern property boundary of the site. This stormwater pipe runs west-to-east and receives run-off via drop inlets from the Diamond Shamrock property to the north, as well as drainage from off-site commercial, and industrial properties to the west. The stormwater pipe discharges to the Hackensack River through an outfall which is located at the northeast corner of the site. This outfall is also equipped with a tide gate to prevent backflow from the river during high tide.

The Hackensack River is adjacent to the entire eastern property boundary. The Hackensack River is tidally influenced and flows south to Newark Bay. The overall direction of flow in the Hackensack River adjacent to the site is from north to south. The Hackensack River in the vicinity of the site receives some sheet flow run-off from the SCCC property.

1.2.1.3 Geology/Hydrogeology

Prior to industrial development, the area of the peninsula that includes the SCCC Site consisted of marshlands that bordered the Hackensack River. Fill materials generally consisting of chromium ore processing residue (COPR) and silty sand were placed in the marshlands to create property for industrial development. As indicated in Section 1.2.1.1, COPR was placed as fill on approximately 85% of the SCCC Site, to depths ranging from two to ten feet below the present grade. The original marsh surface, now located beneath the fill materials, consists of silt, humus and peat. This layer is regionally referred to as the Meadow Mat, and is typically two to five feet thick on the SCCC Site. The upper surface of the Meadow Mat is undulating rather than planar.

A sand layer, which is generally less than 10 feet thick, is present beneath the Meadow Mat. A varved silt and clay unit is present beneath the sand layer. This unit is reportedly continuous beneath the site. The thickness of this unit is estimated at greater than 40 feet.

The water table at the SCCC Site occurs in the fill material placed above the Meadow Mat. The Meadow Mat acts as a basal semi-confining unit that limits, but does not completely eliminate, the hydraulic connection between the shallow fill materials and the underlying sand unit. Potentiometric data acquired

from nested well locations during low tide indicates the existence of a downward vertical gradient between the fill material and the sand layer that underlies the Meadow Mat. Groundwater within the fill material exists under unconfined conditions. Previous studies have indicated that the groundwater within the fill material is not tidally influenced.

A potentiometric mound exists in the fill material in the vicinity of the lagoons. Groundwater flows radially away from this potentiometric high in the lagoon area. Beyond the influence of this mound, groundwater flow in the fill material is primarily to the south, approximately parallel to the direction of flow in the Hackensack River. Groundwater in the fill unit in the eastern portion of the SCCC Site discharges to the Hackensack River and the southern drainage ditch. It is also possible that shallow groundwater flow is intercepted by the stormwater sewer and associated backfill material along the northern property boundary.

Groundwater in the sand unit beneath the Meadow Mat exists under semi-confined conditions. The underlying varved clay reportedly acts as a barrier to the downward migration of groundwater from this unit. Groundwater flow in this unit is primarily to the south-southeast. A slight potentiometric mound has been reported in the area to the northwest of the lagoons. Groundwater flow toward the east is observed in the northeast portion of the site in the immediate vicinity of this mound.

Groundwater within the sand unit is tidally influenced to a limited extent. Fluctuations in potentiometric surface elevations that are correlated to tides in the Hackensack River have been reportedly observed in wells located immediately adjacent to the river. The tidal influence has not been observed to create significant changes in groundwater flow directions between high and low tide.

1.2.2 Areas of Concern

Specific AOCs identified on the SCCC Site include the following:

- AOC 1 – Lagoon Sludges
- AOC 2 – Western Area Soil
- AOC 3 – Eastern Area Soil
- AOC 4 – Shallow Fill Unit Groundwater
- AOC 5 – Deeper Sand Unit Groundwater
- AOC 6 – Bedrock Groundwater
- AOC 7 – DNAPL
- AOC 8 – Drainage Ditch Surface Water
- AOC 9 – Hackensack River Surface Water
- AOC 10 – Drainage Ditch Sediments
- AOC 11 – Hackensack River Sediments
- AOC 12 – Transformer Area

A summary of each of the AOCs is included in Sections 1.2.2.1 through 1.2.2.12. Historical information regarding each AOC was obtained from the *October 2004 Pre-Design Workplan for the Standard Chlorine Chemical Company Site and Former Diamond Site (Key Environmental Incorporated).*

1.2.2.1 Lagoon Sludges

The sludge lagoons occupy a surface area of approximately 33,000 square feet, and have an average depth of six feet. The lagoons contain an estimated 7,300 cubic yards of material. Based on previous investigation activities conducted for this AOC, lagoon sludges contain naphthalene, volatile organic compounds (benzene, ethylbenzene, and toluene) and semi-volatile organic compounds (polynuclear

aromatic hydrocarbons and phenols). Hexavalent chromium has not been detected in the lagoon sludge. Results of dioxin analyses indicated the presence of 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (TCDD) in 46 of the 82 samples analyzed.

