Superfund Proposed Plan

U.S. Environmental Protection Agency, Region II

Diamond Head Oil Refinery Superfund Site
Kearny Township, New Jersey

June 2017

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the U.S. Environmental Protection Agency's (EPA's) proposed change to the Light Non-Aqueous Phase Liquid (LNAPL) source area remedy selected in the Operable Unit 1 (OU1) September 25, 2009 Record of Decision (ROD), and identifies the Operable Unit 2 (OU2) Preferred Alternative to address contaminated soil and sediment at the Diamond Head Oil Refinery Superfund Site (Site), located in the Town of Kearny, Hudson County, New Jersey.

The 2009 OU1 ROD addressed the LNAPL source material at the Site. EPA, with the concurrence of the New Jersey Department of Environmental Protection (NJDEP), selected a combination of offsite disposal and on-site biocell treatment as the remedy for OU1. Results of bench-scale testing of the biocell treatment technology, however, indicated that it would not achieve the remedial action objectives (RAOs) and remediation goals outlined in the OU1 ROD. The RAOs would be achieved by attaining the remediation goals of no measurable thickness of LNAPL in monitoring wells, and no potential for LNAPL-contaminated soil to leach oil to groundwater. As there are no Federal or State cleanup standards for LNAPL, EPA established these remediation goals based upon the toxicity and mobility and the principal threats to address this continuing source. Based on these results, EPA is proposing to amend the OU1 ROD and has identified [1]excavation and off-site treatment/disposal as the Preferred Alternative to address LNAPL source material at the Site.

1 Excavation and Off-Site Treatment/Disposal was evaluated in the OU1 FS and is identified as Alternative 4 in the OU1 ROD

MARK YOUR CALENDARS

PUBLIC COMMENT PERIOD
June 19– July 19, 2017
EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING
June 29, 2017 at 6 P.M.
EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at the main council chambers in Town Hall, 402 Kearny Avenue, Kearny, Hudson County, New Jersey, 07032

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.

Kearny Public Library
318 Kearny Avenue
Kearny, Hudson County, New Jersey 07031
(201) 998-2666

The Administrative Record for the Diamond Head Oil Refinery Site can also be found at the following website: https://www.epa.gov/superfund/diamond-head-oil

Send comments on the Proposed Plan to:
Brittany Hotzler, Remedial Project Manager
U.S. EPA, Region 2
290 Broadway, 19th Floor
New York, NY 10007-1866
Telephone: 212-637-4337
Email: hotzler.brittany@epa.gov

510579

The Preferred Alternative for OU2 calls for the placement of two feet of soil cover over residual contamination found within the Diamond Head Oil Refinery site. Institutional controls (ICs) in the form of deed notices will be implemented to maintain the integrity of the vegetated soil cover.

Any hazardous wastes encountered during the implementation of the OU1 or OU2 remedies would be disposed of offsite at an appropriate disposal facility.

Groundwater will be the subject of a subsequent remedial investigation (RI), Operable Unit 3 (OU3), after completion of the OU2 remedy.

This Proposed Plan was developed by EPA, the lead agency, in consultation with NJDEP, the support agency. EPA, in consultation with NJDEP, will select a remedy for OU1 and OU2 after reviewing and considering all information submitted during the 30-day public comment period. EPA, in consultation with NJDEP, may modify the Preferred Alternative or select another response action presented in this 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 Remedial Investigation (RI) and Feasibility Study (FS) reports as well as other related documents contained in the Administrative Record. 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 Superfund activities that have been conducted there.

SITE DESCRIPTION

The Site, located near the Hackensack Meadowlands at 1401 Harrison Avenue, Kearny, New Jersey, was the location of a former oil reprocessing facility. Figure 1 shows the Site location. The Site is comprised of a 20.2-acre unoccupied parcel that includes wetland areas, a drainage ditch, a small wetland/pond, a vegetated landfill area along the western border, and the remnants of the former Diamond Head Oil Refinery on the eastern portion of the Site. The parcel is bordered by Harrison Avenue (also called the Newark Turnpike) to the north, entrance ramp "M" of Interstate 280 (I-280) to the east, I-280 to the south, and Campbell Distribution Foundry to the west. The Site also includes a 10.3-acre portion of the I-280 interchange clover leaf located east of the 20.2-acre unoccupied parcel.

The Site is currently undeveloped and is designated on the tax map as industrial/commercial. The land use surrounding the Site is industrial/commercial and open space/wetlands, and is not anticipated to change in the future. The nearest residential area is located a half-mile to the west, and is not impacted by Site contamination. A Municipal Sanitary Landfill Authority (MSLA) landfill, identified as the 1-D Landfill, is situated south of I-280.

Prior Site operations took place on the eastern half of the 20.2-acre parcel. The landfilled area on the western portion of the parcel was once an access road to the 1-D Landfill, and a landfill mound remains from those activities, rising 10 to 15 feet above the rest of the Site. Surface water drains through a drainage ditch that eventually discharges to Frank's Creek, which in turn discharges to the Passaic River.

OU1 addresses the remedial target areas (RTAs) containing source material LNAPL, and the remedial alternatives for OU2 address residually contaminated soils, sediment, and surface water (Figure 2). OU2 consists of Area A, within the 20.2-acre parcel, and Areas B and C, the I-280 interchange cloverleaf area.

SITE HISTORY

Oil reprocessing at the Diamond Head Oil facility operated under several companies, including PSC Resources, Inc., Ag-Met Oil Service, Inc., and Newtown Refining Corporation, from 1946 to early 1979. All of these companies were owned by Mr. Robert Mahler. During facility operations, multiple aboveground storage tanks and possibly subsurface pits were used to store oily wastes. These wastes were intermittently discharged directly to adjacent properties to the east, and to the wetland area on the south side of the Site, creating an "Oil Lake."

In 1968, the New Jersey Department of Transportation (NJDOT) purchased several lots from PSC Resources, Inc., as part of its plans for construction of I-280. In 1977, NJDOT removed over 10 million gallons of oil and oil-contaminated liquid, and over 230,000 cubic yards of oily sludge, from the vicinity of the Oil Lake. The liquid wastes were shipped to waste-oil recycling facilities. The oil-contaminated sludge from the bottom of the Oil Lake was excavated and placed in a series of disposal cells – one atop the MSLA 1-D Landfill, and a series of smaller cells located within the I-280 right-of-way (ROW) soil berms, next to the oil-reprocessing facility which was still in operation at the time. The details of these disposal efforts are not well documented, but a simple liner and clay-based capping material were to be used as part of the disposal efforts for the sludge. While the surficial Oil Lake was removed and filled in, the NJDOT also reported finding an "underground lake" of oil-contaminated groundwater, extending from the eastern limits of the I-280 right-of-way to Frank's Creek, located west of the Site.

Plant operations ceased in 1979. In 1982, during the dismantling of the oil reprocessing facility, approximately 7,500 gallons of materials were pumped out of tanks and disposed of off-site, and 27 tons of contaminated soil were reportedly removed from the Site. Sampling conducted during this cleanup effort identified hazardous substances, including polychlorinated biphenyls (PCBs) in waste material collected from the Site. In 1985, part of the refinery property, Block 285, Lot 3, was sold to Mimi Urban Development Corporation, which subsequently changed its name to Hudson Meadows Urban Development Corporation. The Town of Kearny has owned the landfill parcel located in Area A and the parcel to the east of the Hudson Meadows Urban Development Corporation parcel since 1942. Parcels in Areas B & C are owned by the NJDOT.

NJDEP requested that EPA evaluate the Site for inclusion on the National Priorities List (NPL) in 1999[2]. The Site was added to the NPL in September of 2002, and a potentially responsible party (PRP) search is ongoing.

A phased RI was initiated for the Site in 2002. The OU1 Phase 1 RI obtained data on the nature and extent of soil, sediment, surface water, and groundwater contamination in areas of the Site where there was no information from previous investigations. The investigation also included a number of test trenches through the landfill in Area A to assess the nature of the buried material, and borings along the I-280 ROW soil berms to confirm the presence of buried sludge. The OU1 Phase 2 Focused RI/FS investigated contamination associated with the LNAPL source material and also concluded that the landfill in Area A was not a contributing source of contamination to the Site.

The RI for OU2 commenced in 2009 and was followed by two supplemental investigations in 2011 and 2015. Over the course of the investigation soil, sediment, surface and groundwater media were sampled and analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and dioxins and furans. The main objective of the OU2 RI was to identify and delineate areas containing contamination in soils and sediment that pose a direct exposure risk. Groundwater will be addressed under OU3 after completion of the remedial actions for OU1 and OU2.

The OU1 ROD, signed in 2009, addressed the LNAPL source material at the Site. The Selected Remedy included the construction of an on-site biocell for treatment of low-level threat source material, and off-site disposal of principal threat source material.

