RECORD OF DECISION

Hercules, Inc. (Gibbstown Plant) Superfund Site
Operable Units One and Two
Gibbstown, Gloucester County, New Jersey

Former Hercules Plant, circa 1958
(Source: *Feasibility Study, Former Hercules Higgins Plant, Gibbstown, New Jersey*, CSI Environmental, LLC, July 2018)

United States Environmental Protection Agency
Region 2
New York, New York
September 2018

550181

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DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Hercules, Inc. (Gibbstown Plant) Superfund Site

Gibbstown, Gloucester County, New Jersey

Superfund Site Identification Number: NJD002349058

Operable Unit(s): 01 and 02

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the U.S. Environmental Protection Agency's (EPA's) selection of a remedy for Operable Units one and two (OU1 and OU2) of the Hercules, Inc. (Gibbstown Plant) Superfund Site (Site), in Gloucester County, New Jersey, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. §§ 9601-9675, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting the OU1 and OU2 remedy. The attached index (see Appendix III) identifies the items that comprise the administrative record upon which the selected remedy is based.

The New Jersey Department of Environmental Protection (NJDEP) was consulted, in accordance with Section 121(f) of CERCLA, 42 U.S.C. § 9621(f), and concurs with the selected remedy (see Appendix IV).

SITE ASSESSMENT

Actual or threatened releases of hazardous substances from the Site, if not addressed by the implementation of the response action selected in this ROD, may present an imminent and substantial endangerment to public health and welfare and to the environment.

DESCRIPTION OF SELECTED REMEDY

The selected remedy addresses the contaminated groundwater in the Former Plant Area of the Site (OU1) and the contaminated soil in the Former Plant Area, and the contaminated sediment in Clonmell Creek and an on-Site storm water retention basin referred to as the Stormwater Catchment Basin (OU2).

The major components of the selected remedy include:

- excavation of lead-contaminated soil with off-Site disposal;
- excavation of volatile organic compound (VOC)-contaminated soil located 0-4 feet (ft.) below the ground surface (bgs) and on-Site treatment with ex-situ bioremediation;

- in-situ treatment of VOC-contaminated soil situated below 4 ft. bgs with enhanced biodegradation;
- hydraulic dredging of contaminated sediment and on-Site treatment with phytoremediation;
- on-Site reuse of treated soil and sediment;
- extraction of contaminated groundwater with on-Site treatment and discharge to groundwater;
- long-term groundwater monitoring; and
- institutional controls (ICs) to restrict groundwater use, prevent soil disturbances in the in-situ soil treatment areas, and require that future buildings on the Site either be subject to a vapor intrusion evaluation or be built with vapor intrusion mitigation systems until the remediation goals are met.

The soils in the Active Process Area, Chemical Landfill/Gravel Pit, Inactive Process Area, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas with contaminant of concern (COC) concentrations exceeding the remediation goals will be excavated to a depth of 4 ft. bgs and treated with ex-situ bioremediation. The soils situated below 4 ft. bgs in these exposure areas, with COC concentrations exceeding the remediation goals, will be treated in-situ using enhanced biodegradation.

Additional sampling will be conducted during the remedial design to confirm the complete delineation of benzene, cumene and colocated COCs in the on-Site soils prior to remediation and to verify that no COCs are present in off-Site soils above the NJDEP residential direct contact soil remediation standards.

Consistent with EPA Region 2's Clean and Green policy, EPA will evaluate the use of sustainable technologies and practices with respect the remedial alternative selected for the Site. This will include consideration of green remediation technologies and practices.

The concentrations of benzene, cumene, and colocated COCs in the Site soils, either adsorbed to soil particles or as non-aqueous phase liquid (NAPL), are an on-going source of contamination to the groundwater and are considered to be principal threat wastes.

The selected remedy will address source materials constituting principal threats by excavating and treating the VOC-contaminated soil from 0 to 4 ft. bgs and through in-situ treatment of the VOC-contaminated soil situated below 4 ft. bgs, thereby satisfying the preference for treatment.

DECLARATION OF STATUTORY DETERMINATION

The selected remedy meets the requirements for remedial actions set forth in Section 121 of CERCLA, 42 U.S.C. § 9621, because 1) it is protective of human health and the environment; 2) it meets a level or standard of control of the hazardous substances, pollutants, and contaminants that at least attains the legally applicable or relevant and appropriate requirements under federal and state laws unless a statutory waiver is justified; 3) it is cost-effective; and 4) it utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. In addition, the selected remedy satisfies the Section 121 of CERCLA, 42 U.S.C. § 9621 preference for the use of treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances as a principal element.

Because the selected remedy will result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the administrative record file for this action.

- A discussion of the current nature and extent of contamination is included in the "Summary of Site Characteristics" section.
- The Site COCs and their respective concentrations are presented in the "Summary of Site Characteristics" section.
- A discussion of the potential adverse effects associated with exposure to Site COCs is included in the "Summary of Site Risks" section.
- The remediation goals for the Site COCs are presented in the "Remedial Action Objectives" section and in Tables 11 through 13 of Appendix II.
- A discussion of principle threat waste is included in the "Principal Threat Wastes" section.
- A discussion of the current and reasonably anticipated future land use assumptions is included in the "Current and Potential Future Land and Resources Uses" section.
- The estimated capital, operation and maintenance, and total present-worth costs are presented in the "Description of Remedial Alternatives" section.
- A discussion of the key factors that led to the selection of the remedy is included in the "Comparative Analysis of Alternatives" and "Statutory Determinations" sections.

AUTHORIZING SIGNATURE

A. Carpenter — 9-25-18

Angela Carpenter, Acting Director
Emergency and Remedial Response Division

Date

RECORD OF DECISION FACT SHEET
EPA REGION II

Site

Site name:	Hercules, Inc. (Gibbstown Plant) Site
Site location:	Gibbstown, Gloucester County, New Jersey
HRS score:	40.36
Listed on the NPL:	September 8, 1983

Record of Decision

Date signed:	September 25, 2018
Selected remedy:	Excavation of lead-contaminated soil with off-Site disposal; excavation of VOC-contaminated soil located 0-4 feet (ft.) below the ground surface (bgs) and treatment with ex-situ bioremediation followed by on-Site reuse; enhanced in-situ biodegradation of VOC-contaminated soil situated below 4 ft. bgs; hydraulic dredging of contaminated sediments with on-Site phytoremediation and reuse; extraction of contaminated groundwater with on-Site treatment and long-term monitoring; and institutional controls
Capital cost:	$7.5 million
Annual operation, and maintenance cost:	$475,000
Present-worth cost:	$11.3 million

Lead	EPA
Primary Contact:	Patricia Pierre, Remedial Project Manager, (212) 637-3865
Secondary Contact:	Joel Singerman, Chief, Central New York Remediation Section, (212) 637-4258
Main PRP	Hercules LLC

Waste

Waste type:	Volatile organic compounds and lead
Waste origin:	On-site waste disposal activities
Contaminated media:	Soil, sediment and groundwater

DECISION SUMMARY

Hercules, Inc. (Gibbstown Plant) Superfund Site
Operable Units One and Two
Gibbstown, Gloucester County, New Jersey

SITE NAME, LOCATION, AND DESCRIPTION

The Hercules, Inc. (Gibbstown Plant) Superfund Site (Site), a former chemical manufacturing facility, is situated on approximately 350 acres located off South Market Street in Gibbstown, Gloucester County, New Jersey (See Figure 1 of Appendix I). The Site is bounded to the east by Paulsboro Refining Company, LLC, to the west by open land owned by E.I. du Pont de Nemours and Company (DuPont), to the north by the Delaware River, and to the south and southwest by residences. Area homes are served by municipal water supply wells. The selected remedy described herein addresses two portions, or operable units, of the Site. Operable unit one (OU1) addresses the contaminated groundwater in the Former Plant Area. OU2 addresses the contaminated soil in the Former Plant Area and contaminated sediment in Clonmell Creek and the Stormwater Catchment Basin.

Clonmell Creek flows northwest through the Site property toward the Delaware River. On the Site property, the creek ranges from 75 to 120 feet (ft.) wide and 0.25 to 3 ft. deep and separates the two primary areas of the Site — the Solid Waste Disposal Area (SWDA) located to the north and the Former Plant Area located to the south.

The SWDA is situated approximately 2,000 ft. north of Clonmell Creek and covers nearly five acres. It is surrounded by wetlands and sits adjacent to the Delaware River. The SWDA and adjacent wetlands have already been addressed as Operable Unit 3 (OU3) of the Site

The Former Plant Area, the manufacturing portion of the facility during its operational period, occupies approximately 80 acres. An unlined stormwater retention pond, referred to as the "Stormwater Catchment Basin," is located within the Former Plant Area, about 600 ft. south of Clonmell Creek. The Stormwater Catchment Basin ranges in width from approximately 64 ft. on its south end to 125 ft. on the north, and 0.25 to 3 ft. deep, dependent upon precipitation levels. Historically, storm water collected in the area now known as the "Stormwater Catchment Basin" and flowed through the 002 outfall, which was a New Jersey Department of Environmental Protection (NJDEP)-permitted discharge point, into an adjacent drainageway before discharging into Clonmell Creek (See Figure 2 of Appendix I). There has been no hydraulic connection between the Stormwater Catchment Basin and Clonmell Creek since 1991.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Before the property was transferred to Hercules Incorporated (Hercules) in 1952, DuPont reportedly used the area now designated as the SWDA and surrounding areas to dispose of lead fragments and tar generated from the production of aniline. In 1952, Hercules acquired title to the Site property from DuPont. Construction of the manufacturing plant began in 1953 and the plant was fully operational by 1959. Phenol and acetone were manufactured at the facility until 1970. After 1970, the plant produced three primary products—cumene hydroperoxide, diisopropylbenzene, and dicumyl peroxide, which are compounds used in phenol and acetone production. Hercules used the SWDA from 1955 until 1974 to dispose of wastes generated from its manufacturing activities. In 2008, Ashland, LLC (Ashland), then known as Ashland, Inc., acquired Hercules, with Hercules continuing to exist as a subsidiary of Ashland.

In 2010, Hercules decommissioned the plant and all the aboveground structures were demolished, except for a groundwater treatment system, a former administration building, and two surface impoundments. Significant subsurface sewer lines, process piping, and utilities associated with the former manufacturing facility remain in portions of the Active Process Area and Inactive Process Area. These structures were abandoned in place and filled with concrete.

In 1981, the U.S. Geological Survey released a report documenting the detection of benzene in a Site production well. Based upon this finding, Hercules, under NJDEP oversight, conducted additional groundwater studies, which led to the discovery of other Site-related chemicals in groundwater at the Site. Because of the contamination identified in the groundwater and the tar and other debris disposed of in the SWDA, the Site was added to the National Priorities List on September 8, 1983.

In 1984, as an interim remedy, Hercules installed a groundwater extraction and treatment system to prevent contaminated groundwater from migrating off-property. The system was upgraded in 2008 and continues to operate.[1]

In 1986, Hercules entered into an Administrative Consent Order with NJDEP to perform a remedial investigation and feasibility study (RI/FS) in the SWDA and adjacent areas. Based upon the results of the RI, conducted between 1987 and 1993, NJDEP issued a ROD in 1996, selecting a remedy for the SWDA and adjacent areas, which comprise OU3 of the Site. The major components of the remedy include consolidation of tar material and miscellaneous solid wastes under an impermeable cap; implementation of engineering controls and institutional controls (ICs)[2], such as fencing and environmental use restrictions, respectively; and the establishment of a Classification Exception Area (CEA)/Well Restriction Area (WRA)[3] for groundwater beneath and surrounding the SWDA. The OU3 remedial action was completed in 2014. Routine maintenance of the SWDA is performed by Hercules.

Under NJDEP oversight, Hercules initiated an RI/FS in 1987 to determine the nature and extent of contamination associated with the first and second operable units (OU1 and OU2). EPA assumed the lead for OU1 and OU2 in 2008. In 2009, EPA entered into an Administrative Settlement Agreement and Order on Consent (AOC) with Hercules for the completion of the RI/FS.

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[1] The system was to operate until a final OU1 groundwater remedy was selected.

[2] ICs are non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and/or protect the integrity of a remedy.

[3] A CEA/WRA serves as an IC by providing notice that there is ground water pollution in a localized area caused by a discharge at a contaminated site and restricting well installation in the affected aquifer.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

On July 30, 2018, EPA released the Proposed Plan for OU1 and OU2 to the public for comment. Supporting documentation comprising the administrative record was made available to the public at the information repositories maintained at the Greenwich Township Branch of the Gloucester County Library System, 411 Swedesboro Road in Gibbstown, New Jersey, the EPA Region 2 Superfund Records Center, 290 Broadway, 18th Floor, New York, New York; and EPA's website for the Site at https://www.epa.gov/superfund/hercules-gibbstown.

EPA published notice of the start of the public comment period, which ran from July 30 to August 28, 2018, and the availability of the above-referenced documents in the *Gloucester County Times* on July 29, 2018. A news release announcing the Proposed Plan, which included the public meeting date, time, and location, was issued to various media outlets and posted on EPA's Region 2 website on July 27, 2018.

A public meeting was held on August 16, 2018 at the Municipal Court Meeting Room, 21 N. Walnut Street, Gibbstown, New Jersey, to discuss the alternatives presented in the RI/FS, and to present EPA's preferred remedy for OU1 and OU2 to the community. Approximately 30 people attended the public meeting, including residents, media, local business people and local government officials. Public comments were related to remedy details, the performance of the work at the Site, and public health concerns.

A copy of the public notice published in the *Gloucester County Times,* along with responses to the questions and comments received at the public meeting and in writing during the public comment period can be found in the attached Responsiveness Summary (See Appendix V).

SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The NCP, at 40 CFR Section 300.5, defines an operable unit as a discrete action that comprises an incremental step toward comprehensively addressing site problems. A discrete portion of a remedial response eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into several OUs, depending on the complexity of the problems associated with the site.

The Site is being addressed in three OUs. OU3, which included the tar and mixed waste in the SWDA, was the first OU to be addressed. A remedial action for OU3 was selected by NJDEP in 1996, calling for waste consolidation and capping, long-term groundwater monitoring, periodic inspections and ICs. The OU3 remedial action was completed in 2014 and maintenance of the cap is being performed by Hercules under NJDEP oversight. EPA conducts five- year reviews (FYRs) to ensure that the OU3 remedy continues to be protective of human health and the environment. The first FYR was conducted in 2015.

The subjects of this ROD are contaminated groundwater in the Former Plant Area (OU1) and contaminated soil in the Former Plant Area and contaminated sediment in Clonmell Creek and the Stormwater Catchment Basin (OU2). The primary objectives of this action are to remediate the sources of groundwater, soil, and sediment contamination, minimize the migration of contaminants, and minimize any potential future health and environmental impacts.

SUMMARY OF SITE CHARACTERISTICS

Hydrogeology

The Site geology is characterized by the presence of thick unconsolidated sand, silt, gravel, and clay layers. The regional aquifer system, supplying water resources to Greenwich Township and the surrounding area, is generally considered to consist of three aquifers (Upper Middle, Lower Middle and Lower), which are separated by two confining units. At the Site, alluvial deposits overlie the regional aquifer. The shallow (A-level) monitoring well network for the Site is screened into these deposits which range from 0 to 25 ft. bgs; the intermediate (B-level) monitoring well network is screened in the Upper Middle aquifer, ranging from 25 to 75 ft. bgs; and the deep (C-level) monitoring wells are screened in the Lower Middle aquifer, which ranges from 80 to 120 ft. bgs. The depth to groundwater in the Former Plant Area ranges between 8 and 10 ft. bgs.

Regional groundwater (intermediate and deep depths) generally flows from north to south, exhibiting some influence from conditions in the Delaware River. Groundwater at the Site flows to the south and downward, which results in shallow aquifer groundwater contamination flowing into the underlying intermediate aquifer and subsequently into the deep aquifer. A network of groundwater recovery wells that pump from the shallow, intermediate and deep aquifers currently maintains hydraulic containment of the contaminated groundwater beneath the Site.

Remedial Investigation

The July 2018 RI report provides the analytical results of the environmental characterization activities conducted to determine the nature and extent of contamination in the OU1/OU2 areas of the Site. RI activities included the installation of monitoring wells and collection of soil and groundwater samples from the Former Plant Area; collection of sediment, surface water, pore water, and soil samples from the Stormwater Catchment Basin, at the 002 outfall, in the adjacent drainageway, and in Clonmell Creek and its associated wetlands; geological, hydrogeological and residential vapor intrusion investigations; preparation of a numerical groundwater flow model; and human health and ecological risk assessments.

Based upon the results of the RI, EPA concluded that VOCs are the predominant contaminants present in the Former Plant Area groundwater and soils and the Clonmell Creek and Stormwater Catchment Basin sediments. The contaminants of concern (COCs) identified for the Site include acetophenone, benzene, cumene, ethylbenzene, lead, phenol, and toluene. Benzene and cumene were found to be the most prevalent of the COCs present at the Site. Acetophenone, ethylbenzene, phenol, and toluene are compounds typically associated with benzene and cumene and were only found to be present at the Site colocated with benzene and cumene. Trichloroethylene (TCE) and 1,2-dichloroethane (DCA) were detected at concentrations exceeding the RI screening values in the monitoring wells located in the downgradient areas of the property, in the groundwater recovery wells associated with the extraction and treatment system and in wells located off-property. Because these contaminants were not found to be present in the Site soils, EPA determined that TCE and 1,2-DCA are not Site-related and, therefore, are not COCs.[4] Based upon these findings, the following discussion of the RI results will primarily focus on benzene and cumene.

The Former Plant Area was divided into the following RI investigation areas, referred to as exposure areas: Active Process Area; Area A/Open Area, Area B; Chemical Landfill/Gravel Pit Area; Clonmell Creek and Wetlands; Inactive Process Area; Northern Chemical Landfill Area; Northern Warehouse Area; Shooting Range;[5] Stormwater Catchment Basin Area; Tank Farm/Train Loading Area; and Township Refuse Area (See Figure 3 of Appendix I).

Soil samples were collected in each of the exposure areas, both above (unsaturated) and below (saturated) the water table. Benzene, cumene and colocated COCs were found to be present at levels exceeding RI screening values in the soils of the Active Process Area, Chemical Landfill/Gravel Pit, Inactive Process Area, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas. However, the bulk of the contamination is present in the Active Process Area saturated soils (to a depth of 17.5 ft.), either adsorbed to soil particles or as non-aqueous phase liquid (NAPL).[6] The maximum benzene and cumene concentrations detected in each of these exposure areas are summarized in Tables 1 and 2 of Appendix II and the OU2 areas with COC concentrations exceeding the RI soil screening values are depicted in Figure 4 of Appendix I.

RI sampling results indicate the presence of lead in the Township Refuse Area and Shooting Range soils at concentrations as high as 2,300 milligrams per kilogram (mg/kg). Additional delineation of the lead contamination in these exposure areas is needed.

<u>Sediment</u>

Sediment samples were collected throughout the Stormwater Catchment Basin (including the adjacent drainageway) and within the on-Site reach of Clonmell Creek (including the 002 outfall area). Upstream and downstream sediment samples were also obtained from Clonmell Creek. Samples were collected down to 3 ft. in the Stormwater Catchment Basin, 0.5 ft. in the drainageway and 5 ft. in Clonmell Creek.

Cumene concentrations were detected throughout the Stormwater Catchment Basin, ranging from 0.00059 to 710 mg/kg and extending down to 3 ft. in the central area of the basin. Cumene was detected in on-Site Clonmell Creek sediment at depths ranging from

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[4] Although TCE and 1,2-DCA are not Site COCs, these contaminants are being treated by the groundwater extraction and treatment system.

[5] The Shooting Range exposure area is currently being used by the Township of Greenwich Police Department as a shooting range.

[6] NAPLs are liquid contaminants that do not easily mix with water and remain in a separate phase in the subsurface.

0.5 to greater than 4 ft., and at concentrations ranging from 0.0014 to 240,000 mg/kg. Cumene was not detected at concentrations exceeding the screening value in downgradient samples collected from Clonmell Creek on the adjacent DuPont property. Based upon the RI results, including the risk assessment (discussed below) EPA determined that the sediments in the Stormwater Catchment Basin and on-Site reach of Clonmell Creek would need to be addressed. The sediment remediation areas are depicted in Figure 5 of Appendix I.

<u>Surface Water</u>

Surface water samples were collected throughout the Stormwater Catchment Basin (including the adjacent drainageway) and within the on-Site reach of Clonmell Creek (including the 002 outfall area). No COCs were detected above the RI screening values. The surface water sampling results for the Stormwater Catchment Basin and Clonmell Creek can be found in Table 8-66 and Table 8-30, respectively, of the July 2018 RI report.

<u>Groundwater</u>

Groundwater has been monitored both on and off the property since 1984. A total of 92 monitoring wells are sampled on an annual basis, with 28 of the 92 wells being sampled quarterly. Figure 6 of Appendix I shows the locations of the OU1 groundwater monitoring wells and extraction wells associated with the existing treatment system. Benzene and cumene concentrations exceeding RI screening values were detected in the shallow, intermediate and deep aquifers. The most significant benzene and cumene detections were in the shallow aquifer in the Active Process Area, Stormwater Catchment Basin and Northern Chemical Landfill exposure areas. Maximum COC concentrations detected in each of these exposure areas are presented in Table 3 of Appendix II.

<u>Vapor Intrusion</u>

Vapors released from VOC-contaminated groundwater and/or soil have the potential to move through the soil (independently of groundwater) and seep through cracks in basements, foundations, sewer lines, and other openings. The vapor intrusion pathway is evaluated at a site when soils and/or groundwater are known or suspected to contain VOCs. In 2011, vapor intrusion sampling was conducted in the residences situated adjacent to the southern property boundary of the Site.

Thirteen soil gas samples, 12 sub-slab samples, one crawl space air sample, eight ambient air samples, and 25 indoor air samples were obtained from 13 properties. Soil gas, sub-slab and ambient air samples were compared against the EPA target shallow gas concentration and the NJDEP residential soil gas screening level. Indoor air samples were compared against the EPA target indoor air concentration (TIAC) and the NJDEP residential indoor air screening level.[7] Indoor air sampling results also were compared to indoor air action levels, which are threshold levels that would trigger the need for further action, if exceeded.

[7] Sub-slab sampling results were multiplied by a factor of 10 to account for attenuation into indoor air.

No Site-related compounds were measured at concentrations above applicable state or federal screening criteria in the analytical results from any of the sub-slab samples. Benzene was detected above the TIAC in the one crawl space sample, however, benzene was not detected in the corresponding indoor air sample collected at this property. Although no Site-related compounds were detected above screening criteria in any sub-slab samples, benzene was detected above the TIAC in 10 indoor air samples from 6 properties. However, benzene was either not detected or detected below the screening values in the sub-slab sampling results from these properties. This indicates that the benzene detections in the indoor air were not the result of vapor intrusion and were likely associated with indoor sources. Based upon these results, EPA determined that no additional vapor intrusion monitoring was necessary. The report documenting the findings of the 2011 vapor intrusion study, entitled *Hercules Incorporated, Higgins Plant, Gibbstown, NJ Sub-Slab, Soil Gas and Indoor Air Vapor Intrusion Investigation Report*, can be found in Appendix I of the July 2018 RI report.

Contamination Fate and Transport

In general, the COCs that were detected in soil and groundwater samples at the Site are understood to be the result of releases and fugitive emissions consistent with operation of a large chemical manufacturing facility for more than 50 years. The location of the COCs and their mass distribution correlate reasonably well to the location of the process areas of the former Hercules plant. In addition, historical subsurface process sewers in the former Active Process Area that were connected to a skimmer located along the boundary of the Active Process Area and the Inactive Process Area likely also have contributed to subsurface cumene releases. A conceptual Site model[8] is depicted in Figure 7 of Appendix I.

CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

Land Use

Gibbstown is an unincorporated community in Greenwich Township. It has an area of about two square miles and a population of approximately 4000, according to the 2010 census report. The Site property is comprised of 350 acres of developed and undeveloped land, currently zoned for commercial/industrial use. It is bordered to the north by the Delaware River, to the south by a residential area of predominantly single-family homes and to the east and west by industrial properties. EPA does not anticipate that the land use designation will change in the foreseeable future.
The Shooting Range exposure area is currently being used by the Township of Greenwich Police Department as a shooting range.

Groundwater Use

The Potomac-Raritan-Magothy Formation (PRM) constitutes the regional aquifer system supplying water resources to Greenwich Township and the surrounding area. It is

[8] A conceptual site model illustrates contaminant sources, release mechanisms, exposure pathways, migration routes, and potential human and ecological receptors.

generally considered to consist of three aquifers (Upper Middle, Lower Middle and Lower), which are separated by two confining clay units. The municipal water supply wells servicing the Gibbstown area are screened in the Lower Middle aquifer; two municipal water supply wells are located near the Site. A network of groundwater recovery wells currently pumps from the Upper Middle and Lower Middle aquifers to maintain hydraulic containment of the contaminated groundwater beneath the Site.

SUMMARY OF SITE RISKS

A Baseline Human Health Risk Assessment (BHHRA) was conducted to estimate current and future effects of contaminants on human health. A BHHRA 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 exposures under current and future site uses. It provides the basis for taking an action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. Tables 4 through 10 of Appendix II provide a summary of relevant information from the BHHRA (i.e. exposure pathways and chemicals found to pose unacceptable risk to human health).

A screening-level ecological risk assessment (SLERA) was also conducted to evaluate the potential for adverse ecological effects from exposure to Site-related contamination. Based on the findings of the SLERA, a baseline ecological risk assessment (BERA) was conducted to further analyze the risk posed to ecological receptors.

The BHHRA report, entitled *Baseline Human Health Risk Assessment for the Hercules Incorporated Former Higgins Plant and* dated June 2017 and the BERA report, entitled Baseline Ecological Risk Assessment for the Hercules Incorporated Former Higgins Plant and dated March 2017, are available in the Administrative Record file and site repository. The BHHRA and BERA results are discussed below.

Human Health Risk Assessment

<u>Summary of the Human Health Risk Assessment Process</u>

A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios is summarized below. Each step is summarized below.

- *Hazard Identification* – uses the analytical data collected to identify the contaminants of potential concern (COPCs) at the site for each medium, with consideration of a number of factors explained below.
- *Exposure Assessment* – estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (*e.g.*, ingesting contaminated soil) by which humans are potentially exposed.
- *Toxicity Assessment* – determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of effect (response).

- *Risk Characterization* – summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks. The risk characterization also identifies contamination with concentrations that exceed acceptable levels, defined by the NCP as an excess lifetime cancer risk greater than 1×10^{-6} to 1×10^{-4} or a Hazard Index greater than 1.0; contaminants at these concentrations are considered COCs and are typically those that will require remediation at the site. Also included in this section is a discussion of the uncertainties associated with these risks.

Hazard Identification

In this step, analytical data collected during the multi-phase RI were used to identify COPCs in the soil, sediment, surface water and groundwater at the Site based on factors such as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentrations of the contaminants as well as their mobility, and persistence. Benzene and cumene were identified as the primary COCs for the Site. The following exposure pathways resulted in unacceptable human health risk: current/future outdoor industrial workers as a result of direct contact with/ingestion of benzene and cumene in the Sitewide shallow (A-level) aquifer; future on-Site residents as a result of direct contact with/ingestion of benzene and cumene in the intermediate (B-level)/deep (C-level) aquifers in the Active Process Area (also phenol and 1,2-DCA), Northern Chemical Landfill and Tank Farm/Train Loading Area (also phenol and TCE); and construction/utility workers as a result of dermal contact with Sitewide shallow (A-level) groundwater. In addition, modeled lead ingestion resulted in an unacceptable potential exposure to outdoor industrial workers and construction/utility workers and the fetuses of females in both groups in the Township Refuse Area and Shooting Range.

Groundwater monitoring data collected from 2013 through 2017 were evaluated as part of the RI and soil samples used to model lead uptake were most recently collected in 2015. Table 3 of Appendix II presents the OU1 maximum concentrations in the A-level aquifer for benzene and cumene of 19,000 μg/L and 140,000 μg/L, respectively. Maximum concentrations of benzene and cumene in B/C-level groundwater were were 22,000 μg/L and 47,000 μg/L in the Active Process Area; 190 μg/L and 27,000 μg/L in the Northern Chemical Landfill; and 400 μg/L and 33,500 μg/L in the Tank Farm/Train Loading Area, respectively. Maximum B/C-level groundwater concentrations of phenol in the Active Process Area and Tank Farm/Train Loading Area were 120,000 μg/L and 59,000 μg/L, respectively. Maximum B/C-level groundwater concentrations of 1,2-DCA in the Active Process Area and TCE in the Tank Farm/Train Loading Area were 620 μg/L and 26 μg/L, respectively. Although 1,2-DCA is present in the Acitive Process Area and TCE is present in Tank Farm/Train Loading Area groundwater at levels that pose a human health exposure risk, EPA has determined that these contaminants are not Site-related, and therefore, are not COCs. Maximum lead concentrations in soils of the Township Refuse Area and Shooting Range[9] were 2,300 mg/kg (mean: 758 mg/kg) and 1,620 mg/kg (mean: 1620 mg/kg), respectively. A comprehensive list of all Site COPCs can be found in the Table 2 series of the June 2017 BHHRA report.

[9] Only one test pit sample was collected because the Shooting Range is still active.

Exposure Assessment

In this step, the different exposure scenarios and pathways through which people might be exposed to the contaminants identified in the previous step were evaluated. Consistent with Superfund policy and guidance, the BHHRA is a baseline risk assessment and therefore assumes no remediation or institutional controls to mitigate or remove hazardous substance releases. Cancer risks and noncancer hazard indices were calculated based on an estimate of the reasonable maximum exposure (RME) expected to occur under current and future conditions at the Site. The RME is defined as the highest exposure that is reasonably expected to occur at a site.

The exposure assessment identified potential human receptors based on a review of current and reasonably foreseeable future land use at the Site. The Site is 350 acres, though the active plant operations occurred in approximately 80 acres in the southwest portion of the property. A branch of Clonmell Creek courses through the Site, flowing northwest into the Delaware River. Areas immediately surrounding Clonmell Creek and to the north are undeveloped wetlands. A DuPont plant and a school athletic field border the Site to the west. To the east is Paulsboro Refinery and to the south is a residential neighborhood. Groundwater in the impacted shallow (A-level) and intermediate (B-level) /deep (C-level) aquifers is not used as a source of domestic water in the study area and is not anticipated to be used for potable purposes in the future. A confining clay layer separates the A- and B/C-level groundwater from the deeper PRM unit which is used for domestic purposes.

Several exposure scenarios for the Site were selected based on information gathered during the RI, such as zoning and demographic information. Based on current and future land uses, the following exposure scenarios were evaluated: outdoor industrial workers (adult and fetus – lead model), indoor workers (adult), construction/utility workers (adult and fetus – lead model), trespassers (adult, youth 6-18), hypothetical on-Site residents (adult/child 0-6), recreational users (youth 6-18), recreational hiker (adult), recreational hunter (adult), recreational angler (adult), and off-Site resident (adult, youth 6-18 and child 0-6). Outdoor industrial workers, construction/utility workers and hypothetical on-Site residents were the sensitive subpopulations identified for the Site.

