Quanta Resources Superfund Site
Operable Unit 2
Edgewater, New Jersey

July 2023

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan describes the alternatives that the U.S. Environmental Protection Agency (EPA) considered to address contaminated sediment and surface water at Operable Unit 2 (OU2) of the Quanta Resources Superfund Site (Site), identifies EPA's preferred alternative for OU2, and describes the rationale for this preference.

The Site is located in Edgewater, New Jersey. Operable Unit 1 (OU1) encompasses the land portion of the Site adjacent to the Hudson River and underlying contaminated groundwater (Figure 1). Remediation of OU1 is being conducted according to the Record of Decision (ROD) issued by EPA in September 2011. Immediately to the east of OU1, OU2 encompasses the contaminated Hudson River sediment and overlying surface water. OU1 is located in an area that has a long history of industrial operations and associated activities that caused the contamination at the Site.

The Preferred Alternative includes the hydraulic dredging of contaminated sediment, backfilling with clean fill, and capping. Dredged material would be disposed of off-site, and institutional controls would be implemented as needed to prevent damage to the cap.

A Remedial Investigation (RI) for OU2 was completed in 2014, pursuant to a 2003 Administrative Order on Consent (AOC) signed by EPA with Honeywell International Inc. (Honeywell). Honeywell completed a Supplemental RI report (SRI) for OU2 in 2019 to address data gaps that were identified following the 2014 RI. The RI reports included data from sampling of sediment, surface water, and non-aqueous phase liquid (NAPL) in OU2. These investigations identified areas within OU2 where remedial action is required.

This Proposed Plan contains descriptions and evaluations of the cleanup alternatives considered for OU2. This Proposed Plan was developed by EPA, the lead agency, in consultation with the New Jersey Department of Environmental Protection (NJDEP), the

MARK YOUR CALENDARS

PUBLIC COMMENT PERIOD
July 7, 2023 – August 7, 2023
EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING
July 25, 2023 at 6:30PM – 9PM
EPA will hold a public meeting to explain the Proposed Plan and alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The public meeting will take place at the **Edgewater Community Center Gymnasium** at **1167 River Road, Edgewater, New Jersey 07020**.

For more information, see the Administrative Record at the following locations:

EPA Records Center, Region 2
290 Broadway, 18th Floor
New York, New York 10007-1866
(212) 637-4308
Hours: Monday-Friday – 9 A.M. to 5 P.M. by appointment

Edgewater Free Public Library
49 Hudson Avenue
Edgewater, New Jersey 07020
(201) 224-6144

Send comments on the Proposed Plan to:

Thomas Dobinson, Remedial Project Manger
U.S. EPA, Region 2
290 Broadway, 19th Floor
New York, NY 10007-1866
Telephone: 212-637-4176
Email: dobinson.thomas@epa.gov

EPA's website for the Quanta Resources Site is:
https://www.epa.gov/superfund/quanta-resources

support agency. EPA, in consultation with NJDEP, will select a final remedy for OU2 after reviewing and considering all information submitted during the 30-day public comment period.

EPA, in consultation with NJDEP, may modify the Preferred Alternatives or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on the alternatives presented in this Proposed Plan.

EPA is issuing this Proposed Plan as part of its community relations program under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund) 42 U.S.C. 9617(a), and Section 300.435(c)(2) (ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information that can be found in greater detail in the Quanta Resources Site OU2 RI, SRI, and Feasibility Study (FS) Reports as well as other related documents contained in the Administrative Record file. The location of the Administrative Record is provided on the previous page. EPA and NJDEP encourage the public to review these documents to gain a more comprehensive understanding of the investigations performed by Honeywell, under EPA and NJDEP oversight.

SITE DESCRIPTION

The Quanta Resources Superfund Site is located on River Road in Edgewater Borough, Bergen County, New Jersey. Contamination at the Site was caused by several former industrial facilities that once operated at that location. OU1 encompasses approximately 24 acres of land and the underlying contaminated groundwater. It includes the former Quanta Resources property, currently a vacant lot, which occupies approximately 5.5 acres of land, and is the remnant of an industrial facility that once covered approximately 15 acres. OU2 is located immediately east of OU1, encompassing approximately 26 acres of tidally influenced mudflats extending approximately 950 feet from shore, and includes the contaminated Hudson River sediment and overlying surface water.

According to EPA's EJSCREEN, there are no demographic indicators for the Borough of Edgewater that identify it as a community with environmental justice concerns.

SITE HISTORY

The Quanta Resources property and other properties that comprise OU1 is in an area that has a long history of industrial operations. Prior to the mid-1800's, the Site and surrounding areas consisted of tidal marshlands associated with the Hudson River. Marshlands were filled during development of rail lines and industry. Industrial fill material from this era contains varying levels of polycyclic aromatic hydrocarbons (PAHs) and heavy metals (from sources such as cinder and coal ash).

This area, known as Shadyside (incorporated as Edgewater in 1899), became home to some of the earliest chemical operations in New Jersey.

Barrett Manufacturing Co. (coal tar) and Quanta Resources (waste oil recycler), plus other waste oil recyclers/handlers, all operated at the Site. From approximately 1896 to 1971, the property was used by Barrett Manufacturing Co., a predecessor of Allied Chemical Company (Allied), for the manufacture of paving and roofing materials. In 1974, Allied sold a portion of the Site to two individuals, James Frola and Albert Van Dohln, who leased it for oil storage and recycling. In 1977, that portion of the Site was leased to companies owned and controlled by Russell Mahler, who collected and re-refined waste oil from up and down the eastern United States. In 1979, Quanta Resources, Inc. purchased the assets of Mahler's operations, including the lease of the Site. Quanta operated the facility until 1981, when the NJDEP stopped all activities upon its discovery that storage tanks at the Site contained waste oil contaminated with poly chlorinated biphenyls (PCBs). EPA issued a series of AOCs in 1985 to Allied (now Honeywell) and a group of other potentially responsible parties (PRPs) to perform or fund further removal actions. In the mid-1980s, storage tanks and other structures were removed from the property and disposed of off-site under several removal actions conducted under EPA oversight. The property has since remained vacant, with no current operations or tenants at the property.

General Chemical Company (principal source of arsenic), also a corporate predecessor of Allied, operated on the northern portion of the former Quanta Resources property from at least 1900 until 1957. The chemical plant produced alums, sodium compounds, and sulfuric acid.

To the south of the Quanta Resources property (but still part of the Site), is 115 River Road, the former location of Spencer-Kellogg & Sons, Inc., where seed oil and other edible oils were manufactured from 1910 to 1981. Southeast of the former Spencer-Kellogg facility, the Lever Brothers property was used for production of soaps and edible products beginning in the 1930s.

The former Celotex property located to the north of the Site was the location of a chemical plant, a gypsum company, a vacuum truck company, and a metal reclaiming/refinishing plant. From approximately 1967 to 1971, Celotex Corporation manufactured gypsum wall board, after which it leased the industrial space to a vacuum truck company and a metal reclaiming/refinishing plant.

Historical National Oceanic and Atmospheric Administration (NOAA) navigation charts and aerial photographs indicate sediment near the piers and shoreline east of the Site was removed to depths that allowed ship access to the Site and neighboring facilities. Sediment dredging ceased in the 1970s, and by 1995, water depths were 5 feet or less within OU2.

Early Regulatory History

Following the closure of the Quanta facility by NJDEP in 1981, NJDEP requested that EPA address Site contamination pursuant to CERCLA. Several removal actions were performed at the Site from 1984 to 1988 by a group of potentially responsible parties (PRPs), under EPA oversight. PRPs included Allied and a number of companies that had sent waste oil to the Site. The removal actions focused on the cleaning and decommissioning of above and underground storage tanks. Several million gallons of product were removed and disposed of or recycled. Some underground piping and shallow soils were also removed.

EPA evaluated the Site for listing on the National Priorities List (NPL) in the late 1980s, but it did not qualify using the Hazard Ranking System in place at that time. EPA retained regulatory responsibility for the stabilized Site within its Removal Program, and through an administrative order with the PRPs, maintained security fencing, periodic inspections, and an absorbent boom to capture floating oil sheens from the neighboring Hudson River mudflat. Site conditions were reassessed by EPA in 1992 through the collection and analysis of soil, sediment, and groundwater samples from the Site. In 1996, EPA and one PRP, the Barrett successor company AlliedSignal (formerly Allied Chemical Company, now Honeywell) entered into an AOC under EPA's removal authority to improve Site security, further investigate the extent of Site conditions, and develop further response actions for the Site. EPA and AlliedSignal entered into a second AOC in 1998, under which AlliedSignal performed a site investigation and an engineering evaluation/cost analysis (EE/CA) designating steps to investigate and address the ongoing coal tar sheens in the mudflats of the Hudson River in front of the Site. The studies performed under these AOCs, along with an ecological risk assessment of the Hudson River sediment performed by the EPA, led to EPA proposing to list the Site on the NPL.

On January 11, 2001, EPA proposed inclusion of the Site on the NPL, and on September 9, 2002, the Site was placed on the NPL. In 2003, a group of 23 PRPs including Honeywell entered into an AOC with EPA to perform the RI/FS for OU1, at the same time that EPA and Honeywell entered into the RI/FS AOC for OU2.

OU1 SITE INVESTIGATIONS

The long history of industrial operations and associated activities at or near the Site, including processing of coal tar for the manufacture of paving and roofing materials and the subsequent oil recycling operations, resulted in the presence of NAPL and PAHs observed in OU1 soil and groundwater.

The OU1 RI and OU1 SRI were completed in 2008 and 2010, respectively. The findings of the RI and SRI were used to define the extent of OU1. The primary constituents of interest used to define the extent of OU1 included Site-related NAPL and associated constituents detected in soil and groundwater – primarily volatile organic compounds (VOCs) and PAHs. Arsenic and PAHs were also identified in the 2008 OU1 baseline Human Health Risk Assessment (HHRA) as the primary contaminants of concern (COCs) contributing most significantly to the risk estimates for most media and receptors evaluated. In July 2010, EPA issued the proposed plan for OU1, and in September 2011, EPA issued the OU1 ROD, selecting the remedy. Based on findings from the OU1 RI, SRI, and HHRA, the OU1 remedy focused in part on the elimination of the exposure pathways associated with arsenic and total

PAHs,[1] as well as NAPL. The OU1 remedy included in-situ solidification/stabilization (ISS) of NAPL source areas and arsenic hotspots in the soil, capping and institutional controls to prevent exposure to residual soil contamination, installation of a groundwater containment system for arsenic, and the construction of a subaqueous reactive barrier (SRB) to treat groundwater before it discharges into the Hudson River. Honeywell is currently performing the OU1 remedy under a 2013 consent decree with EPA.