SITE CHARACTERISTICS OF THE DIAMOND HEAD OIL REFINERY SUPERFUND SITE

Site Hydrogeology

The stratigraphy at the Site consists of a relatively uniform vertical sequence of unconsolidated materials from top to bottom, as follows:

- A highly variable (in content and thickness) layer of anthropogenic fill across the Site, consisting of typical demolition-type debris,

2 The *National Priorities List* (NPL) is the list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide EPA in determining which sites warrant further investigation.

including wood, brick, metal, glass, plastic, and concrete mixed in a matrix of poorly sorted fine to coarse sand and gravel or silt, sand, and gravel;

- A sand unit about five feet thick on the western side of the Site, pinching out until it is not present on the eastern side of the Site;

- A silty clay unit, up to eight feet thick in sections of the Site, that appears to be continuous throughout the study area;

- A distinctive peat layer of varying thickness, but considered continuous across the Site;

- A silt and sand unit approximately 15 to 20 feet thick, beneath the peat layer;

- Laminated silt and clay unit, the full thickness of which was not observed in any of the study borings to date (as deep as 50 feet); and

- Bedrock, which also has not been encountered to date.

Groundwater at the Site is generally observed from 2 to 6 feet below ground surface, within the fill materials and natural and reworked soils that form the shallow overburden aquifer. The water table fluctuates seasonally and is highly influenced by precipitation and freeze-thaw cycles. Groundwater in some areas of the Site is observed in the form of perched water that is trapped above less permeable materials at shallower depths than the water table.

Water levels in the shallow groundwater above the silty clay and peat layers indicate a mounding of water near the wetland area in the southeastern portion of the property. At the local scale of the property, the shallow groundwater is considered to flow somewhat radially from this mounded area.

In the water-bearing unit below the peat layer, groundwater flows generally from northeast to southwest, consistent with regional trends in groundwater flow.

The nearest surface water body is Frank's Creek which drains into the Passaic River. As a result of I-280's construction, all drainage on the north side of the highway now travels a distance of 600 feet to the creek by a man-made drainage ditch. Prior to the 1940s, the area south of Harrison Avenue was wetlands. Landfilling activities that started in the 1940s began to shrink and divide the wetland areas. The eventual Oil Lake, estimated in 1977 to be between six and seven acres, appears to have formed in a remaining lowland area surrounded by properties filled in for industrial development, and by what would become the MSLA 1-D Landfill. With the construction of I-280, including the placement of the I-280 ROW soil berms, there is an isolated, frequently ponded wetland located just south of the former Diamond Head Oil facility.

Two factors have a significant influence on the water table at the Site: the first is the presence of wetlands along the southern Site boundary that includes areas of surface water, and the second is the presence of an LNAPL plume in the southeast corner of the Site in the area of the former Oil Lake. Although lighter than water, the density of the LNAPL has the effect of depressing the water table and influencing groundwater flow. Excepting these areas, groundwater is generally first encountered at a depth of 2 to 6 feet below ground surface. During wet seasons, extensive surficial flooding and standing water occur across much of the property, including the delineated wetland areas.

Summary of Diamond Head Oil Refinery Superfund Site Investigations

The complete results of the OU1 and OU2 Remedial Investigations can be found in the Diamond Head Oil Refinery Superfund Site Remedial Investigation Reports (2005 & 2009; 2016) which are part of the Administrative Record.

Summary of the OU1 Pre-Design Investigation

A Pre-Design Investigation (PDI) for OU1 was conducted between 2010 and 2015. The PDI: (1) refined the criteria used for measuring the extent of LNAPL source material; (2) identified the RTA for LNAPL source material, and (3) determined that the on-site biocell treatment technology would not attain the RAOs and remediation goals outlined in the 2009 ROD. The information collected has been used to refine the excavation/off-site disposal component of Alternative 4 (EPA's Preferred Alternative) in the OU1 ROD.

Following extensive bench scale testing, it was determined that the biocell technology would not be an effective treatment for the low-level threat source material.

Bench-scale testing of the biocell technology was performed in two phases, with Phase 1 testing focusing on LNAPL solubility, and the application of the biocell technology on soils excavated from areas of source material containing principal threat waste LNAPL. Phase 2 testing focused on the application of the biocell technology on soils excavated from areas of source material containing low-level threat waste. Phase 1 testing concluded that biocell technology would not be effective for treating LNAPL principal threat waste. Following 8 months of monitoring and testing during Phase 2, no significant changes in contaminant mass were observed, and there was no definitive indication that augmented degradation would occur in the low-level threat waste. Phase 2 bench-scale testing was therefore terminated before fully completing the scheduled test cycle.

In 2014/2015, EPA completed a second PDI of the LNAPL source material at the Site. The PDI collected a significant amount of information on the chemical and physical characteristics of the LNAPL, and the extent of its presence at the Site. It also included information on the Site's physical characteristics and how such characteristics may relate to LNAPL behavior and implemented remedies. The PDI helped to refine the criteria used to measure the extent of LNAPL source material at the Site. Based on the refined criteria, the volume of LNAPL source material measured at the Site increased by 3,000 cubic yards – from approximately 46,000 cubic yards to approximately 49,000 cubic yards. The PDI also helped to identify the RTA for LNAPL source material, and helped to further refine the preliminary remediation goals (PRGs) to permit field verification of their attainment.

Summary of the OU2 Remedial Investigation

EPA collected additional soil, sediment, and surface water samples from the Site over the course of the OU2 RI. Samples were analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and dioxins and furans. Soil samples at the Site were categorized as being taken from within or outside the property boundary – "within" referring to the 20.2 acres of Area A that served as the original Diamond Head Oil Refinery property, and "outside" referring to the 10.3 acres of Areas B and C containing the I-280 interchange clover leaf.

Analytical results were compared to Federal or New Jersey standards for each medium, whichever was more stringent, to determine if concentrations pose a potential threat to human health or the environment and need further evaluation in the baseline risk assessment.

Analytical results were compared to the following:

- Soil: NJDEP's Non-Residential Direct Contact Soil Remediation Standards (NRDCSRS), New Jersey Ecological Screening Criteria, National Oceanic and Atmospheric Administration Screening Quick Reference Tables (SQuiRTs), and EPA Regional Screening Level (RSL) for Dioxins and Furans;

- Sediment: NJDEP's Ecological Screening Criteria Lowest Effects Levels;

- Surface water: New Jersey Surface Water Quality Standards (NJSWQS) for Fresh Water; and,

- Impact to groundwater pathway: NJDEP's Impact to Groundwater Soil Screening Levels.

The RI revealed multiple contaminants, including chromium, dioxin, PCBs, lead, aldrin, thallium, and benzo[a]pyrene.

Soils: Soil samples were taken in approximately 118 sample locations at multiple depths, from surface soils (0-4 ft.), subsurface soils (5-10 ft.), and the I-280 ROW soil berms, both inside (Area A) and outside (Area B and Area C) the property boundary (Figure 2). Samples were tested for VOCs, SVOCs, pesticides, PCBs, metals, and dioxins and furans. Surface soil samples taken within the property boundary revealed maximum concentrations of lead at 27,900 parts per million (ppm), chromium at 7,650 ppm, and PCBs at 14 ppm. Subsurface soil samples taken within the property boundary revealed concentrations of chromium at 22,300 ppm, thallium at 45.7 ppm, and benzo[a]pyrene at 35 ppm. The highest levels of contamination in the surface and subsurface soils were located in Area A in the general area of the former refining operations, and in the central section of Area A at the location of the former Oil Lake.

Sampling of the I-280 ROW soil berms on the eastern and southern portion of the Site revealed maximum concentrations of lead at 306 ppm and chromium at 7,700 ppm, at depths of 5-7 feet.

Surface soil samples taken outside the property boundary (Areas B and C) revealed maximum concentrations of PCBs at 1,800 ppm and aldrin at 75 ppm. Subsurface soil samples taken outside the property boundary revealed concentrations of lead at 13,200 ppm and PCBs at 8.4 ppm. The highest levels of contamination in the surface and subsurface soils were found from 0-2 feet in the surface soil and 5-17 feet in the subsurface soil, and were located in Areas B and C, within the footprint of the former Oil Lake.

Surface soil samples analyzed for dioxin and furan contamination from within the property boundary revealed a concentration of 1,873 parts per trillion (ppt) at 0-2 feet, located in the central section of Area A, within the location of the former Oil Lake. Soil samples taken from outside the property boundary revealed concentrations of dioxin/furans at 8,188 ppt from 0-2 feet, and 11,172 ppt from 2.5-3 feet, and were located in Area C, within the footprint of the former Oil Lake.

Sediment: Sediment samples were taken from the drainage ditch, which is only underwater during flooding events, and from Frank's Creek in approximately 25 locations. Sediment samples were tested for VOCs, SVOCs, pesticides, PCBs, metals, and dioxins and furans. Sediment samples revealed lead contamination at a concentration of 84,400 ppm, found at 0-3 feet in the central section of Area A, within the footprint of the former Oil Lake. Sediment samples taken from the drainage ditch, near it's confluence with Frank's Creek, revealed lead contamination at a concentration of 84,300 ppm, from a depth of 0-0.5 feet. The sediments analyzed from the drainage ditch function more like soils, in that they are compacted and vegetated, and are less likely to travel into Frank's Creek. The contamination present in sediments that were analyzed from Frank's Creek are therefore likely related to contributing sources other than the Site, which is reflective of the industrial nature of the Creek's surrounding and upstream areas.