Potential exposure routes for the Site varied by receptors and included incidental ingestion of, dermal contact with, and inhalation of volatiles/particulates from soil (including wetland soil), incidental ingestion of and dermal contact with sediment in Clonmell Creek, the Inactive Process Area pond and the Stormwater Catchment Basin, Sludge Drying Beds (located within the Stormwater Catchment Basin EA and associated drainage way, inidental ingestion of, dermal contact with and inhalation of volatiles from groundwater and surface water in Clonmell Creek, the Inactive Process Area pond and the Stormwater Catchment Basin, Sludge Drying and associated drainage ways, inhalation of volatiles in indoor air, and ingestion of game (deer, rabbits) and fish tissue. Table 5 of Appendix II presents all exposure pathways considered in the BHHRA, and the rationale for the selection or exclusion of each pathway.

Toxicity Assessment

In this step, the types of adverse health effects associated with contaminant exposures and the relationship between magnitude of exposure and severity of adverse health effects were determined. Potential health effects are contaminant-specific and may include the risk of developing cancer over a lifetime or other noncancer health effects, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some contaminants can cause both cancer and noncancer health effects.

Under current EPA guidelines, the likelihood of carcinogenic risks and noncancer hazards due to exposure to Site chemicals are considered separately. Consistent with current EPA policy, it was assumed that the toxic effects of the Site-related chemicals would be additive. Thus, cancer and noncancer risks associated with exposures to individual COPCs were summed to indicate the potential risks and hazards associated with mixtures of potential carcinogens and non-carcinogens, respectively.

Toxicity data for the BHHRA come from the Integrated Risk Information System (IRIS) database, the Provisional Peer Reviewed Toxicity Database (PPRTV), or another source that is identified as an appropriate reference for toxicity values consistent with EPA's directive on toxicity values. Additional toxicity information for all COPCs is presented in the Table 5 and 6 series of the June 2017 BHHRA.

Lead is not evaluated in the same manner as other non-carcinogenic contaminants. EPA has not published conventional quantitative toxicity values for lead because available data suggest a very low or possibly no threshold for adverse effects, even at exposure levels that might be considered background. However, the toxicokinetics of lead are well understood and, as a result, lead is regulated based on the blood lead concentration. In lieu of evaluating current and future risks using typical intake calculations and toxicity criteria, EPA developed models specifically to evaluate lead exposures. For this BHHRA, blood lead concentrations were estimated using the Integrated Exposure Uptake Biokinetic model (IEUBK) and the Adult Lead Model (ALM).

The BHHRA identified a potential for exposure to lead in the Township Refuse Area as well as the Shooting Range to cause elevated blood lead levels in adult outdoor workers and the fetuses of female workers. The projected blood lead levels from exposure of the outdoor industrial workers at a 95th percentile were modeled as follows: Township Refuse Area: 7.0 micrograms per deciliter (μg/dL); fetus: 6.3 μg/dL and Shooting Range: 13.2 μg/dL; fetus: 11.8 μg/dL. The projected blood lead levels from exposure of adult construction workers and the fetuses of female workers were modeled as follows: Township Refuse Area: 7.9 μg/dL; fetus: 8.8 μg/dL and Shooting Range: 19.1 μg/dL; fetus: 17.2 μg/dL. A blood lead reference value of 10 μg/dL is no longer considered by EPA to be protective to human health. In a recent directive (EPA OLEM Directive 9285.6-52), EPA approved the use of 5 μg/dL as the accepted blood lead reference value. The Site-specific risk reduction goal is to limit the probability of an individual's blood lead level exceeding 5 μg/dL to 5% of the population or less. Model input parameters are available in the June 2017 BHHRA.

Risk Characterization

In this step, the outputs of the exposure and toxicity assessments were summarized and combined to provide a quantitative assessment of site risks. Exposures were evaluated based on the potential risk of developing cancer and the potential for noncancer health hazards.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen, using the cancer slope factor (SF) for oral and dermal exposures and the inhalation unit risk (IUR) for inhalation exposures. Excess lifetime cancer risk for oral and dermal exposures is calculated from the following equation, while the equation for inhalation exposures uses the IUR, rather than the SF:

$$\text{Risk} = \text{LADD} \times \text{SF}$$

Where: Risk = a unitless probability (1×10^{-6}) of an individual developing cancer;

LADD = lifetime average daily dose averaged over 70 years (mg/kg-day); and

SF = cancer slope factor, expressed as [1/(mg/kg-day)]

The likelihood of an individual developing cancer is expressed as a probability that is usually expressed in scientific notation (such as 1×10^{-4}). For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk"; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund regulations and guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk) with 10^{-6} being the point of departure.

For noncancer health effects, a hazard index (HI) is calculated. The HI is determined based on a comparison of expected contaminant intakes and benchmark comparison levels of intake (reference doses, reference concentrations). Reference doses (RfDs) and reference concentrations (RfCs) are estimates of daily exposure levels for humans (including sensitive individuals) which are thought to be safe over a lifetime of exposure. The estimated intake of chemicals identified in environmental media (*e.g.*, the amount of a chemical ingested from contaminated drinking water) is compared to the RfD or the RfC to derive the hazard quotient (HQ) for the contaminant in the particular medium. The HI is obtained by adding the hazard quotients for all compounds within a particular medium that impacts a particular receptor population.

The HQ for oral and dermal exposures is calculated as below. The HQ for inhalation exposures is calculated using a similar model that incorporates the RfC, rather than the RfD.

$$\text{HQ} = \text{Intake}/\text{RfD}$$

Where: HQ = hazard quotient

Intake = estimated intake for a chemical (mg/kg-day)

RfD = reference dose (mg/kg-day)

The intake and the RfD will represent the same exposure period (*i.e.*, chronic, subchronic, or acute).

The key concept for a noncancer HI is that a "threshold level" (measured as an HI of less than 1) exists below which noncancer health effects are not expected to occur.

The HI is calculated by summing the HQs for all chemicals for likely exposure scenarios for a specific population. An HI greater than 1 indicates that the potential exists for non-carcinogenic health effects to occur due to Site-related exposures, with the potential for health effects increasing as the HI increases. When the HI calculated for all chemicals for a specific population exceeds 1, separate HI values are then calculated for those chemicals which are known to act on the same target organ. These discrete HI values are then compared to the acceptable limit of 1 to evaluate the potential for noncancer health effects on a specific target organ. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

Noncancer hazards identified due to exposure to Site contamination and unacceptable cancer risks are summarized in Table 8 and Table 9 of Appendix II, respectively.

Uncertainty in the Risk Assessment

The process of evaluating human health cancer risks and noncancer health hazards involves multiple steps. Inherent in each step of the process are uncertainties that ultimately affect the final risks and hazards. Important site-specific sources of uncertainty are identified for each of the steps in the four-step risk process above.

Uncertainties in Hazard Identification

Uncertainty is always involved in the estimation of chemical concentrations. Errors in the analytical data may stem from errors inherent in sampling and/or laboratory procedures.

While the datasets for the Site are robust, since environmental samples are variable, the potential exists that these datasets might not accurately represent reasonable maximum concentrations, which could result in either an underestimate or an overestimate of Site risk.

If applicable screening levels were not available for a particular constituent, surrogate screening values were selected based on constituents with structural and toxicological similarity. The use of surrogate screening values could overestimate or underestimate the actual toxicity of the contaminants and subsequently risk, though the approach is more conservative than qualitatively evaluating contaminants without available toxicity information.

Uncertainties in Exposure Assessment

There are two major areas of uncertainty associated with exposure parameter estimation. The first relates to the estimation of EPCs. The second relates to parameter values used to estimate chemical intake (e.g., ingestion rate, exposure frequency). The following reflects uncertainty related to chemical intake.

Recreational anglers and hunters were evaluated as part of the risk assessment; however, biota samples were not collected. Instead, these pathways were modeled using conservative assumptions regarding exposure frequencies, number of meals and size of meals. Estimation of COPC concentrations in tissue were estimated using conservative bioaccumulation factors. As a result, risks are likely overestimated for these exposure pathways.

Uncertainties in Toxicity Assessment

A potentially large source of uncertainty is inherent in the derivation of the EPA toxicity criteria (i.e., RfDs, RfCs, SFs). The use of a chronic RfD or RfC to evaluate subchronic exposures may have overestimated the risk because typically, individuals (particularly construction workers) can be exposed to higher concentrations over a shorter period.

Additionally, the use of surrogate toxicity values has the potential to overestimate or underestimate actual risk depending on the actual toxicokinetics of the contaminant.

Uncertainties in Risk Characterization

When all the uncertainties from each of the previous three steps are added, uncertainties are compounded. The uncertainties may have resulted in an underestimation or overestimation of risk, though due to the conservative nature of many assumptions, the overall risk assessment likely overestimates risks and hazards as a result of exposure to Site contaminants.

Ecological Risk Assessment

Sediment, surface water, pore water and soil samples were collected as part of the ecological risk assessment. The areas of the Site evaluated in the BERA include the Stormwater Catchment Basin (including at the 002 outfall and within the adjacent drainageway), Clonmell Creek and the adjacent wetland area. Aquatic plants, benthic invertebrates and fish, and semi-aquatic mammals and birds were assessed in the Stormwater Catchment Basin (including at the 002 outfall and within the adjacent drainageway) and in Clonmell Creek. In the wetland area, terrestrial plants and invertebrates along with terrestrial mammals and birds were evaluated. Toxicity testing and macroinvertebrate surveys were also conducted to support the BERA.

Measurement endpoints consisted of a comparison of estimated or measured exposure levels of contaminants to levels reported to cause adverse effects, evaluation of macroinvertebrate community metrics, sediment toxicity testing results, and comparison of observed effects at the Site with those observed at reference locations. The results for each ecological area evaluated in the BERA are summarized below.

The results of the macroinvertebrate survey in the Stormwater Catchment Basin indicated a slight to moderate impairment of the benthic community. Toxicity testing indicated a significant decrease in survival compared to the reference location. The potential for adverse effects to semi-aquatic mammals and birds is negligible.

The results of the macroinvertebrate survey in the drainageway indicated the presence of a slightly impaired benthic community with marginal habitat quality. No significant toxicity was observed and risk to mammalian and avian receptors is considered negligible.

The results of the macroinvertebrate survey in Clonmell Creek suggest a moderately impaired benthic community at several locations and suboptimal habitat quality at most locations. Toxicity testing results at several sampling locations indicated a significant decrease in survival compared to the reference location. Unacceptable risk to mammalian receptors was identified, primarily due to exposure to cumene.

In the Clonmell Creek Wetland Area, the likelihood of adverse effects to terrestrial plants and invertebrates, mammals and birds exposed to contaminants in wetlands soils is essentially non-existent.

The BERA concluded that there is a potential for adverse ecological effects associated with Site contaminants in the sediments of the Stormwater Catchment Basin and in Clonmell Creek, in the vicinity of the 002 outfall.

Basis for Taking Action

Based on the results of the OU1/OU2 RI/FS, including the risk assessments, EPA has determined that the response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

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), requirements to-be-considered (TBCs) [10], and Site-specific risk-based levels.

The following RAOs have been established for OU1 and OU2:

- Protect human health by preventing exposure to contaminated groundwater, soil and soil vapor;
- Prevent off-Site migration of contaminated groundwater;
- Minimize exposure of fish, biota and wildlife to contaminated sediments;

[10] TBCs are advisories, criteria, or guidance that were developed by EPA, other federal agencies, or states that may be useful in developing CERCLA remedies.

- Mitigate potential for contaminant migration from soils into groundwater and surface water; and
- Restore groundwater to levels that meet state and federal standards within a reasonable time frame.

EPA and NJDEP have promulgated maximum contaminant limits (MCLs) and NJDEP has promulgated groundwater quality standards (GWQSs) which are enforceable, health-based, protective standards for various drinking water contaminants. In the Proposed Plan, EPA selected the more stringent of the MCLs and GWQSs as the preliminary remediation goals (PRGs) for the COCs in the Site groundwater. EPA used the more stringent of the NJDEP nonresidential direct contact soil remediation standards (NRDCSRSs) and the NJDEP impact to groundwater soil screening levels as the PRGs for the unsaturated soils. Because there is no impact to groundwater screening level established for cumene, a Site-specific PRG was developed using the NJDEP Soil-Water Partition Equation Calculator (back calculated from either the MCL or GWQS). The NJDEP NRDCSRSs were used as the PRGs for the saturated soils and, when no NRDCSRS was available, the EPA Regional Screening Level (RSL) for industrial soil was used.

PRGs become final remediation goals when EPA selects a remedy after taking into consideration all public comments. EPA has selected the PRGs identified in the Proposed Plan as the remediation goals for OU1 and OU2.

EPA has determined that the COCs acetophenone, ethylbenzene and toluene, which were found at the Site colocated with the primary COCs (cumene and benzene) do not pose a human health exposure risk at this Site. These contaminants are COCs because they are present at concentrations that exceed ARARs. The remediation goals established for the Site COCs are identified in Tables 11 through 13 of Appendix II.

Because there is no screening value available for cumene in sediment, a Site-specific value of 120 mg/kg was developed for comparison with the RI sampling results. In lieu of developing a Site-specific sediment cleanup value for cumene, a mass-removal based approach will be used to ensure that the RAO of minimizing exposure of fish, biota and wildlife to contaminated sediments is achieved. The goal for cumene mass removal is 100% for the Stormwater Catchment Basin and 99% for Clonmell Creek.

DESCRIPTION OF REMEDIAL ALTERNATIVES

CERCLA Section 121(b)(1), 42 U.S.C. § 9621(b)(1), mandates that remedial actions be protective of human health and the environment, cost-effective, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives, to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA Section 121(d), 42 U.S.C. § 9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA Section 121(d)(4), 42 U.S.C. § 9621(d)(4). Detailed descriptions of the remedial alternatives for addressing the contamination associated with OU1 and OU2 at the Site can be found in the Feasibility Study (FS) report, dated July 2018.

Several studies were conducted during the RI to evaluate the use of various treatment techniques and processes and support the development of FS to address the contamination associated with OU1 and OU2 at the Site. A treatability study was conducted in the Active Process Area exposure area to evaluate the use of both aerobically- and anaerobically-enhanced biodegradation to treat source-area soils. Because the study results showed that anaerobically-enhanced biodegradation resulted in greater cumene concentration reductions, only anaerobic processes were considered for in-situ soil treatment.

An air sparging/soil vapor extraction pilot test was also performed in the Active Process Area. Based upon the results of the study, it was concluded that the heterogeneity of the soil conditions at the Site resulted in preferential flow paths in the subsurface lithology that inhibited the effective treatment of air flow through the saturated soil. Because this would likely limit the effectiveness of the treatment technology, this technology was eliminated from further consideration.

In addition, a pilot study was conducted in Clonmell Creek to evaluate the use of hydraulic dredging versus mechanical excavation for the removal of contaminated sediments. Hydraulic dredging was determined to be the more suitable of the two removal techniques because of its ability to target the unconsolidated sediments rather than the underlying clay, its ability to minimize fugitive emissions and downstream sediment transport, and the minimal impact that it has on the surrounding wetland area. Therefore, only hydraulic dredging is considered for the sediment alternatives involving dredging.

Along with the pilot study, a 12-month treatability study was conducted on the dredged material to evaluate the viability of utilizing phytoremediation[11] for the treatment of the cumene-contaminated sediments at the Site. Phytoremediation can occur through several mechanisms, including stabilization, accumulation, volatilization, degradation, and rhizosphere biodegradation. During the study period, plants were allowed to grow in the dredged sediment. At the end of the study period, sediment and plant tissue samples (above- and below-ground) were collected. The study results showed that the cumene in the sediment was reduced from concentrations ranging from 18 to 98 mg/kg to concentrations ranging from “non-detect” to 0.10 mg/kg. Cumene was not detected in any of the plant tissue samples, indicating that the cumene was destroyed through rhizosphere degradation, which is the breakdown of contaminants in the rhizosphere (soil surrounding the roots of plants) through microbial activity that is enhanced by the presence of plant roots. Based upon these results, it was determined that cumene-contaminated sediments at the Site can effectively be treated using phytoremediation.

[11] Phytoremediation is a process that uses living plants to remove, destroy or contain contaminants in environmental media.

As was noted above, for more than 30 years, a groundwater extraction and treatment system has been operated at the Site as an interim action. This system has successfully reduced contaminant concentrations in the groundwater and prevented contaminated groundwater from migrating off-property. Because of the effectiveness of the existing system and the anticipated removal of the contaminant source under an active soil remedial alternative, additional groundwater alternatives to address this groundwater contamination were not considered.

The OU1/OU2 remedial alternatives are summarized below. The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate the performance of the remedy with any potentially responsible parties, or procure contracts for design and construction. The "no-action" alternative was evaluated for soil, sediment, and groundwater because the Superfund program requires that the "no-action" alternative be considered as a baseline for comparison against other alternatives.

OU2 Soil Alternatives

Alternative S-1: No Action

Capital Cost:	$0
Annual Operation and Maintenance (O&M) Cost:	$0
Total Present-Worth Cost:	$0
Construction Time:	0 months

The no-action remedial alternative for soil does not include any physical remedial measures or controls to address the soil contamination at the Site.

Alternative S-2: Excavation with Off-Site Disposal and Enhanced In-Situ Biodegradation

Capital Cost:	$11,183,360
Annual O&M Cost:	$248,181
Total Present-Worth Cost:	$12,191,308
Construction Time:	12 months

Under this alternative, the soils in the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas with COC concentrations exceeding the remediation goals would be excavated to a depth of 4 ft. bgs in preparation for the enhanced in-situ biodegradation process discussed below. As noted above, significant subsurface structures remain in the Active Process Area and Inactive Process Area. Because the presence of these structures would make excavation impracticable, a limited volume (approximately 500 cubic yards [CY]) of the soils in these exposure areas exceeding the remediation goals would be treated in-situ rather than being excavated.

The soil in the Township Refuse Area with lead concentrations exceeding the remediation goals would be excavated. A Best Management Practices (BMP) plan would be developed and implemented to manage lead and minimize contamination of the Shooting Range exposure area while the shooting range continues to be used for its current purpose. If the current use of the Shooting Range exposure area ends or changes, delineation of the lead contamination would be performed and the soils the in the Shooting Range exposure area with lead concentrations exceeding the remediation goals would be excavated and disposed of off-Site.

An estimated 13,804 CY of contaminated soil would be excavated under this alternative, consisting of 1,052 CY[12] of lead-contaminated soil and 12,752 CY of soil contaminated with benzene, cumene and colocated COCs.

The contaminated soil would be excavated using standard construction equipment, such as backhoes and track excavators. The excavated soil would be placed directly onto a dump truck and transported to an on-Site staging area. The staging area would be designed with proper controls, including an impermeable liner, to maintain containment of the excavated soils and prevent any impacts to the surrounding soil and groundwater. The lead-contaminated soils would be segregated from other soils at the staging location because they may require disposal at a different facility. The excavated soil would then be sampled and transported off-Site for treatment and/or disposal at an appropriately licensed off-Site treatment and/or disposal facility.

Post-excavation sampling would be conducted to identify/confirm the areas where the remediation goals are exceeded in the soils situated below 4 ft. bgs. These soils (saturated and unsaturated) would be treated using enhanced in-situ biodegradation. Enhanced in-situ biodegradation would involve applying a magnesium sulfate solution to the contaminated soils to stimulate activity and reproduction in naturally-occurring anaerobic microorganisms. The microorganisms would then destroy or transform the COCs into less toxic compounds by using them as a food and energy source. Because the extent of the contamination is much greater and deeper in the Active Process Area and Inactive Process Area than in the other exposure areas, application of the anaerobic treatment solution in these exposure areas would be achieved using lateral infiltration galleries, consisting of perforated piping installed at the base of the excavated areas. The solution would be applied directly to the base of the excavations in the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas. The final design criteria for the infiltration galleries would be detailed in the remedial design.

Certified clean soil, meeting applicable state regulations, would be imported and used to backfill excavated areas and construct an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater and control surface water runoff/drainage. Vegetation would be placed in areas disturbed during excavation activities to stabilize the soil and maintenance of the soil cover would be performed.

[12] The estimated soil excavation volumes and associated costs do not include the lead-contaminated soil in the Shooting Range exposure area.

Performance and compliance monitoring would be conducted to determine residual contaminant concentrations and assess the need for additional treatment. The estimated time frame to achieve the RAOs and meet the remediation goals under this alternative is 10 years. An IC would be put in place to prevent intrusive activities in in-situ treatment areas until the remediation goals are met.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, in accordance with CERCLA the Site would be reviewed at least once every five years until the remediation goals are met.

Alternative S-3: Excavation with Off-Site Disposal, Ex-Situ Bioremediation/Reuse and Enhanced In-Situ Biodegradation

Capital Cost:	$5,198,118
Annual O&M Cost:	$248,181
Total Present-Worth Cost:	$6,206,066
Construction Time:	18 months

Under this alternative, the contaminated soils would be excavated as detailed above for Alternative S-2. The volumes and on-Site handling of excavated soils and the backfilling of excavated areas with certified clean fill would be the same as for Alternative S-2, the limited volume (approximately 500 cubic yards [CY]) of the soils in the Active Process Area and Inactive Process Area exceeding the remediation goals would be treated in-situ, rather than being excavated, and the lead-contaminated soil from the Township Refuse Area would be transported to an appropriately licensed off-Site treatment and/or disposal facility. This alternative would also include the development and implementation of a BMP plan in the Shooting Range, as described in Alternative S-2.

The soils excavated from the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas would be treated on-Site using ex-situ bioremediation instead of being transported of-Site for treatment/disposal. Conventional methods of ex-situ bioremediation include biopiles/composting, landfarming with tilling, phytoremediation or a combination of these methods. All methods were evaluated in the FS and biopiles/composting was determined to be the most suitable for application at the Site.

The excavated soil would be mixed with soil amendments, formed into piles and aerated, either passively or actively (using blowers or vacuum pumps). As part of the remedial design, an analysis would be performed to confirm that the average VOC concentrations that may be generated and released from ex-situ treatment of the soils would not exceed applicable state and federal air emissions standards. If air emissions controls are determined to be necessary based upon these calculations, then those controls would be detailed in the remedial design. In addition, vapors from the VOCs in the biopiles that volatilize into the air would be monitored to protect Site workers and ensure that state and federal air emission standards are not exceeded. Post-remedial sampling of the treated soils would be conducted to ensure that the remediation goals are met.

The ex-situ-remediated soils would be reused on-Site as part of an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater and control surface water runoff/drainage. Vegetation would be placed in areas disturbed during excavation activities to stabilize the soil, and maintenance of the soil cover would be performed for a period of 15 years.

The contaminated soils situated below 4 ft. bgs in the excavated areas would be treated using enhanced in-situ biodegradation, as described in Alternative S-2. The estimated time frame to achieve the RAOs and meet the remediation goals under this alternative is 10 years. An IC would be put in place to prevent intrusive activities in in-situ treatment areas until the remediation goals are met.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, in accordance with CERCLA the Site be reviewed at least once every five years until the RAOs are met.

OU2 Sediment Alternatives

Alternative SED-1: No Action

Capital Cost:	$0
Annual O&M Cost:	$0
Total Present-Worth Cost:	$0
Construction Time:	0 months

The no-action remedial alternative for sediment does not include any physical remedial measures or controls to address the sediment contamination at the Site.

Alternative SED-2: Hydraulic Dredging with Off-Site Disposal

Capital Cost:	$4,086,780
Annual O&M Cost:	$0
Total Present-Worth Cost:	$4,086,780
Construction Time:	12 months

Under this alternative, a hydraulic dredge would remove a mixture of contaminated sediment and water (referred to as slurry) from the bottom surfaces of the Stormwater Catchment Basin and Clonmell Creek. The work area would be enclosed with silt curtains to prevent downstream migration of contaminated sediment during dredging activities. Also, the surface water outside the work area would be monitored to ensure that contaminated sediments are not being resuspended in the water column and transported downstream.

The slurry would be transferred via pipeline into geotextile tubes (located in a staging area) for dewatering. The staging area would be designed with proper controls, including but not limited to an impermeable liner, to prevent any impacts to the surrounding soil and groundwater and maintain containment of the dredged sediments and effluent water from the geotextile tubes.

The effluent would be sampled and, if necessary, treated on-Site before being discharged to the Stormwater Catchment Basin in compliance with substantive New Jersey Pollutant Discharge Elimination System (NJPDES) discharge to groundwater permit requirements. The details of the effluent treatment system would be finalized during the remedial design. Monitoring of groundwater wells around the Stormwater Catchment Basin would be conducted to ensure compliance with substantive permit requirements. The dewatered solids left in the geotextile tubes would be transported to an appropriately licensed off-Site treatment and/or disposal facility.

As discussed above, because there is no screening value available for cumene in sediment, a Site-specific value of 120 mg/kg was developed for comparison with the RI sampling results. In lieu of developing a Site-specific sediment cleanup value for cumene, the volumes of sediment to be dredged were determined using a mass-removal approach. It is estimated that 1,225 CY of sediment from the Stormwater Catchment Basin and 7,275 CY of sediment from Clonmell Creek would be dredged. These volumes represent removal of 100 percent of the cumene mass in the Stormwater Catchment Basin sediment and approximately 99 percent of the cumene mass within the Clonmell Creek sediment and include all the sediment identified in the BERA as posing a risk to ecological receptors. The estimated time frame to achieve RAOs under this alternative is 18 months.

Alternative SED-3: Hydraulic Dredging with On-Site Treatment/Reuse

Capital Cost:	$1,860,320
Annual O&M Cost:	$0
Total Present-Worth Cost:	$1,860,320
Construction Time:	24 months

This alternative is the same as Alternative SED-2, except instead of being transported off-Site for treatment and/or disposal, the dredged sediments would be treated on-Site using phytoremediation and, if necessary, ex-situ bioremediation.

Under this alternative, the geotextile tubes would be located in a treatment area, designed with proper controls, including but not limited to an impermeable liner, to maintain containment of the dredged sediments and prevent any impacts to the surrounding soil and groundwater. Plants would be planted in the cumene-contaminated sediment within the geotextile tubes for a pre-determined growth period.[13]

Based upon the results obtained during the phytoremediation pilot study, it is expected that cumene concentrations in the sediment would be reduced to “non-detect.” However, if sampling results indicate that cumene concentrations remain above the remediation goals[14] at the end of the growth period, then ex-situ bioremediation, as described above for Alternative S-3, would be used to further treat the sediments.

[13] Additional studies would be conducted during the remedial design phase to refine plant species selection and determine the optimal growth period.

[14] Because the treated sediment would be reused on-Site in an engineered soil cover, the final COC concentrations would need to meet the unsaturated soil remediation goals.

The treated sediments would be reused on-Site as part of an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater and control surface water runoff/drainage. The plant residuals would be harvested and composted on-Site. The estimated time frame to achieve RAOs under this alternative is 18 months.

OU1 Groundwater Alternatives

Alternative GW-1: No Further Action

Capital Cost:	$0
Annual O&M Cost:	$0
Total Present-Worth Cost:	$0
Construction Time:	0 months

Under this remedial alternative, operation of the existing groundwater treatment system would be discontinued, and no further remedial measures would be taken to address the groundwater contamination at the Site.

Alternative GW-2: Extraction with On-Site Treatment and Long-Term Monitoring

Capital Cost:	$409,826
Annual O&M Cost:	$225,938
Total Present-Worth Cost:	$3,181,534
Construction Time:	12 months

As discussed above, as an interim remedy, operation of a groundwater extraction and treatment system has been on-going at the Site since 1984. The current system consists of extraction wells and subsurface pipelines that capture and carry contaminated groundwater into a treatment unit (currently housed in an on-Site trailer), with a treatment capacity of 125 gallons per minute (gpm). The treatment process consists of filtration through sand units to reduce iron and suspended solids, followed by transmission through a series of granular activated carbon (GAC) canisters to remove the COCs. The treated groundwater is then pumped through a pipeline and discharged into the Delaware River under a NJPDES discharge to surface water permit. Groundwater quality monitoring is conducted on a quarterly basis to verify that the system continues to maintain hydraulic control of the contaminated groundwater beneath the Site.

Under this alternative, a new treatment unit, with an approximate treatment capacity of 125 gpm, would be built to replace/upgrade the existing one and a small building would be constructed in the Stormwater Catchment Basin exposure area to house the new treatment unit. The extracted groundwater would be pumped from the existing extraction well infrastructure into an equalization tank within the treatment building and then treated with a polymer. The polymer would be combined with pH adjustment, if necessary, to promote flocculation of iron and other solids in the groundwater.

The groundwater would then be pumped through conventional geotextile tubes followed by GAC-impregnated geotextile tubes, if necessary, to remove iron and solids and treat the COCs. The flocculated iron and solids would be captured in the geotextile tubes. The COCs would partition to the solids in the geotextile tubes where they would biodegrade. The spent tubes would be transported off-Site to a permitted disposal facility. Treated water would be discharged to the groundwater in compliance with substantive NJPDES discharge to groundwater permit requirements (using the Stormwater Catchment Basin as an infiltration point). Long-term groundwater monitoring would be continued until the remediation goals are met.

It is estimated that, in combination with active treatment of source-area soils, it would take 10 years to remediate the contaminated groundwater to remediation goals under this alternative. However, a conservative 15-year time frame is used for groundwater monitoring to provide maximum protection of human health and the environment. The groundwater monitoring timeline may be truncated if the remediation goals can be met in a shorter time frame.

ICs would be put in place at the Site, including the establishment of a CEA/WRA to restrict groundwater use and require that future buildings on the Site either be subject to a vapor intrusion evaluation or be built with vapor intrusion mitigation systems until the remediation goals are met.

Because this alternative would result in contaminants remaining on-Site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years.

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy for a site, EPA considers the factors set forth in Section 121 of CERCLA 42 U.S.C. § 9621, and conducts a detailed analysis of the viable remedial alternatives pursuant to Section 300.430(e)(9) of the NCP, 40 C.F.R § 300.430(e)(9), EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies, OSWER Directive 9355.3-01, and EPA's A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents, OSWER 9200.1-23.P. The detailed analysis consists of an assessment of the individual alternatives against each of the nine evaluation criteria at 40 C.F.R. § 300.430(e)(9)(iii) and a comparative analysis focusing upon the relative performance of each alternative against those criteria. The evaluation criteria are described below.

Threshold Criteria – The first two criteria are known as "threshold criteria" because they are the minimum requirements that each response measure must meet to be eligible for selection as a remedy.

- <u>Overall protection of human health and the environment</u> addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with ARARs addresses whether a remedy will meet all the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provide grounds for invoking a waiver.

Primary Balancing Criteria – The next five criteria are known as "primary balancing criteria." These criteria are factors by which tradeoffs between response measures are assessed so that the best options will be chosen, given site-specific data and conditions.

- Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.
- Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies, with respect to these parameters, which a remedy may employ.
- Short-term effectiveness addresses the period needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.
- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
- Cost includes estimated capital, O&M, and present-worth costs.

Modifying Criteria – The final two evaluation criteria are called "modifying criteria" because new information or comments from the state or the community on the Proposed Plan may modify the preferred response measure or cause another response measure to be considered.

- State acceptance indicates if, based on its review of the FS report and Proposed Plan, the State concurs with the preferred remedy.
- Community acceptance refers to the public's general response to the alternatives described in the FS report and Proposed Plan.

A comparative analysis of these alternatives based upon the evaluation criteria noted above follows.

Overall Protection of Human Health and the Environment

Alternative S-1 would not be protective of human health because it would not actively address the contaminated soils, which are acting as a source of contamination to the groundwater and pose a human health risk. Alternatives S-2 and S-3 would be protective of human health, because these alternatives would employ a remedial strategy capable of eliminating direct contact risk for soil and the impact to groundwater, removing/treating the source of groundwater contamination and the threat to public health.