Migration of the contaminated waste oil and coal tar from the land portion of the Site, in addition to direct discharges of waste from barges into the Hudson River, led to contamination of OU2 surface water and sediment with arsenic, NAPL, and PAHs. Upland sources of contaminants migrating from OU1 to OU2 were primarily historical in nature and have been largely eliminated by the implementation of the OU1 remedial actions beginning in 2017, including ISS of NAPL-contaminated soils, collection of deeper NAPL above the silty clay confining layer, installation of a new sheet pile wall bulkhead between OU1 and OU2, and a temporary cap to address direct contact and potential migration of OU1 contaminants. ISS of soils (not including soils under River Road) was completed in early 2021. A component of the OU1 remedy includes the construction of a reactive barrier close to the OU2 shoreline to treat groundwater before it reaches the Hudson River. This component, known as the SRB will be designed and implemented in coordination with the OU2 remedial action.

SITE CHARACTERISTICS

The majority of OU2 is a tidally influenced mudflat extending approximately 1,800 feet along the western bank of the lower Hudson River and 750 feet eastward from the shoreline during low tide.

The central portion of OU2 is bordered on the west by a steel sheet pile bulkhead installed along the shoreline for the OU1 remedy. There is a brick walking path in the northern area of OU1, and the walking path is separated from OU2 by riprap shoreline and a landscaped border of trees and shrubs. There is an elevation change of approximately 15 feet from the walking path to the mudflat.

At 115 River Road, the former Spencer & Kellogg property, is a pier that includes a building. The shoreline north and south of the 115 River Road pier building consists primarily of a new steel sheet pile bulkhead. The 115 River Road building extends from OU1 into OU2. The 115 River Road pier building was constructed on timber piles nearly 100 years ago. The OU1 land portion of the 115 River Road building was demolished as part of the OU1 remedial action, but the portion of the building on the pier remains.

There are also remnant pile structures and piers within OU2, including the former Navy pier, which is located north of the 115 River Road pier.

Summary of the OU2 Remedial Investigations

The 2014 OU2 RI and the 2019 OU2 SRI reports can be found in the Administrative Record file.

The OU2 study area addressed during the RI covers approximately 26 acres and extends from the Hudson River shoreline to approximately 950 feet from the shore. The purpose of the field investigations were to establish the sediment surface elevation, identify debris, and define the distribution and extent of contamination in OU2 sediment. The investigations included bathymetric and geophysical surveys, field screening to determine the extent of coal tar impacted sediment, and surface [0-6 inches below sediment surface (bss)] and subsurface (up to 30 feet bss) sediment sampling. Field investigations to support the OU2 RI and Baseline Ecological Risk Assessment (BERA) were performed between 2006 and 2009 by Honeywell, under EPA oversight. Additional field and sampling programs were conducted in 2008 in support of the BERA.

Additional sediment sampling and analysis was conducted in 2009, 2011, and 2013.

The results of the RI report showed that a total PAH sediment concentration greater than 100 milligrams per kilogram (mg/kg) correlates to the presence of NAPL in subsurface sediment. A background total PAH concentration of 10 mg/kg in sediment upstream of the study area was also identified in the RI.

Data gaps were identified after the completion of the 2014 OU2 RI which had to be addressed with additional field work. Between 2016 and 2018,

1 Total PAHs refers to the sum of polyaromatic hydrocarbons that are included in the analytical method used to measure the concentration of contamination in a given medium

additional sediment sampling was conducted to further fill data gaps and to support the delineation of remediation zones. NAPL mobility testing during the SRI indicated that a total PAH concentration of 1,300 mg/kg corresponded to the threshold of potentially mobile NAPL. The designation of NAPL as being mobile or potentially mobile is significant, as mobile NAPL can move in the pore or void spaces of the sediment and is capable of expanding or migrating outside of its existing footprint.

PAHs and NAPL

The historical migration of NAPL from OU1 has led to the presence of NAPL and elevated PAH (e.g., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzofuran, 2-methylnapthalene, and napthalene) concentrations in OU2 sediment. In general, NAPL and PAH concentrations are highest near the shoreline, adjacent to OU1, and decrease with distance from the shoreline. NAPL is present at distances greater than 500 feet from the shore, within the top 10 feet of sediment. Completion of the remedial action for OU1 has mitigated the migration of NAPL from OU1 to OU2, but NAPL present in OU2 is considered a continuing source of contamination to sediment and surface water in OU2.

A combined total of 638 sediment samples were collected and analyzed for total PAHs during the RI and SRI. The top 3 to 6 inches of sediment cores taken during the SRI were light brown in color and not stained black from NAPL, which is expected due to the regular deposition of suspended sediment in OU2. As a result, samples used to evaluate PAH impacts in OU2 exclude surface samples (0 to 6 inches bss) because these samples are considered to be unrepresentative of existing Site conditions. As described below, however, NAPL sheening and ebullition were observed in the shallowest sediments indicating migration from below.

Based on PAH concentrations, the greatest PAH contamination in sediment is nearest the shore (within 100 feet) and decreases with increased distance from the shore. PAH concentrations are greater north of the 115 River Road pier, with the majority of these samples falling in the vicinity of a former oil-water separator that was located on shore in OU1. The PAH impacts in the area south of the 115 River Road pier are found closer to shore than PAH impacts observed in the area north of the 115 River Road pier. Total PAH concentrations indicative of NAPL (100 mg/kg) can be observed at distances greater than 500 feet from shore, however, the majority of these samples fall within 300 feet from the shore. Concentrations of total PAHs indicating potentially mobile NAPL (1,300 mg/kg) are observed within 400 feet from the shore, with 96% of these samples falling within 300 feet, and 58% of samples falling within 100 feet from the shore. A total of 579 samples out of the 638 analyzed (91%) exceeded the background level of 10 mg/kg for total PAHs. The majority of these samples (95%) are within 400 feet from the shore, with 5% greater than 400 feet from the shore.

Potentially mobile NAPL was observed from the surface to depths greater than 30 feet bss within 400 feet from the shore. The highest concentration of total PAHs observed within 100 feet from the shore was 226,240 mg/kg, at a depth between 5 and 10 feet bss. Within 200 feet from the shore, the highest concentration of total PAHs observed was 33,212 mg/kg, at a depth between 20 and 30 feet bss. The highest concentration of total PAHs observed within 300 feet from the shore was 11,737 mg/kg, at a depth between 10 and 20 feet bss. There was at least one sample with total PAH concentrations greater than 100 mg/kg at all depth intervals for distances within 400 feet from the shore, and at all depth intervals except 20 to 30 feet bss, within 500 feet from the shore. For distances greater than 500 feet from the shore, there was at least one sample greater than 100 mg/kg total PAHs at all depth intervals except 10 to 20 feet bss and 20 to 30 feet bss.

NAPL Sheening

During the RI investigation in 2011 and 2013, a time lapse camera survey and visual boat surveys were conducted to identify NAPL sheening and ebullition sources in offshore sediment where periodic NAPL sheening is observed. Ebullition, or gas bubbles that are produced from the natural decomposition of organic material in shallow sediment, provides preferential pathways for NAPL migration to the surface water. Advection, along with ebullition, are the primary mechanisms for NAPL seeps and sheens present within OU2. During these investigations, NAPL seeps/sheening were observed on the sediment surface and water surface on a consistent basis near the OU1 shoreline, extending up to 300 feet from the shoreline during the summer months. The RI attributed NAPL sheens to both the upland source area and the NAPL present within OU2 sediment.

In 2016, a Probe Study was conducted to further evaluate the mobility of NAPL present within the top 5 feet of sediment and determine whether NAPL present beyond 300 feet from the shore could be mobilized as a result of disturbances to the sediment. Sheen generated from probing, observations of originating sheens or seeps, and sheens generated from boat prop wash, were used to identify areas with potentially mobile NAPL in shallow sediment. Drifting sheens were also recorded but the exact location of the origin of the sheen could not be determined. The Probe Study consisted of 141 probe locations arranged in a grid across the OU2 study area and began near the shoreline, extending out approximately 550 feet from shore. Probe-generated sheens were observed at 6 locations at the 6-inch depth, 25 locations at the 2-foot depth, and 54 locations for the 5-foot depth. The majority of the locations where a sheen was produced were within 200 to 350 feet from the shore. There were 10 locations between 350 feet and 550 feet from the shore where sheen was generated by probing to a depth of 5 feet bss.

Based on total PAH analytical results, and results from the sheen survey and Probe Study, NAPL is present over a significant portion of OU2 – approximately 684,000 square feet of the OU2 study area, extending approximately 800 feet from the shore, and to a depth of 30 feet bss.

PAHs in Surface Water, Porewater, and Groundwater

The RI included the collection of surface water, shallow porewater, and groundwater samples to further evaluate PAH impacts. Concentrations of PAHs were detected in both surface water and porewater in OU2, which indicates there exists a pathway for contaminants to reach the surface; however, exceedances for one or more PAH compounds observed for both surface water and porewater samples collected were within 50 ft of the shore. In general, concentrations detected in surface and porewater samples collected beyond 100 feet from the shore were all below the NJDEP groundwater or surface water quality standards for detected contaminants.

Arsenic

Approximately 278 samples were analyzed for arsenic in OU2 sediment. Of these samples, 49% had concentrations greater than the background level of 15 mg/kg. Of the samples collected from 0 to 0.5 feet bss, 21% of samples had concentrations greater than background levels. For samples collected from 0 to 5 feet bss, excluding surface samples, 61% had concentrations greater than background levels. Arsenic concentrations in shallow sediment ranged from 5 to 1,040 mg/kg. The greatest concentration found in the shallow sediment (0-5 feet bss) was observed within 100 feet of the shore, with a concentration of 1,040 mg/kg. Arsenic concentrations in OU2 increase with depth and range from 17 to 432 mg/kg for samples collected deeper than 5 feet bss. Greater than 200 feet from the shore, the greatest concentrations of arsenic are found deeper than 10 feet bss. Sediment arsenic concentrations north of the 115 River Road pier, near the base of the former Navy pier, are greater than 200 mg/kg at depths of 5 ft bss or more at five locations.