1.2.2.2 Western Area Soil

Since 1984, several soil investigations have been conducted in this area of the site. The area is located west of the railroad right-of-way on the site. The results of these historic investigation activities indicate the presence of chlorobenzene, 1, 2 ,4-trichlorobenzene, 1, 2-dichlorobenzene, 1, 3-dichlorobenzene, 1, 4-dichlorobenzene, and naphthalene at concentrations greater than the NRDCSCC. In addition, surface soils on the western portion of the SCCC Site were also analyzed for hexavalent chromium during an investigation conducted by Maxus as a responsible party for the Diamond Shamrock Site. Results of these analyses indicate the presence of hexavalent chromium at concentrations greater than the NRDCSCC at several locations.

1.2.2.3 Eastern Area Soil

Since 1984, several soil investigations have also been conducted in this area of the site. The area is located east of the railroad right-of-way on the site and includes soils associated with lagoons. Results of historic investigation activities indicate the presence of chlorobenzene, 1, 2, 4-trichlorobenzene, 1, 2-dichlorobenzene, 1, 3-dichlorobenzene, 1, 4-dichlorobenzene, and naphthalene, at concentrations greater than the NRDCSCC. The investigation of surface soils in the eastern potion of the site indicates the presence of hexavalent chromium at concentrations greater than the NRDCSCC in certain areas located to the north and south of the lagoons. The presence of dioxin in soil is limited to surface soil in the vicinity of a former dichlorobenzene storage tank.

1.2.2.4 Shallow Fill Unit Groundwater

Two shallow fill unit groundwater investigations (*Weston, 1984 and 1993)* have been conducted on the SCCC Site. As a result of both investigations, ten shallow fill unit monitoring wells were installed on the site. Analytical results from groundwater sampling indicate concentrations of volatile organic compounds (VOCs), chlorobenzene and dichlorobenzene isomers, semi-volatile organic compounds (SVOCs), naphthalene and 1, 2, 4-trichlorobenzene in groundwater in the shallow fill unit above GWQS for a Class IIA aquifer. Concentrations of hexavalent chromium in shallow groundwater are elevated, with concentrations up to approximately 100 milligrams per liter (mg/L). Dioxin was not detected in the shallow fill unit groundwater. DNAPL identified in this shallow unit is described in Section 1.2.2.7.

1.2.2.5 Deeper Sand Unit Groundwater

Three deeper sand unit groundwater investigations *(Weston 1984, Weston 1993 and Key 1999)* have been conducted on the SCCC Site. A total of twenty-two deeper sand unit monitoring wells have been installed on-site. Analytical results from groundwater sampling activities indicate that chlorobenzene, dichlorobenzene isomers, and naphthalene have been detected in the deep sand unit groundwater at concentrations that exceed the GWQS for a Class IIA aquifer. Chlorinated VOCs have also been detected in the deeper sand unit along the northern property boundary. Concentrations of total chromium in the deeper sand unit groundwater also exceed the Class IIA GWQS. No hexavalent chromium has been detected in the deeper sand unit.

1.2.2.6 Bedrock Groundwater

No bedrock monitoring wells currently exist on-site. Groundwater samples were collected for analysis in 1998 prior to sealing a production well (350 feet deep). PAHs, lead and chromium were identified in the groundwater sample at concentrations slightly greater than the Class IIA GWQS.

1.2.2.7 Dense Non-Aqueous Phase Liquid (DNAPL)

The presence and extent of DNAPL at the site has been evaluated during several investigations at the SCCC Site. Investigation activities have included visual inspection of DNAPL in monitoring wells and delineation using laser-induced fluorescence (LIF) technology, and confirmatory soil borings. The presence of DNAPL in the shallow fill unit above the Meadow Mat is reportedly limited to the area immediately surrounding the lagoons and the area adjacent to Building 4. Significant lateral migration of DNAPL in the shallow fill unit has not been identified, based on historic information.

DNAPL is reportedly more widely distributed in the deeper sand unit, and is present on top of the varved clay. DNAPL is present from west of the lagoon area to the vicinity of the former railroad right-of-way. Also, DNAPL is present in the deeper sand unit at the northern property boundary, and in the area between the lagoons and river. DNAPL is also inferred to be present in the area south of the lagoons and along the southwest property boundary, in the vicinity of Buildings 2 and 4.

1.2.2.8 Drainage Ditch Surface Water

In October 2002, EPA collected surface water samples for analysis from 17 locations within the Southern Drainage ditch, swales that discharge to the ditch, and a "wetland" area on the adjacent Koppers Seaboard Site that is hydraulically downgradient of the ditch. Results of these analyses indicate the presence of chromium at a concentration greater than the SWQC in one sample collected immediately adjacent to the stone-covered area where Maxus constructed an IRM for COPR. Chromium concentrations in samples collected downstream of this location are less than the SWQC. 1, 2, 4-trichlorobenzene was detected above its SWQC in a sample furthest from the river, but at a concentration less than their SWQC.