Alternative SED-1 would not be protective of the environment because no action would be taken to eliminate or mitigate ecological exposure to the contaminated sediments in the Stormwater Catchment Basin and Clonmell Creek. Alternatives SED-2 and SED-3 would be protective of the environment because, under these alternatives, the contaminated sediments posing an ecological risk in the Stormwater Catchment Basin and Clonmell Creek would be removed.

Alternative GW-1 would not be protective of human health because it would not prevent off-Site migration or actively treat the contaminated groundwater, which poses a human health risk. Alternative GW-2 would be protective of human health because it would rely upon groundwater extraction to prevent contamination from reaching downgradient receptors and active treatment to restore groundwater quality to levels that meet state and federal standards within a reasonable time frame. The ICs under Alternative GW-2 would provide protection of public health until groundwater standards are met.

Compliance with ARARs

Soil remediation goals for the Site were established based on NJDEP's NRDCSRSs (chemical-specific ARARs) and TBC criteria, including NJDEP's impact to groundwater screening levels and EPA's RSLs for industrial soil.

No action would be taken under Alternative S-1 to address contaminated soils. Therefore, this alternative would not achieve the soil remediation goals. Alternatives S-2 and S-3 would comply with ARARs because both alternatives would actively remediate contaminated soil to achieve the soil remediation goals.

Because Alternatives S-2 and S-3 would involve the excavation of contaminated soils, these alternatives would require compliance with fugitive dust and VOC emission regulations.

Both Alternatives S-2 and S-3 would be subject to state and federal regulations related to the transportation and off-site treatment and/or disposal of wastes.

There are currently no federal or state promulgated standards for contaminant levels in sediments. The New Jersey Ecological Screening Criteria (NJESC) are TBC criteria used in the RI and BERA to evaluate Site data. The primary location-specific ARARs for sediment would be the Freshwater Wetlands Protection Act (NJSA 13:9B-1 *et seq.*) and Flood Hazard Area Control Act Regulations (NJAC 7:13-10 and 11).

Alternatives SED-2 and SED-3 would result in minimal disturbance to the surrounding area and would not likely involve replacing the dredged sediment, therefore, both alternatives would comply with location-specific ARARs.

EPA and NJDEP have promulgated MCLs and NJDEP has promulgated GWQSs, which are enforceable health-based, protective standards for various drinking water contaminants (chemical-specific ARARs). Although the groundwater at the Site is not presently being utilized as a potable water source, achieving MCLs in the groundwater is an applicable standard because the aquifer beneath the Site is designated as a Class II-A potable water source.

No action would be taken under Alternative GW-1 to remediate the groundwater. Therefore, this action would not achieve chemical-specific ARARs. Alternative GW-2 would be more effective in reducing groundwater contaminant concentrations below MCLs and GWQSs, because it involves active remediation of the contaminated groundwater. Alternative GW-2 would also be subject to discharge to groundwater ARARs because treated water would be discharged to the groundwater using the Stormwater Catchment Basin as an infiltration point.

The ICs included in Alternatives S-2, S-3 and GW-2 would be implemented consistent with the provisions of State of New Jersey Administrative Requirements for the Remediation of Contaminated Sites (N.J.A.C. 7:26C).

Long-Term Effectiveness and Permanence

Alternative S-1 would not involve any active remedial measures and, therefore, would not be effective in preventing exposure to contaminants in the soil and would allow the continued migration of contaminants from the soil to the groundwater. Alternatives S-2 and S-3 would both be effective in the long term and would provide permanent remediation by removing contaminated soils (from 0-4 ft. bgs) in the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin, and Tank Farm/Train Loading Area exposure areas and either treating them on-Site or treating/disposing of them off-Site, and by treating the source-area soils in the Active Process Area exposure area to achieve the remediation goals. Both Alternatives S-2 and S-3 would rely on an IC to prevent intrusive activities in in-situ treatment areas until the remediation goals are met and would maintain reliable protection of human health and the environment over time.

Under Alternative S-2, lead-contaminated soils and VOC-contaminated soils (from 0 to 4 ft. bgs) would be disposed of off-Site, whereas Alternative S-3 would involve treating the excavated VOC-contaminated soils on-Site and reusing the treated soils as part of an engineered soil cover. Alternative S-2 would result in a more rapid reduction in risk, because the contaminated soils would be removed from the Site. However, it is anticipated that, under Alternative S-3, proper management and successful treatment of VOCs in the soils would be achievable within a reasonable time frame using ex-situ bioremediation. Therefore, on-Site reuse of the treated soils would not result in an unacceptable exposure risk at the Site.

Alternative SED-1 would not involve any active remedial measures and, therefore, would not be effective in minimizing the exposure of ecological receptors to contaminated sediments. Alternatives SED-2 and SED-3 would be equally effective in the long term and both would provide permanent remediation by removing the contaminated sediments posing a risk to ecological receptors in the Stormwater Catchment Basin and Clonmell Creek.

Under Alternative SED-2, the contaminated sediments would be disposed of off-Site, whereas Alternative SED-3 would involve treating the contaminated sediments on-Site and reusing the treated sediments as part of an engineered soil cover. Alternative SED-2 would result in a more rapid reduction in risk, because the contaminated sediments would be removed from the Site. However, it is anticipated that, under Alternative SED-3, proper management and successful remediation of cumene in the sediments (to non-detectable concentrations) would be achievable within a reasonable time frame using phytoremediation and, if necessary, ex-situ bioremediation. Therefore, on-Site reuse of the treated sediments would not result in an unacceptable exposure risk at the Site.

Alternative GW-1 would be expected to have minimal long-term effectiveness and permanence because it would rely upon natural processes to restore groundwater quality and would not prevent off-Site migration of contaminated groundwater. Alternative GW-2 would provide long-term effectiveness and permanence because it would rely on groundwater extraction and treatment and ICs (in combination with one of the action soil alternatives) to achieve the PRGs, prevent off-Site migration of contaminants, and prevent human exposure to contaminated groundwater and soil vapor.

Reduction in Toxicity, Mobility, or Volume Through Treatment

Alternative S-1 would involve no active remedial measures and, therefore, would provide no reduction in toxicity, mobility, or volume through treatment. Alternative S-2 would reduce the mobility of contaminants by removing the lead-contaminated soils and the VOC-contaminated soils (from 0 to 4 ft. bgs) from the property and would reduce the toxicity, mobility, and volume through in-situ treatment of the remaining source-area soils. Alternative S-3 would reduce the mobility of the contaminants (though not through treatment) by excavating the lead-contaminated soils and the VOC-contaminated soils (from 0-4 ft. bgs) and removing the lead-contaminated soil from the property. The toxicity and volume of the contaminants would be reduced through ex-situ treatment of the excavated VOC-contaminated soils. The toxicity, mobility, and volume of the source-area soils would be addressed through in-situ treatment.

Alternative SED-1 would involve no active remedial measures and, therefore, would provide no reduction in toxicity, mobility, or volume through treatment. Both Alternatives SED-2 and SED-3 would reduce the mobility of the contaminants (though not through treatment) by removing the contaminated sediments posing a risk to ecological receptors in the Stormwater Catchment Basin and Clonmell Creek. However, Alternative SED-3 would also provide a reduction in the toxicity and volume of the contaminated sediments through on-Site treatment.

Alternative GW-1 would not effectively reduce the toxicity, mobility or volume of contaminants in the groundwater through treatment, as it involves no active remedial measures. Alternative GW-2, on the other hand, would reduce the toxicity, mobility, and volume of contaminated groundwater through extraction and treatment in the on-Site treatment system, thereby satisfying CERCLA’s preference for treatment.

Short-Term Effectiveness

Because no actions would be performed under Alternative S-1, there would be no implementation time. The time frames for the excavation of the unsaturated soils (12 months) and in-situ treatment of the source-area soils (10 years) would be the same for Alternatives S-2 and S-3. Ex-situ treatment of the excavated VOC-contaminated soils under Alternative S-3 would take approximately 18 months.

Alternative S-1 would not include any physical construction measures in any areas of contamination and, therefore, would not present any potential adverse impacts to remediation workers or the community. Alternatives S-2 and S-3 could present some limited adverse impacts to remediation workers through dermal contact and inhalation related to the excavation of contaminated soils. The risks to remediation workers under Alternatives S-2 and S-3 could be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Both Alternatives S-2 and S-3 would require the off-Site transport of contaminated soils, which could potentially adversely affect local traffic. However, the volume transported under Alternative S-2 (approximately 830 truckloads) would be significantly greater than for Alternative S-3 (approximately 63 truckloads).

For Alternatives S-2 and S-3, there is a potential for increased storm water runoff and erosion during construction and excavation activities that would have to be properly managed to prevent or minimize any adverse impacts. For these alternatives, appropriate measures would have to be taken during excavation activities to prevent transport of fugitive dust and exposure of workers and downwind receptors to the VOCs in the Site soils.

The installation of infiltration galleries and interim- and post-remediation soil sampling activities, associated with the in-situ treatment of source-area soils under Alternatives S-2 and S-3 would pose an additional risk to on-Site workers, because these activities would be conducted within areas of potential soil and groundwater contamination.

Because no actions would be performed under Alternative SED-1, there would be no implementation time. Both Alternatives SED-2 and SED-3 would require some infrastructure construction, however, the infrastructure required to implement Alternative SED-3 would be more extensive and, therefore, would require more time to complete. It is estimated that it would take 12 months to implement Alternative SED-2 and 24 months to implement Alternative SED-3.

Alternative SED-2 would require the off-Site transport of contaminated sediments (approximately 550 truckloads), which has the potential to adversely affect local traffic. Both Alternatives SED-2 and SED-3 would present some limited risk to remediation workers through dermal contact and inhalation related to the handling of the dredged sediments, however, this risk would be increased under Alternative SED-3 due to the longer potential exposure time associated with on-Site treatment. The risks to remediation workers under Alternatives SED-2 and SED-3 could be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Because no actions would be performed under Alternative GW-1, there would be no implementation time. It is estimated that, under Alternative GW-2, it would take 12 months to complete the modifications to the existing underground piping, build the structure to house the new treatment system and install the new treatment system. The overall time to meet the remediation goals throughout the entire groundwater plume under Alternative GW-2 (in combination with one of the action soil alternatives) is estimated to be 10 years.

Alternative GW-1 would have no short-term impact to remediation workers or the community and would have no adverse environmental impacts from implementation, because no actions would be taken under this alternative. Alternative GW-2 could present some limited risk to remediation workers through dermal contact and inhalation related to construction activities associated with the underground piping modifications, building construction and periodic groundwater sampling activities. The risks to remediation workers could be mitigated by following appropriate health and safety protocols, exercising sound engineering practices and utilizing proper personal protective equipment.

Implementability

Alternative S-1 would be the easiest soil alternative to implement because there are no activities to undertake. Both Alternatives S-2 and S-3 would employ technologies known to be reliable and that are readily implementable. The equipment, services and materials needed to implement Alternatives S-2 and S-3 are readily available and the actions under these alternatives would be administratively feasible.

Under Alternatives S-2 and S-3, real-time air quality monitoring for VOCs and dust during excavation activities would need to be conducted to protect remediation workers and downwind residents. Sufficient facilities are available for the treatment and disposal of the excavated materials and determining the achievement of the soil remediation goals could be easily accomplished through post-excavation soil sampling and analysis under Alternatives S-2 and S-3.

Alternative SED-1 would be the easiest sediment alternative to implement because it would not involve undertaking any actions. Alternatives SED-2 and SED-3 would employ hydraulic dredging, which is a commonly-used technology proven to be effective in the removal of contaminated sediments. Alternative SED-3 would involve on-Site treatment of contaminated sediments through phytoremediation in geotextile tubes, which was successfully demonstrated during the treatability study conducted on the Clonmell Creek sediment during the RI. The equipment, services and materials needed to implement Alternatives SED-2 and SED-3 are readily available and the actions under these alternatives would be administratively feasible.

Alternative GW-1 would be the easiest groundwater alternative to implement, because it would not entail the performance of any activities. The equipment, services and materials needed to implement Alternative GW-2 are readily available and the actions under this alternative would be administratively feasible. The existing extraction and treatment system has been successful at maintaining hydraulic control and reducing COC concentrations in the groundwater at the Site and the ICs under Alternative GW-2 would be relatively easy to implement.

In accordance with CERCLA, no permits would be required for on-site work (although such activities would comply with substantive requirements of otherwise required permits). Permits would be obtained as needed for off-Site work.

Cost

Cost includes estimated capital and annual O&M 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. This is a standard assumption in accordance with EPA guidance.
The estimated capital costs, O&M costs and present worth costs for the alternatives are discussed in detail in the FS Report. The cost estimates are based on the best available information. The present-worth costs for the soil alternatives were calculated using a discount rate of 7 percent and a 15-year time frame for soil cap maintenance. The present-worth cost for Alternative GW-2 was calculated using a discount rate of 7 percent and a 10-year time interval for operation and maintenance of the treatment system (the estimated time to meet the groundwater remediation goals) and a discount rate of 7 percent and a 15-year time interval for groundwater monitoring. The estimated costs for the OU1 and OU2 remedial alternatives are summarized below.

Alternative	Capital	Annual O&M	Total Present Worth
S-1	$0	$0	$0
S-2	$11,183,360	$248,181	$12,191,308
S-3	$5,198,118	$248,181	$6,206,066
SED-1	$0	$0	$0
SED-2	$4,086,780	$0	$4,086,780
SED-3	$1,860,320	$0	$1,860,320
GW-1	$0	$0	$0
GW-2	$409,826	$225,938	$3,181,534

State Acceptance

NJDEP concurs with the selected remedy. A letter of concurrence is attached in Appendix IV.

Community Acceptance

Comments received during the public comment period indicate that the public generally supports the selected remedy. These comments are summarized and addressed in the Responsiveness Summary, which is attached as Appendix V to this document.

PRINCIPAL THREAT WASTES

The NCP establishes an expectation that the EPA will use treatment to address the principal threats posed by a Site whenever practicable (NCP Section 300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, 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 in the event exposure should occur. Non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The decision to treat principal threat wastes is made on a site-specific basis through a detailed analysis of alternatives, using the remedy selection criteria which are described above. The manner in which principal threat wastes are addressed provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

The high concentrations of benzene, cumene, and colocated COCs in the Site soils, either adsorbed to soil particles or as NAPL, are an on-going source of contamination to the groundwater and are considered to be principal threat wastes. By utilizing treatment as a significant component of the remedy for soil, the statutory preference for remedies that employ treatment as a principal element is satisfied.

SELECTED REMEDY

Summary of the Rationale for the Selected Remedy

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, EPA has determined that Alternative S-3, Alternative SED-3 and Alternative GW-2 best satisfy the requirements of CERCLA Section 121, 42 U.S.C. §9621, to respectively address the soil, sediment and groundwater at the Site, and provide the best balance of tradeoffs among the remedial alternatives with respect to the NCP's nine evaluation criteria, 40 CFR § 300.430(e)(9).

Both Alternative S-2 and Alternative S-3 would address principal threat wastes through excavation and treatment and effectively achieve the soil the remediation goals. Alternative S-2 would meet the remediation goals in the soils from 0-4 ft. bgs more quickly by removing the excavated soils from the property. However, Alternative S-3 will achieve the remediation goals in these soils through treatment within a reasonable time frame (12 months) and will provide a greater environmental benefit than Alternative S-2 because it will allow for on-Site reuse of the treated soils. Alternative S-2 would be considerably more expensive to implement than Alternative S-3 because of the significantly larger volumes of contaminated soil that would need to be transported off-Site for treatment and/or disposal and clean fill that would need to be imported to backfill the excavated areas and construct an engineered soil cap under Alternative S-2. Therefore, EPA believes that Alternative S-3 will effectively address the soil contamination at the Site while providing the best balance of tradeoffs with respect to the evaluating criteria.

Both Alternative SED-2 and Alternative SED-3 would effectively and permanently eliminate the risk posed to environmental receptors by removing the contaminated sediments from the Stormwater Catchment Basin and Clonmell Creek. Alternative SED-2 would require less time and infrastructure construction to implement than Alternative SED-3, however, Alternative SED-2 would be considerably more expensive to implement than Alternative SED-3 because it would involve transporting the contaminated sediments off-Site for treatment and/or disposal and would require a larger volume of clean fill to be imported onto the Site. Alternative SED-3 will provide a greater environmental benefit than Alternative SED-2 because it will allow for on-Site treatment and reuse of the treated sediments as part of an engineered soil cover. EPA believes Alternative SED-3 will effectively mitigate the threat to ecological receptors at the Site while providing the best balance of tradeoffs with respect to the evaluating criteria.

For more than 30 years, a groundwater extraction and treatment system has been operated at the Site as an interim action. This system has successfully reduced contaminant concentrations in the groundwater and prevented contaminated groundwater from migrating off-property. Because of the effectiveness of the existing system and the anticipated removal of the contaminant source under the selected soil alternative, EPA has selected Alternative GW-2 as the remedy for the OU1 groundwater.

EPA believes that the selected remedy will provide the greatest protection of human health and the environment and long-term effectiveness, will achieve the ARARs more quickly, or as quickly, as the other alternatives, and is cost effective. Therefore, the selected remedy will provide the best balance of tradeoffs among alternatives with respect to the evaluating criteria. EPA and NJDEP believe that the selected remedy will address principal threat wastes, be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The selected remedy also will meet the statutory preference for the use of treatment as a principal element, as well as include consideration of EPA Region 2's Clean and Green Energy Policy.[15]

Description of the Selected Remedy

Based upon an evaluation of the various alternatives, EPA, in consultation with NJDEP, has selected Alternative S-3, Alternative SED-3 and Alternative GW-2 to respectively address the contaminated soil, sediment and groundwater in the OU1 and OU2 areas of the Site. Figure 8 of Appendix I shows the soil and sediment remediation areas and Figure 9 of Appendix II depicts the conceptual layout of the selected remedy components which include the following:

- excavation of lead-contaminated soil with off-Site disposal;
- excavation of VOC-contaminated soil located 0-4 ft. bgs and treatment with ex-situ bioremediation;

[15] See https://www.epa.gov/greenercleanups/epa-region-2-clean-and-green-policy.

- enhanced in-situ biodegradation of VOC-contaminated soil situated below 4 ft. bgs;
- hydraulic dredging of contaminated sediment with on-Site phytoremediation
- on-Site reuse of treated soil and sediment; and
- extraction of contaminated groundwater with on-Site treatment and discharge to groundwater;
- long-term groundwater monitoring; and
- ICs to restrict groundwater use, prevent soil disturbances in the in-situ soil treatment areas, and require that future buildings on the Site either be subject to a vapor intrusion evaluation or be built with vapor intrusion mitigation systems until the remediation goals are met.

The soils in the Active Process Area, Chemical Landfill/Gravel Pit, Inactive Process Area, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas with COC concentrations exceeding the remediation goals will be excavated to a depth of 4 ft. bgs and treated with ex-situ bioremediation.[16] The soils situated below 4 ft. bgs in these exposure areas with COC concentrations exceeding the remediation goals will be treated in-situ using enhanced biodegradation.

Additional sampling will be conducted during the remedial design to confirm the complete delineation of benzene, cumene and colocated COCs in the on-Site soils prior to remediation and to verify that no COCs are present in off-Site soils above the NJDEP residential direct contact soil remediation standards.

The soil in the Township Refuse Area with lead concentrations exceeding the cleanup value will be excavated. Additional delineation of the lead contamination in this area will be performed during the remedial design.

A BMP plan will be developed and implemented to manage lead and minimize contamination of the Shooting Range exposure area while the Shooting Range exposure area continues to be used for its current purpose. If the current use of shooting range ends or changes, delineation of the lead contamination will be performed and the soils the in the Shooting Range exposure area with lead concentrations exceeding the remediation goals will be excavated and disposed of off-Site.

The excavation will be performed using standard construction equipment, such as backhoes and track excavators. An estimated 13,804 CY of contaminated soil will be excavated, consisting of 1,052 CY of lead-contaminated soil and 12,752 CY of soil contaminated with benzene, cumene and colocated COCs will be excavated.

[16] Approximately 500 CY of the soils in the Active Process Area and Inactive Process Area exceeding the cleanup values will be treated using enhanced in-situ biodegradation rather than being excavated, because the presence of structures would make excavation impracticable.

The excavated lead-contaminated soil will be transported to an off-Site treatment and/or disposal facility.

The excavated soil containing benzene, cumene and colocated COC concentrations above the remediation goals will be treated on-Site using ex-situ bioremediation. Specifically, these soils will be mixed with soil amendments, formed into piles and aerated, either passively or actively (using blowers or vacuum pumps). As part of the remedial design, an analysis will be performed to confirm that the average VOC concentrations that may be released from ex-situ treatment of the soils will not exceed applicable state and federal air emissions standards. If air emissions controls are determined to be necessary based upon these calculations, then those controls will be included in the remedial design. In addition, vapors from the VOCs in the biopiles that volatilize into the air will be monitored to protect Site workers and ensure that state and federal air emission standards are not exceeded, and post-remedial sampling will be conducted to ensure that the remediation goals are met.

Post-excavation sampling will be conducted to identify/confirm the areas where the remediation goals are exceeded in the soils situated below 4 ft. bgs. These soils (saturated and unsaturated) will be treated using enhanced in-situ biodegradation. Enhanced in-situ biodegradation will involve injecting a magnesium sulfate solution into the contaminated soils to stimulate activity and reproduction of naturally-occurring anaerobic microorganisms. The microorganisms will then destroy or transform COCs into less toxic compounds by using them as a food and energy source. Application of the anaerobic treatment solution will be achieved using lateral infiltration galleries consisting of perforated piping installed in a series of shallow trenches. The solution would be applied directly to the base of the excavations in the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas. Performance and compliance monitoring will be conducted to determine residual contaminant concentrations and assess the need for additional treatment.

The ex-situ-remediated soils will be reused on-Site, along with imported, certified clean soil, meeting applicable state regulations, to backfill excavated areas and construct an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater, and control surface water runoff/drainage. Vegetation will be placed in areas disturbed during excavation activities to stabilize the soil and maintenance of the soil cover will be performed.

The remedy will also include hydraulic dredging to remove a mixture of contaminated sediment and water (referred to as slurry) from the bottom surfaces of the Stormwater Catchment Basin and Clonmell Creek. It is estimated that 8,500 CY of contaminated sediment will be removed; 1,225 CY from the Stormwater Catchment Basin and 7,275 CY from Clonmell Creek. These volumes represent the removal of 100 percent of the cumene mass in the Stormwater Catchment Basin and approximately 99 percent of the cumene mass within the Clonmell Creek sediment and include all the sediment posing a risk to ecological receptors.

The work area will be enclosed with silt curtains to prevent downstream migration of contaminated sediment during dredging activities. Also, the surface water outside the work area will be monitored to control resuspension and prevent downstream transportation of contaminated sediments in the water column.

The slurry will be transferred via pipeline into geotextile tubes (located in a treatment cell within the Stormwater Catchment Basin exposure area) for dewatering. The staging area will be designed with proper controls, including but not limited to an impermeable liner, to prevent any impacts to the surrounding soil and groundwater and maintain containment of the dredged sediments and effluent water from the geotextile tubes. The effluent water will be sampled and, if necessary, treated on-Site before being discharged to the Stormwater Catchment Basin in accordance with substantive NJPDES discharge to groundwater permit requirements. The details of the effluent treatment system will be finalized during the remedial design. Monitoring of groundwater wells around the Stormwater Catchment Basin will be conducted to ensure compliance with substantive permit requirements.

Plants will be planted in the cumene-contaminated sediment within geotextile tubes for a pre-determined growth period.[17] The treated sediments will be reused on-Site as part of an engineered soil cover to reduce infiltration of surface water to the groundwater, and control surface water runoff/drainage, and the plant residuals will be harvested and composted on-Site.

Under the groundwater component of this remedy, a new treatment unit will be built to replace/upgrade the existing one and a small building will be constructed in the Stormwater Catchment Basin exposure area to house the new treatment unit. The existing extraction wells and subsurface pipelines will to be used to capture and carry contaminated groundwater to the new treatment unit.

The extracted groundwater will be pumped into an equalization tank within the treatment building and then treated with a polymer. The polymer will be combined with pH adjustment, if necessary, to promote flocculation of iron and other solids in the groundwater. The groundwater will then be pumped through conventional geotextile tubes followed by GAC-impregnated geotextile tubes, if necessary, to remove iron, solids, and treat COCs. The solids, flocculated iron and other metals, will be captured in the geotextile tubes. The COCs will partition to the solids in the geotextile tubes where they will biodegrade. The spent tubes will be transported off-Site to a permitted disposal facility.

The new system will have an approximate treatment capacity of 125 gallons per minute. Treated water will be discharged to the groundwater in compliance with substantive NJPDES discharge to groundwater permit requirements (using the Stormwater Catchment Basin as an infiltration point). Long-term groundwater monitoring will be continued until the remediation goals are met.

[17] Additional studies would be conducted during the remedial design to refine plant species selection and determine the optimal growth period.

A CEA/WRA will be established to restrict groundwater use, and other ICs will restrict soil disturbances in the in-situ treatment areas and require that future buildings on the Site either be subject to a vapor intrusion evaluation or be built with vapor intrusion mitigation systems until the remediation goals are met.

EPA anticipates that the remedy selected to address the source area and enhance the groundwater treatment system will further reduce concentrations of benzene, cumene and phenol in Site-related groundwater. This will result in reduced VOC concentrations in the shallow (A-level) as well as intermediate (B-level)/deep (C-level) groundwater so that current/future outdoor workers and construction/utility workers will no longer be at risk for dermal contact with the shallow groundwater, and future on-Site residents will no longer be at risk for direct contact with, or ingestion of, the intermediate/deep groundwater. Continued groundwater monitoring will determine when remediation goals have been achieved and the CEA/WRA will prevent exposure until that time.

Summary of the Estimated Selected Remedy Costs

The estimated total present-worth costs for the three components of the selected remedy is $11,247,920. The cost estimates are based on available information and are order-of-magnitude engineering cost estimates that are expected between +50 to -30 percent of the actual project cost. Changes to the cost estimate can occur as a result of new information and data collected during the design of the remedy.

Cost estimates for the soil, sediment and groundwater components of the selected remedy are presented in Appendix II, Tables 14 through 17 of Appendix II. Individual cost estimates for each remedial alternative evaluated are provided in Tables 3-1 through 3-5 and Table 4-2 of the FS report.

Expected Outcomes of the Selected Remedy

The selected remedy actively addresses VOC and lead contamination in the OU1 and OU2 areas of the Site. The results of the risk assessment indicate excess cancer risk from direct contact with COCs in the Site groundwater, noncancer health hazards associated with future human ingestion of groundwater, the potential for unacceptable on-Site blood lead levels, and risk to ecological receptors in Clonmell Creek and the Stormwater Catchment basin from exposure to contaminated sediments. The response action selected in this ROD will address the contaminated Site soils and sediments, and, thereby, will eliminate the risks associated with these exposure pathways, facilitate the commercial/industrial use of the Site property, and restore the groundwater to levels that meet state and federal standards within a reasonable time frame, allowing it to be used without restriction in approximately 10 years.

Remediation goals for the OU1/OU2 COCs are presented in Tables 11 through 13 of Appendix II.

STATUTORY DETERMINATIONS

EPA has determined that the selected remedy complies with the CERCLA and NCP provisions for remedy selection, meets the threshold criteria, and provides the best balance of tradeoffs among the alternatives with respect to the balancing and modifying criteria. These provisions require the selection of remedies that are protective of human health and the environment, comply with ARARs (or justify a waiver from such requirements), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the toxicity, mobility and volume of hazardous substances as a principal element (or justifies not satisfying the preference). The following sections discuss how the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

The selected remedy will protect human health and the environment because it will prevent human exposure to contaminated groundwater, soil and soil vapor and minimize exposure of biota to contaminated sediments in the short term. Over the long term, the selected remedy will restore groundwater to levels that meet state and federal standards within a reasonable time frame. In addition, ICs will protect human health over both the short and long term by preventing groundwater use and the disturbance of in-situ soil treatment areas until remediation goals are met, as well as requiring any new construction consider the vapor intrusion pathway. This action will result in the reduction of exposure risk to levels within EPA's generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogens and below a HI of 1.0 for noncarcinogens. Implementation of the selected remedy will not pose unacceptable short-term risks.

Compliance with ARARs

The selected remedy is expected to achieve meet the remediation goals for COCs in the soils, developed based on NJDEP's NRDCSRSs (chemical-specific ARARs) for the COCs in the soils, and federal MCLs or more stringent NJDEP GWQSs (chemical-specific ARARs) for the COCs in the groundwater. The remedy will comply with location- and action-specific ARARs.

A full list of the ARARs, TBCs, and other guidance related to implementation of the selected remedy is presented in Tables 18, 19 and 20 of Appendix II.

Cost Effectiveness

A cost-effective remedy is one whose costs are proportional to its overall effectiveness (40 C.F.R. § 300.430(f)(1)(ii)(D)). Overall effectiveness is based on the evaluations of long-term effectiveness and permanence, reduction in toxicity, mobility, and volume through treatment, and short-term effectiveness. Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to cost to determine cost-effectiveness.

Each of the alternatives underwent a detailed cost analysis. In that analysis, capital and annual O&M costs were estimated and used to develop present-worth costs. In the present-worth cost analysis, annual O&M costs were calculated for the estimated life of each alternative. The total estimated present worth cost for implementing the selected remedy is $11,247,920.

Based on the comparison of overall effectiveness to cost, the selected remedy meets the statutory requirement that Superfund remedies be cost effective (40 C.F.R. § 300.430(f)(1)(ii)(D)) and is the least-cost action which will achieve remediation goals in the Site soils and restore groundwater to levels that meet state and federal standards within a reasonable time frame. A 15-year time frame for soil cap maintenance and groundwater monitoring and a 10-year time interval for operation and maintenance of the groundwater treatment system (the estimated time to meet the groundwater remediation goals) was used for planning and estimating purposes, although remediation time frames could exceed these estimates.

Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to Maximum Extent Practicable

The selected remedy complies with the statutory mandate to utilize permanent solutions, alternative treatment technologies, and resource recovery alternatives to the maximum extent practicable because it represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner to remediate the OU1 and OU2 areas. The selected remedy satisfies the criteria for long-term effectiveness and permanence by permanently reducing the mass of contaminants in the Site soils, sediments and groundwater, thereby reducing the toxicity, mobility and volume of contamination.

Preference for Treatment as a Principal Element

Using in-situ biodegradation and ex-situ bioremediation and phytoremediation processes, in conjunction with an ex-situ groundwater extraction and treatment technology, the selected remedy satisfies the statutory preference for remedies that employ treatment as a principal element.