Arsenic in Surface Water, Porewater, and Groundwater

Subsurface arsenic concentrations are generally greater than surface arsenic concentrations. The greatest groundwater concentrations of arsenic were also present north of the 115 River Road pier. Concentrations of dissolved arsenic at depths from 14.7 to 15.7 feet bss and 23.4 to 24.4 feet bss, were 340 and 134 ug/l, respectively, which were greater than the 5.1 ug/l concentration found at depths of 4.4 to 4.9 feet bss. Porewater samples in areas close to the shore also had dissolved arsenic concentrations of 15 ug/l and 34 ug/l, but surface water samples at these locations were non-detect, indicating that porewater arsenic concentrations are not significantly impacting surface water in this area. This distribution of arsenic in OU2 sediment indicates that historical groundwater transport, historical surface runoff, or other discharges from OU1 led to elevated subsurface concentrations that were buried by cleaner sediment over time. Dissolved arsenic was not detected in OU2 surface water samples, demonstrating negligible impacts to the surface sediment or the overlying water column.

SCOPE AND ROLE OF OPERABLE UNIT

The Quanta Resources Superfund Site has been divided into two OUs. OU1 addressed the remediation of upland source materials, including contaminated soils and NAPL coal tar, which constitute principal threat wastes, and containment of arsenic groundwater contamination. The OU1 remedy, which is currently being implemented, also includes remediation of contaminated groundwater associated with the principal threat wastes before it discharges to the Hudson River by means of an SRB. While the SRB will be designed and implemented under OU2, it is a component of the OU1 remedy that addresses contaminated groundwater that discharges to OU2. OU2 addresses the contaminated sediment and surface water within the Hudson River east of OU1 and is addressed in this Proposed Plan.

PRINCIPAL THREAT WASTE

Principal Threat Waste (PTW) is defined in the box below. NAPL with the potential for migration to the surface sediment is considered highly mobile and highly toxic and is therefore considered a principal threat waste.

WHAT IS A "PRINCIPAL THREAT"?

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in ground water may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

SUMMARY OF SITE RISKS

The RI included a baseline risk assessment consisting of a HHRA and BERA that were conducted to estimate current and future effects of contaminants on human health and the environment. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects caused by hazardous substance exposure in the absence of any actions to control or mitigate these exposures under current and future land, groundwater, surface water, and sediment uses.
The HHRA incorporated sediment and surface water data (sampling and analysis conducted between 2006 and 2009) to estimate exposures and health risks to current and potential future human receptors in OU2. The cancer risk and noncancer health hazard estimates are based on current and future reasonable maximum exposure (RME) scenarios. These estimates were developed by considering various health-protective estimates about the concentrations, frequency, and

WHAT IS *ECOLOGICAL* RISK AND HOW IS IT CALCULATED?

A Superfund baseline ecological risk assessment is an analysis of the potential adverse health effects to biota caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current and future land and resource uses. The process used for assessing site-related ecological risks includes:

Problem Formulation: In this step, the contaminants of potential ecological concern (COPECs) at the site are identified. Assessment endpoints are defined to determine what ecological entities are important to protect. Then, the specific attributes of the entities that are potentially at risk and important to protect are determined. This provides a basis for measurement in the risk assessment. Once assessment endpoints are chosen, a conceptual model is developed to provide a visual representation of hypothesized relationships between ecological entities (receptors) and the stressors to which they may be exposed.

Exposure Assessment: In this step, a quantitative evaluation is made of what plants and animals are exposed to and to what degree they are exposed. This estimation of exposure point concentrations includes various parameters to determine the levels of exposure to a chemical contaminant by a selected plant or animal (receptor), such as area use (how much of the site an animal typically uses during normal activities); food ingestion rate (how much food is consumed by an animal over a period of time); bioaccumulation rates (the process by which chemicals are taken up by a plant or animal either directly from exposure to contaminated soil, sediment or water, or by eating contaminated food); bioavailability (how easily a plant or animal can take up a contaminant from the environment); and life stage (e.g., juvenile, adult).

Ecological Effects Assessment: In this step, literature reviews, field studies or toxicity tests are conducted to describe the relationship between chemical contaminant concentrations and their effects on ecological receptors, on a media-, receptor- and chemical-specific basis. In order to provide upper and lower bound estimates of risk, toxicological benchmarks are identified to describe the level of contamination below which adverse effects are unlikely to occur and the level of contamination at which adverse effects are more likely to occur.

Risk Characterization: In this step, the results of the previous steps are used to estimate the risk posed to ecological receptors. Individual risk estimates for a given receptor for each chemical are calculated as a hazard quotient (HQ), which is the ratio of contaminant concentration to a given toxicological benchmark.
In general, an HQ above 1 indicates the potential for unacceptable risk. The risk is described, including the overall degree of confidence in the risk estimates, summarizing uncertainties, citing evidence supporting the risk estimates and interpreting the adversity of ecological effects.

risk of an HI of 1 are typically those that will require remedial action at the site.

duration of an individual's exposure to chemicals selected as contaminants of potential concern (COPCs), as well as the toxicity of these contaminants.

For the ecological risk assessment, representative ecological receptors were identified, and measurement and assessment endpoints were developed during the BERA to identify those receptors and areas where unacceptable risks are present. The final, EPA-approved, HHRA and BERA can be found in the Administrative Record file. The following information is a summary of the findings of human health and ecological risks.

Human Health Risk Assessment

EPA follows a four-step human health risk assessment process for assessing site-related cancer risks and noncancer health hazards. The four-step process is comprised of: Hazard Identification, Exposure Assessment, Toxicity Assessment, and Risk Characterization (see adjoining box "What is Risk and How is it Calculated" for more details on the risk assessment process).

The following receptors and exposure pathways were evaluated quantitatively in the HHRA:

- Recreational Visitors/Residents –
  - Sediment: Direct contact with and incidental (hand-to-mouth) ingestion of surface sediment from 0 to 1 ft bss during assumed wading activities
  - Surface water: Direct contact with surface water during assumed wading activities
  - NAPL: Direct contact with NAPL in sediment from 0 to 1 ft bss during assumed wading activities

- Anglers – Fish
  - Ingestion of fish whose home range includes the OU2 study area

- Crabber – Crab
  - Ingestion of crab whose home range includes the OU2 study area

The HHRA identified an unacceptable risk from exposure of recreational visitors/residents to NAPL in the area adjacent to the bulkhead closest to the shoreline. The HHRA identified certain PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzofuran, 2-methylnapthalene, and napthalene) as COCs in surface water and NAPL.

The estimated cancer risks for current and future recreators exposed to NAPL in sediment and surface water in the OU2 study area were above EPA's target cancer risk range of 1 in 10,000 (i.e., 10^{-4}) to 1 in 1,000,000 (i.e., 10^{-6}); however, the estimated non-cancer hazards were below 1. The Excess Lifetime Cancer Risk (ELCR) was estimated at $1x10^{-3}$ for a recreator who is exposed from childhood through adulthood and $6x10^{-4}$, $4\ x10^{-4}$, and $2\ x10^{-4}$ for the child, adolescent, and adult recreators respectively.

Based on the results of the HHRA, unacceptable risks to human health exist in areas where humans may come in direct contact with NAPL or surface water that has been impacted by NAPL sheens. As discussed above, NAPL in shallow sediment (0-5 ft bss) has the potential to migrate upward into surface sediment and surface water where it poses a direct contact risk.

Ecological Risk Assessment

A baseline ecological risk assessment (BERA) for OU2 evaluated current and potential future exposure and risk for the following assessment endpoints:

- Benthic community structure and integrity
- Survival and reproduction of fish populations
- Survival and reproduction of bird populations
- Survival and reproduction of mammal populations

Multiple lines of evidence (LOEs) were used to evaluate potential risks to these receptors. LOEs included site-specific sediment toxicity testing on sediment dwelling amphipods and fish, benthic community assessments (which indicated a biological active zone (BAZ) of 0-6 inches, or 0-0.5 ft bss), solid phase microextraction of porewater for estimates of bioavailable PAHs for comparison to early life stage fish ecotoxicity benchmarks, consideration of EPA's equilibrium partitioning of PAHs as they may relate to toxicity, bulk sediment chemistry and comparison to sediment quality benchmarks, food web modeling for mammals and birds, and consideration of potential oiling for birds.

The results of the BERA show that the area adjacent to the OU1 shoreline bulkhead poses an unacceptable risk, including locations with a total PAH toxic unit[2] (TU) greater than 2 and/or an arsenic hazard quotient (HQ) greater than 1, for effects on the benthic community and fish with a small home range. Mammal and bird populations are not at risk from existing levels of PAHs. Because there were unacceptable risks to ecological receptors identified in the BERA, a remedial action is warranted to protect ecological receptors associated with OU2.

Based on the results of the HHRA and BERA, a remedial action is necessary to protect public health, welfare, and the environment from actual or threatened releases of hazardous substances.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards such as Applicable or Relevant and Appropriate Requirements (ARARs), to-be-considered (TBC) advisories, criteria and guidance, and site-specific risk-based levels. The primary objective of any remedial strategy is overall protectiveness.

The following RAOs address the human health and ecological risks from ongoing sources of NAPL loading to the sediment and surface water of OU2. These RAOs assume that the OU1 remedy will be fully implemented, and the OU1 RAO related to migration to OU2, "Prevent current or potential future migration of free-phase NAPL to the Hudson River or to areas that would result in direct contact exposure," will be met as a result.

RAO 1. Prevent the transport of NAPL from sediment to surface water.

RAO 2. Prevent the emanation of NAPL sheens from sediment.

RAO 3. Control the transport and migration of NAPL and prevent lateral expansion of the NAPL area.

RAO 4. Prevent exposure to current and future recreators (via direct contact) to NAPL above levels posing an unacceptable risk in shallow sediment (0-5 ft bss).

RAO 5. Prevent exposure to the benthic community and small home range fish to COCs above levels posing an unacceptable risk in surface sediment (0-0.5 ft bss).

To achieve these RAOs, EPA has selected sediment preliminary remedial goals (PRGs) for the OU2 COCs, which are total PAHs and arsenic. PRGs are generally chemical-specific remediation goals for each medium and/or exposure route that are established to protect human health and the environment. They can be derived from ARARs, risk-based levels (human health and ecological), and from comparison to background concentrations, where available. Human health risks are associated with exposure to NAPL, and surface water impacted by NAPL. NAPL is defined as concentrations of total PAHs greater than 100 mg/kg. Achieving the NAPL migration RAOs above will prevent unacceptable human health risk. The PRGs for OU2 are therefore based on the BERA and will also be protective of human receptors.