Surface Water: Surface water samples were taken from approximately 10 sample locations. Samples were tested for VOCs, SVOCs, pesticides, PCBs, and metals. Surface water samples revealed maximum concentrations of lead at 712 µg/L (microgram per Liter), thallium at 160 µg/L, and beryllium at 990 µg/L, found in ponded surface water within Area A, and in one sample taken in the drainage ditch near its confluence with Frank's Creek.

PRINCIPAL THREATS

OU1 LNAPL source material is a principal threat waste. Exposure to residual contaminants in OU2 soil and sediment, while not considered principal threat waste, present unacceptable risks to ecological and human receptors if not addressed by remedial action.

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.

SCOPE AND ROLE OF ACTION

EPA is addressing the Diamond Head Oil Refinery Site in three operable units (OUs):

OU1:	LNAPL Source Area
OU2:	Residual contamination in soils, sediment, and surface water
OU3	Groundwater

This Proposed Plan identifies EPA's proposed change to the remedy selected in the 2009 OU1 ROD, and contains descriptions and evaluations of the remedial alternatives considered for OU2. The remedies for OU1 and OU2 will be implemented concurrently. While the scope of OU2 originally included contaminated groundwater at the Site, at this time, EPA is adding a third operable unit (OU3) to address groundwater, after completion of the OU1 and OU2 remedies.

The remedy identified in the 2009 OU1 ROD intended to address the LNAPL source material at the Site through excavation and off-site disposal of principal threat waste source material and on-site treatment of low-level threat waste source material (biocell treatment technology). However, bench scale testing indicated that the biocell treatment technology would not meet the RAOs and remediation goals outlined in the 2009 OU1 ROD. EPA's proposed changes to the 2009 OU1 ROD include excavation and off-site treatment/disposal of all LNAPL source material, as defined by the OU1 RTA (Figure 2). The I-280 ROW soil berms containing non-hazardous wastes will be moved during excavation to facilitate removal of LNAPL source materials from the RTA identified below the berms. After excavation, berm soils will be used as backfill in the excavated areas in Area A (Figure 2).

After the LNAPL source material has been removed, OU2 will address the residually contaminated surface and subsurface soil, sediment, and surface water at the Site.

WHAT ARE THE "CONTAMINANTS OF CONCERN" (COCs)?

EPA has identified Chromium, Dioxin, PCBs, Aldrin, Lead, Thallium, and Benzo[a]pyrene, as the primary contaminants of concern at the Diamond Head Oil Refinery Superfund Site that pose the greatest potential risk to human health and the environment.

Chromium: Chromium is a naturally-occurring element that can exist in several different forms, and is widely used in manufacturing processes to make various metal alloys. Chromium (VI) compounds are classified as known carcinogens.

Dioxin: Dioxins can occur during the manufacture of certain organic chemicals.

PCBs: Polychlorinated biphenyls (PCBs) are mixtures of chlorinated compounds that have historically been used as coolants and lubricants in electrical equipment. PCBs are classified as probable carcinogens.

Aldrin: Aldrin is an insecticide that was widely used on crops such as corn and cotton. Aldrin is considered to be a probable carcinogen.

Lead: Lead is a naturally-occurring metal found in the earth's crust. Lead is used in the production of batteries and ammunition, and was formerly used in the production of paints, caulking, and as an additive to gasoline. Lead is considered a probable carcinogen.

Thallium: Thallium is a naturally-occurring metal found in trace amounts in earth's crust, and is mostly used in the manufacture of electronic devices.

Benzo[a]pyrene: Benzo[a]pyrene is a polycyclic aromatic hydrocarbon (PAH) that forms during the incomplete burning of coal, oil, gas, wood, or other organic substances. Benzo[a]pyrene is classified as a probable carcinogen.

SUMMARY OF SITE RISKS

As part of the RI/FS, a baseline human health risk assessment (HHRA) and a baseline ecological risk assessment (BERA) were conducted to estimate the risks and hazards associated with the current and future effects of contaminants on human health and the environment. A baseline human health risk assessment is an analysis of the potential adverse human health effects caused by hazardous-substance exposure in the absence of any actions to control or mitigate these under current and future land uses.

In the HHRA, cancer risk and noncancer health hazard estimates are based on current reasonable maximum exposure scenarios. They were developed by taking into account various health protective estimates about the concentrations, frequency and duration of a variety of 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 for each exposure area. Measurement and assessment endpoints were developed during the BERA to identify those receptors and areas where unacceptable risks are present.

Human Health Risk Assessment

A four-step human health risk assessment process was used 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 baseline human health risk assessment began with selecting COPCs in the various media (i.e., surface soil, subsurface soil, sediment and surface water) that could potentially cause adverse health effects in exposed populations. The current and future land use scenarios refer to exposure to soil from within or outside the property boundary – "within" referring to the 20.2 acres of Area A that served as the original Diamond Head Oil Refinery property, and "outside" referring to the 10.3 acres of Areas B and C containing the I-280 interchange clover leaf. As the Site is currently undeveloped and is designated on the tax map as industrial/commercial, the current and future land use scenarios included the following exposure pathways and populations:

- Site Maintenance Worker (adult): current/future ingestion, dermal contact and inhalation of soil particles and vapors for surface and subsurface soil from within the property boundary (Area A, Figure 2), and future exposure to the I-280 ROW berm soil

- Trespassers (child/adult): current/future ingestion, dermal contact and inhalation of soil particles and vapors for surface and subsurface soil from within the property boundary and the I-280 ROW berm, and sediment and surface water

- Highway Worker (adult): current/future ingestion and dermal contact and inhalation of soil particles and vapors for surface and subsurface soil from outside of the property boundary (Area B and C, Figure 2), including the I-280 ROW berm

- Industrial Worker (adult): future ingestion, dermal contact and inhalation of soil particles and vapors for surface and subsurface soil from within the property boundary and the I-280 ROW berm

- Construction Workers (adult): future ingestion, dermal contact and inhalation of soil particles and vapors from surface and subsurface soil from within the property boundary and the I-280 ROW berm

In this assessment, exposure point concentrations were estimated using either the maximum detected concentration of a contaminant or the 95% upper-confidence limit (UCL) of the average concentration. Chronic daily intakes were calculated based on the reasonable maximum exposure (RME), which is the highest exposure reasonably anticipated to occur at the Site. The RME is intended to estimate a conservative exposure scenario that is still within the range of possible exposures. Central tendency exposure (CTE) assumptions, which represent typical average exposures, were also developed. A complete summary of all exposure scenarios can be found in the baseline human health risk assessment.

Summary of the Human Health Risk Assessment

This section provides an overview of the human health risks from the major COCs. A complete discussion of all risks from the Site can be found in the Human Health Risk Assessment which is contained in the Administrative Record.

Surface Soil

Risks and hazards were evaluated for current and/or future exposure to surface soil. The populations of interest included adult maintenance workers, child and adult trespassers, adult highway workers, adult industrial workers and adult construction workers. The estimated hazards and risks are presented in Table 1.

The potential current hazards for trespassers (child), industrial workers and construction workers is above the acceptable hazard index of 1 from exposure to surface soil within the property boundary. The potential current risk for all populations is above the acceptable risk range for exposure to surface soil within the property boundary. Chromium[3], dioxin, and PCBs are COCs for surface soil within the property boundary. Exposure to surface soil from the berms results in estimated hazards that are equal to or below the acceptable hazard index of 1, and the cancer risk is

3 Chromium speciation was not conducted on the samples, therefore the risks and hazards from chromium exposure was evaluated assuming that total chromium was 100% chromium VI, the most toxic form of chromium.

equal to or above the acceptable risk range, with chromium being identified as a COC. The potential future hazards and risks for future highway workers exposed to surface soil outside of the property boundary exceed the acceptable hazard index of 1 and the cancer risk range, due to dioxin, aldrin and PCBs.

Lead was evaluated separately for surface soil. Initially lead concentrations were compared to the New Jersey Non-Residential Direct Contact value of 800 ppm. An additional evaluation for lead using the Adult Lead Model, which is documented in a technical memorandum in the administrative record, was also conducted. The ALM provided a comparison value of 784 ppm. Based on both evaluations, surface soil lead concentrations were elevated within the property boundary, the berm soil, and surface water. Therefore, lead was also identified as a COC at the site.

Table 1. Summary of hazards and risks associated with surface soil.

Receptor	Hazard Index	Cancer Risk
Within Property Boundary Current/Future		
Maintenance Worker – adult	0.8	**$2x10^{-4}$**
Trespasser – adult	0.8	**$2x10^{-4}$**
Trespasser – child	**7**	**$2x10^{-3}$**
Future		
Industrial Worker – adult	**4**	**$9x10^{-4}$**
Construction Worker – adult	**5**	**$1x10^{-4}$**
Berm Future		
Trespasser – child	**1**	**$2x10^{-4}$**
Industrial Worker – adult	0.8	**$1x10^{-4}$**
Outside Property Boundary Future		
Highway Worker – adult	**3**	**$4x10^{-4}$**
The COCs identified in the surface soil within the property boundary were chromium, dioxin and PCBs. The COCs identified in the berm surface soil was chromium. The COCs identified in the off property surface soil were dioxin, aldrin and PCBs. In addition, lead is a COC in surface soil within the property boundary and the berm.		