Five-Year Review Requirements

Because the selected remedy results in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the site be reviewed at least once every five years.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for OU1 and OU2 was released to the public on July 29, 2018. The Proposed Plan identified Alternatives S-3, SED-3, and GW-2 as the preferred alternatives for remediating the contaminated soil, sediment, and groundwater, respectively, in the OU1 and OU2 areas of the Site. Based upon review of the written and verbal comments submitted during the public comment period, EPA determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

APPENDIX I

FIGURES

CSI Environmental, LLC

401 Headquarters Dr., Suite 203
Millersville, MD 21108
443-688-6453

SITE LOCATION MAP

Hercules, Inc. (Gibbstown Plant)
Gibbstown, New Jersey

FIGURE

1

Date\Time : Mon, 07 Feb 2005 - 7:36pm | Path\Name : C:\LIBRARY\csi\Gibbstown\SITLO.dwg

Figure 2: Site Vicinity Map

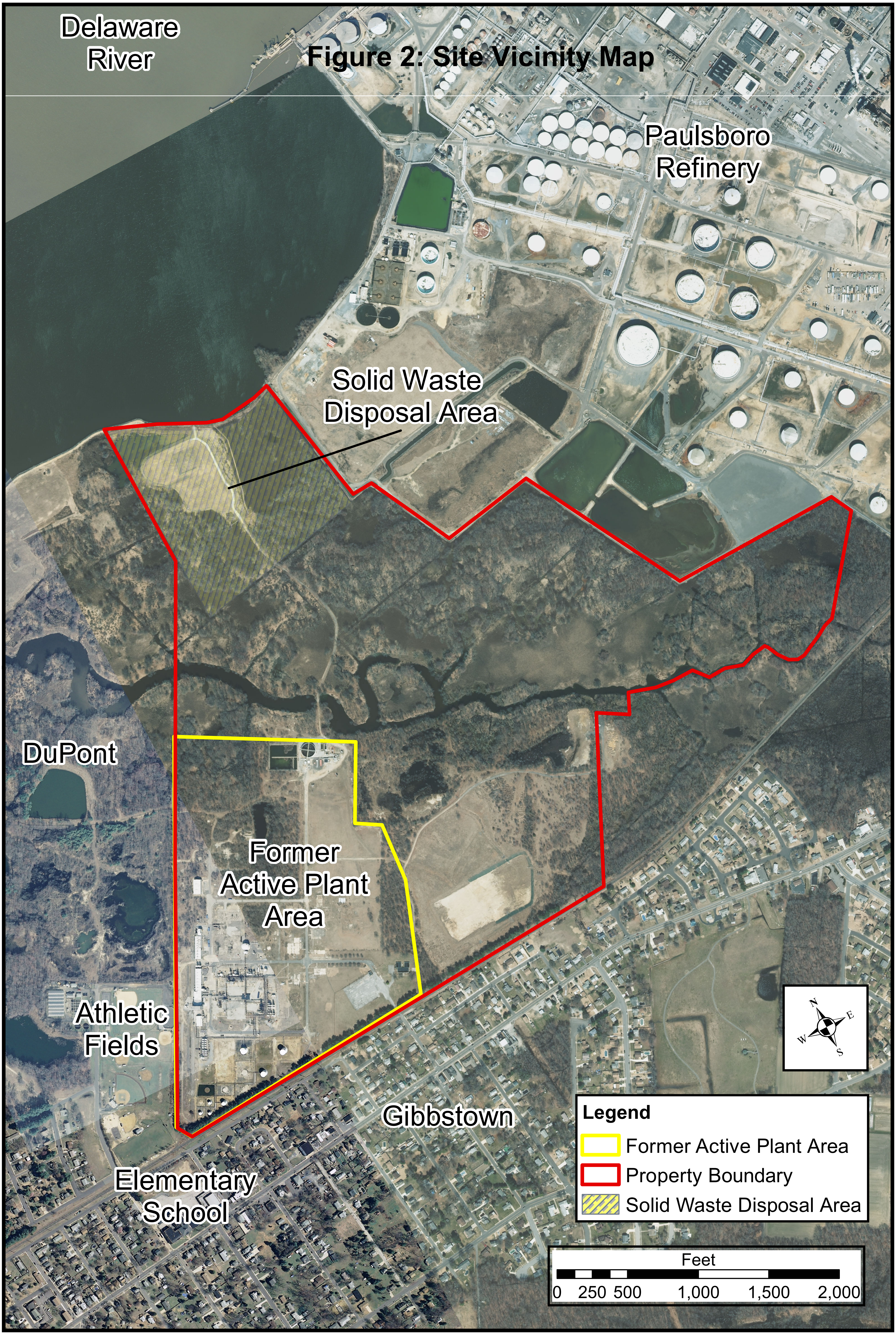


Figure 3: Exposure Area Map

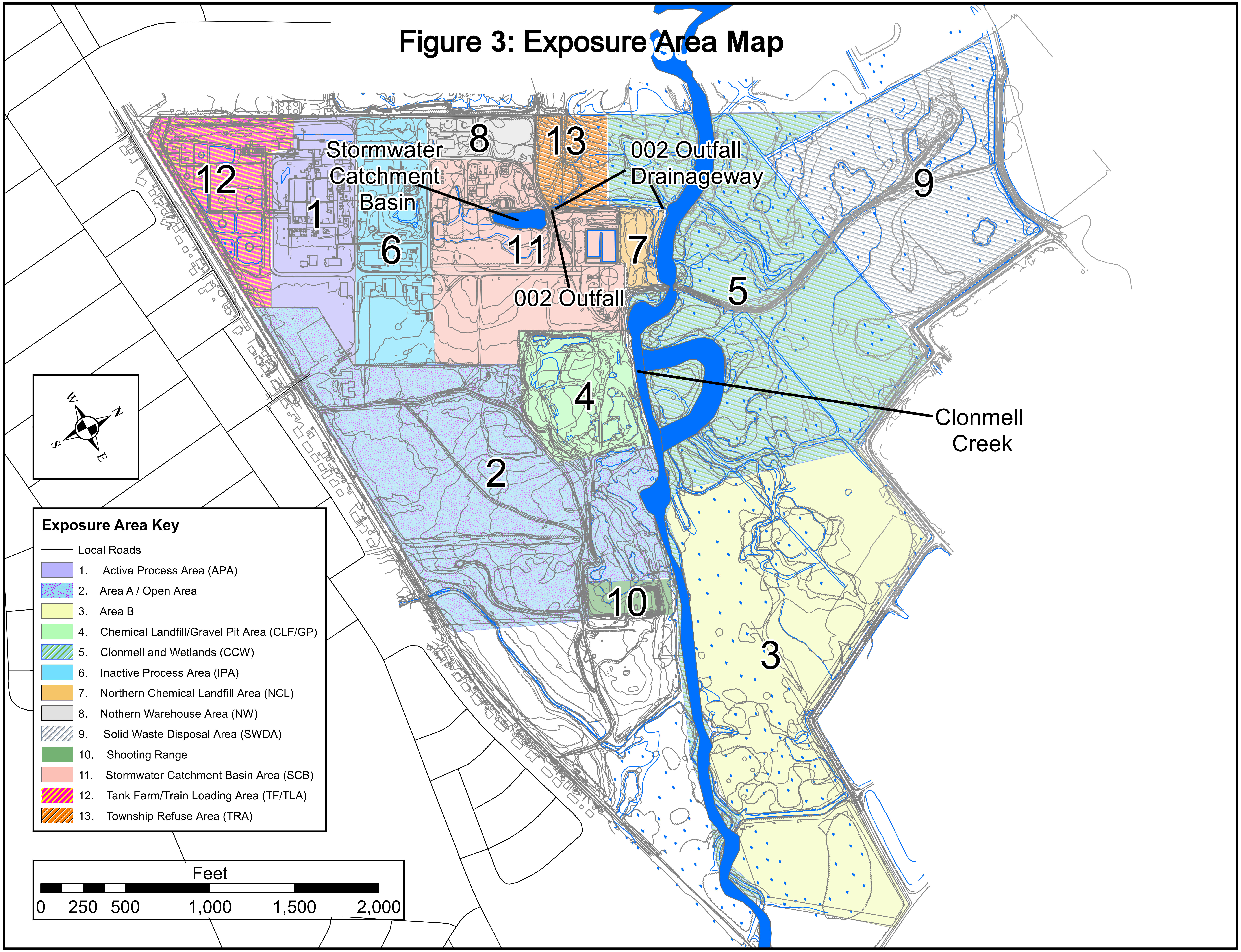
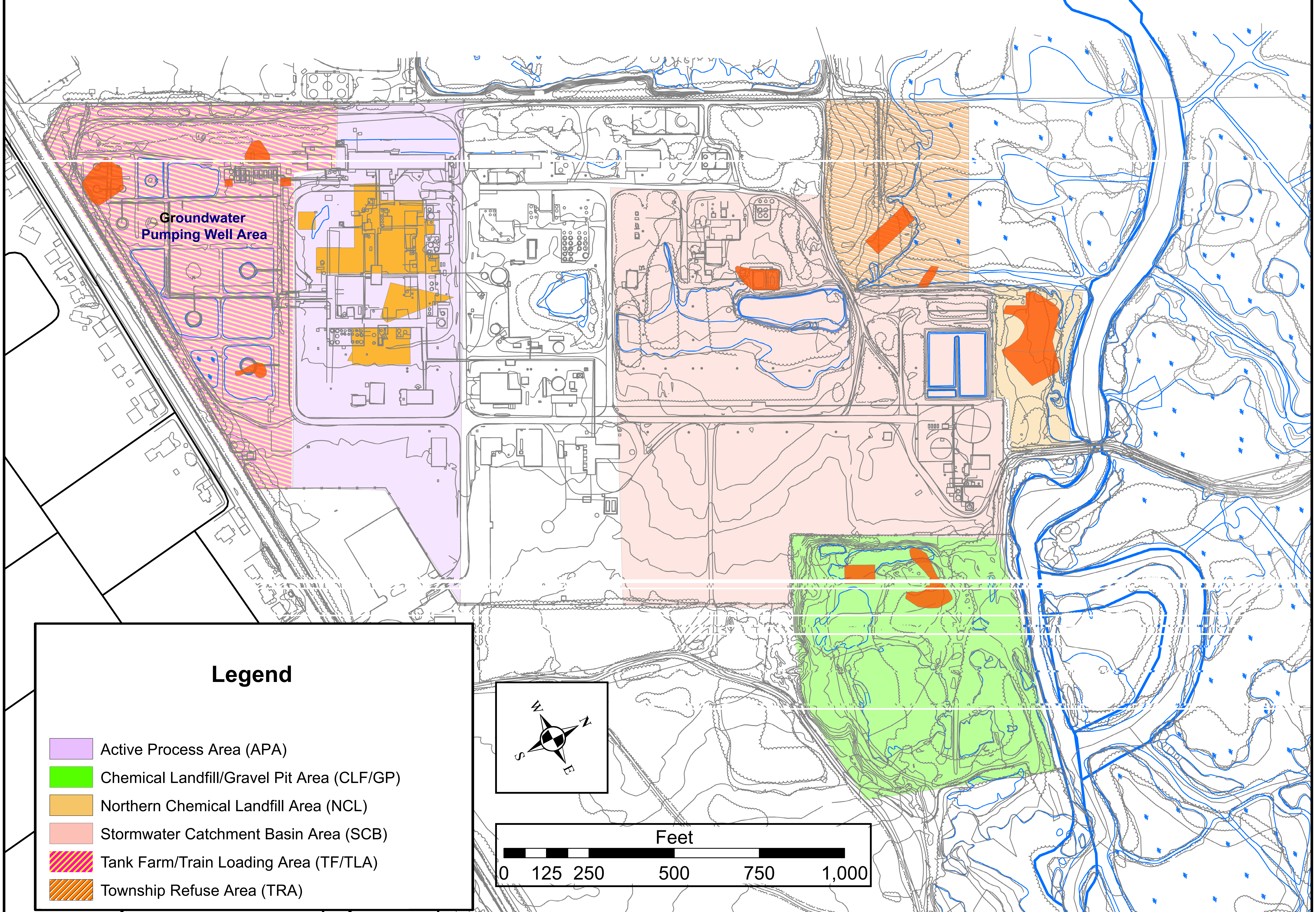


Figure 4: Areas Exceeding RI Soil Screening Values



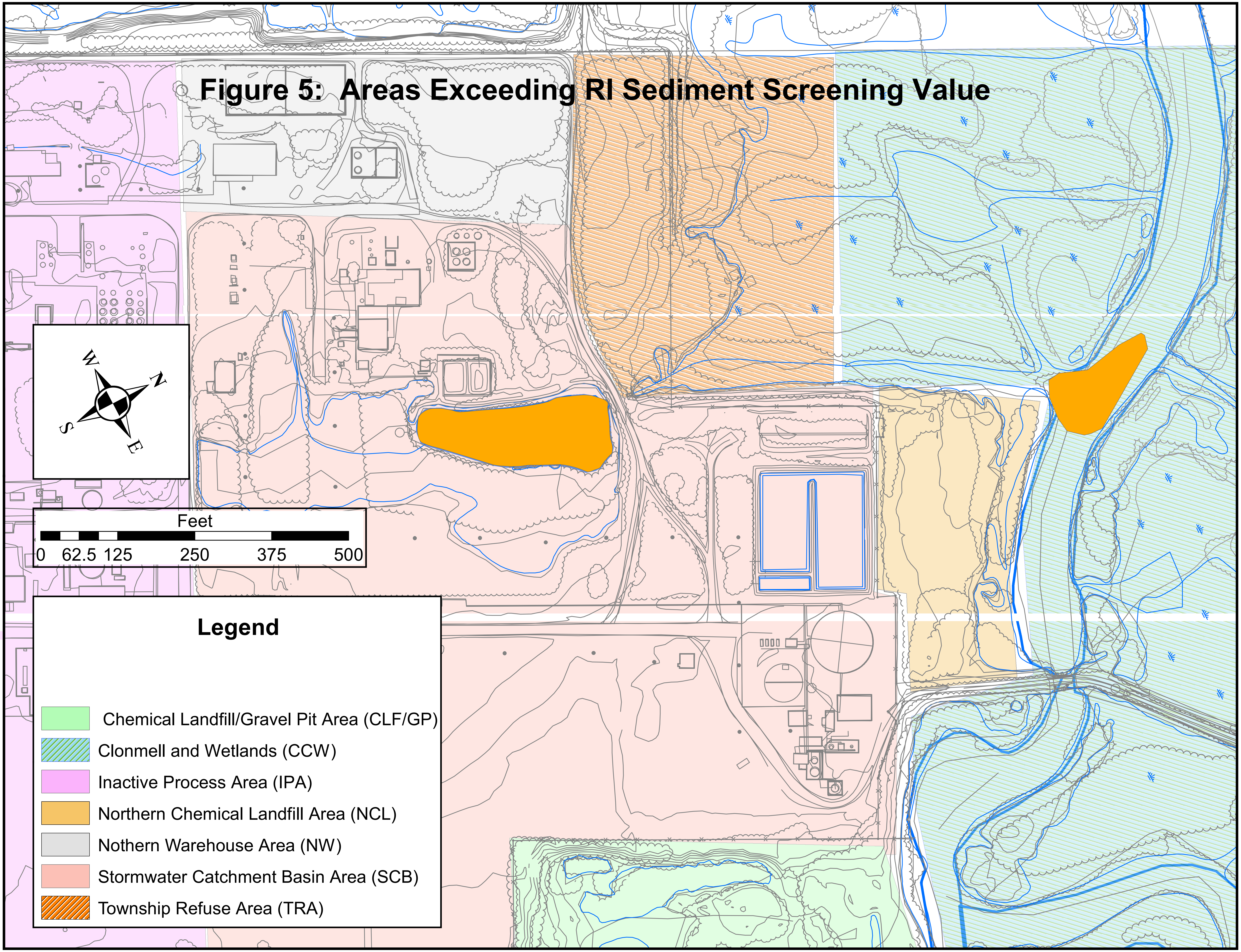


Figure 5: Areas Exceeding RI Sediment Screening Value
W
N
S
E
Feet
0 62.5 125 250 375 500
Legend
Chemical Landfill/Gravel Pit Area (CLF/GP)
Clonmell and Wetlands (CCW)
Inactive Process Area (IPA)
Northern Chemical Landfill Area (NCL)
Nothern Warehouse Area (NW)
Stormwater Catchment Basin Area (SCB)
Township Refuse Area (TRA)

Figure 6: Site Well Location Map

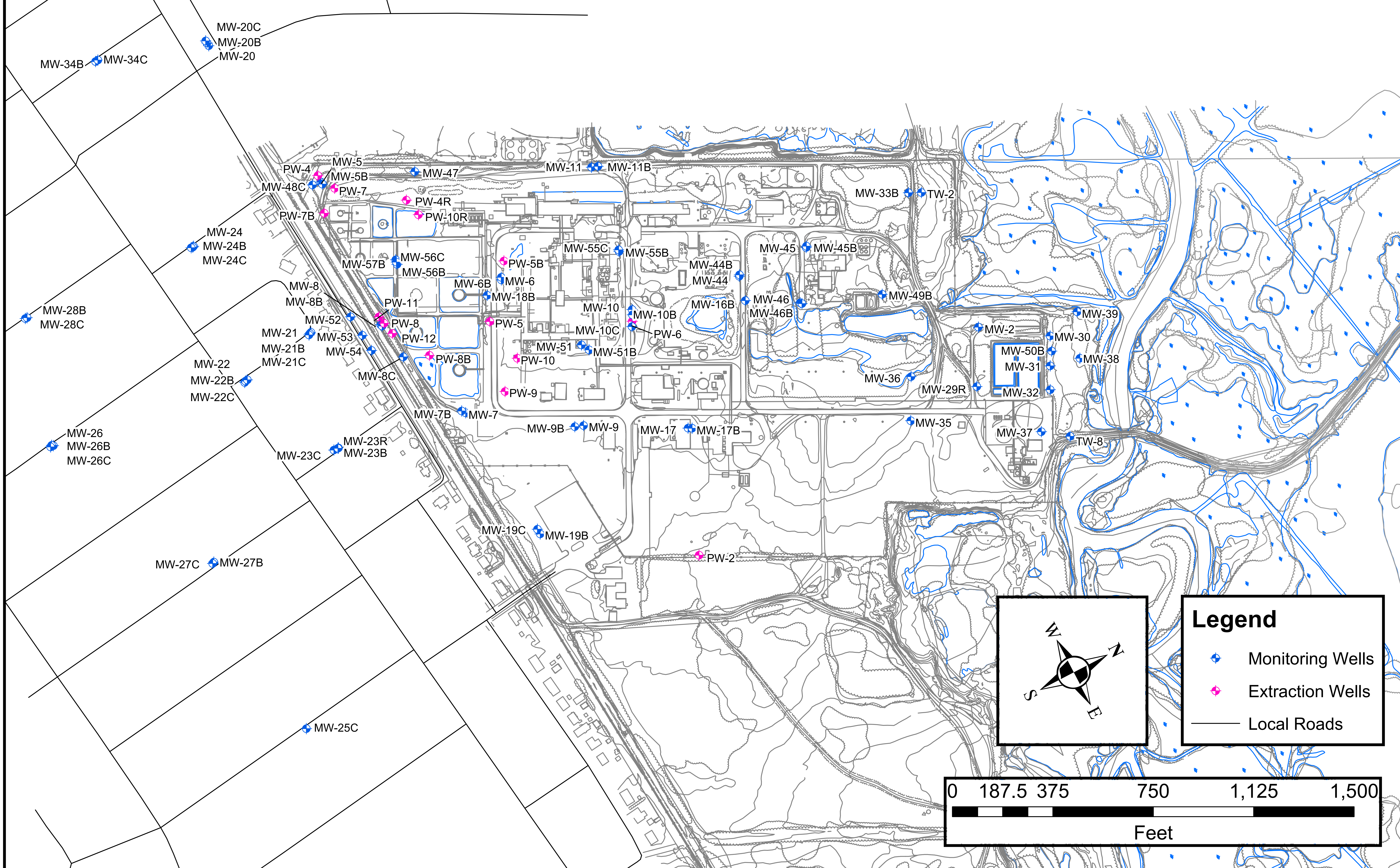


Figure 7: Conceptual Site Model

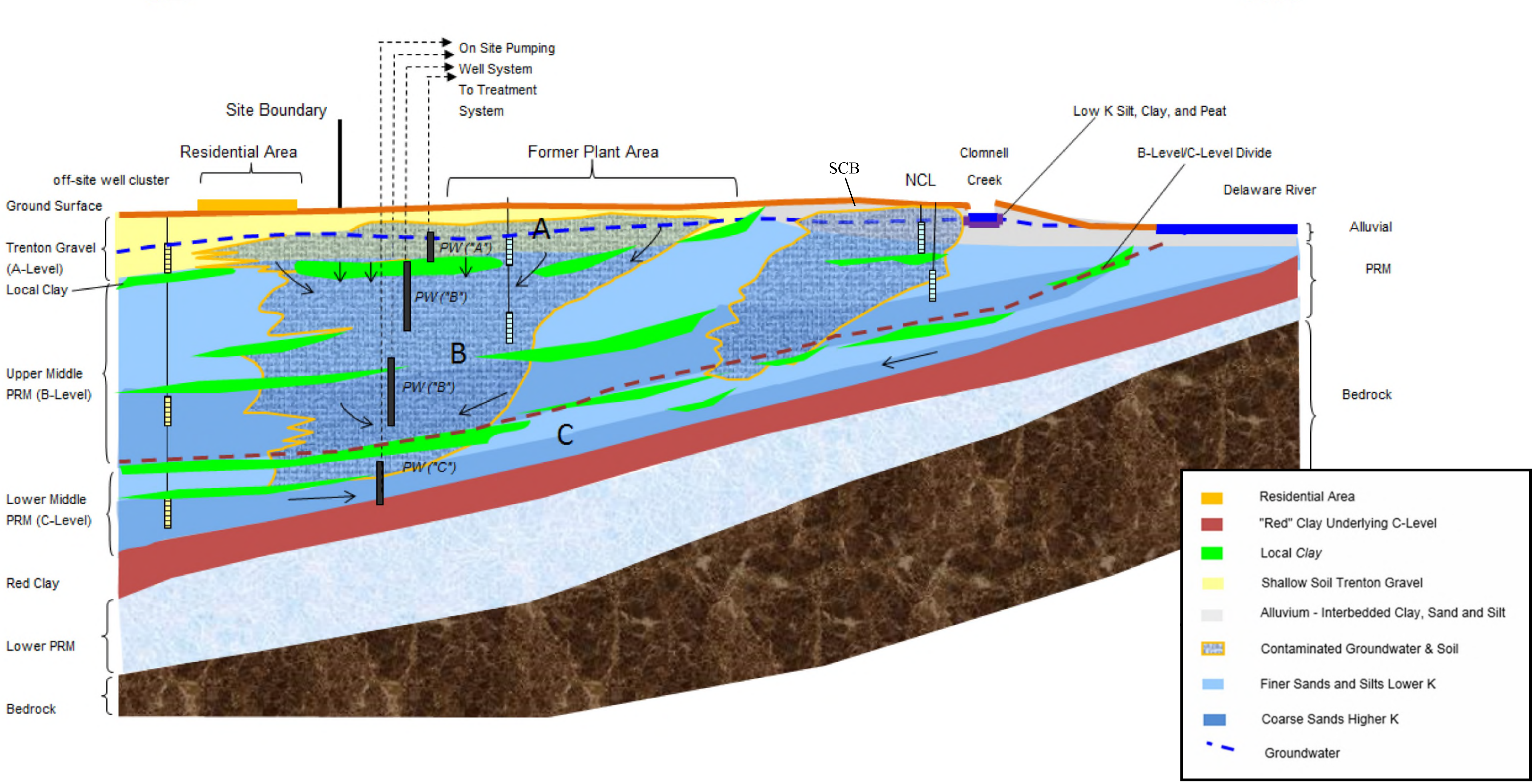


Figure 8: Soil and Sediment Remediation Areas

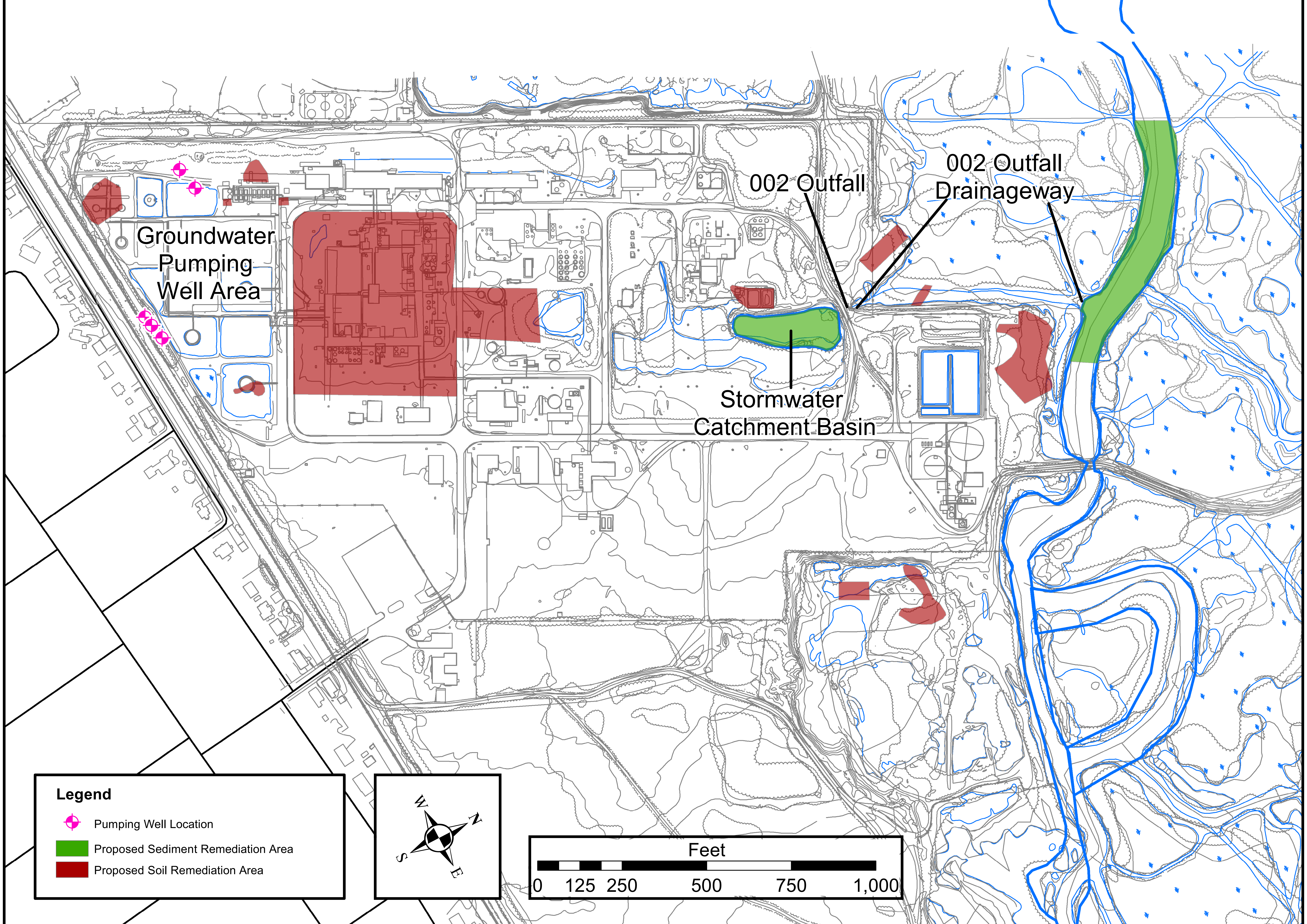
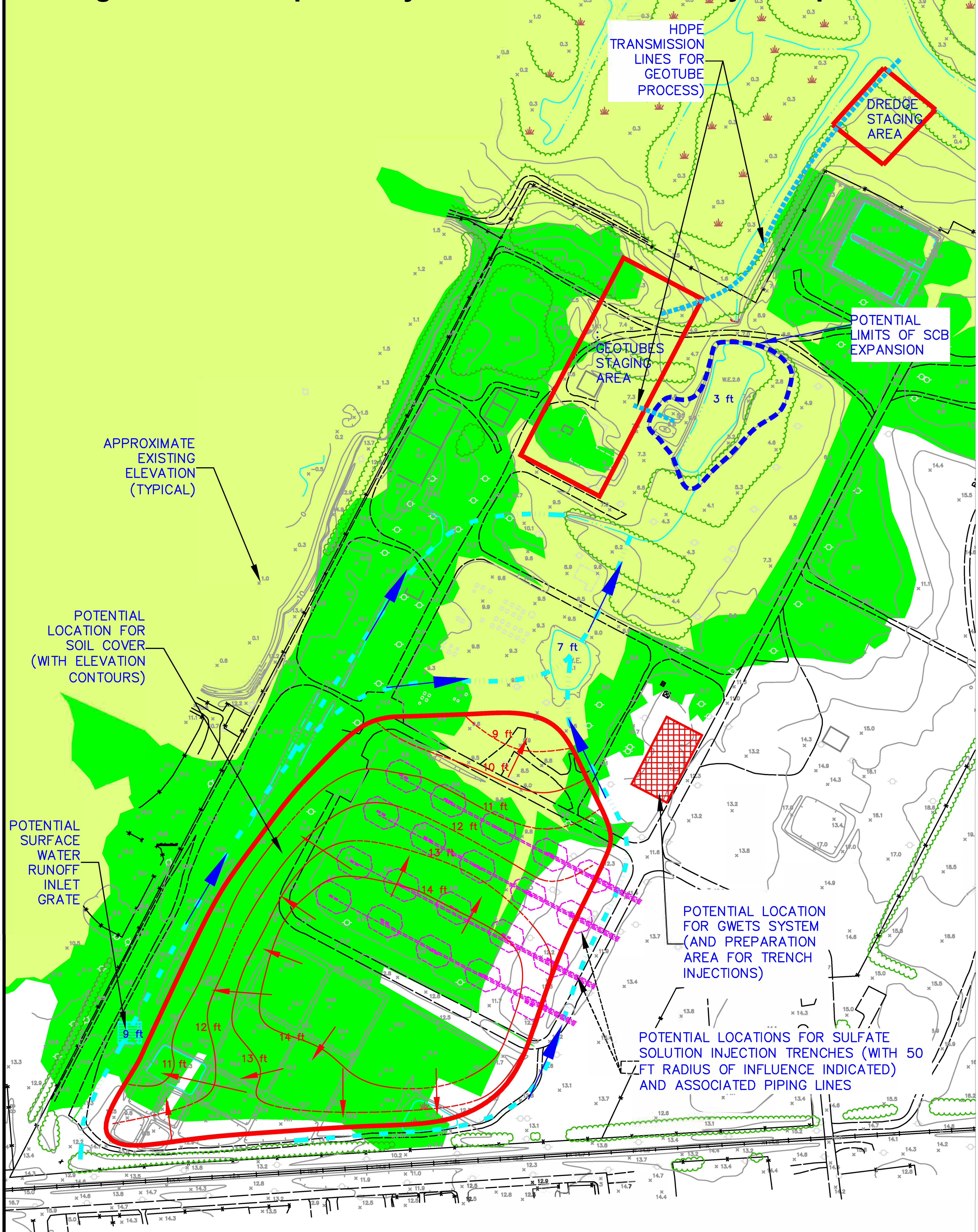


Figure 9: Conceptual Layout of Selected Remedy Components



LEGEND

= Approx. location of 500 year floodplain

= Approx. location of 100 year floodplain

= Approx. locations for surface water drainage improvements

NOT TO SCALE

APPENDIX II

TABLES

Table 1: Maximum Unsaturated Soil Concentrations (mg/kg)		
Exposure Area	Benzene	Cumene
Active Process Area	58	17,000
Chemical Landfill/Gravel Pit	80	11,000
Inactive Process Area	27	2,500
Northern Chemical Landfill	0.55	1,295
Stormwater Catchment Basin	831	2,200
Tank Farm/Train Loading Area	1,292	35,439

Table 2: Maximum Saturated Soil Concentrations (mg/kg)		
Exposure Area	Benzene	Cumene
Active Process Area	4.8	200,000
Inactive Process Area	0	5,500
Northern Chemical Landfill	0	460
Stormwater Catchment Basin	130	1,700
Tank Farm/Train Loading Area	0.3	2,400