The PRGs for OU2 sediment are as follows:

Arsenic:	170 mg/kg
Total PAHs:	72 mg/kg

REMEDIAL TARGET AREAS

To facilitate the development and evaluation of remedial alternatives, OU2 was divided into three remedial target areas (RTAs). The RTAs are primarily based on the mass and physical characteristics of the contamination. The results of a pre-design investigation (PDI) will be used to reassess and refine the boundaries of each RTA, as needed, and finalize during the remedial design phase. The three subareas, RTA 1, RTA 2, and RTA 3 are presented on Figure 2.

The three RTAs are defined below:

RTA 1: RTA 1 is defined as the footprint of mobile NAPL in the upper 10 feet of sediment. RTA 1 is considered to contain PTW. Within RTA 1, the presence, volume, and degree of mobile NAPL is not uniform. RTA 1 predominantly includes the following

2 Toxic Units (TU) are calculated by dividing the organic carbon-normalized sediment concentration by a chronic toxicity value for each target PAH included in the analytical method that is protective of the benthic invertebrate community. Toxic units are summed for the PAHs and results greater than 1 indicate ecological effects to the benthic invertebrate community.

characteristics:

- Mobile NAPL in the upper 10 feet of the sediment column with potential for migration to the sediment surface
- NAPL in the upper 5 feet of the sediment column with potential for direct contact risks
- Mobile NAPL observations at depths greater than 10 feet with potential for lateral migration
- PAH and/or arsenic concentrations greater than the PRGs in surface sediment (0-0.5 feet bss) with potential for migration and direct contact risks
- NAPL in the upper 5 feet of the sediment column that may pose dissolved phase contaminant migration risk

RTA 2: In general, RTA 2 is characterized as the area where NAPL is present in the top 10 feet of sediment. There are fewer analytical samples in RTA 2 especially in the 1-to-5-foot sediment depth range. While the limited investigation data results for RTA 2 do not show the presence of mobile NAPL, results of the Probe Study within RTA 2 suggest there may be areas of potentially mobile NAPL present within the top 5 feet of sediment. These areas will be further investigated during a PDI, and the boundary for RTA 2 will be adjusted accordingly. NAPL in RTA 2 poses a sediment migration, direct contact, and/or dissolved phase contaminant migration risk.

RTA 3: The area identified as RTA 3 is based on the estimated limit of NAPL at depths greater than 10 feet. There are relatively fewer analytical samples in RTA 3, especially in the 1- to 5-foot sediment depth range, and SRI data is not available for RTA 3. Although there is NAPL at depth, based on the available data, there are three discreet areas where analytical data (total PAH concentrations greater than 100 mg/kg) indicate NAPL to be present in the upper 5 feet of sediment, and one discrete area where a NAPL sheen was observed, which indicates NAPL to be present in the upper 5 feet of sediment within RTA 3. There were no analytical samples with total PAH concentrations greater than 1,300 mg/kg in the upper 10 feet of sediment (indicative of mobile NAPL) or visual core observations of mobile NAPL during the remedial investigations.

Details regarding the criteria used for the development of each RTA, including observations and LOEs used to define the RTAs, can be found in the 2023 OU2 FS in the Administrative Record file.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA requires that each selected remedy be protective of human health and the environment, be cost effective, comply with other statutory laws, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practical. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances.

Potentially applicable technologies were identified and screened with emphasis on the effectiveness of the remedial action. Those technologies that passed the initial screening were then assembled into remedial alternatives.

The time frames below are for construction and do not include the time to implement the common elements, negotiate with a responsible party, design a remedy, or the time to procure necessary contracts. Annual operation and maintenance (O&M) costs are associated with routine maintenance of caps, while periodic costs include the replacement and/or replenishment of caps to maintain their long-term integrity and effectiveness. Alternatives where more NAPL and contaminated sediments are removed have the lowest O&M and periodic costs. Five-year reviews would be conducted as a component of the alternatives that would leave contamination in place above levels that allow for unlimited use and unrestricted exposure.

Common Elements:

Alternatives 2 through 4B share the following common elements:

Pre-Design Investigation (PDI):

A pre-design investigation, which includes the collection of sediment samples for PAH analysis to verify the limits of the RTAs, is included as part of each remedial alternative except for No Action. The results of the sampling will be used to further refine the RTA boundaries based on these analytical results. The Probe Study results showed that there may be a few areas along the border of RTA 2 and RTA 3 where mobile NAPL may be present in the top 5 feet of sediment. These areas will be further investigated during a PDI to determine whether mobile NAPL is present.

115 River Road Pier Building:

The 115 River Road pier building would be demolished and disposed of off-site under each alternative except for No Action. The pier was constructed on timber piles nearly 100 years ago, and the original construction details and capacity of these piles are unknown. Since its construction, the piles have exhibited severe, visible deterioration. Although some piles have been repaired, other piles remain compromised, some structural braces are dislodged or missing, and some areas of the substructure exhibit charring from a fire. The piles are tightly spaced and often misaligned and attempted past repairs do not appear to have repaired the bending resistance of the piles. The 115 River Road pier is currently used as both office space and a parking structure and is at high risk of damage from nearby disturbances associated with construction activities due to the age and condition of the pier. Due to the quantity of contaminated material, including the depth and high concentration of mobile NAPL around and underneath the pier, and the structural integrity of the pier structure, the pier and associated building and parking structure must be demolished in order to successfully implement the remedy.

Sheet Pile Wall:

A sheet pile wall is included as a common element of all alternatives except No Action and would be installed between RTA 2 and RTA 3 to control water levels inside the work area to accommodate barge mounted equipment during construction. Following the remedy construction, the sheet pile wall will be cut at the sediment surface or pushed into the mudline and will remain in place to prevent lateral migration of mobile NAPL. The final location of the sheet pile wall would be determined based on data collected as part of the PDI.

The sheet pile wall would be installed to a depth of 50 feet bss and approximately 1,100 linear feet in length. It is estimated that installation of the sheet pile wall would take between 2 to 3 months.

Pile and Debris Removal:

A common element included in each remedial alternative except No Action is relic pile and debris removal, which includes an estimated 870 piles that need to be pulled and disposed of off-site, along with the 115 River Road pier structure and remnants of the former Navy pier and associated pilings.

The area of debris and pile removal is assumed to be approximately 50,500 square feet. The removal would address scattered debris in the OU2 area, piles, the remnants of the concrete pier immediately south of the former Celotex property, and the small former wooden pier and pilings north of the 115 River Road pier structure. General debris removal is assumed to be conducted along the shoreline and cover an area of approximately 26,500 square feet.

Pile removal would be accomplished with excavators and cranes. As material is removed, it would be transported to an enclosed tented fabric structure (TFS) staged on the Quanta Resources property, for processing before off-site disposal. For development of the alternatives, it is assumed that the TFS would be staged on the Quanta Resources property, however, other properties may be considered based on feasibility factors determined in the remedial design. Debris removal more than 50 feet from the shore would be completed with barge mounted equipment, and debris would be transported to a TFS covered barge for transport to the onshore TFS for processing, prior to off-site disposal. To the extent practicable, debris would be removed while under water to reduce emissions. Debris and pile removal is assumed to take 1 to 2 months to complete.

Subaqueous Reactive Barrier (SRB):

The subaqueous reactive barrier is a component of the OU1 remedy that will treat upwelling OU1 groundwater before it discharges to the Hudson River and is included in each remedial alternative except No Action. Per the OU1 ROD, the SRB consists of a permeable subaqueous mat to treat COCs as the porewater discharges by advection through the sediment to the surface water. The SRB will be designed to meet the objectives described in the OU1 ROD, as well as the OU2 RAOs, and will be included in the remedial design for OU2.

Remediation in RTA 3:

The remediation for RTA 3 in all the remedial alternatives except No Action would include monitored natural recovery (MNR) for a majority of the area. MNR is a passive remedy where contaminated sediment is left in place and monitored while existing physical, chemical, and/or biological processes contain, destroy, alter, or otherwise reduce the bioavailability and toxicity of contaminants in sediment. Natural sedimentation on top of contaminated material can create a surface sediment layer with lower chemical concentrations over time, forming a protective barrier that minimizes the potential of contaminated sediment resuspension and migration, and helps isolate contamination from contact with ecological and human receptors. The natural sedimentation rate in OU2 will provide a clean sediment cover over areas of RTA 2 and RTA 3 in areas where no NAPL impacts have been observed in the top 5 feet. Specific details regarding the monitoring of MNR areas, including, but not limited to, sediment chemistry sampling, would be designed as part of the remedial design for OU2. At a minimum, a statistically robust number of samples of surface sediments will be collected in multiple locations in RTA 3 to establish that natural recovery (declines) in PAHs concentrations are occuring as anticipated. Because of the potential influence from off-Site sources, upstream monitoring of COCs will also occur to evaluate potential non-Site impacts. Monitoring will take place at the time remediation is completed to establish the post-remedy condition and be repeated at a minimum of every 5 years to support five-year review evaluations.

The remediation in RTA 3 in all remedial alternatives except No Action also includes a dissolved phase cap for discrete areas where NAPL is present in the top 5 feet of sediment, and a NAPL cap in areas where sheens have been observed along the boundary between RTA 2 and RTA 3. All the remedial alternatives except No Action include some type of cap. The dissolved phase cap, also known as an amended cap, includes amendments such as activated carbon, organo-clays, or other natural or synthetic materials that are blended with conventional capping materials to reduce the mass loading of contamination to the surface water by reducing the dissolved phase contaminant concentrations to less that the NJDEP groundwater quality standards. The dissolved phase cap is assumed to be multi-layered, having an overall thickness of 12 inches, which would retain dissolved phase contamination. The NAPL cap is an enhanced version of the dissolved phase cap, with additional layers and/or materials included specifically to adsorb NAPL, in addition to addressing dissolved-phase contaminants. The NAPL cap would include amendments for sequestering both NAPL and dissolved phase contamination. It is assumed that a two-inch-thick layer of an organic adsorption media would be used for the dissolved phase cap and 10 inches of an amended layer (organoclay or activated carbon) would be used for the NAPL cap. The actual thickness, extent, and overall design of the cap would be completed during the remedial design following the collection of additional data during the OU2 PDI. Placement of the dissolved phase cap over the four discrete areas in RTA 3 is estimated to take 2 to 3 days, assuming a cap placement rate of 300 cubic yards per day.