1.2.2.9 Hackensack River Surface Water

EPA collected four samples of water discharging to the Hackensack River during its 2002 investigation of the SCCC Site. Three locations adjacent to the SCCC Site were sampled. A fourth sample location was north of the SCCC Site, and was designated by EPA as a "background" location. One sample of surface water seepage collected along the bank of the Hackensack River contained chromium at a concentration of 3,000 ug/L, which is slightly less than NJDEP Class SE2 SWQC of 3,230 ug/L. Hexavalent chromium was not detected at the detection limit of 10 ug/L. Chlorinated aromatic hydrocarbons were detected in these samples, but at concentrations less than their respective SE2 SWQC.

1.2.2.10 Drainage Ditch Sediments

EPA collected sediment samples at the same 17 locations where water samples were collected within the drainage ditch network and the hydraulically connected wetland on the Koppers Seaboard Site. In the October 2004 Pre-Design Workplan, sediment concentrations were compared to NJDEP Marine/Estuarine Screening Guidelines, Effects Range-Median (ER-M) criterion, which are used for screening purposes, but are not enforceable standards.

Chromium concentrations exceeded the ER-M in each of the 17 samples. Naphthalene concentrations greater than the ER-M were reported in nine of the 17 samples. With the exception of one sediment sample, dioxin concentrations in sediment samples collected at the SCCC Site were consistent with, and in many instances less than, the dioxin concentration measured at the background location. The dioxin investigation completed by NJDEP identified only two areas on the SCCC Site where dioxin was present (lagoon sludges and the former distillation building area). Migration of dioxin-impacted media from these areas to drainage ditches is reported as unlikely, based on the distance from the impacted areas to the drainage ditch; the low mobility of dioxin in the groundwater; and the absence of dioxin in surface soil samples collected between the drainage ditches and the potential dioxin source areas.

1.2.2.11 Hackensack River Sediments

The near-shore sediments were characterized in 2000 (Enviro-Sciences, Inc.) and 2002 (EPA). During both investigations, a total of twelve sediment samples were collected from the Hackensack River adjacent to the SCCC Site. An additional sample collected by EPA was from a "background location". EPA did not analyze their samples for hexavalent chromium. The EPA samples were split with the owner of the Diamond Shamrock Site, Tierra Solutions, and were analyzed for hexavalent chromium. Results of both investigations indicate that chromium concentrations in the near-shore Hackensack River surficial sediments exceed the ER-M criterion at eleven of the twelve locations. Hexavalent chromium was not detected in the split samples analyzed by Tierra Solutions. Naphthalene concentrations exceed the ER-M criterion in eight of the 12 samples. Dioxin was detected in the three surficial sediment samples collected by EPA.

1.2.2.12 Transformer Area

During a previous RI, a sample of "sediment" was collected from the surface of a concrete pad in a former transformer area. This sample was analyzed for PCBs. A concrete chip sample and samples of soils surrounding the area were also collected for laboratory analysis during a subsequent investigation. These samples were also analyzed for PCBs. The results of the concrete chip sample indicated concentrations of PCBs greater than the NRDCSCC. PCBs were not detected in the surrounding surface soil samples.

1.2.2.13 Other Areas of Concern

Other potential AOCs that will require investigation and remediation include septic tanks, asbestos-containing materials within existing structures, and other potential AOCs within and around existing structures. In addition, approximately 600 drums of dioxin-contaminated asbestos from previous demolition activities are currently stored in containers on-site.

1.2.3 Proposed Investigation and Remedial Activities

A Proposed Remedial Action Plan (PRAP) and Focused Remedial Investigation Report (FRI) was submitted for the SCCC site in 1997. In this report, the proposed remedial alternative for the easternmost portion of the site, adjacent to the Hackensack River (lagoon area), consisted of two major components: capping and containment of the contaminated soil and groundwater via a barrier wall; and passive DNAPL recovery. NJDEP, in a letter dated June 3, 1997, conditionally approved the capping and containment portion of the proposed remedy. Passive DNAPL recovery was not approved, given the extent, amount and off-site migration of this material.

In a letter dated January 12, 2001, NJDEP outlined the following minimum requirements for remedial action at the site:

- A hydraulic barrier around the perimeter of the site, capable of containing any additional migration of DNAPL and dissolved groundwater contamination to the Hackensack River and neighboring properties
- Source control, including active DNAPL recovery
- Hydraulic control of the dissolved plume within the containment structure
- Remediation of the on-site lagoons
- Elimination of direct contact with contaminated soils

In a letter dated January 25, 2001, NJDEP requested that EPA conduct a removal action at the SCCC Site associated with the approximately 600 drums of dioxin-contaminated asbestos stored in containers on-site. To date, these materials have not been removed from the SCCC site.