Subsurface Soil

Risks and hazards were evaluated for the potential future exposure to subsurface soil. The populations of interest included future adult industrial workers, construction workers, maintenance workers and trespassers within the property boundary and highway workers from outside of the property boundary. The hazard index was equal to or greater than 1 for all populations, and the cancer risk was above the acceptable risk range for all populations. The COCs within the property boundaries were chromium, thallium and benzo[a]pyrene while the COCs outside of the property boundary were PCBs and dioxin (Table 2).

Table 2 Summary of hazards and risks associated with subsurface soil.

Receptor	Hazard Index	Cancer Risk
Within Property Boundary Future		
Industrial Worker – Adult	**5**	**$2x10^{-3}$**
Construction Worker - Adult	**8**	**$2x10^{-4}$**
Maintenance Worker – Adult	**1**	**$4x10^{-4}$**
Trespasser – Adult	**1**	**$3x10^{-4}$**
Trespasser – Child	**9**	**$4x10^{-3}$**
Outside of Property Boundary Future		
Highway Worker – Adult	**3**	**$4x10^{-4}$**
The COCs identified in the subsurface soil within the property boundary are chromium, thallium and benzo[a]pyrene. PCBs and dioxin were identified as a COC in subsurface soil outside of the property boundary. In addition, lead was detected in elevated concentrations in subsurface soil in several areas outside of the property boundary.		

Surface Water and Sediment

Risks and hazards were evaluated for the potential current and future exposure to surface water and sediment in Frank's Creek, and sediment from the drainage ditch, which is more representative of soil. The population of interest included adult maintenance workers and adult and child trespassers. The non-cancer hazards for surface water were above the EPA acceptable value of 1 for the maintenance worker and child trespasser. The COCs identified for surface water were beryllium and thallium. The cancer risks were below or within the EPA acceptable ranges for all populations. Lead was also identified as a COCs for the sediment due to several hot spot locations with lead concentrations exceeding both the NJNRDC and ALM values.

Table 3. Summary of hazards and risks associated with surface water and sediment.

Receptor	Hazard Index	Cancer Risk
Frank's Creek and Drainage Ditch Current/Future Surface Water		
Maintenance Worker – Adult	**3**	$5x10^{-5}$
Trespasser – Adult	0.6	$2x10^{-5}$
Trespasser – Child	**3**	$6x10^{-5}$
Frank's Creek and Drainage Ditch Current/Future Sediment		
Maintenance Worker – Adult	0.05	$2x10^{-5}$
Trespasser – Adult	0.09	$2x10^{-5}$
Trespasser – Child	0.02	$5x10^{-5}$
Beryllium and thallium were identified as COCs in the surface water. Lead was identified in several locations at elevated concentrations. These areas may represent hot spots and lead would be considered a sediment COC.		

Groundwater and Vapor Intrusion

Although LNAPL source material is present on site, contaminant levels in groundwater, in general, slightly exceed the groundwater standards. For example, benzene (with relatively higher solubility and mobility compared to other site contaminants) was detected in exceedance of the NJ Class IIA standard of 1 part per billion (ppb) in groundwater in only 4 wells where LNAPL source material is present in the RTAs (Area A, Figure 2). The large majority of wells had no exceedances of VOC criteria, or had just one exceedance for only one VOC during the three sampling rounds, and were observed in wells that contained LNAPL source material. LNAPL has not been observed in any deep monitoring wells (monitoring wells screened beneath the clay and peat layers) in any of the monitoring events conducted. Based on the low level of contaminants in groundwater, the low solubility of SVOCs, dioxins/furans and PCBs, and the removal of LNAPL source material, there would be limited potential for remaining soil contaminants to migrate to groundwater and thus levels of groundwater contaminants would be expected to decrease over time and not require active treatment.

The potential risks and hazards associated with contaminated groundwater and volatilization of volatile organic compounds (VOCs) from contaminated groundwater into future buildings that are over the contaminated groundwater were evaluated in the human health risk assessment, however, exposure to groundwater and vapors are being addressed in OU3, thus they are not discussed in this proposed plan.

Based on the results of the human health risk assessment a remedial action is necessary for substances in the surface soil, subsurface soil, surface water, and sediment to protect public health, welfare and the environment from actual or threatened releases of hazardous substances.

Ecological Risk Assessment

A baseline ecological risk assessment (BERA) focused on evaluating the potential for impacts to sensitive ecological receptors to site-related constituents of concern through exposure to surface soil, surface water, sediment, and prey items (i.e., small mammals and fish). Surface soil, surface water and sediment concentrations were compared to ecological screening values, and food web modeling for upper trophic level predators was completed to determine the potential for adverse effects to ecological receptors. A complete summary of all exposure scenarios can be found in the baseline level ecological risk assessment (BERA).

Surface Soil

Although animals using the site do not distinguish boundaries, soil was evaluated using two different exposure areas, exposure to site-wide soil and exposure to berm soil. This was done to identify if there are different risks associated with different areas of the site. Soil concentrations were compared with screening values that are protective for soil invertebrates. Based on the evaluation, there is a potential for adverse effects to soil invertebrates from exposure to surface soil in both the site-wide soil and the berm soil. The risk from exposure to berm soil was less than the risk for site-wide soil. The surface soil screening criteria for soil invertebrates were exceeded for 38 compounds consisting of metals, pesticides, SVOCs and PCBs in the site-wide soil, which resulted in hazard quotients (HQs) greater than the acceptable value of 1. The soil screening criteria for soil invertebrates were exceeded for 30 compounds consisting of metals, pesticides, SVOCs, a VOC and dioxin in berm soil, which resulted in HQs greater than the acceptable value of 1.

Surface Water

Surface water concentrations were compared to ecological screening values. There is a potential for adverse effects to water column aquatic communities from exposure to surface water in the drainage ditch. The surface water screening criteria were exceeded for 9 compounds consisting of metals and pesticides, which resulted in HQs greater than the acceptable value of 1.

Sediment

Sediment concentrations from the drainage ditch and Frank's Creek were compared to ecological screening values. There is a potential for adverse effects to benthic invertebrates from exposure to sediment in the drainage ditch leading to Frank's Creek. The sediment screening criteria were exceeded for 54 compounds consisting of metals, pesticides, SVOCs and VOCs, which resulted in HQs greater than the acceptable value of 1.

Food Web Modeling

Exposure to compounds in the soil and prey items (small mammals) was evaluated for upper trophic level terrestrial animals, including short-tailed shrew, white-footed mouse, mourning dove, barred owl, American woodcock and red fox. All of the terrestrial receptors exposed to site-wide soil had HQs greater than 1 due to metals, PCBs and dioxin for both No Observed Adverse Exposure Levels (NOAELs) and Lowest Observed Adverse Exposure Levels (LOAELs) comparisons. Short-tailed shrew, white-footed mouse and American woodcock exposed to berm soil had HQs greater than 1 for LOAEL comparisons due to a combination of either metals, PCBs, and/or dioxin, and all terrestrial receptors had HQs above 1 for NOAEL comparisons due to metals, PCBs and/or dioxin.

Exposure to compounds in the surface water, sediment and prey items (fish) was evaluated for upper trophic level aquatic animals, including mink, muskrat, raccoon and belted kingfisher. All of the aquatic receptors evaluated had HQs greater than 1 due to a combination of metals, PCBs and/or dioxin for the NOAEL comparison. Muskrat had an HQ greater than 1 for the LOAEL comparison due to lead, and belted kingfisher had an HQ greater than 1 for the LOAEL comparison due to mercury. The rest of rest of the aquatic receptors had HQs less than 1. Additionally, mummichogs in the drainage ditch had HQs greater than 1 for 9 compounds consisting of metals, pesticides, and PCBs.

Based on the results of the ecological risk assessment remedial action is necessary for site-wide soils and the drainage ditch to protect the environment from actual or threatened releases of hazardous substances.

REMEDIAL ACTION OBJECTIVES

The remedial action objectives (RAOs) describe what the proposed site cleanup is expected to accomplish. These objectives are based on available information and standards, such as Applicable or Relevant and Appropriate Requirements (ARARs), to-be-considered standards and guidance, and site-specific risk based levels.

OU1 RAOs from the 2009 OU1 ROD

- Remove or treat principal threats, consistent with the NCP, to the extent practicable;
- Prevent current and future migration of LNAPL and associated chemical contaminants to the various media at the Site, including groundwater and seeps to surface water; and,
- Prevent human exposure through direct contact with the principal threat LNAPL.

OU2 RAOs

EPA established the OU2 RAOs to prevent/minimize potential receptor exposures that present unacceptable risk as a result of contact, ingestion, or inhalation (dust).