Institutional Controls (ICs):

Institutional controls are included as a component of all remedial alternatives except No Action. Following the remedial action, institutional controls would be used to restrict future uses of OU2, as appropriate, to protect the long-term integrity of the selected remedy. ICs may include signs prohibiting swimming, wading, or fishing, land use or deed restrictions, or, for areas where no deed exists, an equivalent notice pursuant to NJDEP requirements, to prohibit tampering with or removal of the selected remedy's features, and requirements for maintaining the remedy. Maintenance agreements, navigational restrictions, and dredging restrictions will be evaluated during the remedial design.

Alternative 1 – No Action

Capital Cost:	*$0*
Annual O&M Cost:	*$0*
Present Worth Cost:	*$0*
Timeframe:	*0 years*

The NCP requires that a "No Action" alternative be evaluated to establish a baseline for comparison with other remedial alternatives. Under this alternative, no remedial activities would be conducted and there would be no short- or long-term monitoring. No Action reflects the Site conditions as they currently exist, and no action would be taken to remediate the contaminated sediment and surface water within OU2.

Alternative 2 – NAPL Cap with Sheet Pile Wall in RTA 1, NAPL Cap in RTA 2 Inside and Outside the Sheet Pile Wall and MNR for Uncapped Areas in RTA 2 Outside the Sheet Pile Wall

Capital Cost:	*$87,000,000*
Annual O&M Cost:	*$1,600,000*
Periodic Costs:	*$6,300,000*
Present Worth Cost:	*$94,800,000*
Construction Timeframe:	*5-6 Months*

Under this alternative, a NAPL cap would be placed over all of RTA 1 and a majority of RTA 2 (Figure 3). The remaining areas of RTA 2 where NAPL impacts have not been observed during investigations would be subject to MNR.

The NAPL cap within RTA 1 and portions of RTA 2 inside the sheet pile wall would be a multilayer cap resistant to erosion and consisting of isolation materials, including clean sediment and/or sand with armoring (as needed), and treatment components, such as organoclay or activated carbon. The final surface elevation after capping would be higher than the existing sediment surface elevation.

Capping would require approximately 47,100 cubic yards of cap materials to be placed throughout RTA 1, RTA 2, and RTA 3. The construction timeframe to complete this alternative is approximately 5-6 months, and RAOs will be achieved upon completion of construction.

Long-term operation and maintenance would include cap visual monitoring and inspections, sediment chemistry sampling, porewater sampling, cap thickness monitoring, and cap replacement. Five-year reviews would be conducted since contamination would remain above levels that allow for unlimited use and unrestricted exposure.

Alternative 3A – ISS to 10 ft Deep with Sheet Pile Wall and Dissolved Phase Cap in RTA 1; NAPL Cap in RTA 2 Inside and Outside Sheet Pile Wall and MNR for Uncapped Areas in RTA 2 Outside the Sheet Pile Wall

Capital Cost:	*$122,300,000*
Annual O&M Cost:	*$800,000*
Periodic Costs:	*$700,000*
Present Worth Cost:	*$123,800,000*
Construction Timeframe:	*2-3 years*

This alternative consists of in situ stabilization (ISS) to a depth of 10 feet and dissolved phase capping in RTA 1 (Figure 4). A NAPL cap would be installed in RTA 2 for areas where NAPL impacts have been observed, and areas where no NAPL impacts have been observed would be included in MNR.

Under this alternative, ISS would be implemented to a maximum depth of 10 feet in RTA 1 by incorporating additives such as Portland cement, blast furnace slag, and/or a mixture of pozzolan reagents into the sediment to immobilize NAPL and destroy preferential transport pathways. ISS is assumed to be conducted in dry conditions using temporary sheet piling to allow dewatering of sediment. ISS would start at the shoreline and work outward from the shore. As areas become stabilized, platforms or mats would be used to allow equipment to be staged on the ISS monolith to stabilize areas further from shore. A TFS would be used to contain air emissions and would be supported by a pile-and-rail system that would be installed outside the sheet pile wall used to dewater the sediment. The TFS would be expanded lengthwise along the rail system, away from the shoreline, as work progressed further offshore. Sheet pile removal/relocation and TFS repositioning would be required approximately seven times to complete the ISS remedy in RTA 1. ISS swell material (additional material resulting from expansion during ISS operations) would be removed. A dissolved phase cap would be placed on top of the ISS monolith to capture COCs leaching from the ISS monolith. The dissolved phase cap would include sand, an amended layer such as activated carbon, and gravel for armoring and erosion control. Approximately 77,000 cubic yards of sediment would be targeted for ISS remediation, with 15,400 cubic yards of excess swell material removed and transported off-site for disposal, and approximately 12,900 cubic yards of capping materials placed for the dissolved phase cap. Due to the removal of excess swell material, the final elevation of the cap surface would be equal to the original sediment elevation prior to implementation of the remedy.

In RTA 2, a multilayer NAPL cap resistant to erosion and consisting of isolation materials, including clean sediment and/or sand with armoring (as needed), and treatment components, such as organoclay or activated carbon, would be placed. Approximately 23,400 cubic yards of capping materials would be required as part of the NAPL cap in RTA 2. The construction timeframe to complete this alternative is approximately 2-3 years, and RAOs will be achieved upon completion of construction.

Long-term operation, maintenance, and monitoring would include cap visual monitoring and inspections, sediment chemistry sampling, porewater sampling, cap thickness monitoring, and cap replacement. The ISS monolith would be a continuing source of dissolved phase contamination, and as a result, cap replacement for 10% of the capped area is assumed every 15 years. Five-year reviews would be conducted since contamination would remain above levels that allow for unlimited use and unrestricted exposure.

Alternative 3B – ISS to 30 ft Deep with Sheet Pile Wall and Dissolved Phase Cap in RTA 1; ISS to 10

ft Deep with Dissolved Phase Cap in RTA 2 Inside Sheet Pile Wall; NAPL Cap in RTA 2 Outside Sheet Pile Wall and MNR for Uncapped Areas in RTA 2 Outside the Sheet Pile Wall

Capital Cost:	*$191,800,000*
Annual O&M Cost:	*$700,000*
Periodic Costs:	*$700,000*
Present Worth Cost:	*$193,200,000*
Construction Timeframe:	*5-6 years*

This alternative consists of ISS to a depth of 30 feet in RTA 1 and ISS to a depth of 10 feet for areas of RTA 2 inside the sheet pile wall (Figure 5). Implementation of ISS under this alternative would be as described above for Alternative 3A, including the use of a TFS to control emissions over the ISS area. Following ISS, a dissolved phase cap would be placed over the areas of ISS in RTA 1 and 2. A NAPL cap would be installed in RTA 2 outside the sheet pile wall. Areas of RTA 2 where no NAPL impacts have been identified would be included in MNR.

Under this alternative, ISS would be implemented to maximum depths of 30 feet in RTA 1 and 10 feet in RTA 2 inside the sheet pile wall to immobilize NAPL and destroy preferential transport pathways. Swell material from expansion during ISS would be removed, and a dissolved phase cap would be placed on top of the ISS monolith to address COCs leaching from the ISS monolith. The dissolved phase cap would include sand, an amended layer such as activated carbon, and gravel for armoring and erosion control. Approximately 260,000 cubic yards of sediment would be targeted for ISS remediation, with 52,000 cubic yards of excess swell removed and transported off-site for disposal, and approximately 17,700 cubic yards of capping materials placed for the dissolved phase cap. Due to the removal of excess swell material, the final elevation of the cap surface would be equal to the original sediment elevation prior to implementation of the remedy.

In RTA 2 outside the sheet pile wall, a multilayer NAPL cap resistant to erosion and consisting of isolation materials, including clean sediment and/or sand with armoring (as needed), and treatment components, such as organoclay or activated carbon, would be placed. Approximately 14,700 cubic yards of capping materials would be required for the NAPL cap in RTA 2. The construction timeframe to complete this alternative is approximately 5-6 years, and RAOs will be achieved upon completion of construction.

Long-term operation, maintenance, and monitoring would include cap visual monitoring and inspections, sediment chemistry sampling, cap thickness monitoring, porewater sampling, and cap replacement. The monolith would be a continuing source of dissolved phase contamination, and as a result, cap replacement for 10% of the capped area is assumed every 15 years. Five-year reviews would be conducted since contamination would remain above levels that allow for unlimited use and unrestricted exposure.

Alternative 4A – Dredge to 10 ft Deep with Sheet Pile Wall and NAPL Cap in RTA 1; Dredge to 10 ft Deep with NAPL Cap in RTA 2 Inside Sheet Pile Wall; NAPL Cap in RTA 2 Outside Sheet Pile Wall and MNR for Uncapped Areas in RTA 2 Outside the Sheet Pile Wall

Capital Cost:	*$119,000,000*
Annual O&M Cost:	*$400,000*
Periodic Costs:	*$300,000*
Present Worth Cost:	*$119,600,000*
Construction Timeframe:	*1.5-2 years*

Under this alternative, RTA 1 would be hydraulically dredged to a depth of 10 feet, followed by backfilling with clean fill and placement of a NAPL cap (Figure 6). Portions of RTA 2 inside the sheet pile wall would also be dredged to 10 feet, followed by backfilling and placement of a NAPL cap. A NAPL cap would be placed over areas of RTA 2 outside the sheet pile wall, and areas with no NAPL impacts in RTA 2 would be subject to MNR.

Approximately 106,000 cubic yards of sediment would be dredged from RTA 1 and RTA 2, with placement of 76,000 cubic yards of backfill, and placement of approximately 45,300 cubic yards of capping materials throughout RTA 1, RTA 2, and RTA 3. The construction timeframe to complete this alternative is approximately 1.5-2 years, and RAOs will be achieved upon completion of construction.

Dredged material would require dewatering, and a TFS located onshore would be required during sediment dewatering to control emissions. Air monitoring may also be required to monitor emissions generated during dredging operations. A water treatment system would be required to treat the collected water prior to discharge back to the Hudson River. Removed dredged material would require off-site disposal. An upgrade to the OU1 bulkhead would also be required to support dredging operations due to structural stability concerns that limit the removal of sediment along the existing OU1 bulkhead.

Long-term operation, maintenance, and monitoring for capped areas would be required. Dredging would remove sediment containing NAPL and PAHs, but would leave contaminated sediment below ten feet, and a NAPL cap would be required to contain residual NAPL and PAH migration. As a result, this area would require a post-dredging NAPL cap. Five-year reviews would also be conducted since contamination would remain above levels that allow for unlimited use and unrestricted exposure.