A RAWP Addendum for the SCCC site was submitted to NJDEP in November 2000, and a RAWP Addendum was submitted in May 2001. The site was recommended by the Governor of New Jersey for inclusion on the NPL on April 10, 2003, and proposed for listing on the NPL by EPA on April 30, 2003.

In a letter dated October 17, 2003, NJDEP requested that EPA defer listing the SCCC Site on the NPL, pending remediation of the Site under New Jersey State law. NJDEP's letter indicated that the responsible parties have committed to remediate the site in accordance with the ACOs and the Technical Requirements for Site Remediation (N.J.A.C. 7:26E), and have provided a remediation funding source in an amount equal to the projected cost of the remediation. Based on NJDEP file review information, it appears that approximately $7.7 million in financial assurances were proposed to remediate the SCCC site, using a combined three-site remedial approach (SCCC, Diamond Shamrock, and Koppers Seaboard Site). Financial assurances are also reportedly in place through Diamond Shamrock's current owner, with regard to chromium contamination on the SCCC site.

Based on a March 2004 Interim Response Action Workplan (IRAW) and the October 2004 Pre-Design Investigation Work Plan prepared for both the SCCC and Diamond Shamrock sites, the proposed remedial action for the SCCC site includes addressing impacted soil through capping and issuance of a Deed Notice. Additional delineation activities and a DNAPL product recovery system are proposed to address product identified in both the shallow and deep aquifers. In-situ solidification of lagoon contents has been proposed to prevent future releases of DNAPL and elevated concentrations of dissolved constituents. A barrier wall system has been proposed to eliminate the migration of contaminated groundwater in the shallow aquifer to the Hackensack River. Other proposed activities include the redesign and replacement of the piping and drainage ditches across the sites, removal of surficial shore sediments (within 50 feet of the shore and within three feet below the top of the sediment in the Hackensack River), and demolition of remaining buildings. The IRAW also proposes reuse of building demolition materials on-site as surface cover, off-site disposal of previously containerized materials to the extent practicable, and closure of septic tanks. Previously containerized materials that cannot be disposed off-site would be consolidated on-site beneath the surface cover, or solidified in conjunction with the lagoon contents. Hackensack River sediments would be consolidated, dewatered, solidified and placed on-site beneath a surface cover. Surface cover materials could include PDM.

A May 2007 IRAW was submitted in response to a NOD issued by NJDEP with regard to a June 2006 IRAW developed by the Peninsula Restoration Group (SCCC, Tierra Solutions and Beazer East, Inc.) to consolidate interim remedial actions at both the SCCC and Diamond Shamrock sites into one project. The components of this plan, which have not been approved by NJDEP, include: 1) installation of a hydraulic barrier along the river and around the perimeter of the site to prevent potential migration of DNAPL and impacted groundwater to the river; 2) construction and operation of a groundwater recovery and treatment system and DNAPL recovery system; 3) lagoon dewatering and backfilling as an interim remedial measure; 4) removal of river sediments within 50 feet of shore to a depth of three feet adjacent to the two sites; 5) maintain existing interim surface covers and implementation of additional interim surface covers and associated stormwater management controls; 6) disposal or consolidation on-site of previously containerized materials; 7) removal and off-site disposal of a concrete pad in a former transformer area; 8) management (disposal or on-site consolidation) of soft soils from the drainage ditch along the southern SCCC boundary to accommodate storm system upgrade and slurry wall construction; 9) maintenance of existing IRM surface covers; and 10) completion of other IRAW activities, including septic tank closure, removal of obstructions (e.g., concrete above grade saddles), removal of vault contents, and protection of utility lines and monitoring wells. Based on information contained in the

IRAW and other SCCC reports, groundwater contamination from the SCCC may impact the western portion Koppers Coke site. Further investigation through the installation of monitoring wells on the western portion of the Koppers Coke site has been proposed.

A December 2005 Hackensack River Study Area Remedial Investigation Work Plan was prepared by the Peninsula Restoration Group to determine the preliminary nature and extent of constituents in the Hackensack River sediments and to conduct a screening level ecological risk assessment. This work plan was approved by the NJDEP on June 20, 2006. Sampling activities were reportedly completed in November 2006. To date, the Remedial Investigation Report has not been completed.

1.3 DIAMOND SHAMROCK

1.3.1 Background Information

1.3.1.1 Site Description

The Diamond Shamrock property is located just north of the SCCC Site. Since 1916, the property was used for the production of sodium bichromate and potassium dichromate, primarily used for the preparation of leather tanning chemicals (produced under the trade name "Tanolin"). Production at the site continued until 1976, and the majority of the buildings on the property were demolished in 1978. The site is covered with 8 to 10 feet of fill comprised of chromium laden slag and silty sand.