Table 3: Maximum Groundwater Concentrations (μg/L)		
Exposure Area	Benzene	Cumene
Active Process Area	35,000	47,000
Stormwater Catchment Basin	160	130
Northern Chemical Landfill	200	30,000

Table 4
Summary of Chemicals of Concern and
Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: A-Level Groundwater (Sitewide)
Exposure Medium: Groundwater

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Groundwater	Benzene	0.3	19,000	μg/L	67/146	8662	μg/L	95% Adj. Gamma UCL
	Cumene	0.13	140,000	μg/L	103/146	53,455	μg/L	95% Chebyshev (Mean, SD) UCL

Table 4
Summary of Chemicals of Concern and
Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: B/C-Level Groundwater
(Active Process Area)

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Groundwater	Benzene	12	22,000	μg/L	20/29	10,632	μg/L	95% Chebyshev (Mean, SD) UCL
	Cumene	0.44 J	47,000	μg/L	22/29	36,548	μg/L	95% Student's-t UCL
	Phenolics	0.76	120,000	μg/L	14/15	66,945	μg/L	95% Adj. Gamma UCL

Table 4
Summary of Chemicals of Concern and
Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: B/C-Level Groundwater
(Northern Chemical Landfill)

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Groundwater	Benzene	74 J	190 JD	μg/L	3/3	190	μg/L	MAX
	Cumene	13,000	27,000 D	μg/L	3/3	27,000	μg/L	MAX

Table 4
Summary of Chemicals of Concern and
Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: B/C-Level Groundwater
(Tank Farm/Township Refuse Area)

Exposure Point	Chemical of Concern	Concentration Detected		Concentratio n Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Groundwater	Benzene	0.69 J	400	mg/L	20/46	250	mg/L	95% KM(t) UCL
	Cumene	0.43 J	33,500	mg/L	36/46	28,640	mg/L	95% Chebyshev (Mean, SD) UCL

Key:
MAX: Too few data points were available to calculate a meaningful UCL, so the maximum concentration was used to calculate risk

Table 5
Selection of Exposure Pathways

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Soil	Surface Soil 0 to 2 feet	All Upland Exposure Areas	Outdoor Industrial Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
						Inhalation of Particulates	Quantitative	
				Indoor Worker	Adult	Incidental Ingestion	None	Pathway incomplete. Worker assumed to spend entire work day indoors.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
						Inhalation of Particulates	None	
				Construction/Utility Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
						Inhalation of Particulates	Quantitative	
				Trespasser	Adult/Youth	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
						Inhalation of Particulates	Quantitative	
		Subsurface Soil 2 to 10 feet	All Upland Exposure Areas	Outdoor Industrial Worker	Adult	Incidental Ingestion	None	Pathway incomplete. Worker assumed to be limited to surface activities only.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
						Inhalation of Particulates	None	
				Indoor Worker	Adult	Incidental Ingestion	None	Pathway incomplete. Worker assumed to spend entire work day indoors.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
						Inhalation of Particulates	None	
				Construction/Utility Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
						Inhalation of Particulates	Quantitative	
				Trespasser	Adult/Youth	Incidental Ingestion	None	Pathway incomplete. Trespasser assumed to be limited to surface activities only.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
						Inhalation of Particulates	None	

Table 5
Selection of Exposure Pathways

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Groundwater	Shallow A-Level Groundwater	All Upland Exposure Areas	Outdoor Industrial Worker	Adult	Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
				Indoor Worker	Adult	Ingestion	None	Pathway incomplete. Worker assumed to spend entire work day indoors, and groundwater is not used as a potable water source.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
				Construction/Utility Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
				Trespasser	Adult/Youth	Ingestion	None	Pathway incomplete. Trespasser assumed to be limited to surface activities only.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
				Hypothetical Onsite Resident	Adult/Child	Ingestion	None	Groundwater in the "A" Zone is too shallow to be used as a potable water source.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
		Deep B/C-Level Groundwater	All Upland Exposure Areas	Outdoor Industrial Worker	Adult	Ingestion	None	Pathway incomplete. Direct contact unlikely due to depth of "B/C" zone groundwater.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
				Indoor Worker	Adult	Ingestion	None	Pathway incomplete. Worker assumed to spend entire work day indoors, and groundwater is not used as a potable water source.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
				Construction/Utility Worker	Adult	Incidental Ingestion	None	Pathway incomplete. Direct contact unlikely due to depth of "B/C" zone groundwater.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
				Trespasser	Adult/Youth	Ingestion	None	Pathway incomplete. Trespasser assumed to be limited to surface activities only.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
				Hypothetical Onsite Resident	Adult/Child	Ingestion	Quantitative	Hypothetical onsite adult/child resident is evaluated for a hypothetical drinking water scenario only. The inhalation of volatiles from showering/bathing will be discussed qualitatively. Acknowledgement will be made that if the ingestion scenario is unacceptable, the shower scenario would also be unacceptable.
						Dermal Contact	Qualitative	
						Inhalation of Volatile Emissions (Ambient Air)	Qualitative	

Table 5
Selection of Exposure Pathways

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Indoor Air (Vapor Intrusion from the Subsurface)	Indoor Air	Area-Specific Buildings	Outdoor Industrial Worker	Adult	Inhalation of Volatile Emissions (Indoor Air)	None	Pathway incomplete. Worker assumed to spend entire work day outdoors.
				Indoor Worker	Adult	Inhalation of Volatile Emissions (Indoor Air)	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
				Construction/Utility Worker	Adult	Inhalation of Volatile Emissions (Indoor Air)	None	Pathway incomplete. Worker assumed to spend entire work day outdoors.
				Trespasser	Adult/Youth	Inhalation of Volatile Emissions (Indoor Air)	None	Pathway incomplete. Trespasser assumed to spend entire exposure duration outdoors.
	Surface Water	Surface Water	Inactive Process Area Pond SCB, SDB, and associated drainage ways	Outdoor Industrial Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
				Indoor Worker	Adult	Incidental Ingestion	None	Pathway incomplete. Worker assumed to spend entire work day indoors.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
				Construction/Utility Worker	Adult	Incidental Ingestion	None	Potentially complete exposure pathway that will not be quantitatively evaluated in the risk assessment because a more frequently exposed receptor (i.e., outdoor worker) is already being considered.
						Dermal Contact	None	
						Inhalation of Volatile Emissions (Ambient Air)	None	
				Trespasser	Adult/Youth	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
	Sediment	Sediment	Inactive Process Area Pond SCB, SDB, and associated drainage ways	Outdoor Industrial Worker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
				Indoor Worker	Adult	Incidental Ingestion	None	Pathway incomplete. Worker assumed to spend entire work day indoors.
						Dermal Contact	None	
				Construction/Utility Worker	Adult	Incidental Ingestion	None	Potentially complete exposure pathway that will not be quantitatively evaluated in the risk assessment because a more frequently exposed receptor (i.e., outdoor worker) is already being considered.
						Dermal Contact	None	
				Trespasser	Adult/Youth	Incidental Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
Current/Future	Soil	Wetland Soil	Wetland Area	Recreational Youth	Youth 6 to 18	Incidental Ingestion	Quantitative	Potentially complete exposure pathways that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
						Inhalation of Particulates	Quantitative	
				Adult Recreational Hiker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathways that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
						Inhalation of Particulates	Quantitative	
				Trespasser	Adult Youth (6 to 18)	Incidental Ingestion	Quantitative	Potentially complete exposure pathways that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
						Inhalation of Particulates	Quantitative	
				Recreational Hunter	Adult	Incidental Ingestion	Qualitative	A qualitative assessment will be included in the risk assessment because the adult recreational hiker; who has the same exposure pathways, is already being considered.
						Dermal Contact	Qualitative	
						Inhalation of Volatile Emissions (Ambient Air)	Qualitative	
						Inhalation of Particulates	Qualitative	

Table 5
Selection of Exposure Pathways

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
				Recreational Angler	Adult	Incidental Ingestion	Qualitative	Potentially complete exposure pathways that will not be quantitatively evaluated in the risk assessment. Since these individuals have to walk through the wetlands to get to Clonmell Creek, storm water runoff and surface water drainage to wetland soils will be evaluated qualitatively.
						Dermal Contact	Qualitative	
						Inhalation of Volatile Emissions (Ambient Air)	Qualitative	
						Inhalation of Particulates	Qualitative	
	Surface Water	Surface Water	Clonmell Creek	Recreational Youth	Youth 6 to 18	Incidental Ingestion	Quantitative	Potentially complete exposure pathways that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
				Adult Recreational Hiker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathways that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
				Trespasser	Adult Youth (6 to 18)	Incidental Ingestion	Quantitative	Potentially complete exposure pathways that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
						Inhalation of Volatile Emissions (Ambient Air)	Quantitative	
				Recreational Angler	Adult	Incidental Ingestion	Qualitative	Potentially complete exposure pathways that will not be quantitatively evaluated in the risk assessment because the adult recreational hiker; who has the same exposure pathways, is already being considered.
						Dermal Contact	Qualitative	
						Inhalation of Volatile Emissions (Ambient Air)	Qualitative	
Current/Future	Sediment	Sediment	Clonmell Creek	Recreational Youth 6 through 18	Youth 6 to 18	Incidental Ingestion	Quantitative	Potentially complete exposure pathways that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
				Adult Recreational Hiker	Adult	Incidental Ingestion	Quantitative	Potentially complete exposure pathways that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
				Trespasser	Adult Youth (6 to 18)	Incidental Ingestion	Quantitative	Potentially complete exposure pathways that will be evaluated in the risk assessment.
						Dermal Contact	Quantitative	
				Recreational Angler	Adult	Incidental Ingestion	Qualitative	Potentially complete exposure pathways that will not be quantitatively evaluated in the risk assessment because the adult recreational hiker; who has the same exposure pathways, is already being considered.
						Dermal Contact	Qualitative	
	Game	Game (Deer, Rabbits)	Wetland Area	Recreational Hunter	Adult	Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment if bioaccumulative COC are identified.
	Fish	Fish Tissue	Clonmell Creek	Recreational Angler	Adult	Ingestion	Quantitative	Potentially complete exposure pathway that will be evaluated in the risk assessment if bioaccumulative COC are identified.
Current/Future	Indoor Air (Vapor Intrusion from Groundwater)	Indoor Air	Offsite Residence	Adult Resident	Adult	Inhalation of Volatile Emissions (Indoor Air)	None	Potential migration of groundwater offsite and subsequent vapor intrusion into an offsite residence was addressed in a separate vapor intrusion investigation which concluded that an unacceptable risk from exposure to site-related volatile contaminants via this pathway does not exist.
				Youth Resident	Youth 6 to 18	Inhalation of Volatile Emissions (Indoor Air)	None	
				Child Resident	Child 0 to 6	Inhalation of Volatile Emissions (Indoor Air)	None	
	Game	Game (Deer, Rabbits)	Offsite Residents	Adult Resident	Adult	Ingestion	Qualitative	Potentially complete exposure pathway that will be evaluated in the risk assessment if bioaccumulative COC are identified. This is based on the assumption that the adult hunter would provide recreationally caught meals to their family. Only the child is evaluated quantitatively because a recreational adult hunter is already evaluated for the Wetland Area.
				Youth Resident	Youth 6 to 18	Ingestion	Qualitative	
				Child Resident	Child 0 to 6	Ingestion	Quantitative	
	Fish	Fish Tissue	Offsite Residents	Adult Resident	Adult	Ingestion	Qualitative	Potentially complete exposure pathway that will be evaluated in the risk assessment if bioaccumulative COC are identified. This is based on the assumption that the adult angler would provide recreationally caught meals to their family. Only the child is evaluated quantitatively because a recreational adult angler is already evaluated for Clonmell Creek.
				Youth Resident	Youth 6 to 18	Ingestion	Qualitative	
				Child Resident	Child 0 to 6	Ingestion	Quantitative	

Table 6 Non-Cancer Toxicity Data Summary										
Pathway: Dermal contact with A-Level Groundwater										
Chemicals of Concern	**Chronic/ Subchronic**	**Oral RfD Value**	**Oral RfD Units**	**Absorp. Efficiency (Dermal)**	**Adjusted RfD (Dermal)**	**Adj. Dermal RfD Units**	**Primary Target Organ**	**Combined Uncertainty /Modifying Factors**	**Sources of RfD Target Organ**	**Dates of RfD**
Benzene	Chronic	4.00E-03	mg/kg-day	1	4.00E-03	mg/kg-day	blood, immune system	300	IRIS	2015
Cumene	Chronic	0.1	mg/kg-day	1	0.1	mg/kg-day	kidney	1000	IRIS	2015
Pathway: Ingestion of B/C- Level groundwater as Drinking water										
Chemicals of Concern	**Chronic/ Subchronic**	**Oral RfD Value**	**Oral RfD Units**	**Absorp. Efficiency (Dermal)**	**Adjusted RfD (Dermal)**	**Adj. Dermal RfD Units**	**Primary Target Organ**	**Combined Uncertainty /Modifying Factors**	**Sources of RfD Target Organ**	**Dates of RfD**
Benzene	Chronic	4.00E-03	mg/kg-day	1	4.00E-03	mg/kg-day	blood, immune system	300	IRIS	2015
Cumene	Chronic	0.1	mg/kg-day	1	0.1	mg/kg-day	kidney	1000	IRIS	2015
Phenolics, Total Recoverable (1)	Chronic	0.3	mg/kg-day	1	0.3	mg/kg-day	whole body, fetus	300	IRIS	2015

Key

mg/kg-day: milligram per kilogram-day

1. Toxicity values for total recoverable phenolics are based on the values for phenol.

Table 7
Cancer Toxicity Data Summary

Pathway: Dermal Contact with A-Level Groundwater							
Chemical of Concern	**Oral Cancer Slope Factor**	**Units**	**Adjusted Cancer Slope Factor (for Dermal)**	**Slope Factor Units**	**Weight of Evidence/ Cancer Guideline**	**Source**	**Date**
Benzene	0.055	$(mg/kg\text{-}d)^{-1}$	0.055	$(mg/kg\text{-}d)^{-1}$	A	IRIS	2015

Pathway: Ingestion of B/C-Level Groundwater as Drinking Water							
Chemical of Concern	**Oral Cancer Slope Factor**	**Units**	**Adjusted Cancer Slope Factor (for Dermal)**	**Slope Factor Units**	**Weight of Evidence/ Cancer Guideline**	**Source**	**Date**
Benzene	0.055	$(mg/kg\text{-}d)^{-1}$	0.055	$(mg/kg\text{-}d)^{-1}$	A	IRIS	2015

Key:
[1] per milligram per killigram-day or 1/(milligram per killigram-day)
IRIS: Integrated Risk Information System

Weight of Evidence definitions:
- A: Human carcinogen
- B1: Probable human carcinogen - Indicates that limited human data are available
- B2: Probable human carcinogen - Indicates sufficient evidence in animals and inadequate or no evidence in humans
- C: Possible human carcinogen
- D: Not classifiable as a human carcinogen
- E: Evidence of noncarcinogenicity

Cancer Toxicity Data Summary

While PCBs may be carcinogenic, they did not pose an unacceptable carcinogenic risk via any of the exposure pathways evaluated

Table 8
Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Outdoor Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical Of Concern	Primary target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
A-Level Groundwater (Sitewide)	Groundwater	Groundwater	Benzene	Immunological	8.3E-01	8.8E-01	2.2	3.9
			Cumene	Urinary	2.1E-01	3.9E-01	3.6	4.3

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical Of Concern	Primary target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
A-Level Groundwater (Sitewide)	Ggroundwater	Groundwater	Benzene	Immunological	1.5E-01	8.4E-01	3.9E-01	1.4
			Cumene	Urinary	3.7E-02	3.1E-01	6.5E-01	1.0

Table 8
Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: On-Site residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical Of Concern	Primary target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
B/C-Level Groundwater (Active Process Area)	Groundwater	Drinking Water	Benzene	Immunological	79.6	-	-	79.6
			Cumene	Urinary	11	-	-	11
			Phenolics	Other (decreased maternal weight gain)	6.7	-	-	6.7

Scenario Timeframe: Future
Receptor Population: On-Site Residents
Receptor Age: Child (2 - <6)

Medium	Exposure Medium	Exposure Point	Chemical Of Concern	Primary target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
B/C- Level groundwater (Active Process Area)	Groundwater	Drinking Water	Benzene	Immunological	133	-	-	133
			Cumene	Urinary	18.2	-	-	18.2
			Phenolics	Other (decreased maternal weight gain)	11.1	-	-	11.1

Table 8
Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: On-Site Residents
Receptor Age: Child (0 - <2)

Medium	Exposure Medium	Exposure Point	Chemical Of Concern	Primary target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
B/C-Level Groundwater (Active Process Area)	Groundwater	Drinking Water	Benzene	Immunological	133	-	-	133
			Cumene	Urinary	18.2	-	-	18.2
			Phenolics	Other (decreased maternal weight gain)	11.1	-	-	11.1

Key:
- : No available data

Table 9
Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Outdoor Industrial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical Of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes
A-Level Groundwater (Sitewide)	Groundwater	Groundwater	Benzene	6.60E-05	7.40E-05	1.70E-04	3.10E-04

Scenario Timeframe: Future
Receptor Population: On-Site Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical Of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes
B/C zone groundwater (Active Process Area)	Groundwater	Drinking Water	Benzene	7.5E-03	-	-	7.5E-03

Scenario Timeframe: Future
Receptor Population: On-Site Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical Of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes
B/C-Level Groundwater (Northern Chemical Landfill)	Groundwater	Drinking Water	Benzene	1.3E-04	-	-	1.3E-04

Scenario Timeframe: Future
Receptor Population: On-Site Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical Of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
B/C- Level Groundwater (Tank Farm/ Township Refuse Area)	Groundwater	Drinking Water	Benzene	1.8E-04	-	-	1.8E-04

Key:
- : No available data

Table 10 Adult Lead Model						
Scenario Time Frame	**Receptor Population**	**Exposure Area**	**Model Output Categories**	**Lead Concentration Soil (mg/kg)**	**Estimated Adult Blood Lead Concentrations (ug/dL)[1]**	**Estimated Fetal Blood Concentrations (µg/dL)[1]**
Current/Future	Outdoor Industrial Worker	Shooting Range	Incidental Ingestion of Soil	1620	**13.2**	**11.8**
		Township Refuse Area	Incidental Ingestion of Soil	758	**7.0**	**6.3**
Current/Future	Construction/Utility Worker	Shooting Range	Incidental Ingestion of Soil	1620	**19.1**	**17.2**
		Township Refuse Area	Incidental Ingestion of Soil	758	**8.8**	**7.9**

Key
mg/kg = milligram per kilogram
µg/dL = microgram per deciliter
[1] Target blood lead level of concern = 5 µg/dL
Bold indicates value exceeds 5 mg/dL

Table 11: Remediation Goals for Saturated and Unsaturated Soil			
COCs	**Saturated Soil Remediation Goal[1] (mg/kg)**	**Source[1]**	**Unsaturated Soil Remediation Goal[2] (mg/kg)**
Acetophenone	5	NJDEP NRDCSRS	3
Benzene	5	NJDEP NRDCSRS	0.005
Cumene	990	EPA RSL Industrial	28
Ethylbenzene	25	EPA RSL Industrial	13
Lead	800	NJDEP NRDCSRS	90
Phenol	25000	EPA RSL Industrial	8
Toluene	4700	EPA RSL Industrial	7

Notes:

[1]From Derivation of Screening Values Benchmark Table memo for the Former Hercules Higgins Plant. CSI Environmental, 2017.
The soil screening level represents the lowest of the EPA Regional Screening Level for Industrial Soil and the NJDEP NRDCSRS.
The screening levels utilize a cancer risk level of 10^{6} or noncancer HI=0.1 to account for addictive effects to a target.

[2]See Table 12 for calculation details
EPA RSL Industrial = USEPA Regional Screening Level Summary Table, May 2016 (value for industrial soil)
NJDEP NRDCSRS = New Jersey DEP Non Residential Direct Contact Soil Remediation Standard, NJAC 7:26D Appendix 1 Soil Remediation Standards Table

Table 12: Calculated and NJDEP Impact to Groundwater Soil Screening Levels				
COCs	Calculated IGW Soil Remediation Standard[1] (mg/kg)	Health based Ground Water Quality Criteria used to back calculate IGW Soil Remediation Standard[2] (µg/L)		Default IGW Soil Remediation Standard[3] (mg/kg)
		c_{gw}	Source	
Acetophenone	3	700	NJDEP GW Quality criteria	3
Benzene	0.006	1	NJDEP GW Quality criteria	0.005*
Cumene	28	700	NJDEP GW Quality criteria	not listed
Ethylbenzene	13	700	EPA MCL	13
Lead	90	5	NJDEP GW Quality criteria	90
Phenol	8	2000	NJDEP GW Quality criteria	8
Toluene	11	600	NJDEP GW Quality criteria	7

Notes:

[1]Calculated using NJDEP Soil Water Partition Equation Calculator v2.1, November 2013.

[2] If USEPA National Primary Drinking Water Regulation Maximum Contaminant Level (MCL) was not available, NJDEP ground water quality standard was used http://www.nj.gov/dep/srp/guidance/rs/partition_equation.xls

[3]Source: Guidance Document, Development of Impact to Ground Water Soil Remediation Standards Using the Soil Water Partition Equation, NJDEP, 2013.

Default values are based on NJDEP GW Quality criteria. Cgw is groundwater concentration in the soil water partion equation.

Default dilution attenuation factor (DAF) = 20 was used in calculation.

*Remediation standard set to Practical Quantification Limit (PQL)

Table 13 : Remediation Goals for Groundwater		
COC	**Remediation Goal[2] (mg/L)**	**Source[3]**
Acetophenone	700	NJDEP GWQS
Benzene	1	NJDEP GWQS
Cumene	700	NJDEP GWQS
Ethylbenzene	700	EPA MCL and NJDEP GWQS
Lead	5	NJDEP GWQS
Phenolics, Total Recoverable	2000	* NJDEP GWQS - Phenol
Toluene	600	NJDEP GWQS

Notes:

1. mg/L = micrograms per liter

2. From Derivation of Screening Values Benchmark Table memo for the Former Hercules Higgins Plant. CSI Environmental, 2017. The groundwater screening level represents the lowest of the EPA MCL and the NJDEP Groundwater Quality Standards. If no value could be found, a surrogate was selected and the appropriate screening value was selected (see Derivation of Supplemental Screening Values Technical Memo, RBR 2017).

3. * Value represents a surrogate screening level (see Derivation of Supplemental Screening Values Technical Memo, RBR 2017)

Table 14: Cost Estimate for Soil Alternative S-3 Excavation with Ex-situ Bioremediation/Reuse and Enhanced In-Situ Biodegradation					
Item	**Quantity**	**Units**	**Unit Cost**	**Extended Cost**	**Total Cost**
DIRECT CAPITAL COSTS (Ex-Situ Treatment)					
Site Preparation					
Mobilization	1.00	LS	$ 50,000	$ 50,000	
Health and Safety Plan	1.00	LS	$ 5,000	$ 5,000	
					$ 55,000
Land clearing - Light vegetation					
Clear And Grub Light Trees, Cut And Chip	3.48	acre	$ 5,000	$ 17,413	
Haul to stockpile location onsite	557	loose CY	$ 4.00	$ 2,229	
					$ 19,642
Surveying	1	LS	$ 3,000	$ 3,000	
					$ 3,000
Sediment Control - Silt fencing	3,000	ft	$ 5.00	$ 15,000	
					$ 15,000
Excavate and Haul to Stockpile Onsite					
Excavate and Load	13,804	bank CY	$ 4.00	$ 55,216	
Haul to stockpile location onsite (2km, 26 CY Off Highway Truck)	17,945	loose CY	$ 4.00	$ 71,781	
					$ 126,997
Backfill					
Unclassified Fill dirt (delivered)	20,706	loose CY	$ 30.00	$ 621,180	
Place fill dirt	20,706	loose CY	$ 3.00	$ 62,118	
Grading, compaction	8,846	SY	$ 3.81	$ 33,705	
Screened Topsoil (delivered)	1,917	loose CY	$ 35.00	$ 67,085	
Spread Topsoil	1,917	loose CY	$ 6.00	$ 11,500	
HydroSeeding/vegetation	79,617	SF	$ 0.15	$ 11,943	
					$ 807,530
Onsite Disposal of Soil - Biopiles/Landfarming					
Biopile Treatment	16,578	loose CY	$ 65.00	$ 1,077,544	
Landfarming	0	CY	$ 85.00	$0	
					$ 1,077,544
Onsite Disposal of Heavy Metals Soils					
Phytoremediation	0	CY	$ 479.00	$0	
					$0
Offsite Disposal of Heavy Metals Soils					
Loading (soils)	1,368	loose CY	$ 4.00	$ 5,470	
Haul (6 miles; 16.5 CY trucks)	1,368	loose CY	$ 9.00	$ 12,308	
Tipping fee, Hazardous Waste Landfill	2,031	ton	$ 240.00	$ 487,413	
Laboratory analysis (landfill requirement)	1	LS	$ 1,000	$ 1,000	
					$ 506,191
TOTAL DIRECT CAPITAL COSTS					**$ 2,610,904**
INDIRECT CAPITAL COSTS					
Contingency (10% +/-)				$261,090	
Engineering (10% +/-)				$261,090	
Administration (5% +/-)				$130,545	
TOTAL INDIRECT CAPITAL COSTS					**$652,726**
TOTAL CAPITAL COSTS (Page 1)					**$3,263,629.81**

Table 14: Cost Estimate for Soil Alternative S-3 Excavation with Ex-situ Bioremediation/Reuse and Enhanced In-Situ Biodegradation					
Item	**Quantity**	**Units**	**Unit Cost**	**Extended Cost**	**Total Cost**
DIRECT CAPITAL COSTS (Engineered Soil Cover)					
Site Preparation					
Mobilization	1	LS	$ 50,000	$ 50,000	
Health and Safety Plan	1.00	LS	$ 5,000	$ 5,000	
					$ 55,000
Land Clearing - Light Vegetation					
Clear And Grub Light Trees, Cut And Chip	15.00	acre	$ 10,000	$ 150,000	
On-Site Composting	4	acre	$ 2,500	$ 10,000	
					$ 160,000
Surveying	1	LS	$ 7,500	$ 7,500	
					$ 7,500
Sediment Control - Silt Fencing	6,000	ft	$ 4.00	$ 24,000	
Modify (Raise Well Infrastucture)					
Grading, compaction, sump, gravity drain	1	LS	150,000	$ 150,000	
					$ 150,000
Excavate and Haul to Clean Soil Cover					
Excavate and Load	14,000	solids CY	$ 3.00	$ 42,000	
Haul to stockpile location onsite (2km, 26 CY Off Highway Truck)	14,000	solids CY	$ 3.00	$ 42,000	
					$ 84,000
Clean Soil Cover (Assume 25,000 CY)					
Place Treated Solids	14,000	CY	$ 3.00	$ 42,000	
Unclassified Fill dirt (delivered)	4,000	loose CY	$ 30.00	$ 120,000	
Place fill dirt	4,000	loose CY	$ 3.00	$ 12,000	
Grading, compaction (treated & fill dirt)	18,000	SY	$ 3.50	$ 63,000	
Screened Topsoil (delivered)	7,000	loose CY	$ 50.00	$ 350,000	
Spread Topsoil (as needed)	7,000	loose CY	$ 4.03	$ 28,210	
HydroSeeding/vegetation (soil cover & excavation areas)	784,617	SF	$ 0.15	$ 117,693	
					$ 690,903
TOTAL DIRECT CAPITAL COSTS					**$ 1,147,403**
INDIRECT CAPITAL COSTS					
Contingency (15% +/-)				$172,110	
Engineering, assumed only grading needed for SW drainage improvements (20% +/-)				$229,481	
Administration (5% +/-)				$57,370	
TOTAL INDIRECT CAPITAL COSTS					**$458,961**
TOTAL CAPITAL COSTS (Page 2)					**$ 1,606,364**

Table 14: Cost Estimate for Soil Alternative S-3 Excavation with Ex-situ Bioremediation/Reuse and Enhanced In-Situ Biodegradation					
Item	**Quantity**	**Units**	**Unit Cost**	**Extended Cost**	**Total Cost**
DIRECT CAPITAL COSTS (Anaerobic Injections)					
Site Preparation					
Mobilization/Site Preparation	1.00	LS	$7,500	$7,500	
Health and Safety Plan	1.00	LS	$5,000	$5,000	
Erosion/Sediment/Dust Control	1.00	LS	$5,000	$5,000	
Clear and Grub	5.00	ACRE	$4,000	$20,000	
Subtotal					**$37,500**
Trench Installation					
Trench Installations	25.00	ea	$3,000	$75,000	
Injection Permit	1.00	ls	$15,000	$15,000	
					$90,000
System Installation					
Mixing Equipment and Vessels	1.00	ls	$15,000	$15,000	
Transfer Equipment (pumps, hoses, etc)	1.00	ls	$10,000	$10,000	
Trenching and Piping (with control valves)	1.00	ls	$60,000	$60,000	
Utility Connections	1.00	ls	$50,000	$50,000	
Subtotal					**$135,000**
TOTAL DIRECT CAPITAL COSTS					**$262,500**
INDIRECT CAPITAL COSTS					
Contingency (10% +/-)				$26,250	
Engineering (10% +/-)				$26,250	
Administration (5% +/-)				$13,125	
TOTAL INDIRECT CAPITAL COSTS					**$65,625**
CAPITAL COSTS SENA SUBTOTAL (Page 3)					**$328,125**
CAPITAL COSTS SUBTOTAL (Page 2)					**$1,606,364**
CAPITAL COSTS SUBTOTAL (Page 1)					**$3,263,630**
TOTAL CAPITAL COSTS					**$5,198,118.56**
ANNUAL O&M COSTS - Anaerobic Injections				**$185,300.00**	
Present Worth - 5 years at 7%					**$759,766.58**
ANNUAL O&M COSTS - ENG. SOIL COVER				**$20,000.00**	
Present Worth - 30 years at 7%					**$248,180.80**
ANNUAL O&M COSTS - SOIL EXCAVATION & DISPOSAL				**$0.00**	
Present Worth - N/A					**$0.00**
TOTAL O&M PRESENT WORTH COST					**$1,007,947.38**
TOTAL ESTIMATED REMEDIAL COST					**$6,206,065.94**