Surface water on the Site appears only as surficial flooding, areas of standing water during wet seasons or flooding events, and in delineated wetlands. An RAO for surface water has therefore not been developed, as soils are the contributing source of contamination to surface water, and any risks presented by surface water will be addressed through attainment of the soil RAO.

Soil:

- Prevent/minimize potential ecological receptor exposures and human receptor exposures through contact, ingestion, and inhalation of contaminated soils.

Sediment:

- Prevent/minimize potential ecological receptor exposures and human receptor exposures to contaminated sediment in the drainage ditch.

After the concurrent implementation of the OU1 and OU2 remedies, OU3 will evaluate changes in groundwater concentrations over time.

To achieve the RAOs for OU2, EPA is proposing soil and sediment cleanup preliminary remediation goals (PRGs) for the COCs based on NJDEP's NRDCSRS and EPA risk-based values. The PRGs are as follows:

Soil:
- Chromium: 20 ppm
- Dioxin: 730 ppt
- PCBs: 1 ppm
- Aldrin: 0.2 ppm
- Lead: 800 ppm
- Thallium: 79 ppm
- Benzo[a]pyrene: 0.2 ppm

Sediment:
- Lead: 800 ppm[4]

DESCRIPTION OF PROPOSED CHANGES TO THE OU1 LNAPL SOURCE AREA REMEDY

After a ROD is signed, new information may be received or generated that could affect the implementation of the remedy selected in the ROD, or could prompt the reassessment of the remedy.

Original Remedy

Capital Cost:	$16,080,000
Annual O&M Cost:	$0
Present Worth Cost:	$17,340,000
Construction Time Frame:	1 year

In 2009, EPA signed a ROD for OU1 to address the principal threat LNAPL waste. The original remedy called for the off-site disposal of the LNAPL principal threat source material, and construction of an on-site biocell for the treatment of low-level threat source material.

The major components of the Original Remedy included:

- Isolation of the remedial target areas with cut-off walls, and excavation of the principal threat LNAPL source material, a total of approximately 46,000 cubic yards of material;

- Transportation and off-site disposal to a facility (with treatment as required to meet land disposal requirements) for the principal threat LNAPL portion of the excavated material that is not amenable to on-site treatment;

- For the low-level threat LNAPL material amenable to on-site treatment, construction of a biocell within the excavated area to facilitate biodegradation of the LNAPL wastes, including the installation of piping for air and nutrient distribution and a collection system for air and water that may accumulate in the biocell;

- Introduction of nutrients and bulking agents to the low-level threat LNAPL material to enhance permeability and the conditions for biological activity, followed by placement of the augmented LNAPL material in the biocell for treatment and capping;

4 The resulting PRG value using the latest information from NHANEs (2009-2014) is 784 ppm incorporating the Region 2 proposed adjusted adult soil and dust ingestion rate and a target blood level of 5 ug/dl. This value was rounded to 800 ppm which is also the NJDEP's NRDCSRS value. This value will be used as the PRG for both soil and sediment cleanup, as sediments found in the drainage ditch function more like soils (compacted and vegetated), and are only underwater during flooding events. There are no ecological receptors associated with the sediments in the drainage ditch, and therefore the cleanup goal should be protective for both human health and the environment.

- Operation of the aeration, nutrient distribution, and water collection systems for the biocell for an estimated five-year period; and,

- Performance sampling and final confirmation sampling to demonstrate that the LNAPL wastes have been destroyed through biological degradation, at which time the biocell components will be dismantled.

Preferred Alternative for OU1, Excavation and Off-Site Treatment/Disposal

Capital Cost:	$13,733,000
Annual O&M Cost:	$0
Present Worth Cost:	$13,733,000
Construction Time Frame:	1 year

EPA's Preferred Alternative, Excavation and Off-site Treatment/Disposal was evaluated in the OU1 Phase 2 Focused RI/FS and presented as Alternative 4 in the 2009 OU1 ROD. This original alternative called for the excavation of only principal threat LNAPL, and is now being modified to also include low-level threat LNAPL, as well as utilizing the I-280 ROW berm soils as fill for the excavated RTAs. Under this alternative, all LNAPL source material will be excavated from the RTA, which is approximately 49,000 cubic yards (Figure 2). The excavated material will then be stabilized on site to allow for transportation for offsite treatment and disposal. The excavated areas will then be backfilled with the non-hazardous I-280 ROW berm soil, and clean fill that will be added to grade. Any hazardous wastes will be transported to an appropriate disposal facility. This alternative will be conducted concurrently with the OU2 remedial action.

A Comparative Analysis between the Original Remedy and the Preferred Alternative is presented below.

EVALUATION OF ALTERNATIVES FOR OU1

1. Overall Protection of Human Health and the Environment

The Original Remedy will not meet RAOs or remediation goals outlined in the OU1 2009 ROD. The Preferred Alternative would achieve the RAOs and remediation goals by providing protection to human health and the environment through the removal, and therefore prevention of direct contact with the entire LNAPL source area.

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

The Preferred Alternative would remove the entire LNAPL source area, while the Original Remedy would only remove the principal threat LNAPL waste. Bench scale testing performed on the low-level threat waste indicated that the biocell treatment technology was not effective and therefore the waste cannot be treated. EPA has developed site-specific remediation goals that are consistent with the expectations of the New Jersey Technical Requirements for the remediation of free product (N.J.A.C 7:26E-1). The Resource Conservation and Recovery Act (RCRA), 40 CFR 261, is applicable for assessing the disposal requirements of potentially hazardous solid wastes, such as the LNAPL-contaminated soils. Based upon the available documentation, EPA has concluded that the LNAPL wastes are not listed hazardous waste, but will require treatment to meet RCRA Land Disposal Restrictions. Both remedies can be designed to meet location- and action-specific ARARs, and would also require a reliance on ICs indefinitely to prevent damage of the soil cover and any intrusive activities into the residual contamination. The Original Remedy would not meet the RAOs, except for preventing direct contact with principal threat LNAPL waste at the surface, while the Preferred Alternative would meet all RAOs at the end of the estimated 1-year construction timeframe.

3. Long-Term Effectiveness and Permanence

The Preferred Alternative would remove all potential risks associated with the presence of LNAPL source material, providing reliable controls to prevent future contact. Use of a soil cover addressed under OU2 would be adequate and reliable in preventing direct contact with, and erosional transport of, berm materials used as backfill. Any remaining contamination present in the I-280 ROW berm soil would still present potential risks, however the concentration would be comparable to the concentration found in the residual soils around the RTA. Any potential risks associated with the I-280 berm soil would be addressed by the placement of the soil cover as part of the OU2 remedy.

The Original Remedy would keep the low-level threat LNAPL within a biocell onsite, and provide a cover to control the potential risks associated with direct contact and erosional transport of the low-level threat LNAPL at the Site, which would be adequate and reliable. Since the biocell was shown to be ineffective at treating the low-level threat LNAPL, the waste would remain unchanged. The preferred alternative would achieve remediation goals that are protective for the LNAPL source material, but a subsequent decision is still necessary to address the residual contaminated soil. Thus, the need for institutional controls, such as a deed notice, would be determined as part of OU2.

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

In the Preferred Alternative, the toxicity and volume of the LNAPL source material would remain unchanged, as the Preferred Alternative does not implement treatment, rather the source material would be transferred from the Site to a disposal facility. The mobility of contaminants in surface soil berm materials used as backfill in the RTAs would be reduced through the use of a soil cover as part of OU2 to control potential releases by water and wind erosion. In the Original Remedy, the toxicity and volume of the principal threat LNAPL waste would remain unchanged, as it would be transferred off-site for disposal, but the toxicity, mobility, and volume of the remaining low-level threat LNAPL waste placed inside the biocell would remain unchanged, since the proposed treatment was found to be ineffective.

5. Short-Term Effectiveness

Both the Original Remedy and the Preferred Alternative would mitigate potential risks to workers through adherence to site-specific health and safety plans, to communities through the use of engineering controls, and would have minimal potential risks to the environment during construction. Short-term risks associated with the Preferred Alternative would be greater than those associated the Original Alternative because of the larger transportation component that is involved, while the short-term risks associated with the Original Alternative would be the lowest for construction and operation.

6. Implementability

The Original Remedy is technically and administratively feasible, and necessary engineering services and materials are readily available to design, construct, and operate the biocell, but the technology has proved ineffective for the treatment of the principal threat LNAPL waste at this Site. The Preferred Alternative is technically and administratively feasible, the necessary engineering services, equipment, and materials are readily available, and excavation and disposal are well proven technologies. Both the Original and Preferred Remedy would require ICs to prevent intrusive activities into remaining residual contamination. ICs for both alternatives are readily implementable.

7. Cost

The Original Remedy has a present worth cost of $17,340,000[5] based on the Phase 2 Focused RI/FS, while the Preferred Alternative has a present worth cost of $13,733,000.

SUMMARY OF REMEDIAL ALTERNATIVES FOR OU2

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.

Potential technologies applicable to soil remediation were identified and screened by effectiveness, implementability, and cost, with emphasis on effectiveness. Those technologies that passed the initial screening were then assembled into remedial alternatives.