From 1952 through 1955, a by-product of the chromic acid manufacturing process was sodium bisulfate. The majority of this material was sold to tanneries; however, some was used in the Tanolin process. The remainder, perhaps up to 100 tons per year, may have been placed on-site along with the COPR. Other byproducts of the manufacture of sodium bichromate were sodium sulfate and alumina hydrate (alum). Prior to the mid- or late 1960s, the alum was sold for beneficial reuse. However, from the late 1960's to 1971, when the bichromate process ceased, it was accumulated on the plant property. In 1973-1974, treatment of alum on the site was conducted by applying a fixation process that used a sodium silicate solution, Portland cement, and a pickle liquor reducing agent. The treated material was graded across the site.

Prior investigations on the Diamond Shamrock site included the following:

- 1974 Subsurface Soil Investigation (Wehran Engineering Corporation) – Determine subsurface soil types and soil conditions in the area adjacent to the southern boundary of the site and Dead Horse Creek for the installation of a 48-inch storm sewer. Twelve test pits were excavated to an average depth of 12 feet.
- 1981 Hydrogeological Investigation (Ground/Water Technology, Inc.) – Nine soil borings that were converted into dual-level groundwater sampling points.
- 1982 Supplemental Hydrogeological Investigation (Geoengineering, Inc.) – Four additional soil borings and monitoring wells in the southwestern portion of the site.
- 1985 Phase II Dioxin Site Investigation (E.C. Jordan Co.) – Collection of six surficial soil samples at the request of NJDEP to be analyzed for 2, 3, 7, 8-TCDD. Samples were found to be non-detect for the compound and no further investigation was recommended.
- April 2001 Remedial Investigation Report (Brown and Caldwell) – Summarized the results of remedial investigation activities initiated on the site since 1992 in accordance with the April 17, 1990 ACO.

1.3.1.2 Topography and Site Drainage

The ground surface on the Diamond Shamrock Site slopes from a high elevation of about 13 ft-msl at the northwest corner to approximately 6 ft-msl along the former location of Dead Horse Creek. The remainder of the site, southeast of that creek, is relatively flat, ranging from approximately 4 to 6 ft-msl. The major drainage feature for the site is the Hackensack River, which forms its eastern boundary. At this location, the Hackensack River is a saline tidal estuary (classified as SE2 by NJDEP), with a normal tide range from 5 to 6 feet.

Prior to 1974, Dead Horse Creek traversed the site from southwest to northeast and discharged into the Hackensack River. In 1974, an alternate drainage conduit, in the form of a 48-inch concrete storm drain, was installed parallel to the southern property line to convey drainage formerly carried by the creek across the site to the Hackensack River. Subsequently, the tide gate at the river end of Dead Horse Creek was sealed with concrete. The culvert from the mouth of the creek to the tide gate was filled with a mixture of clay and concrete. The remainder of Dead Horse Creek, from the tide gate back to the railroad tracks, and up to, and including, the 30-inch culvert under Belleville Turnpike, was filled with clay. The first 50 to 75 linear feet nearest the river was filled with clay.

1.3.1.3 Geology/Hydrogeology

Geology on the Diamond Shamrock Site is similar to that on the SCCC site. Soils indigenous to this area consist of an approximately five-foot-thick Meadow Mat layer underlain by a five- to eight-foot-thick deposit of fine sand and gravel. Beneath these soils is a relatively thick deposit of varved clay and silt that overlies bedrock of the Brunswick Formation (Newark Group). The depth to bedrock is approximately 80 to 100 feet.

During the 1900s, as part of the development of the Hackensack River Basin, a layer of fill material was placed on top of the Meadow Mat. This fill layer is reported to range in thickness from 10 to 15 feet.

Groundwater occurs within both the fill material above the Meadow Mat (upper water-bearing zone), and in the fine sand below the Meadow Mat (lower water-bearing zone). The depth to groundwater on the Diamond Shamrock Site ranges from one to three feet below grade. Groundwater flow in both zones is generally towards the Hackensack River or its tidal backwaters. In some cases, local underground utilities, such as storm sewers, may also serve as groundwater discharge points.

1.3.2 Areas of Concern

In accordance with a 1992 IRM Work Plan, it was determined that certain areas of the site required IRMs to prevent the discharge of chromium and its compounds by way of potential human exposure, and allow present uses of the site to continue to the greatest extent possible. Along the eastern section of the property, parallel to Belleville Turnpike, an IRM was installed that consisted of a geotextile fabric/geomembrane liner composite underlying four inches of dense-graded aggregate (DGA), which was placed over existing soils. This same design was used in two central areas of the site and along the Amtrak embankment in the northeast corner of the site. Along the bank of the Hackensack River, the IRM consists of geotextile fabric/geomembrane liner composite overlain by rip-rap. The majority of the eastern portion of the site is covered by four inches of bituminous asphalt over four inches of DGA underlain by geotextile fabric over existing soils. Along the entrance roadway and within a portion of the site around the former production buildings, the IRM consists of two inches of asphalt over existing pavement.