Alternative 4B – Dredge to 30 ft Deep with Sheet Pile Wall in RTA 1; Dredge to 10 ft Deep with NAPL Cap in RTA 2 Inside Sheet Pile Wall; NAPL Cap in RTA 2 Outside Sheet Pile Wall and MNR for Uncapped Areas in RTA 2 Outside the Sheet Pile Wall

Capital Cost:	*$163,300,000*
Annual O&M Cost:	*$300,000*
Periodic Costs:	*$100,000*
Present Worth Cost:	*$163,700,000*
Construction Timeframe:	*3-4 years*

Under this alternative, RTA 1 would be hydraulically dredged to an average depth of approximately 30 feet, followed by backfilling with clean fill. Portions of RTA 2 inside the sheet pile wall would be dredged to an average depth of approximately 10 feet, followed by backfilling and placement of a NAPL cap (Figure 7). A NAPL cap would be placed over areas of RTA 2 outside the sheet pile wall that have not been dredged, and areas with no NAPL impacts would be subject to MNR. The final depth of dredging for RTA 1 and RTA 2 would be determined based on data collected as part of the PDI.

Approximately 260,000 cubic yards of sediment would be dredged from RTA 1 and RTA 2, with placement of 239,000 cubic yards of backfill, and placement of approximately 24,300 cubic yards of capping material throughout RTA 1, RTA 2, and RTA 3. The construction timeframe to complete this alternative is approximately 3-4 years, and RAOs will be achieved upon completion of construction.

Dredged material would require dewatering, and a TFS located onshore would be required during sediment dewatering to control emissions. Air monitoring may also be required to monitor emissions generated during dredging operations. An upgrade to the OU1 bulkhead would also be required to support dredging operations.

For the area of RTA 2 that would be dredged to approximately 10 feet, sediment containing NAPL and PAHs would be left below 10 feet and could potentially

THE NINE SUPERFUND EVALUATION CRITERIA

1. Overall Protectiveness of Human Health and the Environment evaluates whether and how an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

3. Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

4. Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

5. Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, the community, and the environment during implementation.

6. Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

7. Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

8. State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.

***9.* Community Acceptance** considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

migrate upward through the clean backfill. As a result, this area would require a post-dredging NAPL cap. Long-term operation, maintenance, and monitoring for capped areas would be similar to those described under Alternative 2, however, because contaminant mass is being removed in RTA 2 inside the sheet pile wall, cap replacement would not be necessary in this area.

EVALUATION OF ALTERNATIVES

The NCP lists nine criteria that EPA uses to evaluate the remedial alternatives individually and against each other to select a remedy. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria (see text box), noting how it compares to the other options under consideration. Seven of the nine evaluation criteria are discussed below. The final two criteria, "State Acceptance" and "Community Acceptance" are discussed at the end of the document. A detailed analysis of each of the alternatives can be found in the 2023 OU2 FS Report.

1. Overall Protection of Human Health and the Environment

Alternative 1 is not protective of human health or the environment because no action would be taken to address sediment contamination.
Alternative 2 would provide protection of human health and ecological receptors through the use of a NAPL cap with dissolved phase treatment. The monitoring of the dissolved phase performance of the cap would require the collection of surface water and porewater samples to assess when the adsorptive material is exhausted. Long-term monitoring, maintenance, and repair, as well as enforcement of institutional controls, would be needed to ensure the continued protectiveness of the cap. Alternative 2 has the highest likelihood of dissolved phase cap failure because NAPL remains untreated under this alternative and is free to migrate upward into the cap. If NAPL migrates through the organo-clay it would overwhelm the activated carbon adsorption layer and continue to release dissolved phase concentrations and NAPL to surface water.
Alternative 3A would provide protection of human health and the environment by permanently solidifying the NAPL and sediment contamination in the upper 10 feet of sediment in RTA 1. NAPL would remain in place within the monolith and would continue to release dissolved phase contamination that would be eliminated by the use of a dissolved phase cap placed over the monolith. There is a relatively high likelihood that the adsorptive material in the dissolved phase cap would need to be replenished over the life of the cap. Replenishment of the adsorptive material could be difficult, given the shallow water depths of RTA 1. Alternative 3A would not reduce the mobility of NAPL deeper than 10 feet, and there would be a risk that the weight of the monolith could increase the mobility of the deeper NAPL due to consolidation of the underlying sediment over time. However, ISS reduces the hydraulic conductivity of the upper 10 feet of sediment, which would create a barrier to vertical migration of NAPL. The sheet pile wall would be a barrier to horizontal migration of NAPL. Cracking or long-term degradation of the ISS monolith could occur, resulting in migration pathways for NAPL through the ISS monolith that would need to be managed with a dissolved phase cap as part of a long-term maintenance program.

Alternative 3B would provide protection of human health and the environment by targeting virtually all the NAPL and sediment contamination within OU2. ISS would permanently reduce the mobility of the NAPL, effectively eliminating the NAPL pathway to the surface. NAPL contamination would remain in place within the monolith and would not be removed or destroyed by the ISS process. Direct contact risk would be eliminated with the use of a cap placed over the monolith, but the monolith would be a continuing source of dissolved phase contamination to surface water. There is a relatively high likelihood that the adsorptive material in the dissolved phase cap would need to be replenished over the life of the cap. Replenishment of the adsorptive material could be difficult given the shallow water depths of RTA 1. Cracking or long-term degradation of the ISS monolith could occur resulting in migration pathways for NAPL through the ISS monolith that would need to be managed with a dissolved phase cap as part of a long-term maintenance program.

Alternative 4A would not be as protective of human health and the environment as Alternative 4B, as less contamination would be removed, and it would rely on a NAPL cap to control the migration of NAPL left at depths greater than 10 feet bss.

Alternative 4B provides the greatest protection of all the remedies, as virtually all the NAPL and sediment contamination would be permanently removed from

RTA 1 and replaced with clean backfill.

Institutional controls are included as part of each Alternative except Alternative 1 to restrict future uses of OU2, as appropriate to protect the long-term integrity of the remedial alternatives. The types of ICs would be similar for each of the Alternatives and would enhance their protectiveness.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Alternative 1 would not meet ARARs.

Alternatives 2 through 4B would be designed to meet applicable location- and action-specific ARARs such as those required for work in and around water bodies, and applicable requirements for disposal of waste during implementation of the remedial action. Examples of applicable location- and action-specific ARARs include, but are not limited to, compliance with the Clean Water Act (CWA) for the regulation of effluent discharge from dewatering activities, Resource Conservation and Recovery Act (RCRA) for the disposal of dredged material as waste, and the Flood Hazard Area Control Act for dredging and placement of clean fill and the cap. Best management practices would be implemented as part of construction to comply as much as practicable with short-term chemical-specific ARARs such as surface water quality limits.

Alternatives 2 through 4A would likely require a waiver from the requirements of the subsection of the NJDEP Technical Requirements for Site Remediation (N.J.A.C. 7:26E 5.1 (e)), that requires free or residual product to be treated or removed to the extent practicable, or to be contained where treatment or removal is not practicable. Although there would be some residual NAPL remaining in RTA 2 under Alternative 4B, this alternative meets the general intent of the regulation by removing the majority of mobile and residual NAPL. It is anticipated that no waiver would be required for Alternative 4B.

3. Long-Term Effectiveness and Permanence

Alternative 1 does not remove existing contamination, and exposures and risks would remain. This alternative does not offer any long-term effectiveness or permanence.

Alternative 2 would provide the least long-term effectiveness and permanence as all NAPL and contaminated sediment would remain in place. The residual risk would be managed by providing a cap containing an amendment layer to adsorb NAPL and dissolved phase contaminants as they migrate upwards through the cap. Once amended layers are expended, NAPL and dissolved phase contaminants would break-through the cap resulting in the resumption of sheens and NAPL seeps to the surface water. There is a high likelihood of the NAPL cap needing replenishment over the life of the cap in order to maintain long-term effectiveness and permanence.

Alternative 3A would provide greater long-term effectiveness and permanence than Alternative 2, because Alternative 3A would solidify the top 10 feet of contaminated sediment in RTA 1. Deeper NAPL and contaminated sediment would be left beneath the ISS and there is a potential that the weight of the monolith could increase the mobility of the deeper NAPL due to consolidation of the underlying sediment. The sheet pile wall would be a barrier to horizontal migration of NAPL. A dissolved phase cap would be necessary to control contaminants that would leach from the monolith. There is a relatively high likelihood that the adsorptive material in the dissolved phase cap would need to be replenished at some point in order to maintain the long-term effectiveness of the remedy.

Alternative 3B would solidify virtually all the NAPL and sediment contamination. ISS would permanently reduce the mobility of the NAPL, effectively eliminating the NAPL pathway to the surface. NAPL contamination would remain in-place within the monolith. Alternative 3B would solidify a greater amount of mass than Alternative 3A, but the dissolved phase cap would be required to prevent leaching of contaminants. Because more NAPL and NAPL contaminated sediment would be solidified under Alternative 3B, there would be fewer remaining residual risks after implementation, when compared to Alternative 3A.

Alternative 4A would provide similar long-term effectiveness and permanence, when compared to Alternative 3B. Alternative 4A removes the top 10 feet of NAPL and contaminated sediment and would rely on a NAPL cap to control the potential migration of deeper NAPL from migrating upward through the clean backfill to the surface water. Alternative 4A would leave greater amounts of NAPL and contaminated sediment in place, when compared to Alternative 4B, and would rely on a NAPL cap to control the migration of NAPL left at depths greater than 10 feet, providing less long-term effectiveness and permanence than Alternative 4B.

Alternative 4B provides the greatest long-term effectiveness and permanence because under this alternative virtually all the NAPL and contaminated sediment would be permanently removed from RTA 1 and replaced with clean backfill. Alternative 4B would have the lowest residual risks following completion of the remedy by removing the contamination and providing short- and long-term protectiveness. Within areas dredged to 30 feet in RTA 1, long-term monitoring would not be required. Capping included for areas of RTA 2 inside and outside the sheet pile wall, and areas of RTA 3, would provide adequate and reliable control of risks remaining in these areas.

All the alternatives include capping for impacted areas in RTA 2 outside the sheet pile wall and in RTA 3. For these areas capping would provide long-term effectiveness and permanence because of the degree of NAPL impacts, and because contaminated sediment are at levels where capping could reliably treat and control the NAPL and contaminated sediment left in place. The natural sedimentation rate would provide a natural clean sediment cover over areas of RTA 2 and RTA 3 where no NAPL impacts have been observed in the top 5 feet.