Table 15: Cost Estimate for Sediment Alternative SED-3 Hydraulic Dredging with On Site Treatment/Reuse					
Item	**Quantity**	**Units**	**Unit Cost**	**Extended Cost**	**Total Cost**
DIRECT CAPITAL COSTS					
Site Preparation					
Mobilization	1.00	LS	$ 60,000	$ 60,000	
Health and Safety Plan	1.00	LS	$ 5,000	$ 5,000	
					$ 65,000
Land Clearing - Light vegetation	3.50	acre	$ 5,000	$ 17,500	
Topsoil and light vegetation composted	1.00	LS	$ 2,500	$ 2,500	
					$ 20,000
Surveying	1	LS	$ 3,000	$ 3,000	
					$ 3,000
Sediment Control - Silt fencing	4,000	ft	$ 4.00	$ 16,000	
					$ 16,000
Dewatering Cell Construct					
Grading, compaction, sump, gravity drain	4	acre	7,500	$ 30,000	
30 milliliter liner	2	acre	$ 60,000.00	$ 120,000	
					$ 150,000
Materials					
Geotextile Tubes (100 ft x 90 ft)	18	Tube	$ 4,500	$ 81,000	
Polymer + Coagulant	1	LS	$ 36,000.00	$ 36,000	
Double wall HDPE Transmission Piping	1	LS	$ 64,800.00	$ 64,800	
Fittings, Hardware, Valves, Fuel	1	LS	$ 64,500.00	$ 64,500	
Hydraulically Dredge Sediments					
Dredge SCB + Clonmell Triad Risk Seds	8,500	CY	$ 72.00	$ 612,000	
Manage Dewatering Cell	8,500	CY	$ 4.00	$ 34,000	
					$ 892,300
OnSite Treatment of Sediments					
Phytoremediation	1	LS	$ 150,000.00	$ 150,000	
Phyto monitoring, nutrients augmentation	1	LS	$ 25,000.00	$ 25,000	
Laboratory analysis (landfill requirement)	1	LS	$ 7,500	$ 7,500	
					$ 182,500
TOTAL DIRECT CAPITAL COSTS					**$ 1,328,800**
INDIRECT CAPITAL COSTS					
Contingency (20% +/-) Reduce Contingency from Pilot Test				$265,760	
Engineering (15% +/-)				$199,320	
Administration (5% +/-)				$66,440	
TOTAL INDIRECT CAPITAL COSTS					**$531,520**
TOTAL CAPITAL COSTS					**$ 1,860,320**

Table 16: Cost Estimate for Groundwater Alternative GW-2 Extraction with On-Site Treatment and Long-Term Monitoring					
Item[1]	Quantity	Units	Unit Cost	Extended Cost	Total Cost
DIRECT CAPITAL COSTS					
Site Preparation					
Mobilization/Site Preparation	1.00	LS	$2,500	$2,500	
Health and Safety Plan	1.00	LS	$5,000	$5,000	
Erosion/Sediment/Dust Control	1.00	LS	$5,000	$5,000	
Clear and Grub (Already Incl.)	0.50	ACRE	$4,000	$2,000	
Well Point System Startup-not required	1.00	LS	$0	$0	
Subtotal					**$14,500**
Outfall Construction for:	1.00	LS	$75,000	$75,000	
Discharge to Groundwater at SCB and Tube Laydown					
Subtotal					**$75,000**
Purchased Treatment Plant Equipment (E)					
GW Recovery Pump (20 gpm)-existing wells	0.00	EA	$2,500	$0	
Equalization Tank (1,000 gallons)	0.00	EA	$1,250	$0	
Clarifier Feed Pump (25 gpm)	0.00	EA	$1,250	$0	
Mix Tank (1000 gallons)	0.00	EA	$1,250	$0	
Clarifier (50 gpm)-slant tray	0.00	EA	$9,500	$0	
Lime Feed System	0.00	LS	$6,250	$0	
Chemical Feed Systems	0.00	LS	$5,000	$0	
Filter Feed Sump Tank (1000 gallons)	0.00	EA	$1,250	$0	
Filter Feed Pump (50 gpm)	0.00	EA	$12,500	$0	
Sand Filter Rehab	0.00	EA	$9,500	$0	
Treated Water Tank (1000 gallons)	0.00	EA	$1,250	$0	
Backwash Pump (100 gpm)	0.00	EA	$2,500	$0	
Sludge Transfer System-not required	1.00	EA	$0	$0	
Sludge Thickener-not required	1.00	EA	$0	$0	
Decant Pump (50 gpm)-not required	1.00	EA	$0	$0	
Filter Press (.5 ton/day)-not required	1.00	EA	$0	$0	
Geotubes and Polymer	1.00	EA	$30,000	$30,000	
Computerized/automated polymer system	1.00	EA	$50,000	$50,000	
Pad/Building Construction	1.00	LS	$25,000	$25,000	
Replenish Carbon for Existing Carbon Units	0.00	LS	$15,000	$0	
Subtotal (E)					**$105,000**
Treatment Plant Components	% of (E)				
Installation	15.00%			$15,750	
Instrumentation and Controls	10.00%			$10,500	
Piping	15.00%			$15,750	
Electrical	20.00%			$21,000	
Building and Site Improvements	15.00%			$15,750	
Services/Utilities	10.00%			$10,500	
Subtotal					**$89,250**
VOC Pretreatment (MW-11)					
Recovery Well with pump	0.00	EA	$5,000	$0	
Air Stripper with sump tank and pump	0.00	EA	$30,000	$0	
Piping	0.00	LF	$30	$0	
Electrical	0.00	LS	$5,000	$0	
Pad/Building	0.00	LS	$25,000	$0	
Subtotal					**$0**

Table 16: Cost Estimate for Groundwater Alternative GW-2 Extraction with On-Site Treatment and Long-Term Monitoring					
Item[1]	**Quantity**	**Units**	**Unit Cost**	**Extended Cost**	**Total Cost**
Discharge					
Piping	800.00	FT	$30	$24,000	
Earthwork	1.00	ACRE	$7,500	$7,500	
Piping End Treatments-included	1.00	EA	$0	$0	
Subtotal					**$31,500**
TOTAL DIRECT CAPITAL COSTS					**$315,250**
INDIRECT CAPITAL COSTS					
Contingency (15% +/-)				$47,288	
Engineering (10% +/-)				$31,525	
Administration (5% +/-)				$15,763	
TOTAL INDIRECT CAPITAL COSTS					**$94,575**
TOTAL CAPITAL COSTS					**$409,826**
ANNUAL OPERATION AND MAINTENANCE COSTS					
Treatment Plant Components					
Operating Labor-N2 Operator	700.00	MANHR	**$95**	$66,500	
Management/Support - Project Manager	250.00	MANHR	**$125**	$31,250	
Maintenance (7% total capital) Reduced O&M	1.00	LS	$28,688	$28,688	
System					
Inspection and Maintenance	1.00	LS	$25,000	$25,000	
Outfall Pipeline					
Inspection and Maintenance	1.00	LS	$12,000	$12,000	
Geotubes and Polymer - Annual Replacement	1.00	LS	$30,000	$30,000	
Geotubes - Residual Solids Management	1.00	LS	$7,500	$7,500	
Chemical Usage	0.00	LS	$17,500	$0	
Carbon Rebedding	0.00	LS	$15,000	$0	
Ion Exchange Regen.				$0	
Water Disposal	0.00	GALLONS	$0.25	$0	
Electrical Requirement	60000.00	KW	$0.15	$9,000	
Quarterly Effluent Monitoring	4.00	EA	$4,000	$16,000	
Subtotal					**$225,938**
Groundwater Monitoring Program					
Present Worth for 15 yr LTM	1.00	LS	$1,184,815	$1,184,815	
Present Worth for Groundwater Mon. O&M					**$1,184,815**
Present Worth of System O&M (10 years @ 7%)					**$1,586,892.70**
Present Worth of 10 Years of O&M/15 LTM					**$2,771,708**
TOTAL ESTIMATED REMEDIAL COST					**$3,181,534**

Notes:

1. The opinion of cost is based upon CSI experience operating the existing system at the Gibbstown site.
   (assumes that carbon and sand filter units from existing system can be reused)

2. The opinion of cost is based upon the current groundwater treatment system flow rate of 125 gpm.

Table 17: Engineered Soil Cover Cost Estimate for Alternatives S-3 and SED-3					
Item	**Quantity**	**Units**	**Unit Cost**	**Extended Cost**	**Total Cost**
DIRECT CAPITAL COSTS					
Site Preparation					
Mobilization	1	LS	$ 50,000	$ 50,000	
Health and Safety Plan	1.00	LS	$ 5,000	$ 5,000	
					$ 55,000
Land Clearing - Light Vegetation					
Clear And Grub Light Trees, Cut and Chip	15.00	acre	$ 10,000	$ 150,000	
On-Site Composting	4	acre	$ 2,500	$ 10,000	
					$ 160,000
Surveying	1	LS	$ 7,500	$ 7,500	
					$ 7,500
Sediment Control - Silt Fencing	6,000	ft.	$ 4.00	$ 24,000	
Modify (Raise Well Infrastucture)					
Grading, compaction, sump, gravity drain	1	LS	150,000	$ 150,000	
					$ 150,000
Excavate and Haul to Clean Soil Cover					
Excavate and Load	14,000	solids CY	$ 3.00	$ 42,000	
Haul to stockpile location onsite (2km, 26 CY Off Highway Truck)	14,000	solids CY	$ 3.00	$ 42,000	
					$ 84,000
Clean Soil Cover (Assume 25,000 CY)					
Place Treated Solids	14,000	CY	$ 3.00	$ 42,000	
Unclassified Fill dirt (delivered)	4,000	loose CY	$ 30.00	$ 120,000	
Place fill dirt	4,000	loose CY	$ 3.00	$ 12,000	
Grading, compaction (treated & fill dirt)	18,000	SY	$ 3.50	$ 63,000	
Screened Topsoil (delivered)	7,000	loose CY	$ 50.00	$ 350,000	
Spread Topsoil (as needed)	7,000	loose CY	$ 4.03	$ 28,210	
HydroSeeding/Vegetation (soil cover & excavation areas)	784,617	SF	$ 0.15	$ 117,693	
					$ 690,903
TOTAL DIRECT CAPITAL COSTS					**$ 1,147,403**
INDIRECT CAPITAL COSTS					
Contingency (15% +/-)				$172,110	
Engineering, assumed only grading needed for SW drainage improvements (20% +/-)				$229,481	
Administration (5% +/-)				$57,370	
TOTAL INDIRECT CAPITAL COSTS					**$458,961**
TOTAL CAPITAL COSTS					**$ 1,606,364**
ANNUAL OPERATING COSTS					
Stormwater & Soil Erosion Management					
Quarterly maintenance, inspections, repairs	4	QTR	$ 5,000	$ 20,000	
					$ 20,000
Present Worth of Soil Cover O&M (30 years @ 5%)					**$ 307,460**
TOTAL ESTIMATED SOIL COVER COST					**$ 1,913,824**

Note: If treated soils are not included in soil cover clean fill by approximately $600,000.

Table 18: Chemical-Specific ARARs, TBCs, and Other Guidelines

FEDERAL or STATE	REGULATORY/ REQUIREMENT	REGULATION/ CITATION	APPLICABILITY/ RELEVANCE	COMMENT
Federal	Safe Drinking Water Act	40 C.F.R. 141	Drinking water standards which apply to specific contaminants determined to have an adverse impact on human health	Relevant and appropriate for B- and C-level groundwater, if needed
	Clean Water Act	33 U.S.C. § 1251 et seq.	National policy for eliminating/mitigating impacts to navigable waters, waters of the contiguous zone and the oceans	ARAR for eliminating point source sources for aquifers and surface water
	RCRA Ground Water Protection Standards	40 CFR § 264.94	Provides guidance for setting concentration limits for hazardous constituents at a particular site	ARAR for groundwater concentration limits
	Federal Water Quality Criteria	51 Federal Register 436665	Establishes recommended water quality criteria for 157 different pollutants	TBC for groundwater
State	New Jersey Surface Water Quality Standards	N.J.A.C. 7:9B	NJDEP sets standards for surface water based on classes	ARAR for various contaminants
	New Jersey Remediation Standards	N.J.A.C. 7:26D	Sets minimum surface water and saturated soil remediation standards, and requires development of impact to groundwater soil remediation standards	Applicable to ingestion/dermal soil remediation standards; TBC for impact to groundwater procedures
	New Jersey Groundwater Quality Standards	N.J.A.C. 7:9-6; N.J.A.C 7:9C	Sets minimum groundwater remediation standards	Applicable to groundwater
	New Jersey Pollutant Discharge Elimination System	N.J.A.C. 7:9B-1.14	Sets permit limitations and effluent criteria for groundwater treatment systems in the state of New Jersey	Applicable to treatment and effluent criteria for groundwater
	NJDEP Ecological Screening Criteria	Ecological Screening Criteria March 10, 2009, not promulgated	Ecological screening criteria in surface water, sediment and soil	TBC for surface water, sediment and soil

Table 19: Action-Specific ARARs TBCs, and Other Guidelines				
FEDERAL or STATE	**REGULATORY/ REQUIREMENT**	**REGULATION CITATION**	**APPLICABILITY/ RELEVANCE**	**COMMENT**
Federal	Resource Conservation and Recovery Act (RCRA)	40 C.F.R. §§ 262, 263, 264, 265	Hazardous waste handling, storage and disposal	Applicable to on-Site treatment and storage activities
	Clean Air Act	40 C.F.R. Part 50	Particulate and fugitive dust emission requirements	Applicable to on-Site activities with potential to generate particulate and/or fugitive dust emissions
	Clean Water Act - NPDES Permitting Requirements for Discharge of Treatment System Effluent	40 C.F.R. Parts 122-125	Provides guidelines for NPDES permitting requirements for discharge of treatement system effluent	Applicable to treatment system effluent; on-Site discharges would comply with substantive requirements of otherwise required permits
	Identification and Listing of, specific Hazardous Waste	40 C.F.R. §§ 261.3, 261.6, 261.10	Defines those wastes, which are subject to regulation as hazardous wastes, and lists specific chemical and industry-source wastes	Applicable to determine whether soil and/or sediment meets requirements for management as hazardous waste
	Toxicity Characteristic	40 C.F.R. § 261.24	Specifies TCLP constituent levels for identifying wastes that exhibit toxicity characteristics	Applicable to determine whetner soil and/or sediment exhibits the characteristic of toxicity.
State	Technical Requirements for Site Remediation	N.J.A.C. 7:26E	Technical requirements for remediation of contaminated sites under New Jersey cleanup programs	Substantive technical reuqirements are potentially relevant and appropriate.
	NJPDES and Effluent Limitations	N.J.A.C. 7:14A, et seq.	Provides guidance for operating treatment systems and setting treatment system effluent limitations in New Jersey	Applicable to treatment system design
	NJDEP Guidance on Capping of Sites Undergoing Remediation	Version 1.0 July 14, 2014	Provides guidance for capping remediation sites in New Jersey	TBC for soil cover design
	NJDEP Guidance for Beneficial Use of Soil and Non-Soil Material in the Remediation of Contaminated Sites and Closure of Solid Waste Landfills	June 2008	Provides guidance for the use of fill during remediation at contaminated sites in New Jersey	TBC for soil handling and on-Site disposal/reuse
	Standards Applicable to Generators of Hazardous Waste	N.J.A.C. 7:26G-6	Regulations guiding the handling and disposal of hazardous waste in New Jersey	Applicable to the handling/disposal of hazardous waste if generated during the remedial action
	Land Disposal Restrictions	N.J.A.C. 7:26G-11	Regulations regarding limitations on disposal of particular pollutants in New Jersey	Potentially applicable if soil or sediment requires management prior to disposal to meet New Jersey requirements
	Noise Control Act	N.J.S.A. 13:1G-1 et seq. and N.J.A.C. 7:29-1.2	Requirements for controlling noise during construction activities	Relevant and appropriate for implementation of remedial actions at a site
	Air Pollution Control Act	N.J.A.C. 7:27-8, 16	Requirements for limiting air emissions in the state of New Jersey	Potentially applicable to implementation of soil and sediment remedial actions
	Soil Erosion and Sediment Control	N.J.S.A. 4:24	Requirements for controlling erosion during land disturbances over 5000 square feet	Applicable to soil/sediment excavation

Table 20: Location-Specific ARARs, TBCs, and Other Guidelines				
FEDERAL or STATE	**REGULATORY/ REQUIREMENT**	**REGULATION/ CITATION**	**APPLICABILITY/ RELEVANCE**	**COMMENT**
Federal	Fish and Wildlife Coordination Act	16 U.S.C. § 662	Requires that the US Fish and Wildlife Service and respective state fish and wildlife agencies be consulted when a federal water resource development project is being implemented	Applicable to the extent that the sediment remedy involves modification of a stream or body of water
	Clean Water Act	33CFR 330, 33 USC 1251 Section 404, 40 CFR 230, 231	Guidelines established criteria for evaluating impacts to waters of the US (including wetlands) and sets forth factors for considering mitigation measures	Applicable to impacts/remedial action in wetlands areas and buffer zones and streams
	Executive Order 11988 "Floodplain Management"		Requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative	TBC for sediment remedy
	Executive Order 11990 "Protection of Wetlands"		Statement of procedures on floodplain management and wetlands protection	TBC for sediment remedy
State	New Jersey Coastal Zone Management Rules	N.J.A.C. 7:7-1.1, et seq.	Provides rules and standards for devleopment, including sediment removal, at or below the mean high tide line of coastal and tidal waters of the State	ARAR for sediment remedy
	Endangered Plant Species Act	N.J.S.A. 13:1B, et seq.	Regulation requiring a survey of endanged plant species in a project area to prevent impacts to these populations	Potentially applicable to sediment remedy
	Soil Erosion and Sediment Control Act	N.J.S.A. 4:24-39, et seq.	Regulates construction that will potentially result in erosion of soils, requires soil erosion and sediment control for certain projects in the state of New Jersey	Applicable for Site activities involving excavation, grading and other soil disturbance actvities
	Freshwater Wetlands Protection Act Rules	N.J.A.C. 7:7A	Regulates all dredging and sediment disturbance or removal activities in freshwater wetlands	Substantive standards applicable to disturbance of wetlands areas and buffer zones
	Flood Hazard Area Control Act Rules	N.J.A.C. 7:13-10,11	Regulates the disturbance, the placement of fill, grading, excavation, or other disturbance within the defined flood hazard area of rivers/streams	Potentially applicable to impacts/remedial action in floodplain areas; remedy will comply with substantive requirements of otherwise required permits

APPENDIX III

ADMINISTRATIVE RECORD INDEX

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

08/15/2018

REGION ID: 02

Site Name: HERCULES, INC. (GIBBSTOWN PLANT)
CERCLIS ID: NJD002349058
OUID: 01 and 02
SSID: 0259
Action:

DocID:	Doc Date:	Title:	Image Count:	Doc Type:	Addressee Name/Organization:	Author Name/Organization:
510509	8/15/2018	ADMINISTRATIVE RECORD INDEX FOR OU1 AND OU2 FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	5	Administrative Record Index		(US ENVIRONMENTAL PROTECTION AGENCY)
501255	05/23/2008	FOCUSED INVESTIGATION WORK PLAN FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	232	Work Plan		
105750	09/10/2009	US EPA REGION II ADMINISTRATIVE SETTLEMENT AGREEMENT AND ORDER ON CONSENT OF REMEDIAL INVESTIGATION/FEASIBILITY STUDY - CERCLA DOCKET NO. 02-2009-2034 FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	71	Legal Instrument		MUGDAN,WALTER,E (US ENVIRONMENTAL PROTECTION AGENCY)
501242	02/10/2010	FEASIBILITY STUDY WORK PLAN FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	36	Work Plan		
499911	07/30/2010	SUPPLEMENTAL VAPOR INTRUSION INVESTIGATION REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	59	Report	(US ENVIRONMENTAL PROTECTION AGENCY)|PIERRE,PATRICIA (US ENVIRONMENTAL PROTECTION AGENCY)	(CONSTRUCTION SERVICES INTERNATIONAL)|STEVENS,CRAIG (CONSTRUCTION SERVICES INTERNATIONAL)
501262	11/11/2010	SUPPLEMENTAL VAPOR INTRUSION DELINEATION SAMPLING PLAN FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	16	Work Plan	PIERRE,PATRICIA (US ENVIRONMENTAL PROTECTION AGENCY)	FERRIS,J. DUSTIN (CSI ENVIRONMENTAL LLC)
501263	11/11/2010	SUB-SLAB SOIL GAS AND INDOOR AIR SAMPLING WORK PLAN FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	28	Work Plan	PIERRE,PATRICIA (US ENVIRONMENTAL PROTECTION AGENCY)	FERRIS,J. DUSTIN (CSI ENVIRONMENTAL LLC)

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501264	09/12/2011	SUB-SLAB SOIL GAS AND INDOOR AIR VAPOR INTRUSION INVESTIGATION REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	48	Report		
501265	09/12/2011	TRANSMITTAL OF THE SUB-SLAB SOIL GAS AND INDOOR AIR VAPOR INTRUSION INVESTIGATION REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	1	Letter	PIERRE,PATRICIA (US ENVIRONMENTAL PROTECTION AGENCY)	FERRIS,J. DUSTIN (CSI ENVIRONMENTAL LLC)
501252	08/01/2013	BASELINE ECOLOGICAL RISK ASSESSMENT WORK PLAN FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	358	Work Plan		
501259	03/23/2015	ADDITIONAL REMEDIAL INVESTIGATION WORK PLAN FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	35	Work Plan		
501256	11/05/2015	ADDITIONAL REMEDIAL INVESTIGATION RESULTS SUMMARY LETTER REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	73	Report	PIERRE,PATRICIA (US ENVIRONMENTAL PROTECTION AGENCY)	(CSI ENVIRONMENTAL LLC)
501250	02/01/2016	RESIDUAL NON-AQUEOUS PHASE LIQUIDS MOBILITY STUDY LETTER REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	8	Report	PIERRE,PATRICIA (US ENVIRONMENTAL PROTECTION AGENCY)	(CSI ENVIRONMENTAL LLC)
501258	02/08/2016	ADDITIONAL REMEDIAL INVESTIGATION WORK PLAN ADDENDUM FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	4	Work Plan	PIERRE,PATRICIA (US ENVIRONMENTAL PROTECTION AGENCY)	(CSI ENVIRONMENTAL LLC)
501260	03/01/2016	CONCEPTUAL SITE MODEL FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	28	Report		

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501243	03/14/2016	BIOTREATABILITY/BIOREMEDIATION WORK PLAN FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	40	Work Plan		
501248	03/31/2016	CLONMELL CREEK SEDIMENT TREATMENT PILOT STUDY WORK PLAN FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	73	Work Plan		
501257	05/04/2016	ADDITIONAL REMEDIAL INVESTIGATION LEAD ADDENDUM RESULTS SUMMARY LETTER REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	19	Report	PIERRE,PATRICIA (US ENVIRONMENTAL PROTECTION AGENCY)	(CSI ENVIRONMENTAL LLC)
501249	08/03/2016	SITE-SPECIFIC CUMENE SOLUBILITY AND CHEMICAL SATURATION VALUES LETTER REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	74	Report	PIERRE,PATRICIA (US ENVIRONMENTAL PROTECTION AGENCY)	(CSI ENVIRONMENTAL LLC)
501245	09/14/2016	BIOTREATABILITY/BIOREMEDIATION PROGRESS REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	17	Report		
501251	03/01/2017	BASELINE ECOLOGICAL RISK ASSESSMENT REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	1203	Report		
501254	04/20/2017	DERIVATION OF SCREENING VALUES BENCHMARK TABLES FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	47	Report	PIERRE,PATRICIA (US ENVIRONMENTAL PROTECTION AGENCY)	(CSI ENVIRONMENTAL LLC)
501246	04/21/2017	CLONMELL CREEK SEDIMENT TREATMENT PILOT DREDGING STUDY REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	60	Report		

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501247	08/11/2017	CLONMELL CREEK SEDIMENT TREATMENT PILOT PHYTOREMEDIATION STUDY REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	460	Report		
501253	09/01/2017	BASELINE HUMAN HEALTH RISK ASSESSMENT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	3401	Report		
501244	10/12/2017	BIOTREATABILITY/BIOREMEDIATION FINAL REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	95	Report		
501266	07/20/2018	NJDEP CONCURRENCE OF THE PROPOSED PLAN FOR OU1 AND OU2 FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	1	Letter	PRINCE,JOHN (US ENVIRONMENTAL PROTECTION AGENCY)	PEDERSON,MARK (NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION)
501287	07/26/2018	REMEDIAL INVESTIGATION REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	279	Report		
533968	7/26/2018	REMEDIAL INVESTIGATION REPORT - TABLES AND FIGURES FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	753	Report		
501288	07/26/2018	REMEDIAL INVESTIGATION REPORT APPENDICES A-T FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	1445	Report		
501289	07/26/2018	REMEDIAL INVESTIGATION REPORT APPENDIX U FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	102	Report		
501290	07/26/2018	FEASIBILITY STUDY REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	1566	Report		(CSI ENVIRONMENTAL LLC)

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Action:

DocID:	Doc Date:	Title:	Image Count:	Doc Type:	Addressee Name/Organization:	Author Name/Organization:
538260	07/27/2018	PROPOSED PLAN FOR OU1 AND OU2 FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	22	Publication		(US ENVIRONMENTAL PROTECTION AGENCY)
533989	8/3/2018	REVISED FEASIBILITY STUDY REPORT FOR THE HERCULES INCORPORATED (GIBBSTOWN PLANT) SITE	1562	Report	(HERCULES INCORPORATED)	(CSI ENVIRONMENTAL LLC)

APPENDIX IV

STATE CONCURRENCE LETTER

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Site Remediation and Waste Management Program
401 E. State Street
PO Box 420, Mail Code 401-06
Trenton, New Jersey 08625
Tel: (609) 292-1250
Fax: (609) 777-1914

September 20, 2018

Angela Carpenter, Acting Director
Emergency and Remedial Response Division
USEPA Region 2
290 Broadway
New York, NY 10007-1866

RE: Hercules Inc Gibbstown Superfund Site – Record of Decision
Greenwich Twp, Gloucester County

Dear Ms. Carpenter:

The New Jersey Department of Environmental Protection (Department) has completed its review of the Record of Decision for Operable Units 1 and 2 of the Hercules Gibbstown Superfund Site. The Department concurs with the selected remedial actions. The selected remedy, comprised of Alternatives S-3, GW-2 and SED-3 in the Record of Decision, consists of the following:

Soils with lead contamination will be excavated and disposed off-site; soils with VOC contamination will be treated on-site by bioremediation; a deed notice will be placed on the entire site. Groundwater will be extracted through use of current pumping wells followed by on-site treatment and establishment of a CEA. Contaminated sediments will be dredged and treated on-site via phytoremediation and ultimately used as on-site cover.

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, and are cost effective.

The Department appreciates the opportunity to participate in the decision-making process to select the appropriate remedies. If you have any questions, please call me at 609-292-1250.

Sincerely,

Mark J. Pedersen
Assistant Commissioner

APPENDIX V

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY
FOR THE
RECORD OF DECISION
HERCULES, INC. SUPERFUND SITE
GIBBSTOWN, GLOUCESTER NEW JERSEY

INTRODUCTION

This Responsiveness Summary provides a summary of citizens' comments and concerns received during the public comment period related to the Proposed Plan for operable units one and two (OU1 and OU2) at the Hercules, Inc. Superfund Site (Site) and provides the U.S. Environmental Protection Agency's (EPA's) responses to those comments and concerns. All comments summarized in this document were considered in EPA's final selection of a remedy to address the contamination at the Site.

SUMMARY OF COMMUNITY RELATIONS ACTIVITIES

Field investigations related to OU1 and OU2 were conducted at the Site from 1987 through 2018, which culminated in the completion of remedial investigation and feasibility study (RI/FS)[1] reports in July 2018. EPA's preferred remedy and the basis for that preference were identified in a Proposed Plan.[2] The RI and FS reports and the Proposed Plan were released to the public for comment on July 30, 2018. These documents were made available to the public at information repositories maintained at the Gloucester County Library System, Greenwich Township Branch, 411 Swedesboro Road, Gibbstown, New Jersey and the EPA Region 2 office in New York City and on EPA's website for the Site at https://www.epa.gov/superfund/hercules-gibbstown.

A notice of availability for the above-referenced documents was published in the *Gloucester County Times* on July 29, 2018. The public comment period ran from July 30, 2018 to August 28, 2018. On August 16, 2018, EPA held a public meeting at the Gibbstown Municipal Court Building to inform local officials and members of the community about the Superfund process, present the Proposed Plan for the Site, including the preferred remedy, and respond to questions and comments from approximately 30 attendees (including residents, media, local business people and local government officials). Based upon the comments received during the public comment period, the public generally supports the selected remedy.

[1] An RI determines the nature and extent of the contamination at a site and evaluates the associated human health and ecological risks and an FS identifies and evaluates remedial alternatives to address the contamination.

[2] A proposed plan describes the remedial alternatives considered for a site and identifies the preferred remedy with the rationale for this preference.

SUMMARY OF COMMENTS AND RESPONSES

Comments were received at the public meeting and in writing.

The transcript from the public meeting can be found in Appendix V-c.

Written comments were received from Jeff Tittel, Director, New Jersey Sierra Club, in a letter, dated August 28, 2018. This letter can be found in Appendix V-d.

A summary of the comments provided at the public meeting and in writing, as well as EPA's responses to those comments, are provided below.

Solid Waste Disposal Area

Comment #1: Two commenters expressed concern that because the selected remedy does not address the tar and mixed waste located in the Solid Waste Disposal Area (SWDA), contaminants leaching into the groundwater underlying the SWDA could threaten local drinking water wells, contaminants could leach into the surrounding wetlands and Clonmell Creek, and contaminants could migrate from Clonmell Creek to the Delaware River. The commenters urged EPA to remove SWDA as part of the selected remedy.

Response #1: The Site is being addressed in three OUs. The SWDA is associated with OU3 and is being addressed under the New Jersey Department of Environmental Protection's (NJDEP's) lead. A remedy for OU3 was selected by NJDEP, with EPA's concurrence, in 1996, calling for consolidation of the waste, installation of an impermeable cap, long-term groundwater monitoring, periodic inspections and institutional controls. The remedial action for OU3 was completed in 2014 and maintenance of the cap is being performed under NJDEP oversight. Quarterly groundwater samples are collected from 20 monitoring wells located in the vicinity of the SWDA. The results from this sampling show minimal impacts to the groundwater in that area and diminishing contaminant concentrations. A network of groundwater recovery wells maintains hydraulic containment of the contaminated groundwater beneath the Site.

For remedial actions that result in any hazardous substances, pollutants, or contaminants remaining above levels that allow for unlimited use and unrestricted exposure, five-year reviews (FYRs) are conducted to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The first FYR for the Site, completed in 2015, concluded that the remedial actions implemented in the SWDA continue to be protective of human health and the environment. Therefore, EPA does not believe that further remedial action at the SWDA is necessary.

Capping

Comment #2: A commenter expressed concern about capping contaminated soils in a flood-prone area.

Response #2: Capping contaminated soils is not a component of the selected remedy for OU1 and OU2. The OU1/OU2 remedy calls for, among other things, excavation of lead-contaminated soil with off-Site disposal, excavation of volatile organic compound (VOC)-contaminated soil located 0-4 feet (ft.) below the ground surface (bgs) and treatment with ex-situ bioremediation, enhanced in-situ biodegradation of VOC-contaminated soil situated below 4 ft. bgs, and hydraulic dredging of contaminated sediment with on-Site phytoremediation. The ex-situ-treated soils and sediments will be reused on-Site as part of an engineered soil cover to reduce infiltration of surface water to the groundwater and control surface water runoff/drainage. The soil cover is not intended as a remedial cap to control direct contact with contaminated material, so the protectiveness is not expected to be disrupted in the event of flood conditions. The soil cover, and any aspect of the remedy that involves adding material in the floodplain, will be implemented to meet the requirements of New Jersey's Flood Hazard Control Act.

Groundwater Contamination

Comment #3: A commenter inquired as to whether the monitoring wells that were installed across the street from the Site are adequate to monitor the migration of contamination.

Response #3: Groundwater has been monitored both on and off the property since 1984. Ninety-two monitoring wells are sampled on an annual basis, with 28 of those wells being sampled quarterly. EPA believes this monitoring well network is more than adequate to monitor groundwater quality at the Site and in the surrounding neighborhoods.