Pursuant to the 1990 ACO, a remedial investigation (RI) was initiated in 1992 to address the extent of chromium contamination in the soils, groundwater, air, surface water, and sediment, and to assess the potential impacts on human health and the environment. As a result of the investigation, approximately

17 additional chemicals of concern were identified on the property exceeding alternate remediation standards. Results of the RI were presented in a RI Report (RIR) dated April 2001. AOCs identified on the property as a result of the RI include contaminated soils, shallow fill unit and deeper sand unit groundwater, Hackensack River surface water, and Hackensack River sediments.

1.3.2.1 Surface and Subsurface Soils

Surface soils from fifty-two locations were sampled at the site. Surface soils samples were analyzed for chromium, hexavalent chromium, and TAL metals. In addition, a total of 37 soil borings were completed at the site. A total of 125 soil samples were collected from these borings for analysis of chromium, hexavalent chromium and TAL metals. In addition, 37 samples (one from each boring) were analyzed for VOCs, SVOCs, TPH, pesticides, and PCBs.

Total chromium for the RI soil samples ranged from 7.2 mg/kg to 54,000 mg/kg. The hexavalent chromium results in soil samples ranged from <0.41 mg/kg to 19,000 mg/kg. Collectively, the data indicates that the majority of the site contains elevated levels of total chromium and hexavalent chromium above the Meadow Mat as a result of the COPR filling that occurred at the site. None of the samples collected below the Meadow Mat were reported to contain hexavalent chromium above NJDEP's most stringent soil cleanup criteria of 240 mg/kg.

NJDEP designated six "metals of interest" as potential indicators of COPR-enriched soil: arsenic, antimony, beryllium, cadmium, nickel and vanadium. Based on the results of linear regression analysis of these six metals versus chromium and hexavalent chromium, statistically significant relationships were found between antimony and hexavalent chromium, nickel and total chromium, and nickel and hexavalent chromium. Based on a comparison of soils data to published data for metals interest, concentrations of arsenic, nickel and vanadium are statistically greater than their respective concentrations in background soils in New Jersey. According to a standard ASTM leaching procedure, the six TAL metals are not water-extractable, and are, therefore, not prone to be mobilized from COPR in typical environmental settings.

Arsenic, beryllium, and lead were detected in soils samples at concentrations exceeding the most stringent soil cleanup criteria. No other TAL metals were reported above the most stringent soil cleanup criteria.

Other parameters, including VOCs, SVOCs, TPH, pesticides, and PCBs, were analyzed in selected soil samples. No exceedances of the most stringent soil cleanup criteria were noted with regard to VOCs, including BTEX. The majority of exceedances for SVOCs included individual PAH compounds such as benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and ideno(1,2,3-cd)pyrene. Elevated concentrations of TPH were identified in two borings (>5,000 mg/kg) located near former underground fuel tanks. Exceedances of the most stringent soil cleanup criteria for PCBs were noted in several of the soil samples. No pesticides were detected above the most stringent soil cleanup criteria.

1.3.2.2 Groundwater

Groundwater sampling events were conducted in 1993 and 1996. Concentrations of hexavalent chromium in groundwater above the Meadow Mat were elevated in six of the nine monitoring wells screened in the upper water-bearing zone. Analytical data for hexavalent chromium shows a high correlation between concentrations in soil and groundwater in the upper water-bearing zone, and suggests that hexavalent chromium is not present at elevated concentrations in groundwater beyond the limits of the COPR soil deposits.

Groundwater samples collected from monitoring wells screened below the Meadow Mat (filtered and non-filtered samples) did not contain hexavalent chromium above the detection limit, with one exception in 1996 and one exception in 1993.

Results of total chromium concentrations in monitoring wells screened above the Meadow Mat were similar those for hexavalent chromium in the upper water-bearing zone. Six of the nine wells reported total chromium in excess of the GWQS of 100 µg/L (changed to 70 µg/L since the 2001 RIR). A low-flow sampling method was not used during sampling activities.

In the lower water-bearing zone, exceedances of the GWQS for total chromium were identified in unfiltered samples from each of the deep wells during at least one of the groundwater sampling episodes. In addition, total chromium was identified above the GWQS in the filtered samples in all but three wells during at least one of the sampling events.

Based on further investigation, it was determined that elevated concentrations of total chromium in the lower water-bearing zone reflect predominantly the trivalent form of chromium believed to have precipitated as a metallic hydroxide and complexed with organic compounds in the Meadow Mat, resulting in low levels of soluble, slightly mobile trivalent chromium in the groundwater immediately below the Meadow Mat. This mobility appears to be limited, since the deeper samples generally contained lower concentrations of trivalent chromium.