Full descriptions of each proposed alternative can be found in the FS which is part of the Administrative Record. Table 1 provides a summary of the components for each alternative.

---

[5] The present worth costs for the Biocell remedy were not updated because the biocell treatment is not technically feasible.

The time frames below are for construction and do not include the time to design a remedy, or the time to procure necessary contracts. Five-year reviews will be conducted as a component of the three alternatives (Alternative 2, Alternative 3, and Alternative 4) that leave contamination in place. The present worth cost for all alternatives includes the periodic present worth cost of five-year reviews.

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 action would be taken to control or remove low-level contamination or to prevent exposure at the Site.

Alternative 2 – Excavation of Soils in Areas B and C; Vegetated Soil Cover in Areas A, B, and C; Institutional Controls; and Excavation of Sediments

Capital Cost:	$8,461,000
Annual O&M Cost:	$67,000
Present Worth Cost:	$10,048,000
Construction Time Frame:	Less than 1 year

This alternative consists of construction of a two-foot soil cover as the primary measure to prevent exposure to residual contamination in the underlying soil. In Areas B and C (Figure 2), up to two feet of surface soil will be excavated, totaling 31,300 cubic yards, before placing a cover to maintain the current drainage patterns. Excavated soils from Areas B and C containing non-hazardous materials will be placed within Area A, and graded to facilitate cover placement. The soil cover for Areas A, B, and C will consist of 18 inches of clean fill and six inches of topsoil. The wetland areas within Area A will also be excavated to a depth of two feet to accommodate the soil cover and wetland restoration, but no other locations within Area A will be excavated.

Sediment in the drainage ditch along I-280 will be excavated to an approximate depth of 18 inches, and 18 inches of stone bedding will be added.

Approximately 440 cubic yards of TSCA/RCRA contaminated soil, and 800 cubic yards of sediment, will be removed under this alternative and transported to an appropriate disposal facility (i.e RCRA Subtitle C or TSCA disposal facility).

For cost estimation purposes, EPA has assumed that approximately 500 cubic yards of soil contaminated with dioxin greater than 7,300 ppt will be disposed of at a Subtitle C facility.

Institutional controls, such as a deed notice will be used to prevent contact with residual contaminated soil and ensure that future use of the site does not damage the soil covers. Since this alternative results in contaminants remaining on site above acceptable levels, five-year reviews are required.

Alternative 3 – Excavation of Soils in Areas A, B, and C and offsite disposal; Vegetated Soil Cover; Institutional Controls; and Excavation of Sediments

Capital Cost:	$18,750,000
Annual O&M Cost:	$67,000
Present Worth Cost:	$20,337,000
Construction Time Frame:	Less than 1 year

This alternative consists of construction of a two-foot soil cover as the primary measure to prevent exposure to residual contamination in the underlying soil. Soils in Areas A, B, and C will be excavated to a depth of two feet, except for the landfill, totaling 70,600 cubic yards. A two-foot soil cover will be added, and the wetlands in Area A will be restored. The soil cover for Areas A, B, and C will consist of 18 inches of clean fill and six inches of topsoil.

Sediment in the drainage ditch along I-280 will be excavated to an approximate depth of 18 inches, and 18 inches of stone bedding will be added.

Approximately 107,470 cubic yards of TSCA/RCRA contaminated soil, and 800 cubic yards of sediment, will be removed under this alternative and transported offsite to an appropriate disposal facility (i.e. RCRA Subtitle C or TSCA disposal facility).

For cost estimation purposes, EPA has assumed that approximately 500 cubic yards of soil contaminated with dioxin greater than 7,300 ppt will be disposed of at a Subtitle C facility.

Institutional controls, such as a deed notice will be used to prevent contact with contaminated soil and ensure that future use of the site does not damage the soil covers. Since this alternative results in contaminants remaining on site above acceptable levels, five-year reviews are required.

Alternative 4 – Excavation of Soils in Areas A, B, and C; Onsite Stabilization and Consolidation of soils and sediments in Area A; Vegetated Soil Cover; Institutional Controls; and Excavation of Sediments

Capital Cost:	$10,561,000
Annual O&M Cost:	$67,000
Present Worth Cost:	$12,148,
Construction Timeframe:	2 years

This alternative consists of construction of a two-foot soil cover as the primary measure to prevent exposure to residual contamination in the underlying soil. Soils in Areas A, B, and C will be excavated to a depth of two feet, except for the landfill, totaling 70,600 cubic yards. Excavated soil from Areas A, B, and C will then be stabilized and placed in Area A, and a six-inch topsoil cover will be added. Wetlands in Area A will be restored. The soil cover placed in Areas B and C will consist of 18 inches of clean fill and six inches of topsoil.

Sediment in the drainage ditch along I-280 will be excavated to an approximate depth of 18 inches, and 18 inches of stone bedding will be added. The excavated sediment will be transported to Area A for stabilization.

Approximately 94,200 cubic yards of soil will be removed, stabilized, and put back in place. Approximately 5,250 cubic yards of TSCA/RCRA contaminated soil, and 800 cubic yards of sediment, will be removed and transported offsite to an appropriate disposal facility (i.e. RCRA Subtitle C or TSCA disposal facility).

For cost estimation purposes, EPA has assumed that approximately 500 cubic yards of soil contaminated with dioxin greater than 7,300 ppt will be disposed of at a Subtitle C facility.

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.

Institutional controls, such as a deed notice will be used to prevent contact with contaminated soil and ensure that future use of the site does not damage the covers.

Since this alternative results in contaminants remaining on site above acceptable levels, five-year reviews are required.

EVALUATION OF ALTERNATIVES FOR OU2

EPA uses nine criteria to evaluate the remedial alternatives individually and against each other to select a remedy. This section of the Proposed Plan presents the relative performance of each alternative against the nine criteria, noting how each alternative compares to the other alternatives under consideration. The nine evaluation criteria are discussed below. A detailed analysis of each of the alternatives appears in the FS report.

1. Overall Protection of Human Health and the Environment

Alternative 1, No Action, would not be protective of human health or the environment since it does not include measures to prevent exposure to contaminated soils or sediments.

Alternatives 2, 3 and 4 are protective, and prevent unacceptable human health and ecological risk by eliminating exposure pathways through containment, removal, or treatment.

Each alternative includes varying degrees of removal or cover, and institutional controls to prevent exposure and address the risk at the site. Alternative 4 includes treatment (stabilization) of soil and incorporation of stabilized soil into the Area A cover, while Alternatives 2 and 3 use clean fill for the soil cover. The stabilization under Alternative 4 would aim to achieve the New Jersey Non-Residential Direct Contact Remediation Standards for industrial use. Treatability testing would be needed to determine the effectiveness of stabilization under Alternative 4 to achieve these standards.

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

Actions taken at any Superfund site must meet all applicable or relevant and appropriate requirements under federal and state laws or provide grounds for invoking a waiver of those requirements. EPA evaluated NJDEP's Impact to Groundwater Soil Remediation Standards while developing alternatives for the Site. New Jersey relies on a series of guidance documents to provide a basis for developing site-specific impact-to-groundwater soil cleanup goals, however, the methodologies for developing the site-specific numbers have not been promulgated, and are therefore not Applicable or Relevant and Appropriate Requirements (ARARs), but are "to be considered".

Alternative 1 is the only alternative that would not comply with chemical-, action-, or location-specific ARARs, since no action will be taken, leaving soils and sediments in place that exceed New Jersey Non-Residential Direct Contact Remediation Standards (NJNRDCSRS), posing an unacceptable risk to human health and the environment.

Alternatives 2, 3, and 4 comply with chemical-specific ARARs, such as the NJNRDCSRS, which establish minimum direct contact soil remediation levels. Alternatives 2 and 3 accomplish this by removing soils and sediment that exceed ARARs, while Alternative 4 accomplishes this by treating soils and sediment through stabilization. Location- and action-specific ARARs can be met through design and implementation for Alternatives 2, 3, and 4. Action-specific ARARs, such as the Toxic Substances Control Act will be met through the proper management of PCB remediation wastes, while location-specific ARARs, such as the Flood Hazard Area Control Act Regulations, will be met by ensuring that measures for excavating, grading, and fill do not impede overland flow of stormwater.

3. Long-Term Effectiveness and Permanence

Alternative 1 provides no controls and does not maintain protection of human health and the environment over the long-term because there is no mechanism to prevent exposure to contaminated soils or sediment.

With regard to soil cover, Alternatives 2 and 3 would have equal reliability of controls since the cover thickness is the same under both alternatives and the cover material would meet New Jersey's Residential Direct Contact Remediation Standards (NJRDCRS). Under Alternative 4, surface soils that are excavated from Areas B and C to accommodate soil cover would be stabilized and incorporated into the soil cover material in Area A.

Alternative 4 would have lower reliability than Alternatives 2 and 3 because stabilized material would be used as part of the cover. The stabilized material would be used as part of the 2-foot cover, except in the wetlands areas and in Areas B and C, where soils with concentrations below New Jersey's Residential Direct Contact Remediation Standards would be used for cover.