Comment #4: A commenter indicated that his house was constructed into the water table and that two sump pumps must continuously operate to keep his basement dry. He also stated that the house has a bad odor. Because he was concerned that the odor was attributable to contaminated groundwater emanating from the Site, he hired a contractor to sample his property. He indicated that the sample results show elevated levels of benzene in his house, which he attributes to groundwater contamination associated with the Site.

Response #4: While benzene is present in the groundwater at the Site, a network of groundwater recovery wells currently maintains hydraulic containment of the contaminated groundwater beneath the Site. This has been confirmed by water level measurements and analytical sample results.

No benzene has been detected off-property in the shallow aquifer. Benzene has been sporadically detected off-property at low concentrations in the deep aquifer at a monitoring well located (horizontally) approximately 200 ft. away from the commenter's residence and situated between the Site and the residence. However, no benzene has been detected in the intermediate aquifer at this location. The aquifers are separated by confining clay layers, which means there is a clean water zone, with no benzene detections, between the residence and the deep aquifer, which is located (vertically) more than 100 ft. below the residence. In 2010 and 2011, an extensive vapor intrusion investigation was conducted in and around the 13 residences located adjacent to the Site (between the Site and the commenter's house). Based upon the results of the study, EPA determined that related vapor intrusion was not occurring in these homes and that no further vapor intrusion assessment was warranted. In addition, a groundwater sample was collected from the shallow aquifer beneath the commenter's property in 2015 and analyzed for VOCs. No Site-related compounds were detected.

Based upon the extensive groundwater studies conducted at the Site and in the surrounding neighborhood and the several lines of evidence which suggest no connection between the benzene detections at the Site and in the off-property deep monitoring wells, EPA has determined that any benzene present in the commenter's house is highly unlikely to be related to the Site.

Land Use

Comment #5: A commenter inquired as to whether the property can be used for housing or farmland once it is remediated. Another commenter asked why the Site is not going to be cleaned up to residential levels.

Response #5: When EPA evaluates the need for a response action and selects a remedy, it considers the current- and reasonably-anticipated future use. EPA considers several factors, including the current use and zoning. The Site property, which is comprised of developed and undeveloped land, is currently zoned for commercial/industrial use. Until recently, it was an active industrial facility; EPA is not aware of any basis for the zoning or land use to change. Therefore, commercial/industrial cleanup levels will be used for the Site, so that once the Site is remediated, it can be used for commercial/industrial purposes.

Property Ownership

Comment #6: A commenter asked about the Site property's ownership history.

Response #6: Hercules, Incorporated (Hercules) (now known as Hercules LLC) acquired the property in 1952. Prior to that time, E.I. du Pont de Nemours and Company reportedly used the SWDA to dispose of lead fragments and tar generated from the production of aniline at a nearby facility. After acquiring the property, Hercules constructed and operated a chemical manufacturing facility, producing organic peroxides, phenols, and acetone. After 1970, Hercules, primarily produced cumene hydroperoxide, dicumyl peroxide, and isopropylbenzene. Other specialty chemicals were also made at the facility. In 2008, Ashland, Inc. (Ashland) acquired Hercules. In 2010, Hercules decommissioned the plant and demolished most of the aboveground structures.

Perceived Conflict of Interest

Comment #7: Several commenters opined that it is a conflict for the party that caused the contamination problem at the Site to investigate and clean it up. Two commenters suggested that either EPA or a third party should undertake the work and bill Ashland for its costs.

Response #7: Under the Superfund law, EPA is authorized to compel the party or parties that are responsible for the site to pay for or to conduct the necessary response actions. The law also authorizes EPA to reach settlements under which potentially responsible parties (PRPs) perform cleanups, with EPA overseeing the work. EPA follows an enforcement-first policy, which calls for PRPs to conduct remedial actions whenever possible. EPA, generally, performs work at Superfund sites using its own contractors only if there are no viable PRPs or if the PRPs are unwilling or unable to perform the work.

Hercules performed the RI/FS under EPA oversight (with NJDEP's review and concurrence) pursuant to a consent order with EPA. All the sampling procedures and the analytical parameters, sampling locations and sampling depths were approved by EPA and NJDEP. In addition, the analyses were performed at EPA-approved and NJDEP-certified laboratories. Following the chemical analyses, the data were verified by an independent third party.

Following the selection of a remedy for the Site, EPA expects to commence negotiations with Hercules to seek its performance of the remedial design and implementation of the selected remedy under EPA oversight. If the negotiations are successful and an enforceable agreement is reached, design work will commence, followed by the remedial action, both under EPA's oversight (with NJDEP's review and concurrence). If the negotiations are not successful, EPA will evaluate its options, including issuing a Unilateral Administrative Order to Hercules or seeking federal funding to perform the work. If federal funds are expended, EPA could seek to recover its costs from Hercules.

Contaminated Soils

Comment #8: A commenter inquired about the potential disruption that will be caused by transporting contaminated soils and sediments off-Site. Another commenter inquired as to the volumes of contaminated soils and sediments that will be excavated.

Response #8: An estimated 14,000 cubic yards (CY) of contaminated soil will be excavated under the selected remedy, consisting of approximately 1,000 CY of lead-contaminated soil and 13,000 CY of soil contaminated with benzene, cumene and colocated contaminants of concern. In addition, it is estimated that 8,500 CY of contaminated sediments will be dredged. Only the lead-contaminated soils will be transported off-Site; the other soils and the sediments will be treated on-Site. An estimated 63 truckloads of lead-contaminated soil will be transported off-Site. Minimizing the disruption of the community is one of the factors considered in EPA's decision to treat most of the contaminated soils and sediments on-Site, rather than transporting them off-Site.

Comment #9: A commenter inquired whether the trucks would be covered and asked what safety measures would be employed on-Site.

Response #9: Trucks carrying the contaminated soil will be covered. Prior to leaving the Site, the trucks carrying the lead-contaminated soils will be decontaminated, if necessary, to prevent tracking contaminated material onto the streets and the payloads will be covered to prevent releases. A health and safety plan will be developed to protect on-Site remediation workers and the public. In addition, air monitoring will be conducted on-Site to ensure that unacceptable releases do not occur during remediation.

Comment #10: A commenter inquired as to where the lead-contaminated soil would be disposed.

Response #10: The lead-contaminated soil would be transported to a licensed disposal facility that will be selected during the design of the remedy.

Community Updates

Comment #11: A commenter asked whether EPA intends to let the public know what will be going on before work starts at the Site.

Response #11: EPA intends to keep the public informed about the work planned at the Site by keeping the EPA Site Profile Page on its website up-to-date, issuing fact sheets and/or conducting public informational meetings.

Human Health Concerns

Comment #12: A commenter inquired as to the potential human health effects associated with the contaminants of highest concern at the Site.

Response #12: Benzene is a known human carcinogen and may have immunological effects. Exposure to cumene could affect the liver and urinary system. Both are volatile organic compounds (VOCs). Exposure to lead is of highest concern to children, as it may cause cognitive impairment.

Based on the data collected at the Site, contamination is not currently migrating off the property via the groundwater or through surface water runoff.

Vapors released from VOC-contaminated groundwater and/or soil have the potential to move through the soil (independently of groundwater) and seep through cracks in basements, foundations, sewer lines, and other openings. Vapor intrusion sampling (soil gas samples, sub-slab samples, indoor air, and ambient air samples) was conducted in 13 residences located adjacent to the southern property boundary of the Site. EPA did not find a completed exposure pathway.

While there are current and future unacceptable on-property exposure risks, EPA has not identified any off-property impacts to the community.

Comment #13: A commenter inquired whether residents should drink bottled water and whether a threat is posed to home gardeners.

Response #13: Ongoing groundwater monitoring associated with the Site, which includes quarterly sampling of the nearby Township water supply wells, indicates that the public water supply is not impacted by the contamination at the Site.

As long as gardening is not performed on the Site property, there is no threat posed by Site-related contaminants. Because the property is zoned for commercial/industrial use, it is unlikely that gardening will be performed on the property.

Remediation Timeframes

Comment #14: A commenter requested clarification regarding the 12-month, 18-month, 2-year, and 10-year timeframes related to the soil, sediment, and groundwater alternatives.

Response #14: The 12-, 18- and 24-month timeframes are the estimated construction times for the various soil, sediment, and groundwater alternatives. The construction includes excavating contaminated soils, dredging contaminated sediments, setting up the ex-situ treatment systems and building the groundwater treatment system. Following construction, the estimated timeframe to achieve the remediation goal for the contaminated sediments through phytoremediation is 12 months. The estimated timeframe to achieve remediation goals for the ex-situ treated soil is 18 months; it will take an estimated 10 years to reach cleanup levels for the in-situ treated soil and the groundwater. In-situ treatment of source area soil also is expected to take 10 years to achieve the remediation goals.

Extent of Remediation

Comment #15: A commenter inquired why remediation is planned for only 80 acres of the 350-acre Site.

Response #15: A detailed RI/FS was conducted of the Site, including a risk assessment. Based on the RI/FS and the record for the Site, EPA identified the eighty acres as the area of the Former Plant Area where contamination is present that requires a response at this time. As described above in Response #1, an action has already been completed for the SWDA. EPA did not identify any other areas of the Site that require an action under the Superfund program.

Development of the Property

Comment #16: A commenter expressed concern that no entity would want to develop the property knowing that it is a Superfund site with the possibility that there is contamination remaining.

Response #16: During the RI, more than 8,000 soil and sediment samples were collected throughout the property. This intensive sampling clearly characterized the nature and extent of the contamination. Several pilot-scale studies were conducted during the RI to evaluate the use of various soil and sediment treatment techniques and processes. Based upon the results of these studies, EPA expects that the in-situ and ex-situ treatment technologies that were selected for the Site will be effective in successfully treating the contaminated soils and sediments. Because the in-situ treatment of the deep contaminated soils will take approximately 10 years, there will be restrictions on development in these areas until the cleanup objectives are met. Nevertheless, there are areas of the Site that do not require an action under the Superfund program and may be available for reuse. Whether a property is a candidate for development depends on many factors, but the fact that it is part of a Superfund site does not prevent reuse. Many Superfund sites, including sites in New Jersey, have been redeveloped.

In the Event of an Unsuccessful Remediation

Comment #17: A commenter expressed concern about the likelihood of further remediation efforts if aspects of the remediation are not successful.

Response #17: As was noted in Response #1, FYRs are conducted at sites to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. If a future FYR determines that aspects of the implemented remedy are not performing as designed or that the remedy is not protective of human health and the environment, the FYR would recommend measures to be implemented to address issues identified.

Off-Property Contamination

Comment #18: A commenter asked whether the athletic fields that are located adjacent to the Site were sampled, as benzene was detected in the underlying groundwater when an irrigation system was installed several years ago.

Response #18: Sampling of the groundwater underlying the athletic fields or of the fields themselves is not necessary. It is known that the groundwater is contaminated from the Site, and the groundwater underlying the athletic fields is within the capture zone of the Site groundwater extraction system. The irrigation well for the athletic fields was not used after it was found to be contaminated. The soil in the athletic fields was not sampled because RI sampling results indicate that soil contamination is not present at the Site property line.

Ecological Impacts

Comment #19: A commenter asked whether risks to flora and fauna were evaluated.

Response #19: A baseline ecological risk assessment, which was performed as part of the RI, concluded that there is a potential for adverse ecological effects associated with Site contaminants in the sediments of the Stormwater Catchment Basin and in Clonmell Creek. Studies indicate impacts to the benthic communities in the Stormwater Catchment Basin and Clonmell Creek, as well as unacceptable risks to mammalian receptors in Clonmell Creek. These contaminated sediments will be addressed by the selected remedy.

Other Sites in Gibbstown

Comment #20: A commenter asked whether there are any other National Priorities List (NPL) sites in Gibbstown.

Response #20: The Site is the only site in Gibbstown that is on the NPL.

APPENDIX V-a

Proposed Plan

Hercules, Inc. (Gibbstown Plant) Superfund Site

Gibbstown, New Jersey

Superfund Proposed Plan *July 2018*

PURPOSE OF THIS DOCUMENT

This document describes the remedial alternatives considered for the first and second operable units (OUs) of the Hercules, Inc. (Gibbstown Plant) Superfund Site (Site) and identifies the preferred remedy for those operable units, with the rationale for this preference. This Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA) in consultation with the New Jersey Department of Environmental Protection (NJDEP). EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The nature and extent of the contamination at the Site and the remedial alternatives summarized in this Proposed Plan are described in the July 2018 remedial investigation (RI) report and feasibility study (FS) report, respectively. EPA and NJDEP encourage the public to review these documents to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted at the Site.

This Proposed Plan is being provided as a supplement to the RI/FS reports to inform the public of EPA's and NJDEP's preferred remedy and to solicit public comments pertaining to all the remedial alternatives evaluated, including the preferred alternative. The preferred remedy consists of extraction of contaminated groundwater with on-Site treatment and long-term monitoring; excavation of lead-contaminated soil with off-Site disposal; excavation of volatile organic compound (VOC)-contaminated soil located 0-4 feet (ft.) below the ground surface (bgs) and treatment with ex-situ bioremediation and on-Site reuse; enhanced in-situ biodegradation of VOC-contaminated soil situated below 4 ft. bgs; hydraulic dredging of contaminated sediment with on-Site phytoremediation[1] and reuse; and institutional controls (ICs).[2]

The remedy described in this Proposed Plan is the preferred remedy for the Site. Changes to the preferred remedy, or a change from the preferred remedy to another remedy, may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the selected remedy will be made after EPA has taken into consideration all public comments. EPA is soliciting public comment on all the alternatives considered in the Proposed Plan and in the detailed analysis section of the FS report because EPA and NJDEP may select a remedy other than the preferred remedy.

[1] Phytoremediation is a process that uses living plants to remove, destroy or contain contaminants in environmental media.

[2] ICs are non-engineered controls, such as property or groundwater use restrictions placed on real property by recorded instrument or by a governmental body by law or regulatory activity for reducing or eliminating the potential for human exposure to contamination and/or Protecting the integrity of a remedy.

MARK YOUR CALENDAR

July 30, 2018 – August 28, 2018: Public comment period related to this Proposed Plan.

August 16, 2018 at 7:00 p.m.: Public meeting at the Municipal Court Meeting Room, 2nd Floor, 21 N. Walnut Street, Gibbstown, NJ

Copies of supporting documentation are available at the following information repositories:

Gloucester County Library System
Greenwich Township Branch
411 Swedesboro Road
Gibbstown, NJ 08027
856-423-0684

EPA-Region II
Superfund Records Center
290 Broadway, 18th Floor
New York, NY 10007-1866
212-637-4308

https://www.epa.gov/superfund/hercules-gibbstown

COMMUNITY ROLE IN SELECTION PROCESS

EPA and NJDEP rely on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, the RI and FS reports and this Proposed Plan have been made available to the public for a public comment period that begins on **July 30, 2018** and concludes on **August 28, 2018**.

A public meeting will be held during the public comment period at the Municipal Court Meeting Room, 2nd Floor, 21 N. Walnut Street, Gibbstown, NJ on **August 16, 2018 at 7:00 p.m.** to present the conclusions of the RI/FS, to elaborate further on the reasons for recommending the preferred remedy and to receive public comments.

Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary section of the Record of Decision (ROD), the document that formalizes the selection of the remedy.

Written comments on the Proposed Plan should be addressed to:

Patricia Simmons Pierre
Remedial Project Manager
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SCOPE AND ROLE OF ACTION

Site remediation activities are sometimes segregated into different phases, or OUs, so that remediation of different aspects of a site can proceed separately, resulting in a more expeditious cleanup of the entire site.

The Site is being addressed by the EPA in three OUs. This Proposed Plan describes EPA's preferred remedial action for OU1, which addresses contaminated groundwater in the Former Plant Area, and for OU2, which addresses contaminated soil in the Former Plant Area and contaminated sediment in Clonmell Creek and the Stormwater Catchment Basin. The primary objectives of this action are to remediate the sources of groundwater, soil, and sediment contamination, minimize the migration of contaminants and minimize any potential future health and environmental impacts.

The third OU (OU3) addresses tar and mixed waste in the Solid Waste Disposal Area (SWDA). A remedial action for OU3 was selected by NJDEP in 1996 and included waste consolidation and capping, long-term groundwater monitoring, periodic inspections and ICs. The OU3 remedial action was completed in 2014 and maintenance of the cap is being performed under NJDEP oversight. EPA is conducts five- year reviews (FYRs) to ensure that the OU3 remedy continues to be protective of human health and the environment. The first FYR was conducted in 2015.

SITE BACKGROUND

Site Description

The Site, a former chemical manufacturing facility, is situated on approximately 350 acres located off South Market Street in Gibbstown, Gloucester County, New Jersey. The Site is bounded to the east by Paulsboro Refining Company, LLC, to the west by open land historically owned by E.I. du Pont de Nemours and Company (DuPont), to the north by the Delaware River, and to the south and southwest by residences. Area homes are served by municipal water supply wells.

Clonmell Creek flows northwest through the Site property toward the Delaware River. On the Site property, the creek ranges from 75 to 120 feet (ft.) wide and 0.25 to 3 ft. deep and separates the two primary areas of the Site -- the SWDA located to the north and the Former Plant Area located to the South.

The SWDA is situated approximately 2,000 ft. north of Clonmell Creek and covers nearly five acres. It is surrounded by wetlands and sits adjacent to the Delaware River.

The "Former Plant Area," the manufacturing portion of the facility during its operational period, occupies approximately 80 acres. An unlined stormwater retention pond, referred to as the "Stormwater Catchment Basin," is located within the Former Plant Area, about 600 ft. south of Clonmell Creek. The Stormwater Catchment Basin ranges in width from approximately 64 ft. on its south end to 125 ft. on the north, and 0.25. to 3 ft. deep, dependent upon precipitation levels. Historically, stormwater collected in the area now known as the Stormwater Catchment Basin and flowed through the 002 outfall (which was an NJDEP-permitted discharge point) into an adjacent drainageway before discharging into Clonmell Creek. However, there has been no connection between the Stormwater Catchment Basin and Clonmell Creek since 1991 (see Figure 1).

The Former Plant Area was divided into the following RI investigation areas, referred to as exposure areas: Active Process Area, Area A/Open Area, Area B, Chemical Landfill/Gravel Pit Area, Clonmell Creek and Wetlands, Inactive Process Area, Northern Chemical Landfill Area, Northern Warehouse Area, Shooting Range, Stormwater Catchment Basin Area, Tank Farm/Train Loading Area, and Township Refuse Area (see Figure 2). The Shooting Range exposure area is currently being used by the Township of Greenwich Police Department as a shooting range.

Site History

Before the property was transferred to Hercules Incorporated (Hercules) in 1952, DuPont reportedly used the area now designated as the SWDA and surrounding areas to dispose of lead fragments and tar generated from the production of aniline. In 1952, Hercules acquired title to the Site property from DuPont. Construction of the manufacturing plant began in 1953 and the plant was fully operational by 1959. Phenol and acetone were manufactured at the facility until 1970. After 1970, the plant produced three primary products — cumene hydroperoxide, diisopropylbenzene and dicumyl peroxide, which are compounds used in phenol and acetone production. Hercules used the SWDA from 1955 until 1974 to dispose of wastes generated from its manufacturing activities.

In 2010, the plant was decommissioned and the above-ground facility structures were demolished, except for a groundwater treatment system, a former administrative building and two surface impoundments. Significant subsurface sewer lines, process piping, and utilities associated with the former manufacturing facility remain in portions of the Active Process Area and Inactive Process Area. These structures were abandoned in place and filled with concrete.

In 1981, the U.S. Geological Survey released a report documenting the detection of benzene in a Site production well. Based upon this finding, Hercules, under NJDEP oversight, conducted additional groundwater studies, which led to the discovery of other Site-related chemicals in groundwater at the Site. Because of the contamination identified in the groundwater and the tar and other debris disposed of in the SWDA, the Site was added to the National Priorities List in December 1982.

In 1984, as an interim remedy, Hercules installed a groundwater extraction and treatment system to prevent contaminated groundwater from migrating off-property. The system was upgraded in 2008. Operation of the system is on-going and will continue until a final OU1 remedy is selected.

In 1986, Hercules entered into an Administrative Consent Order with NJDEP to perform an RI/FS in the SWDA and adjacent areas. Based upon the results of the OU3 RI, conducted between 1987 and 1993, NJDEP issued a ROD in 1996, selecting a remedy for OU3. The major components of the remedy include consolidation of tar material and miscellaneous solid wastes under an impermeable cap; implementation of engineering controls and ICs, such as fencing and environmental use restrictions; and the establishment of a Classification Exception Area (CEA)[3] for groundwater beneath and surrounding the SWDA. The OU3 remedial action was completed in 2014. Routine maintenance of the SWDA is performed by Hercules.

Under NJDEP oversight, Hercules initiated an RI/FS in 1987 to determine the nature and extent of contamination associated with OU1 and OU2. EPA assumed the enforcement lead for OU1 and OU2 in 2008 and in 2009, EPA entered into an AOC with Hercules for the completion of the RI/FS. RI/FS activities included the installation of monitoring wells and collection of soil and groundwater samples from the Former Plant Area; sediment, surface water, pore water and soil samples from the Stormwater Catchment Basin, at the 002 outfall, in the adjacent drainageway and in Clonmell Creek and its associated wetlands; geological, hydrogeological and residential vapor intrusion[4] investigations; preparation of a numerical groundwater flow model; human health and ecological risk assessments; and various treatability studies.

SITE HYDROGEOLOGY

Site Hydrogeology

The Site geology is characterized by the presence of thick unconsolidated sand, silt, gravel, and clay layers. The regional aquifer system, supplying water resources to Greenwich Township and the surrounding area, is generally considered to consist of three aquifers (Upper Middle, Lower Middle and Lower), which are separated by two confining units. At the Site, alluvial deposits overlie the regional aquifer. The "shallow" monitoring well network is screened into these deposits which range from 0 to 25 ft. bgs; the "intermediate" monitoring well network is screened in the Upper Middle aquifer, ranging from 25 to 75 ft. bgs; and the "deep" monitoring wells are screened in the Lower Middle aquifer, which ranges from 80 to 120 ft. bgs. The depth to groundwater in the Former Plant Area ranges between 8 and 10 ft. bgs.

Regional groundwater (intermediate and deep depths) generally flows from north to south, exhibiting some influence from conditions in the Delaware River. Groundwater at the Site flows to the south and downward, which results in shallow aquifer groundwater contamination flowing into the underlying intermediate aquifer and subsequently into the deep aquifer. A network of existing groundwater recovery wells that pump from the shallow, intermediate and deep aquifers, currently maintains hydraulic containment of the contaminated groundwater beneath the Site.

RESULTS OF THE REMEDIAL INVESTIGATION

Based upon the results of the RI, EPA has concluded that VOCs are the predominant contaminants in the Former Plant Area groundwater and soils and the Clonmell Creek and Stormwater Catchment Basin sediments. The contaminants of concern (COCs) identified for the Site are listed below in Table 1.

Table 1: Site COCs	
acetophenone	ethylbenzene
benzene	lead
cumene	phenol
toluene	

Benzene and cumene were found to be the most prevalent of the COCs present at the Site. Acetophenone, ethylbenzene, phenol and toluene are compounds typically associated with benzene and cumene and were only found to be present at the Site collocated with benzene and cumene. Trichloroethylene

[3] A CEA serves as an IC by providing notice that there is ground water pollution in a localized area caused by a discharge at a contaminated site.

[4] Vapor intrusion is a process by which VOCs move from a source below the ground surface (such as contaminated groundwater) into the indoor air of overlying or nearby buildings.

(TCE) and 1,2-dichloroethane (DCA) were detected at concentrations exceeding the RI screening values in the monitoring wells located in the downgradient areas of the property, in the groundwater recovery wells associated with the extraction and treatment system and in wells located off-property. EPA has determined, however, that TCE and 1,2-DCA are not Site-related and, therefore, are not COCs. Based upon these findings, the following discussion of the RI results will primarily focus on benzene and cumene.

Soil

Soil samples were collected in each of the exposure areas, both above (unsaturated) and below (saturated) the water table. Benzene and cumene were found to be present at levels exceeding RI screening values in the soils of the Active Process Area, Chemical Landfill/Gravel Pit, Inactive Process Area, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas. However, the bulk of the cumene and benzene is present in the Active Process Area saturated soils (to a depth of 17.5 ft.), either adsorbed to soil particles or as non-aqueous phase liquid (NAPL).[5]

The concentrations of benzene, cumene and collocated COCs found in the Site soils are an on-going source of contamination to the groundwater and are considered to be principal threat wastes. Principal threat wastes are materials that include or contain hazardous substances, pollutants or contaminants that act as a reservoir for the migration of contamination to groundwater, surface water or air or act as a source for direct exposure. The cumene and benzene sampling results for each of the exposure areas are summarized below in Tables 2 and 3.

Table 2: Maximum Soil Concentrations (mg/kg)		
Unsaturated		
	Benzene	Cumene
Active Process Area	58	17,000
Chemical Landfill/Gravel Pit	80	11,000
Inactive Process Area	27	2,500
Northern Chemical Landfill	0.55	1,295
Stormwater Catchment Basin	831	2,200
Tank Farm/Train Loading Area	1,292	35,439

Table 3: Maximum Soil Concentrations (mg/kg)		
Saturated		
	Benzene	Cumene
Active Process Area	4.8	200,000
Inactive Process Area	0	5,500
Northern Chemical Landfill	0	460
Stormwater Catchment Basin	130	1,700
Tank Farm/Train Loading Area	0.3	2,400

RI sampling results indicate the presence of lead in the Township Refuse Area and Shooting Range soils at concentrations as high as 2,300 mg/kg. Additional delineation of the lead contamination in these exposure areas is needed.

Sediment

Because no ecological screening value is available for cumene in sediment, a Site-specific value of 120 mg/kg was calculated for the RI. This value was developed based on information obtained from several studies related to cumene toxicity on aquatic organisms.

Sediment samples were collected throughout the Stormwater Catchment Basin (including the adjacent drainageway) and within the on-Site reach of Clonmell Creek (including the 002 outfall area). Upstream and downstream sediment samples were also obtained from Clonmell Creek. Samples were collected down to 3 ft. in the Stormwater Catchment Basin, 0.5 ft. in the drainageway and 5 ft. in Clonmell Creek.

Cumene concentrations were detected throughout the Stormwater Catchment Basin, ranging from 0.00059 to 710 mg/kg and extending down to 3 ft. in the central area of the basin. Cumene was detected in on-Site Clonmell Creek sediment at depths ranging from 0.5 to greater than 4 ft., and at concentrations ranging from 0.0014 to 240,000 mg/kg. Cumene was not detected at concentrations exceeding the screening value in downgradient samples collected from Clonmell Creek on the adjacent DuPont property.

Surface Water

Surface water samples were collected throughout the Stormwater Catchment Basin (including the adjacent drainageway) and within the on-Site reach of Clonmell Creek (including the 002 outfall area). No COCs were detected above the RI screening values.

[5] NAPLs are liquid contaminants that do not easily mix with water and remain in a separate phase in the subsurface. They can potentially migrate independently of groundwater and remain as a residual source of groundwater contamination.

Groundwater

Groundwater has been monitored both on and off the property since 1984. A total of 92 monitoring wells are sampled on an annual basis, with 28 of the 92 wells being sampled quarterly. Benzene and cumene concentrations exceeding RI screening values were detected in the shallow, intermediate and deep aquifers. The most significant benzene and cumene detections were in the shallow aquifer in the Active Process Area, Stormwater Catchment Basin and Northern Chemical Landfill exposure areas. Maximum concentrations detected in each of these exposure areas are presented in below in Table 4.

Table 4: Maximum Groundwater Concentrations (μg/L)

	Benzene	Cumene
Active Process Area	35,000	47,000
Stormwater Catchment Basin	160	130
Northern Chemical Landfill	200	30,000

SITE RISKS

A baseline human health risk assessment (BHHRA) was conducted to evaluate cancer risk and noncancer health hazards posed by exposure to Site-related contamination in the absence of any remedial action or controls (see the "What is Human Health Risk and How is it Calculated?" textbox, to the right).

A screening-level ecological risk assessment (SLERA) was also conducted to evaluate the potential for adverse ecological effects from exposure to Site-related contamination. Based on the findings of the SLERA, a baseline ecological risk assessment (BERA) was conducted to further analyze the risk posed to ecological receptors (see the "What is Ecological Risk and How is it Calculated?" textbox, below). The BHHRA and BERA results are discussed below.

Human Health Risk Assessment

The human health risk estimates summarized below are based on current reasonable maximum exposure scenarios and were developed by considering various conservative estimates about the frequency and duration of an individual's exposure to the COCs, as well as the toxicity of these contaminants.

The Site property is currently zoned for commercial/industrial use and it is not anticipated that the land use designation will change in the future. The baseline risk assessment identified the current and potential future receptors that may be affected by contamination at the Site, the pathways by which these receptors may be exposed to Site contaminants in various environmental media, and the parameters by which these

WHAT IS HUMAN HEALTH RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. The following four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the chemicals of potential concern (COPCs) at the site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants in air, water, soil, etc. identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil and ingestion of and dermal contact with contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations in specific media that people might be exposed to and the frequency and duration of that exposure. Using these factors, a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health hazards, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals can cause both cancer and non-cancer health hazards.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all COPCs. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a $1x10^{-4}$ cancer risk means a "one in ten thousand excess cancer risk;" or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of $1x10^{-4}$ to $1x10^{-6}$, corresponding to a one in ten thousand to a one in a million-excess cancer risk. For non-cancer health effects, a "hazard index" (HI) is calculated. The key concept for a non-cancer HI is that a threshold (measured as an HI of less than or equal to 1) exists below which non-cancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a non-cancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site and are referred to as COCs in the ROD.

exposures and risks were quantified. The receptors evaluated under the current/future scenarios included outdoor industrial workers, construction/utility workers,trespassers, residents (vapor intrusion), recreational youth, recreational hikers, recreational hunters and recreational anglers.[6] Future scenarios also considered the exposure of indoor workers and on- and off-Site residents to groundwater as drinking water.

The risks associated with potential exposures to Site soils, surface water, and sediments, as well as groundwater, on- and off-property, were assessed. The area is served by municipal water, therefore, it is not likely that the groundwater underlying the Site will be used for potable purposes in the foreseeable future. However, potential exposure to groundwater was evaluated because regional groundwater is designated as a drinking water source.

The potential for off-Site indoor air vapor intrusion into nearby residences, was also evaluated by EPA and determined not to warrant further assessment. However, because no buildings were present on-Site at the time of the vapor intrusion investigation and VOCs are present in Site soils and groundwater above RI screening values, a deed notice will be placed on the property requiring that future on-Site buildings either be constructed with a vapor barrier or be evaluated for the vapor intrusion pathway prior to occupancy and periodically (*e.g.*, annually) until EPA determines that the pathway is incomplete.

The following exposure pathways resulted in excess lifetime cancer risks that exceed EPA's target risk range of $1x10^{-4}$ to $1x10^{-6}$: current/future outdoor industrial workers (Sitewide: $3x10^{-4}$) as a result of direct contact with benzene and cumene in the shallow aquifer and future on-Site residents (Active Process Area: up to $8x10^{-3}$, Northern Chemical Landfill Area: up to $2x10^{-4}$ and Tank Farm/Train Loading Area: up to $2x10^{-4}$) as a result of direct contact with benzene, cumene, phenol, TCE and 1,2-DCA in the intermediate/deep aquifer.[7]

The following exposure pathways resulted in a noncancer hazard index (HI) greater than the EPA threshold value of one: future residents (Active Process Area: HI up to 168 for children) as a result of ingestion of benzene, cumene, phenol and 1,2-DCA in the intermediate/deep aquifer, current/future outdoor industrial workers (Sitewide: HI of 8.8 and Inactive Process Area: HI up to 11.6) and current/future construction/utility workers (Sitewide: HI of 3.2, mainly resulting from exposure in the Inactive Process Area) as a result of dermal contact with benzene and cumene in the shallow aquifer.