Groundwater samples were also analyzed for VOCs. Chlorobenzene was detected in four of the 18 monitoring wells, with the highest concentration (4,200 µg/L) detected in the lower water-bearing zone adjacent to the SCCC Site and the Hackensack River. This finding is likely the result of migration of chlorobenzene in the form of a separate DNAPL. BTEX compounds were also detected in several of the deep groundwater monitoring wells adjacent to the SCCC Site. Elevated BTEX concentrations may also be attributed to former underground fuel oil tanks. Trichloroethylene and tetrachloroethylene were detected in two monitoring wells at concentrations above the GWQS.

Arsenic was detected above the GWQS in seven of the nine deep wells and three of the nine shallow wells. Less frequent exceedances of the GWQS were noted for the following compounds: beryllium (1 well), cadmium (8 wells), cyanide (1 well), lead (5 wells), nickel (4 wells), and mercury (1 well).

The majority of exceedances for other organic chemicals (VOCs and SVOCs) are reported in the deep monitoring wells and are reportedly related to the SCCC Site. A total of six pesticide compounds exceeded the GWQS with the majority of the exceedances being reported in only one or two wells primarily in the lower water-bearing zone. PCBs were detected above the GWQS in one well.

Highest groundwater elevations in the upper water-bearing zone are located in the northwestern portion of the site, probably due to the relatively higher infiltration rate (from precipitation) in this unpaved area. This situation creates a groundwater mound with flow radially from its center. In the eastern portion of the site, groundwater discharges into the Hackensack River, while in other portions of the site, groundwater reportedly discharges into storm drains and sewers.

Groundwater elevations below the Meadow Mat are uniform when compared to the upper zone. Generally, higher elevations are found in the central portion of the site, and flow outward. Groundwater head in the upper zone is generally greater than in the lower zone, indicating a downward vertical gradient.

Based on tidal studies conducted at the site, tidal fluctuations in the Hackensack River reportedly do not appreciably influence water levels in the upper water-bearing zone. A response to tidal fluctuations was

noted in three deep monitoring wells. However, the tidal studies overall indicated that the Hackensack River had little influence on the direction or rate of groundwater flow at the site.

1.3.2.3 Surface Water and Sediment

Surface water and sediment samples were collected from five transects in the Hackensack River. Except for the northern-most transect, three sediment samples were collected from each transect. Surface water samples were analyzed for TAL metals and hexavalent chromium, while sediment samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and TAL metals.

Five of 15 sampling locations reported hexavalent chromium concentrations above the method detection limit, concentrations ranging from 13.4 µg/L to 104 µg/L. Six of 15 surface water sampling locations reported total chromium above the method detection limit. The highest total chromium concentration was 63 µg/L, which are less than the SWQS for chromium for SE2 waters of 3,230 µg/L.

The maximum hexavalent chromium concentrations detected in the sediment samples was 19 mg/kg. Total chromium concentrations ranged from 39.3 to 3,660 mg/kg with no discernable concentration trends with respect to sample locations. No screening levels are available for hexavalent chromium. The sediment screening value for total chromium is 370 mg/kg.

Chlorobenzene was detected in four of the 13 sediment sample locations. Two of the samples were detected at trace levels, while the other two samples reported concentrations of 120 mg/kg and 340 mg/kg. These samples were collected slightly downstream of the site and adjacent to the SCCC site. Three sediment samples contained elevated concentrations of BTEX compounds.

1.3.2.4 Air

Air sampling activities for total chromium and hexavalent chromium were conducted in 1989 and 1990, and included three outdoor and three indoor sampling locations. The specific indoor locations occurred in Building 6, which was subsequently demolished. Overall, a total of 34 air samples for hexavalent chromium and five samples for total chromium were collected at the site. Hexavalent chromium concentrations detected in samples ranged from 0.8 to 3.5 nanograms per cubic meter (ng/m^3) in the indoor areas. The outdoor hexavalent chromium concentrations ranged from 0.4 to 0.6 ng/m^3. The highest concentration of hexavalent chromium detected (3.5 ng/m^3) is below the current OSHA Permissible Exposure Level (PEL) of 52,000 ng/m^3 (proposed new PEL of 1,000 ng/m^3 to become effective on January 18, 2006).

Total indoor chromium concentrations ranged from 17 ng/m^3 to 300 ng/m^3. One outdoor total chromium sample was collected and analyzed. The outdoor total Cr concentration was 14 ng/m^3. The indoor and outdoor total chromium concentrations are below the OSHA PEL for total chromium of 500,000 ng/m^3.

1.3.3 Proposed Investigation and Remedial Activities

The April 2001 RIR indicated that two potentially exposed populations identified were industrial workers and construction workers. The possible exposure pathways included dermal contact, ingestion, and inhalation of both the soil and groundwater. Analytical results from field sampling activities identified 17 individual chemicals of concern that exceed site-specific alternative remediation standard values calculated for these exposure scenarios. Based on these results, it was recommended in the RIR that remediation or engineering and institutional controls be developed and implemented to protect future site workers from exposure to these chemicals of concern.