Under Alternatives 2, 3, and 4, institutional controls, such as a deed notice, would be used to prevent contact with contaminated soil and ensure that future use of the site does not damage the covers.

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

Alternative 1 does not implement any treatment processes, and therefore does not provide for a reduction in the toxicity, mobility, or volume of contaminants. Alternative 1 also does not generate any treatment residuals, and it does not meet the statutory preference for treatment.

Alternative 2 does not implement any treatment processes, and the toxicity, mobility, and volume of contaminants remains unchanged.

Alternative 3 does not implement any treatment processes, and the toxicity, mobility, and volume of contaminants remains unchanged.

Alternative 4 is the only remedial alternative that includes a treatment component (stabilization), which provides a greater reduction of toxicity and mobility than Alternatives 2 and 3. The stabilization component of Alternative 4 results in a reduction in the toxicity and mobility, but it would be expected to result in an increase in volume due to the addition of stabilization materials.

5. Short-Term Effectiveness

Alternative 1 involves no action, so there is no risk to workers, no additional risks to the community or the environment, and the Alternative will not achieve RAOs.

Alternative 2 has the lowest potential risks for workers, the shortest construction duration, and is the least intrusive when compared to Alternatives 3 and 4. Alternative 2 also has the lowest potential risks to the community due to the short construction duration and the fewest impacts to traffic. The potential for additional risks to the environment is minimal for Alternative 2, and RAOs are expected to be met within 1 year.

Alternative 3 has a longer construction duration than Alternative 2, and a shorter construction duration than Alternative 4. Alternative 3 would produce more truck traffic when compared to Alternatives 2 and 4, and would have the greatest traffic impact to the community resulting from the volume of material transported offsite for disposal, and the importing of backfill material. The potential for additional risks to the environment is minimal for Alternative 3, and RAOs are expected to be met within 2 years.

Alternative 4 would have the longest construction duration, and more construction related activities than Alternatives 2 and 3. Alternative 4 would present the highest potential risks to workers, but have less traffic impacts that Alternative 3. Alternative 4 would also present the highest potential risks to the community resulting from a longer construction duration, including additional noise, odor, and dust. Additional emission control techniques would need to be implemented under Alternative 4. The potential for additional risks to the environment is minimal for Alternative 4, and RAOs are expected to be met within 2 years.

6. Implementability

Alternative 1 is implementable and feasible because no action would be taken.

Alternative 2 is the most technically feasible, and is administratively feasible, and materials and services for Alternative 2 are readily available.

Alternative 3 is technically feasible, but would require additional soil management and traffic management when compared to Alternative 2. Alternative 3 is administratively feasible, and materials and services are readily available, however it may require increased transport distances due to the larger quantity of backfill materials needed for this alternative.

Alternative 4 is the least technically feasible, and requires additional soil management to stabilize the soils, when compared to Alternatives 2 and 3. Alternative 4 is administratively feasible, and materials and services are readily available. Alternative 4 would require treatability testing to determine the effectiveness of the technology to select the appropriate stabilizing agent(s).

For Alternatives 2, 3, and 4, access requirements would have to be addressed with property owners for each alternative, as well as institutional controls, such as deed notices.

7. Cost

The total estimated present worth costs of Alternatives 1, 2, 3, and 4 are $0, $10,048,000, $20,337,000, and $12,148,000, respectively. Alternative 3 is the most expensive and Alternative 1 is the least expensive.

SUMMARY OF PREFERRED ALTERNATIVES

OU1 Preferred Alternative

The Preferred Alternative for OU1 is Alternative 4 – Excavation and Off-site Treatment/Off-site Disposal. The major components of this alternative include:

- Excavation and offsite disposal of entire RTA of LNAPL source material
- Backfilling of excavated areas with I-280 ROW berm soil containing non-hazardous soil, and additional clean fill to grade; and,
- Supplementing backfill with clean soil as needed.

OU2 Preferred Alternative

The Preferred Alternative for OU2 is Alternative 2 – Excavation of Soil in Areas B and C; Vegetated Soil Cover in Areas A, B, and C; Institutional Controls; and Excavation of Sediments. The major components of this alternative include:

- Excavation of 2 feet of surface soil from Area B and C, and wetland areas located in Area A, totaling 31,300 cubic yards;
- Disposal of any RCRA or TSCA hazardous waste at an appropriate offsite facility (i.e. RCRA Subtitle C or TSCA disposal facility);
- Distribution of excavated soils from Areas B and C, and wetland areas, across Area A for regrading;
- Disposal of excavated sediments at an appropriate offsite facility;
- Installation of a 2-foot vegetated clean soil cover as an engineering control;
- Wetland restoration; and
- Implementation of a deed notice as an institutional control.

A two-foot soil cover will be constructed as the primary measure to prevent exposure to contaminants in the underlying soil. In Areas B and C, up to two feet of surface soil, approximately 31,300 cubic yards, will be excavated before placing a cover to maintain the current drainage patterns. For cost estimation purposes, EPA has assumed that approximately 500 cubic yards of soil contaminated with dioxin greater than 7,300 ppt will be disposed of at a Subtitle C facility. In addition, EPA has estimated that approximately 440 cubic yards of TSCA/RCRA contaminated soil will be disposed of offsite at an appropriate disposal facility (i.e. RCRA Subtitle C or TSCA disposal facility).

Based on groundwater data to date, EPA does not believe that soil remaining onsite will contribute to groundwater contamination. To confirm this, Synthetic Precipitation Leaching Procedure (SPLP), or a comparable test, will be performed during the design phase. For soils that fail SPLP, or a comparable test, additional actions will be taken to prevent the migration of contaminants to groundwater. Excavated soils from Areas B and C will be placed within Area A, and graded to facilitate cover placement. The wetland areas within Area A will also be excavated to a depth of two feet, to accommodate the soil cover, and restored, but no other locations within Area A will be excavated.

Sediment in the drainage ditch along I-280 will be excavated to an approximate depth of 18 inches, and 18 inches of stone bedding will be added.

The Preferred Alternative was selected over other alternatives because it reduces the risk within a reasonable time frame, and at a lower cost than other alternatives. The Preferred Alternative will meet chemical-specific ARARs and can be designed to meet action- and location-specific ARARs. It poses the lowest potential risks to onsite workers and the community because it would have the shortest construction duration, and the fewest impacts to traffic.

The Preferred Alternative is technically feasible, and is administratively feasible, and materials and services are readily available for its implementation. The potential for additional risks to the environment are minimal, and RAOs are expected to be met within 1 year.

The Preferred Alternative would achieve PRGs that are protective for non-residential use, but would not achieve levels that would allow for unrestricted use and therefore, institutional controls, such as a deed notice would be required. Five-year reviews would be conducted since contamination would remain above levels that allow for unlimited use and unrestricted exposure.

State Acceptance

The State of New Jersey concurs with the EPA's Preferred Alternatives presented in this Proposed Plan.

Community Acceptance

The Preferred Alternatives are believed to provide the best balance of tradeoffs among the alternatives based on the information available to EPA at this time. EPA believes the Preferred Alternatives would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions. The selected alternatives may change in response to public comment or new information.

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.

COMMUNITY PARTICIPATION

EPA provided information regarding the cleanup of the Site through meetings, the Administrative Record file for the Site, and announcements published in the local newspaper. EPA encourages the public to gain a more comprehensive understanding of the OUs and the remedial investigation activities that have been conducted at them.

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.

For further information on EPA's Preferred Alternative for the Diamond Head Oil Refinery Superfund Site contact:

Brittany Hotzler
Remedial Project Manager
(212) 637-4337

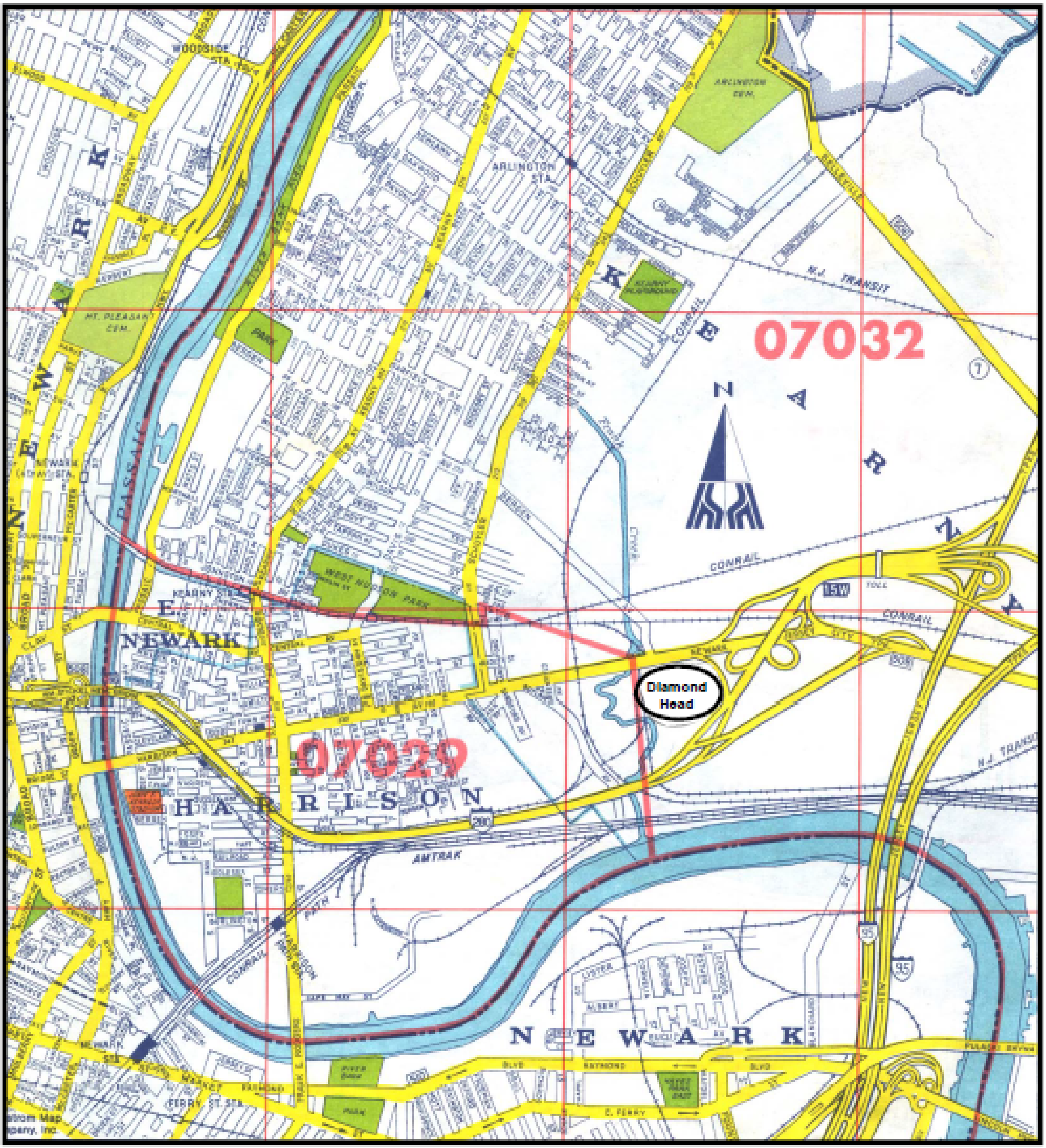
Wanda Ayala
Community Relations
(212) 637-3676

U.S. EPA
290 Broadway, 19th Floor
New York, New York 10007-1866

On the Web at:
https://www.epa.gov/superfund/diamond-head-oil

Source: Hagstrom Union/Hudson/Essex County Atlas, 1990

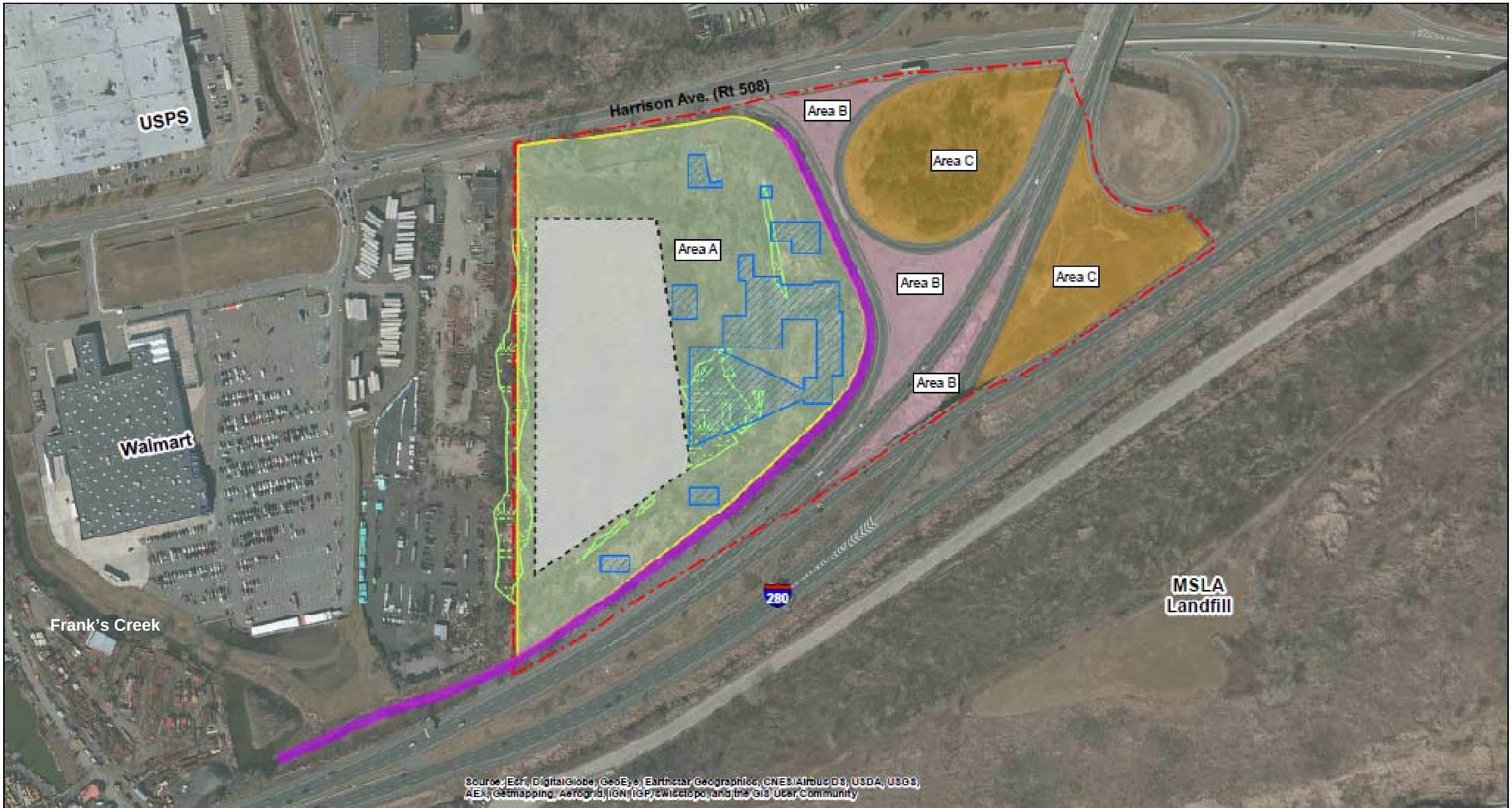
Hudson County, Page 6, Grid C-7



Block 285, Lots: 3, 14, 15
Vacant Lot Adjacent to 1235 Harrison Avenue
Kearny, NJ 07032 (Hudson County)

See Also: USGS 7.5' Quadrangle: Elizabeth, NJ: Photorevised 1981
40° 44' 50" lat., 74° 07' 55.9" long. (NAD 83)

FIGURE 1
Site Location Map
Diamond Head Oil Superfund Site, Operable Unit 2
Kearny, NJ



Legend

- Drainage Ditch
- Remedial Target Area for OU2 - Soils
  - Area A
  - Area B
  - Area C
- Current Property Boundary
- Site Boundary
- Landfill
- Delineated Wetlands
- Remedial Target Area for OU1 Principal Threat LNAPL Waste

N

0 62.5 125 Feet

Figure 2
Extent of OU2 Remedial Target Area
Diamond Head Oil Superfund Site
Kearny, NJ

CH2MHILL

Table 1

Diamond Head - Summary of Alternative Components

	Alternative 2 (1)						Alternative 3						Alternative 4					
	Area A (1)	Area A-wetlands	Landfill	Area B	Area C	Drainage Swale	Area A	Area A-wetlands	Landfill	Area B	Area C	Drainage Swale	Area A	Area A-wetlands	Landfill	Area B	Area C	Drainage Swale
Institutional Controls	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Removal and Treatment Ex-situ																		
Excavate Surface soil (2 feet) Sediment (18 inches)		x		x	x	x	x	x		x	x	x	x	x		x	x	x
Treat by Stabilization													x	x		x	x	
On-site reuse																		
Consolidate excavated soil in Area A		x		x	x									x		x	x	
Disposal																		
Dispose in Subtitle D						x	x	x		x	x	x						x
Dispose in Subtitle C Area A - 10% assumed Area B - TSCA soil				x			x			x						x		
Cover (2 feet)																		
Stabilized excavated soil													x					
Clean fill (18 inches)	x	x	x	x	x		x	x	x	x	x			x	x	x	x	
Top soil (6 inches)	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	
Restore wetlands																		
Grade		x						x						x				
Seed		x						x						x				

(1) Under Alternative 2, while a cover would be placed over the existing surface soils, wetland areas and Areas B and C will also be excavated to maintain drainage patterns and existing grade.

(2) Disposal includes addition of drying agent to pass paint filter test.

Note: Excavation of berm materials and their re-use to backfill the OU1 RTA is included under OU1.