The proximity of OU1 to the Hudson River, and the location of OU2 within the River, make the Site susceptible to climate change related events such as more intense and frequent storms, as well as sea-level rise, which poses a risk of storm surge and flooding that may result in contaminant release. As part of the OU2 FS, a screening level evaluation was conducted using climate assessment tools to approximate the intensity and frequency of these future climate related events. According to the assessment tools, there are over 670 properties in the Borough of Edgewater that have greater than a 26% chance of being severely affected by flooding over the next 30 years, which gives the Borough a rating of "Major." The Site's location falls within areas of "Moderate" to "Severe" flooding risk and the area is also designated as a "shallow coastal flooding area." Intense rainstorms in the area are projected to increase, as well as the number of annual days with high tide flooding. While the Borough of Edgewater is vulnerable to sea level rise, OU1 in particular is predicted to become partially covered with water with only a 5-foot increase in sea level rise and to be fully inundated with a 10-foot increase in sea level rise. Hydrodynamic modeling and sediment erodibility analyses were also performed as part of the FS to identify any areas within OU2 that exhibited signs of erosion or could experience erosion during a high-flow event, as well as to calculate the potential depth of scour associated with high-flow events. While the hydrodynamic analysis found that there were no areas of RTA 1 or RTA 2 that exhibited signs of erosion during a 100-year flood, there is uncertainty related to an increase in the intensity and frequency of storm events, making 500-year floods likely to become more frequent. Based on these analyses, all the alternatives would be designed to withstand the frequency and intensity of climate change related storm events and flooding.

Monitoring and maintenance would be performed as part of all the alternatives except No Action because all the alternatives include placement of a cap. Institutional Controls would be implemented as part of all the alternatives except No Action because contamination will be remaining in place in all other alternatives.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 1 does not reduce the toxicity, mobility, or volume of NAPL and contaminated sediment.

Alternatives 2, 4A, and 4B do not provide reduction of toxicity, mobility, or volume through treatment.

The greatest reduction in mobility through treatment is provided by Alternatives 3A and 3B, which incorporate ISS to solidify NAPL and contaminated sediment, thereby reducing the overall mobility of these contaminants. The dissolved phase cap would address contaminants leaching from the ISS monolith. Alternative 3B includes solidifying the greatest volume of contaminated sediment and would therefore provide the greatest reduction to mobility. While Alternatives 4A and 4B do not include a treatment component, dredged material would need to be treated prior to disposal. Mobility will effectively be eliminated not through treatment, but by shipping the dredged sediments to disposal facilities. There would be no reduction in toxicity, mobility or volume of the COCs specifically through treatment. However, an amendment would be added (as needed) to stabilize the removed material and meet transportation and disposal requirements. The addition of an amendment would reduce the mobility of contaminants contained within the sediments compared to unamended sediments. In addition, the NAPL and dissolved phase caps would effectively isolate the remaining sediments that are not removed, and a carbon amendment would be incorporated into the cap to prevent the migration of contamination through the cap. While these alternatives may not meet the statutory preference for utilizing treatment to the maximum extent practicable, a degree of treatment is a secondary benefit of amendment addition during sediment processing (for transportation and disposal requirements).

5. Short-Term Effectiveness

Alternative 1 does not present any short-term risks to the community, Site workers, or the environment, because this alternative does not include any active remediation work.

Alternatives 2 through 4B all include short-term impacts associated with debris removal, including odor and air emissions, and noise due to heavy equipment use and sheet pile wall installation. Alternatives 2 through 4B would also increase the local truck traffic to and from the Site as construction materials are transported to the Site and waste materials are transported offsite for disposal. Alternative 2 would result in the lowest truck traffic, followed by Alternatives 3A, 3B, 4A, and 4B.

Short-term impacts would be the least under Alternative 2, because construction activities would result in the least disturbance of contaminated sediment and would have the shortest construction duration (estimated at one to two construction seasons).

Alternatives 3A and 4A would have similar construction time frames (an estimated 2 to 3 construction seasons for Alternative 3A and 1.5 to 2 construction seasons for Alternative 4A) and are expected to have similar short-term impacts in regard to noise and traffic. Impacts associated with air emissions are expected to be greater under Alternative 3A, which includes ISS under dry conditions that will generate emissions and odors during the ISS mixing and curing process, than Alternative 4A, which includes hydraulically dredging under wet conditions. Mitigation measures would be implemented to help reduce impacts associated with air emissions; however, use of the TFS enclosure under Alternative 4A would be limited to debris removal and sediment processing onshore, and would be installed on the shore, versus Alternative 3A, which would require use of a TFS onshore for debris removal processing, and installation of a TFS offshore during ISS mixing and curing. Hydraulic dredging operations under Alternative 4A are not expected to exceed air quality standards and use of a TFS offshore would not be necessary.

The greatest short-term impacts are expected under Alternatives 3B and 4B which have longer construction durations (an estimated 5 to 6 construction seasons for Alternative 3B and 3 to 4 construction seasons for Alternative 4B). As described above, air emissions are expected to be greater under Alternative 3B than 4B and mitigation measures, such as the use of TFS enclosures under Alternative 3B, are expected to be more challenging. Under Alternative 4B, use of the TSF enclosure would be limited to debris removal and sediment processing onshore. Hydraulic dredging operations are not expected to exceed air quality standards and use of a TFS offshore will not be necessary.

6. Implementability

Alternative 1 would not include any activity, so no implementation is required.
Alternative 2 is the most readily implementable, as this alternative minimizes intrusion into the sediment bed, and materials, equipment, and supplies for placing the sheet pile wall and cap are readily available. Emissions generated under this alternative would be less than for Alternatives 3A, 3B, 4A, and 4B, and use of a TFS enclosure would be limited to debris and pile removal activities.

Alternatives 4A and 4B follow Alternative 2 in implementability ranking. Structural upgrades would be necessary to complete dredging near the existing bulkhead. Emissions are expected for debris removal and sediment dewatering and would be controlled through the use of a TFS staged onshore. Air monitoring would be conducted in the areas surrounding the remedial action to ensure no adverse impacts to the residential community. Equipment, materials, and supplies to complete dredging and backfill are available. There is sufficient room on-site for processing dredged sediment (dewatering and possibly stabilization) prior to transport off site to a disposal facility.

More emissions would be expected from implementation of Alternatives 3A and 3B. These would be the most difficult to implement due to the challenges of constructing a TFS enclosure offshore in OU2 to contain emissions anticipated to be generated during construction.

7. Cost

The total estimated present worth costs are: $0 for Alternative 1; $94.8 million for Alternative 2; $123.8 million for Alternative 3A; $193.2 million for Alternative 3B; $119.6 million for Alternative 4A; and $163.7 million for Alternative 4B.

PREFERRED ALTERNATIVE

The preferred alternative for cleanup of the Quanta Resources Operable Unit 2 is Alternative 4B. The preferred alternative consists of hydraulic dredging to a depth of 30 feet in RTA 1, followed by backfilling with clean fill, and dredging to 10 feet in portions of RTA 2 inside the sheet pile wall, followed by backfilling and placement of a NAPL cap. A NAPL cap would be placed over areas of RTA 2 outside the sheet pile wall that have not been dredged, and areas with no NAPL impacts would be subject to MNR. Dredging to 30 feet in RTA 1 would remove PTW and essentially all the mobile NAPL and PAH-contaminated sediment from this area. As a result, a NAPL cap would not be needed for areas dredged to 30 feet. For the area of RTA 2 inside the sheet pile wall that would be dredged to 10 feet, any remaining sediment containing NAPL that may be left below the 10-ft dredge depth, and potentially available to migrate upward, would be subject to a post-dredging NAPL cap. The NAPL cap over the dredged areas in RTA 2 inside the sheet pile wall is assumed to be 34 inches thick, consisting of 15 inches of sand, 14 inches of an amended layer (organoclay or activated carbon), and 5 inches of gravel for armoring and erosion protection. The NAPL cap for areas of RTA 2 outside the sheet pile wall where NAPL was observed is assumed to be 30 inches thick, consisting of 10 inches of an amended layer (organoclay or activated carbon), a 15-inch sand layer, and a 5-inch gravel layer for armoring and erosion protection. Dredged material would require dewatering, and a TFS located onshore would be required during dredging operations to control emissions from dredged material. An upgrade to the OU1 bulkhead would also be required to support the dredging operations due to structural stability concerns that limit the removal of sediment along the existing OU1 bulkhead. Long-term operation and maintenance for capped areas would be required; however, because contaminant mass is being removed in RTA 1 and RTA 2 inside the sheet pile wall, it is assumed that cap replacement would not be necessary in this area. The proposed remediation for RTA 3 includes MNR for a majority of the area, a dissolved phase cap for four discrete areas where NAPL is present in the top 5 feet of sediment, and a NAPL cap in areas where sheens have been observed along the boundary between RTA 2 and RTA 3. The dissolved phase cap would be multi-layered, having an overall thickness of 12 inches, which would consist of a 2-inch amended layer for retaining dissolved phase contamination. The NAPL cap would include a 10-inch amended layer for retaining both dissolved phase contamination and NAPL. Long-term operation and maintenance for capped areas would be required.

The major components of the Preferred Alternative include:

- Performance of a PDI as part of the remedial design
- Permanent relocation of businesses located within the 115 River Road pier with appropriate compensation of the owner and/or tenants of the pier structure, as well as complete demolition and removal of the 115 River Road pier structure
- Installation of a sheet pile wall for lateral containment of NAPL
- Pile and debris removal from an area of approximately 50,500 square feet, including the removal of the concrete remnants of the former Navy pier, associated pilings, and a small former wooden pier and associated pilings, to facilitate construction of the remedial action
- Dredging, transportation, and disposal of approximately 260,000 cubic yards of contaminated sediment, followed by approximately 239,000 cubic yards of backfill, and placement of 9,000 cubic yards of cap material in RTAs 1 and 2
- Placement of approximately 14,700 cubic yards of NAPL cap material over areas of RTA 2 outside the sheet pile wall with evidence of NAPL impacts, or in areas where sheens have been observed along the boundary of RTA 2 and RTA 3
- MNR for areas of RTA 2 with no NAPL impacts
- MNR for the majority of RTA 3, with placement of approximately 600 cubic yards of dissolved phase cap materials in areas where NAPL is present in the top 5 feet of sediment
- Use of TFS staged on the Quanta Resources property, or an alternative location, for

processing of materials, sediment dewatering, and to house a water treatment system
- Use of a TFS covered barge for transportation of excavated pile/debris materials to the onshore TFS before processing and off-site disposal
- Construction of a water treatment system on the Quanta Resources property, or an alternative location, to treat collected water prior to discharge to the Hudson River
- Implementation of institutional controls following the remedial action, including but not limited to: signs prohibiting swimming, wading, or fishing; land use or deed restrictions to prohibit tampering with or removal of the selected remedy's features; and requirements for maintaining the remedy
- Long-term operations, maintenance, and monitoring for capped areas

Under the Preferred Alternative, RAOs 1-3 will be achieved by dredging to 30 feet and backfilling in RTA 1, and dredging to 10 feet in areas of RTA 2 inside the sheet pile wall, along with backfilling and placement of a NAPL cap. Placement of a NAPL cap in RTA 2 outside the sheet pile wall, along with placement of a NAPL cap in areas where sheens have been observed along the border of RTA 2 and RTA 3 will also achieve RAOs 1-3. These actions will remove or cap NAPL, eliminating the potential for migration, sheen generation, and transport. In addition, the installation of the sheet pile wall between RTAs 2 and 3 will help to prevent lateral migration of NAPL to achieve RAO 3. RAOs 4 and 5 will be achieved in RTAs 1 and 2 through dredging and capping actions. There is only one surface sediment location within 100 feet of the shoreline that is above the ecological PRG for arsenic (170 mg/kg), located in the north/northwest corner of OU2, at the base of the former Navy pier, adjacent to the former Celotex property. This area will be addressed by the Preferred Alternative through dredging to 30 feet and backfilling with clean fill. No remedial action is required for arsenic beyond that proposed for PAHs and NAPL in all three RTAs. In RTA 3, RAOs 4 and 5 will be achieved through MNR and natural sedimentation, as well as discrete areas of dissolved phase caps.