Based on a baseline ecological evaluation (BEE) included in the April 2001 RIR, it was concluded that site-specific data indicate an impact to groundwater from chromium in site soils, and that hexavalent

chromium has been detected in both surface water and sediments in the Hackensack River. Since the extent of impact to the shallow groundwater is documented to be confined to areas where COPR soils have been deposited, it was concluded that no further ecological evaluation was necessary relative to groundwater. Further ecological investigation was warranted to assess the potential impact of hexavalent chromium in the surface water and sediments of the Hackensack River.

The RIR cited a previous ecological assessment conducted in 1991 and 1992, the findings of which were reportedly accepted by NJDEP. The assessment involved a comparative study between a control site with no known COPR soil and an area with COPR deposits to determine the impacts on flora and fauna in adjacent wetlands and the Hackensack River. Findings of this report indicated: (1) surface water chromium concentrations were consistently four times lower than New Jersey and Federal surface water quality criteria; (2) the reducing conditions and high organic carbon content of the sediments precludes the formation or existence of hexavalent chromium and limits the bioavailability of chromium to indigenous living organisms in the food chain; (3) no ecologically or biologically significant effects were observed that could be attributed to COPR; (4) findings were consistent with existing knowledge and literature regarding the fate of chromium, the relatively low toxicity of chromium, and the low potential for chromium to bioaccumulate; and (5) due to the extent and proximity of the study site to the marsh/river, results are representative of "worst-case" conditions with respect to the potential for chromium to adversely affect the ecology.

Based on the findings of this assessment, the April 2001 RIR ultimately concluded that no ecological impact from the site on the adjacent Hackensack River and that no further ecological investigation was warranted. NJDEP reportedly commented on the RIR on December 23, 2005.

Proposed additional remedial investigation and remedial activities at the site were proposed in the March 2004 IRAW and the October 2004 Pre-Design Investigation Work Plan, which was also prepared for the SCCC site. The following proposed activities at the site were included in these reports:

- Surface and Subsurface Soils – Consistent with RIR recommendations, the proposed interim remedial action for soil is the construction of a surface cover. This cover would serve to reduce the infiltration of stormwater into the subsurface to enhance the performance of the barrier wall system. Groundwater modeling would be required to determine the permeability specification for the surface cover. The surface cover would be designed to eliminate potential direct contact exposure to impacted soil and potential upward migration of hexavalent chromium from the COPR.
- Shallow Fill Unit Groundwater and Deeper Sand Unit Groundwater – Consistent with RIR recommendations, no further investigation of shallow and deep groundwater was recommended. Proposed remedial activities for both the shallow and deep groundwater would include extension of the steel sheet pile wall and a slurry wall keyed into the varved clay along the SCCC Site and the Diamond Shamrock Site, to prevent migration of impacted groundwater and DNAPL to the Hackensack River surface water and sediments. In addition, barrier wall "wings" would be installed along the northern boundary of the Diamond Shamrock site to increase the length of the groundwater flow path to the Hackensack River. A wing wall would also be installed along the southwestern boundary of the SCCC to prevent the migration of impacted groundwater and/or DNAPL off site.
- Hackensack River Surface Water and Sediments – Further investigation of river surface water and sediments associated with the Diamond Shamrock Site was proposed to be conducted in conjunction with investigation of river impacts associated with the SCCC Site. Submittal of a workplan for these activities was scheduled for November 2004. Consistent with the remedial approach for the SCCC Site and Koppers Seaboard Site, surficial shore sediments would be removed from the Hackensack River adjacent to the Diamond Shamrock Site (within 50 feet of the shore and within three feet below

the top of the sediment), and would be consolidated, dewatered, solidified and placed on-site beneath a surface cover. Surface cover materials could include PDM.

The following proposed remedial activities for the Diamond Shamrock site were included in the May 2007 IRAW submitted for both the Diamond Shamrock and SCCC sites:

- Installation of a hydraulic barrier along the river and around the perimeter of the entire site to prevent potential migration of impacted groundwater to the river;
- Construction and operation of a groundwater recovery and treatment system in conjunction with the SCCC site;
- Removal of river sediments within 50 feet of shore to a depth of three feet adjacent to the site;
- Maintain existing interim surface covers; and
- Implementation of additional interim surface covers and associated stormwater management controls.

A December 2005 Hackensack River Study Area Remedial Investigation Work Plan was prepared by the Peninsula Restoration Group to determine the preliminary nature and extent of constituents in the Hackensack River sediments and to conduct a screening level ecological risk assessment. This work plan was approved by NJDEP on June 20, 2006. Sampling activities were reportedly completed in November 2006. To date, the Remedial Investigation Report has not been completed.