In MNR areas in RTA 3 without active remediation, total PAH concentrations exceed background levels (10 mg/kg total PAHs) at all depths from 0-30 feet bss, with the majority of exceedances found in the 0-5- and 5–10-foot bss interval. The majority of these samples are under 100 mg/kg total PAHs, located far from shore at depths from 5-10 feet bss, in areas with natural sediment deposition which creates a surface sediment layer with lower chemical concentrations over time. The OU2 RI showed that historical sediment deposition in OU2 is on the order of 3 inches/year and has substantially reduced the surface sediment concentrations of PAHs. The natural sedimentation rate will continue to provide a sediment cover over areas in RTA 2 and RTA 3 where no shallow NAPL impacts have been observed.

Long-term operation, monitoring, and maintenance for the NAPL cap in RTA 2 inside and outside the sheet pile wall would include visual monitoring and inspections of the cap and cap thickness monitoring. Routine visual monitoring of the cap is assumed to be conducted twice per year. In addition to routine monitoring, the cap is assumed to be monitored after significant storm/flood events, estimated at once every ten years. Visual monitoring is assumed to include an overall Site inspection using a small boat and underwater camera. During the inspection, any evidence of surface damage (erosion, sloughs of material, damage due to boat traffic, cap penetration by bottom-dwelling organisms, etc.) or evidence of NAPL seeps/sheens emanating from the cap would be noted, and corrective actions would be evaluated and implemented as necessary. The overall cap thickness would need to be monitored to ensure the overall thickness of the cap remains intact. To accomplish this, benchmarks would be established, and a bathymetric survey would then be completed at a minimum of once every five years for the life of the cap and compared with previous surveys to evaluate cap settlement. Other methods for monitoring cap thickness such as side sonar, sub-bottom profilers, or other surveys, could also be used, and final survey methods would be determined during the RD. It is assumed that the overall cap thickness would need to be replenished as a result of erosion from storm damage every ten years. Total cap replacement would not likely be necessary in RTA 2 inside the sheet pile wall because NAPL mass would be mostly removed, eliminating migration of NAPL and dissolved phase contamination to the surface.

Post-remedial monitoring in all RTAs, including areas with caps, would be conducted following the remedy to assess remedy performance and remedial action objective attainment. Remedial performance would be verified by establishing that contaminants are effectively isolated. This would include measures of physical stability (including bathymetry and coring) and chemical stability (including chemical sampling of the sediment, surface water, and porewater). Upstream monitoring of COCs would also occur to evaluate potential non-Site impacts. Monitoring would take place at the time remediation is completed to establish the post-remedy condition and be repeated at a minimum of every 5 years to support five-year review evaluations. The monitoring program will continue until RAOs are satisfied and the Site is deleted.

Specific details regarding the monitoring of capped and MNR areas, including, but not limited to, sediment chemistry sampling, would be designed as part of the remedial design for OU2. For MNR areas, at a minimum, a statistically robust number of surface sediment samples would be collected in multiple locations in RTA 3 to establish that natural recovery (declines) in PAH concentrations are occuring as anticipated. Because of the potential influence from off-Site sources, upstream monitoring of COCs would also occur to evaluate potential non-Site impacts. Monitoring would take place at the time remediation is completed to establish the post-remedy condition and be repeated at a minimum of every 5 years to support five-year review evaluations.

Basis for the Remedy Preference

The Preferred Alternative was selected over other alternatives because it is expected to achieve substantial and long-term risk reduction with greater certainty and less long-term monitoring and maintenance than other alternatives. The Preferred Alternative will produce fewer emissions than other active alternatives, is not expected to exceed air quality standards during dredging operations and is the only alternative that is likely to meet all ARARs. The Preferred Alternative reduces risk within a reasonable timeframe and provides for long-term effectiveness of the remedy by permanently addressing the greatest quantity of PTW.

Based on information currently available, EPA, the lead agency, believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the alternatives with respect to the balancing and modifying criteria. EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA Section 121: (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; and (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Although the statutory preference for treatment will not be met, the Preferred Alternative includes removal and off-site disposal of PAH- and arsenic-contaminated sediment which is permanent and irreversible. The total present worth cost for Preferred Alternative is $163.7 million. Consistent with EPA Region 2's Clean and Green policy, EPA will evaluate the use of sustainable technologies and practices with respect to implementation of a selected remedy.

State Acceptance

The Proposed Plan is currently under review by NJDEP.

Community Acceptance

Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be described in the Record of Decision. Based on public comment, the Preferred Alternative could be modified from the version presented in this Proposed Plan, or a different alternative identified as the preferred alternative. The Record of Decision is the document that formalizes the selection of the remedy for a site.

Community Participation

EPA encourages the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted there.

The dates for the public comment period, the date, location and time of the public meeting, and the locations of the Administrative Record file are provided on the front page of this Proposed Plan. Written comments on the Proposed Plan should be addressed to the Remedial Project Manager at the address below.

For further information on EPA's Preferred Alternative for the Quanta Resources Site OU2 contact:

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On the Web at:
https://www.epa.gov/superfund/quanta-resources

FIGURE 1: Site Overview

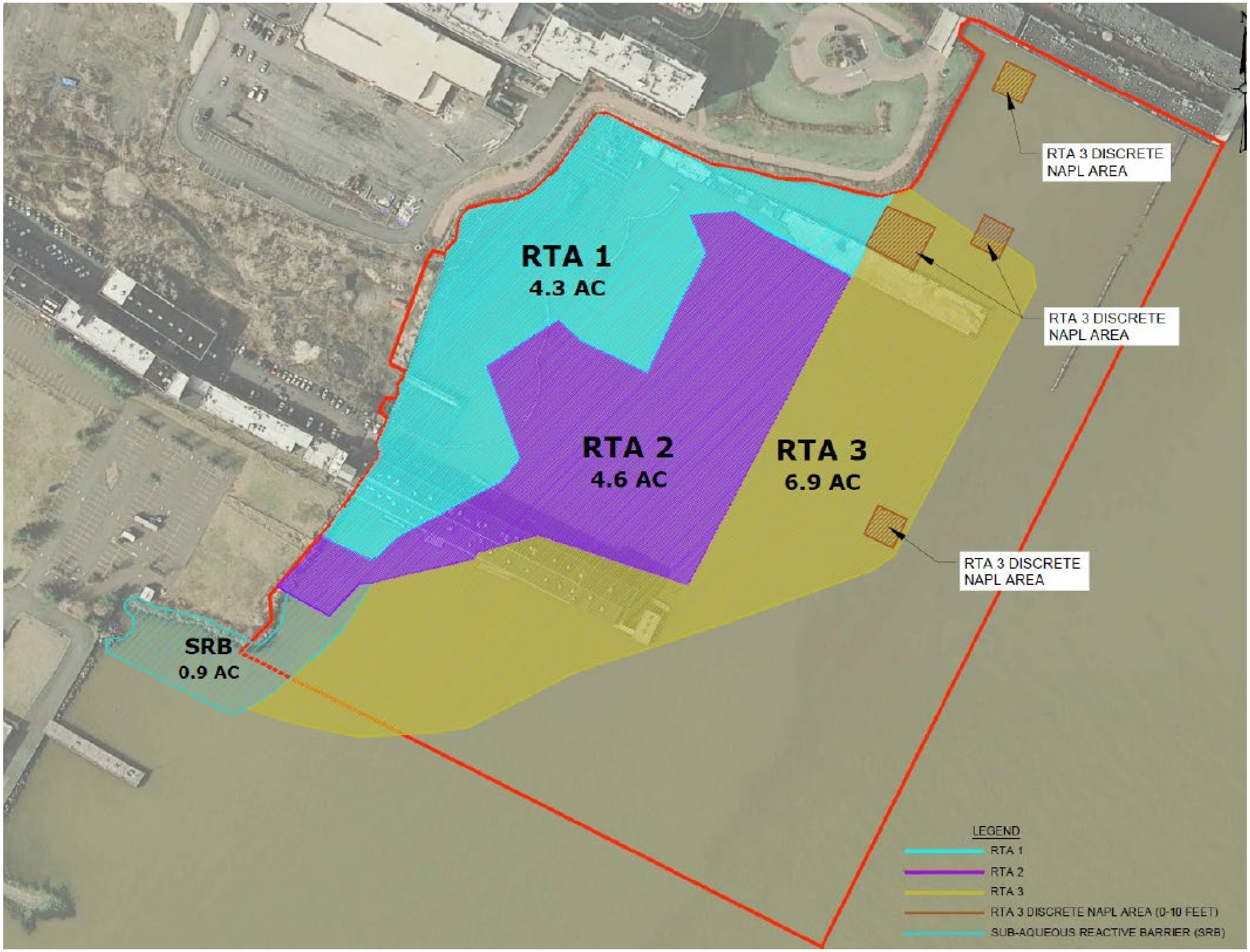

FIGURE 2: Remedial Target Areas

FIGURE 3: Alternative 2

FIGURE 4: Alternative 3A

FIGURE 5: Alternative 3B

FIGURE 6: Alternative 4A

FIGURE 7: Alternative 4B