The following modeled exposure pathways resulted in elevated blood lead levels [over 5 migrograms per deciliter (μg/dL)] as a result of direct contact with lead in soils: outdoor industrial workers in the Shooting Range exposure area (11.8 μg/dL) and Township Refuse Area (6.3 μg/dL) and construction/utility workers in the Shooting Range exposure area (17.2 μg/dL) and Township Refuse Area (7.9 μg/dL).

Ecological Risk Assessment

Sediment, surface water, pore water and soil samples were collected as part of the ecological risk assessment. The areas of the Site evaluated in the BERA include the Stormwater Catchment Basin (including at the 002 outfall and within the adjacent drainageway), Clonmell Creek and the adjacent wetland area. Aquatic plants, benthic invertebrates and fish, and semi-aquatic mammals and birds were assessed in the Stormwater Catchment Basin (including at the 002 outfall and within the adjacent drainageway) and in Clonmell Creek. In the wetland area, terrestrial plants and invertebrates along with terrestrial mammals and birds were evaluated. Toxicity testing and macroinvertebrate surveys were also conducted to support the BERA.

Measurement endpoints consisted of a comparison of estimated or measured exposure levels of contaminants to levels reported to cause adverse effects, evaluation of macroinvertebrate community metrics, sediment toxicity testing results, and comparison of observed effects at the site with those observed at reference locations. The results for each ecological area evaluated in the BERA are summarized below.

The results of the macroinvertebrate survey in the Stormwater Catchment Basin indicated a slight to moderate impairment of the benthic community. Toxicity testing indicated a significant decrease in survival compared to the reference location. The potential for adverse effects to semi-aquatic mammals and birds is negligible.

The results of the macroinvertebrate survey in the drainageway indicated the presence of a slightly impaired benthic community with marginal habitat quality. No significant toxicity was observed and risk to mammalian and avian receptors is considered negligible.

The results of the macroinvertebrate survey in Clonmell Creek suggest a moderately impaired benthic community at several locations and suboptimal habitat quality at most locations. Toxicity testing results at several sampling

[6] Recreational anglers were evaluated because Clonmell Creek is fishable, however, access controls are in-place to prevent fishing on-Site.

[7] Phenol is present in the Active Process Area and Tank Farm/Train Loading Area groundwater at levels that pose a human health exposure risk. Although TCE is present in the Tank Farm/Train Loading Area groundwater and 1,2-DCA is present in the Active Process Area groundwater at levels that pose a human health exposure risk, EPA has determined that these contaminants are not Site-related, and therefore, are not COCs.

locations indicated a significant decrease in survival compared to the reference location. Unacceptable risk to mammalian receptors was identified, primarily due to exposure to cumene.

In the Clonmell Creek Wetland Area, the likelihood of adverse effects to terrestrial plants and invertebrates, mammals and birds exposed to contaminants in wetlands soils is essentially non-existent.

The BERA concluded that there is a potential for adverse ecological effects associated with Site contaminants in the sediments of the Stormwater Catchment Basin and in Clonmell Creek, in the vicinity of the 002 outfall.

Based upon the results of the RI and risk assessments, EPA has determined that actual or threatened releases of hazardous substances from the Site, if not addressed by the preferred remedy or one of the other active measures considered, may present a current or potential threat to human health and the environment.

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) guidance, and site-specific risk-based levels.

The following RAOs were established for the Site:

- Protect human health by preventing exposure to contaminated groundwater, soil and soil vapor;
- Prevent off-Site migration of contaminated groundwater;
- Minimize exposure of fish, biota and wildlife to contaminated sediments;
- Mitigate potential for contaminant migration from soils into groundwater and surface water; and
- Restore groundwater to levels that meet state and federal standards within a reasonable time frame.

EPA and NJDEP have promulgated maximum contaminant limits (MCLs) and NJDEP has promulgated groundwater quality standards (GWQSs), which are enforceable, health-based, protective standards for various drinking water contaminants. The more stringent of the MCLs and GWQSs will be used as the preliminary remediation goals (PRGs) for the COCs in the Site groundwater.

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. 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.

The more stringent of the NJDEP nonresidential direct contact soil remediation standards (NRDCSRSs) and the NJDEP default impact to groundwater soil remediation standards (IGWSRS) will be used as the Site PRGs for the unsaturated soils. Because there is no default IGWSRS established for cumene, a Site-specific value was developed using the NJDEP Soil-Water Partition Equation Calculator (back calculated from either the MCL or GWQS). The NJDEP NRDCSRSs will be used as the Site PRGs for the saturated soils. When no NRDCSRS is available, the EPA RSL for industrial soil will be used.

As discussed above, because there is no screening value available for cumene in sediment, a Site-specific value of 120 mg/kg was developed for comparison with the RI sampling results. In lieu of developing a Site-specific sediment cleanup criterion for cumene, a mass-removal based approach will be used to ensure that the RAO of minimizing exposure of fish, biota and wildlife to contaminated sediments is achieved. The goal for cumene mass removal is 100% for the Stormwater Catchment Basin and 99% for Clonmell Creek.

The PRGs established for the Site COCs are identified in Table 5 below.

Table 5: Site PRGs

COC	Unsaturated Soil (mg/kg)	Saturated Soil (mg/kg)	Groundwater (mg/L)
acetophenone	3	5	700
benzene	0.005	5	1
cumene	28	990	700
ethylbenzene	13	25	700
lead	90	800	5
phenol	8	25,000	2,000
toluene	7	4,700	600

EPA has determined that the COCs acetophenone, ethylbenzene and toluene, which were found at the Site collocated with the primary COCs, cumene and benzene, do not pose a human health exposure risk. These contaminants are COCs because they are present at concentrations that exceed the ARARs.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA §Section121(b)(1), 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, cost-effective, comply with ARARs, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives, to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA Section§121(d), 42 U.S.C. § 9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA Section§121(d)(4), 42 U.S.C. § 9621(d)(4).

Detailed descriptions of the remedial alternatives for addressing the contamination associated with the Site can be found in the FS report. To facilitate the presentation and evaluation of the alternatives, the FS report alternatives were reorganized in this Proposed Plan to formulate the remedial alternatives discussed below.

The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate the performance of the remedy with any potentially responsible parties, or procure contracts for design and construction.

A number of studies were conducted during the RI to evaluate the use of various treatment techniques and processes to address the contamination at the Site. A treatability study was conducted in the Active Process Area exposure area to evaluate the use of both aerobically- and anaerobically-enhanced biodegradation to treat source-area soils. Because the study results showed that anaerobically-enhanced biodegradation resulted in greater cumene concentration reductions, only anaerobic processes were considered for in-situ soil treatment.

An air sparging/soil vapor extraction pilot test was also performed in the Active Process Area. Based upon the results of the study, it was concluded that the heterogeneity of the soil conditions at the Site resulted in preferential flow paths in the subsurface lithology that inhibited the effective treatment of air flow through the saturated soil. Because this would likely limit the effectiveness of the treatment technology, this technology was eliminated from further consideration.

In addition, a pilot study was conducted in Clonmell Creek to evaluate the use of hydraulic dredging versus mechanical excavation for the removal of contaminated sediments. Hydraulic dredging was determined to be the more suitable of the two removal techniques because of its ability to target the unconsolidated sediments rather than the underlying clay, its ability to minimize fugitive emissions and downstream sediment transport, and the minimal impact that it has on the surrounding wetland area. Therefore, only hydraulic dredging is considered for the sediment alternatives involving dredging.

Along with the pilot study, a 12-month treatability study was conducted on the dredged material to evaluate the viability of utilizing phytoremediation for the treatment of the cumene-contaminated sediments at the Site. Phytoremediation can occur through several mechanisms, including stabilization, accumulation, volatilization, degradation, and rhizosphere biodegradation. During the study period, plants were allowed to grow in the dredged sediment. At the end of the study period, sediment and plant tissue samples (above- and below-ground) were collected. The study results showed that the cumene in the sediment was reduced from concentrations ranging from 18 to 98 mg/kg to concentrations ranging from "non-detect" to 0.10 mg/kg. Cumene was not detected in any of the plant tissue samples, indicating that the cumene was destroyed through rhizosphere degradation, which is the breakdown of contaminants in the rhizosphere (soil surrounding the roots of plants) through microbial activity that is enhanced by the presence of plant roots. Based upon these results, it was determined that cumene-contaminated sediments at the Site can effectively be treated using phytoremediation.

As was noted above, for more than 30 years, a groundwater extraction and treatment system has been operated at the Site as an interim action. This system has successfully reduced contaminant concentrations in the groundwater and prevented contaminated groundwater from migrating off-property. Because of the effectiveness of the existing system and the anticipated removal of the contaminant source under an active soil remedial alternative, additional groundwater alternatives to address this groundwater contamination were not considered. The remedial alternatives are summarized below.

Soil Alternative S-1: No Action

Capital Cost:	$0
Annual OM&M Cost:	$0
Present-Worth Cost:	$0
Construction Time:	0 months

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative for soil does not include any physical remedial measures that address the soil contamination at the Site. Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove, treat, or contain contaminated soils.

Soil Alternative S-2: Excavation with Off-Site Disposal and Enhanced In-Situ Biodegradation

Capital Cost:	$11,183,360
Annual OM&M Cost:	$248,181
Present-Worth Cost:	$12,191,308
Construction Time:	12 months

Under this alternative, the soils in the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas with COC concentrations exceeding the PRGs would be excavated to a depth of 4 ft. bgs in preparation for the enhanced in-situ biodegradation process discussed below. As noted above, significant subsurface structures remain in the Active Process Area and Inactive Process Area. Because the presence of these structures would make excavation impracticable, a limited volume [approximately 500 cubic yards (CY)] of the soils in these exposure areas exceeding the PRGs would be treated in-situ rather than being excavated.

The soil in the Township Refuse Area with lead concentrations exceeding the PRGs would be excavated. A Best Management Practices (BMP) plan would be developed and implemented to manage lead and minimize contamination of the Shooting Range exposure area while the shooting range remains active. If the shooting range becomes inactive, delineation of the lead contamination would be performed and the soils the in the Shooting Range exposure area with lead concentrations exceeding the PRGs would be excavated and disposed of off-Site.

An estimated 13,804 CY of contaminated soil would be excavated under this alternative, consisting of 1,052 CY[8] of lead-contaminated soil and 12,752 CY of soil contaminated with benzene, cumene and collocated COCs.

The contaminated soil would be excavated using standard construction equipment, such as backhoes and track excavators. The excavated soil would be placed directly onto a dump truck and transported to an on-Site staging area. The staging area would be designed with proper controls, including, but not limited to, an impermeable liner, to maintain containment of the excavated soils and prevent any impacts to the surrounding soil and groundwater. The lead-contaminated soils would be segregated from other soils at the staging location because they may require disposal at a different facility. The excavated soil would then be sampled and transported off-Site for treatment and/or disposal at a Resource Conservation and Recovery Act (RCRA)-compliant facility.

[8] The estimated soil excavation volumes and associated costs do not include the lead-contaminated soil in the Shooting Range exposure area.

Post-excavation sampling would be conducted to identify/confirm the areas where the PRGs are exceeded in the soils situated below 4 ft. bgs These soils (saturated and unsaturated) would be treated using enhanced in-situ biodegradation. Enhanced in-situ biodegradation would involve applying a magnesium sulfate solution to the contaminated soils to stimulate activity and reproduction in naturally-occurring anaerobic microorganisms. The microorganisms would then destroy or transform the COCs into less toxic compounds by using them as a food and energy source. Because the extent of the contamination is much greater and deeper in the Active Process Area and Inactive Process Area than in the other exposure areas, application of the anaerobic treatment solution would be achieved using lateral infiltration galleries, consisting of perforated piping installed at the base of the excavated areas. The solution would be applied directly to the base of the excavations in the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas. The final design criteria for the infiltration galleries would be detailed in the remedial design.

Certified clean soil, meeting applicable state regulations, would be imported and used to backfill excavated areas and construct an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater and control surface water runoff/drainage. Vegetation would be placed in areas disturbed during excavation activities to stabilize the soil and maintenance of the soil cover would be performed.

Performance and compliance monitoring would be conducted to determine residual contaminant concentrations and assess the need for additional treatment. The estimated timeframe to achieve the RAOs and meet the PRGs under this alternative is 10 years. An IC, in the form of a deed notice, would be put in place to prevent intrusive activities in in-situ treatment areas until the PRGs are met.

Soil Alternative S-3: Excavation with Off-Site Disposal, Ex-Situ Bioremediation/Reuse and Enhanced In-Situ Biodegradation

Capital Cost:	$5,198,118
Annual OM&M Cost:	$248,181
Present-Worth Cost:	$6,206,066
Construction Time:	18 months

Under this alternative, the contaminated soils would be excavated as detailed above for Alternative S-2. The volumes and on-Site handling of excavated soils and the backfilling of excavated areas with certified clean fill would be the same as for Alternative S-2, the lead-contaminated soil from the Township Refuse Area would be transported to an off-Site treatment and/or disposal facility. This alternative would also include the development and implementation of a BMP plan in the Shooting Range, as described in Alternative S-2.

The soils excavated from the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas would be treated on-Site using ex-situ bioremediation instead of being transported of-Site for treatment/disposal. Conventional methods of ex-situ bioremediation include biopiles/composting, landfarming with tilling, phytoremediation or a combination of these methods. All methods were evaluated in the FS and biopiles/composting was determined to be the most suitable for application at the Site.

The excavated soil would be mixed with soil amendments, formed into piles and aerated, either passively or actively (using blowers or vacuum pumps). As part of the remedial design, an analysis would be performed to confirm that the average VOC concentrations that may be generated and released from ex-situ treatment of the soils would not exceed applicable state and federal air emissions standards. If air emissions controls are determined to be necessary based upon these calculations, then those controls would be detailed in the remedial design. In addition, vapors from the VOCs in the biopiles that volatilize into the air would be monitored to protect Site workers and ensure that state and federal air emission standards are not exceeded. Post-remedial sampling would be conducted to ensure that the PRGs are met.

The ex-situ-remediated soils would be reused on-Site as part of an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater and control surface water runoff/drainage. Vegetation would be placed in areas disturbed during excavation activities to stabilize the soil and maintenance of the soil cover would be performed for a period of 15 years.

The contaminated soils situated below 4 ft. bgs in the excavated areas would be treated using enhanced in-situ biodegradation, as described in Alternative S-2. The estimated timeframe to achieve the RAOs and meet the PRGs under this alternative is 10 years. An IC, in the form of a deed notice, would be put in place to prevent intrusive activities in in-situ treatment areas until the PRGs are met.

Sediment Alternative SED-1: No Action

Capital Cost:	$0
Annual OM&M Cost:	$0
Present-Worth Cost:	$0
Construction Time:	0 months

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative for sediment does not include any physical remedial measures that address the sediment contamination at the Site.

Because this alternative would result in cumene remaining in the sediments above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove, treat, or contain contaminated sediments.

Sediment Alternative SED-2: Hydraulic Dredging with Off-Site Disposal

Capital Cost:	$4,086,780
Annual OM&M Cost:	$0
Present-Worth Cost:	$4,086,780
Construction Time:	12 months

Under this alternative, a hydraulic dredge would remove a mixture of contaminated sediment and water (referred to as slurry) from the bottom surfaces of the Stormwater Catchment Basin and Clonmell Creek. The work area would be enclosed with silt curtains to prevent downstream migration of contaminated sediment during dredging activities. Also, the surface water outside the work area would be monitored to ensure that contaminated sediments are not being resuspended in the water column and transported downstream.

The slurry would be transferred via pipeline into geotextile tubes (located in a staging area) for dewatering. The staging area would be designed with proper controls, including but not limited to an impermeable liner, to prevent any impacts to the surrounding soil and groundwater and maintain containment of the dredged sediments and effluent water from the geotextile tubes.

The effluent would be sampled and, if necessary, treated on-Site before being discharged to the Stormwater Catchment Basin in compliance with substantive New Jersey Pollutant Discharge Elimination System (NJPDES) discharge to groundwater permit requirements. The details of the effluent treatment system would be finalized during the remedial design. Monitoring of groundwater wells around the Stormwater Catchment Basin would be conducted to ensure compliance with substantive permit requirements. The dewatered solids left in the geotextile tubes would be transported off-Site to a RCRA-compliant treatment and/or disposal facility.

As discussed above, because there is no screening value available for cumene in sediment, a Site-specific value of 120 mg/kg was developed for comparison with the RI sampling results. In lieu of developing a Site-specific sediment cleanup value for cumene, the volumes of sediment to be dredged were determined using a mass-removal approach. It is estimated that 1,225 CY of sediment from the Stormwater Catchment Basin and 7,275 CY of sediment from Clonmell Creek would be dredged. These volumes represent removal of 100 percent of the cumene mass in the Stormwater Catchment Basin sediment and approximately 99 percent of the cumene mass within the Clonmell Creek sediment and include all the sediment identified in the BERA as posing a risk to ecological receptors. The estimated timeframe to achieve RAOs under this alternative is 12 months.

Sediment Alternative SED-3: Hydraulic Dredging with On-Site Treatment/Reuse

Capital Cost:	$1,860,320
Annual OM&M Cost:	$0
Present-Worth Cost:	$1,860,320
Construction Time:	24 months

This alternative is the same as Alternative SED-2, except instead of being transported off-Site for treatment and/or disposal, the dredged sediments would be treated on-Site using phytoremediation and, if necessary, ex-situ bioremediation.

Under this alternative, the geotextile tubes would be located in a treatment area, designed with proper controls, including but not limited to an impermeable liner, to maintain containment of the dredged sediments and prevent any impacts to the surrounding soil and groundwater. Plants would be planted in the cumene-contaminated sediment within the geotextile tubes for a pre-determined growth period[9].

Based upon the results obtained during the phytoremediation pilot study, it is expected that cumene concentrations in the sediment would be reduced to "non-detect." However, if sampling results indicate that cumene concentrations remain above the PRGs[10] at the end of the growth period, then ex-situ bioremediation, as described above for Alternative S-3, would be used to further treat the sediments.

[9] Additional studies would be conducted during the remedial design phase to refine plant species selection and determine the optimal growth period.

[10] Because the treated sediment would be reused on-Site in an engineered soil cover, the final COC concentrations would need to meet the unsaturated soil PRGs.

The treated sediments would be reused on-Site as part of an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater and control surface water runoff/drainage. The plant residuals would be harvested and composted on-Site. The estimated timeframe to achieve RAOs under this alternative is 18 months.

Groundwater Alternative GW-1: No Further Action

Capital Cost:	$0
Annual OM&M Cost:	$0
Present-Worth Cost:	$0
Construction Time:	0 months

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. Under this remedial alternative, operation of the existing groundwater treatment system would be discontinued and no further remedial measures would be taken to address the groundwater contamination at the Site.

Because this alternative would result in contaminants remaining on-Site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to treat the contaminated groundwater.

Groundwater Alternative GW-2: Extraction with On-Site Treatment and Long-Term Monitoring

Capital Cost:	$409,826
Annual OM&M Cost:	$225,938
Present-Worth Cost:	$3,181,534
Construction Time:	12 months

As discussed above, as an interim remedy, operation of a groundwater extraction and treatment system has been on-going at the Site since 1984. The current system consists of extraction wells and subsurface pipelines that capture and carry contaminated groundwater into a treatment unit (currently housed in an on-Site trailer), with a treatment capacity of 125 gallons per minute (gpm). The treatment process consists of filtration through sand units to reduce iron and suspended solids, followed by transmission through a series of granular activated carbon (GAC) canisters to remove the COCs. The treated groundwater is then pumped through a pipeline and discharged into the Delaware River under a NJPDES discharge to surface water permit. Groundwater quality monitoring is conducted on a quarterly basis to verify that the system continues to maintain hydraulic control of the contaminated groundwater beneath the Site.

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Under this alternative, a new treatment unit, with an approximate treatment capacity of 125 gpm, would be built to replace/upgrade the existing one and a small building would be constructed in the Stormwater Catchment Basin exposure area to house the new treatment unit. The extracted groundwater would be pumped from the existing extraction well infrastructure into an equalization tank within the treatment building and then treated with a polymer. The polymer would be combined with pH adjustment, if necessary, to promote flocculation of iron and other solids in the groundwater.

The groundwater would then be pumped through conventional geotextile tubes followed by GAC-impregnated geotextile tubes, if necessary, to remove iron and solids and treat the COCs. The flocculated iron and solids would be captured in the geotextile tubes. The COCs would partition to the solids in the geotextile tubes where they would biodegrade. The spent tubes would be transported off-Site to a permitted disposal facility. Treated water would be discharged to the groundwater in compliance with substantive NJPDES discharge to groundwater permit requirements (using the Stormwater Catchment Basin as an infiltration point). Long-term groundwater monitoring would be continued until the PRGs are met.

It is estimated that, in combination with active treatment of source-area soils, it would take 10 years to remediate the contaminated groundwater to PRGs under this alternative. However, a conservative 15-year timeframe is used for groundwater monitoring to provide maximum protection of human health and the environment. The groundwater monitoring timeline may be truncated if the PRGs can be met in a shorter timeframe.

ICs would be put in place at the Site, including the establishment of a CEA to prevent groundwater use and the placement of a deed notice on the property, restricting the land use to commercial/industrial and requiring that future buildings on the Site either be subject to a vapor intrusion evaluation or be built with vapor intrusion mitigation systems until the PRGs are met.

Because this alternative would result in contaminants remaining on-Site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years.

COMPARATIVE ANALYSIS OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative is assessed against nine evaluation criteria, namely, overall protection of human health and the environment, compliance with applicable or relevant and appropriate requirements, long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, cost, and state and community acceptance. The evaluation criteria are described below.

Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or ICs.

Compliance with ARARs addresses whether a remedy would meet all the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provide grounds for invoking a waiver.

Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

Reduction in toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies, with respect to these parameters, a remedy may employ.

Short-term effectiveness addresses the time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

Cost includes estimated capital and OM&M costs, and net present-worth costs.

State acceptance indicates if, based on its review of the RI/FS and Proposed Plan, the state concurs with the preferred remedy at the present time.

Community acceptance will be assessed in the ROD and refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports.

The following is a comparative analysis of these alternatives, based upon the evaluation criteria noted above.

Overall Protection of Human Health and the Environment

Alternative S-1 would not be protective of human health because it would not actively address the contaminated soils, which are acting as a source of contamination to the groundwater and pose a human health risk. Alternatives S-2 and S-3 would be protective of human health, because these alternatives would employ a remedial strategy capable of removing/treating the source of groundwater contamination and the threat to public health.

Alternative SED-1 would not be protective of the environment because no action would be taken to eliminate or mitigate ecological exposure to the contaminated sediments in the Stormwater Catchment Basin and Clonmell Creek. Alternatives SED-2 and SED-3 would be protective of the environment because, under these alternatives, the contaminated sediments posing an ecological risk in the Stormwater Catchment Basin and Clonmell Creek would be removed.

Alternative GW-1 would not be protective of human health because it would not prevent off-Site migration or actively treat the contaminated groundwater, which poses a human health risk. Alternative GW-2 would be protective of human health because it would rely upon groundwater extraction to prevent contamination from reaching downgradient receptors and active treatment to restore groundwater quality to levels that meet state and federal standards within a reasonable time frame. The ICs under Alternative GW-2 would provide protection of public health until groundwater standards are met.

Compliance with ARARs

Soil PRGs for the Site were established based on NJDEP's NRDCSRSs and IGWSRS (chemical-specific ARARs) and EPA's RSLs for industrial soil (TBC criteria).

No action would be taken under Alternative S-1 to address contaminated soils. Therefore, this alternative would not achieve the soil PRGs. Alternatives S-2 and S-3 would comply with ARARs because both alternatives would actively remediate contaminated soil to achieve the soil PRGs.

Because Alternatives S-2 and S-3 would involve the excavation of contaminated soils, these alternatives would require compliance with fugitive dust and VOC emission regulations.

Both Alternatives S-2 and S-3 would be subject to state and federal regulations related to the transportation and off-site treatment and/or disposal of wastes.

There are currently no federal or state promulgated standards for contaminant levels in sediments. There are, however, other federal or state advisories, criteria, or guidance (which are used as TBC criteria). Specifically, New Jersey Ecological Screening Criteria (NJESC) are TBC criteria. The primary location-specific ARARs for sediment would be the Freshwater Wetlands Protection Act (NJSA 13:9B-1 *et seq.*) and Flood Hazard Area Control Act Regulations (NJAC 7:13-10 and 11).

Alternative SED-1 would not take any action to address contaminated sediments exceeding NJESC and, therefore, would not comply with this TBC criteria. Alternatives SED-2 and SED-3 would comply with NJESC because these alternatives would involve removing the contaminated sediments posing a risk to ecological receptors in the SCB and Clonmell Creek. Alternatives SED-2 and SED-3 would result in minimal disturbance to the surrounding area and would not likely involve replacing the dredged sediment, therefore, both alternatives would comply with location-specific ARARs.

EPA and NJDEP have promulgated MCLs and NJDEP has promulgated GWQSs, which are enforceable health-based, protective standards for various drinking water contaminants (chemical-specific ARARs). Although the groundwater at the Site is not presently being utilized as a potable water source, achieving MCLs in the groundwater is an applicable standard because the aquifer beneath the Site is designated as a Class II-A potable water source.

Alternative GW-1 would not provide for any direct remediation of groundwater and would, therefore, rely upon natural processes to achieve chemical-specific ARARs. Alternative GW-2 would be more effective in reducing groundwater contaminant concentrations below MCLs and GWQSs, because it involves active remediation of the contaminated groundwater. Alternative GW-2 would also be subject to discharge to groundwater ARARs because treated water would be discharged to the groundwater using the Stormwater Catchment Basin as an infiltration point.

The provisions of State of New Jersey Administrative Requirements for the Remediation of Contaminated Sites (N.J.A.C. 7:26C) are applicable to the ICs included in Alternatives S-2, S-3 and GW-2.

Long-Term Effectiveness and Permanence

Alternative S-1 would not involve any active remedial measures and, therefore, would not be effective in preventing exposure to contaminants in the soil and would allow the continued migration of contaminants from the soil to the groundwater. Alternatives S-2 and S-3 would both be effective in the long term and would provide permanent remediation by removing contaminated soils (from 0-4 ft. bgs) in the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin, and Tank Farm/Train Loading Area exposure areas and either treating them on-Site or treating/disposing of them off-Site, and by treating the source-area soils in the Active Process Area exposure area to achieve the PRGs. Both Alternatives S-2 and S-3 would rely on an IC, in the form of a deed notice, to prevent intrusive activities in in-situ treatment areas until the PRGs are met and would maintain reliable protection of human health and the environment over time.

Under Alternative S-2, lead-contaminated soils and VOC-contaminated soils (from 0 to 4 ft. bgs) would be disposed of off-Site, whereas Alternative S-3 would involve treating the excavated VOC-contaminated soils on-Site and reusing the treated soils as part of an engineered soil cover. Alternative S-2 would result in a more rapid reduction in risk, because the contaminated soils would be removed from the Site. However, it is anticipated that, under Alternative S-3, proper management and successful treatment of VOCs in the soils would be achievable within a reasonable timeframe using ex-situ bioremediation. Therefore, on-Site reuse of the treated soils would not result in an unacceptable exposure risk at the Site.

Alternative SED-1 would not involve any active remedial measures and, therefore, would not be effective in minimizing the exposure of ecological receptors to contaminated sediments. Alternatives SED-2 and SED-3 would be equally effective in the long term and both would provide permanent remediation by removing the contaminated sediments posing a risk to ecological receptors in the Stormwater Catchment Basin and Clonmell Creek.

Under Alternative SED-2, the contaminated sediments would be disposed of off-Site, whereas Alternative SED-3 would involve treating the contaminated sediments on-Site and reusing the treated sediments as part of an engineered soil cover. Alternative SED-2 would result in a more rapid reduction in risk, because the contaminated sediments would be removed from the Site. However, it is anticipated that, under Alternative SED-3, proper management and successful remediation of cumene in the sediments (to non-detectable concentrations) would be achievable within a reasonable timeframe using phytoremediation and, if necessary, ex-situ bioremediation. Therefore, on-Site reuse of the treated sediments would not result in an unacceptable exposure risk at the Site.

Alternative GW-1 would be expected to have minimal long-term effectiveness and permanence because it would rely upon natural processes to restore groundwater quality and would not prevent off-Site migration of contaminated groundwater. Alternative GW-2 would provide long-term effectiveness and permanence because it would rely on groundwater extraction and treatment and ICs (in combination with one of the action soil alternatives) to achieve the PRGs, prevent off-Site migration of contaminants, and prevent human exposure to contaminated groundwater and soil vapor.

Reduction in Toxicity, Mobility or Volume Through Treatment

Alternative S-1 would involve no active remedial measures and, therefore, would provide no reduction in toxicity, mobility, or volume. Alternative S-2 would reduce the mobility of contaminants by removing the lead-contaminated soils and the VOC-contaminated soils (from 0 to 4 ft. bgs) from the property and reduce the toxicity, mobility, and volume through in-situ treatment of the remaining source-area soils. Alternative S-3 would reduce the mobility of the contaminants by excavating the lead-contaminated soils and the VOC-contaminated soils (from 0-4 ft. bgs) and removing the lead-contaminated soil from the property. The toxicity and volume of the contaminants would be reduced through ex-situ treatment of the excavated VOC-contaminated soils. The toxicity, mobility, and volume of the source-area soils would be addressed through in-situ treatment.

Alternative SED-1 would involve no active remedial measures and, therefore, would provide no reduction in toxicity, mobility, or volume. Both Alternatives SED-2 and SED-3 would reduce the mobility of the contaminants by removing the contaminated sediments posing a risk to ecological receptors in the Stormwater Catchment Basin and Clonmell Creek. However, Alternative SED-3 would also provide a reduction in the toxicity and volume of the contaminated sediments through on-Site treatment.

Alternative GW-1 would not effectively reduce the toxicity, mobility or volume of contaminants in the groundwater, because this alternative involves no active remedial measures. Alternative GW-2, on the other hand, would reduce the toxicity, mobility, and volume of contaminated groundwater through extraction and treatment in the on-Site treatment system, thereby satisfying CERCLA's preference for treatment.

Short-Term Effectiveness

Because no actions would be performed under Alternative S-1, there would be no implementation time. The timeframes for the excavation of the unsaturated soils (12 months) and in-situ treatment of the source-area soils (10 years) would be the same for Alternatives S-2 and S-3. Ex-situ treatment of the excavated VOC-contaminated soils under Alternative S-3 would take approximately 18 months.

Alternative S-1 would not include any physical construction measures in any areas of contamination and, therefore, would not present any potential adverse impacts to remediation workers or the community as a result of its implementation. Alternatives S-2 and S-3 could present some limited adverse impacts to remediation workers through dermal contact and inhalation related to the excavation of contaminated soils. The risks to remediation workers under Alternatives S-2 and S-3 could be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Both Alternatives S-2 and S-3 would require the off-Site transport of contaminated soils, which could potentially adversely affect local traffic and may pose the potential for traffic accidents, which in turn could result in releases of hazardous substances. However, the volume transported under Alternative S-2 (approximately 830 truckloads) would be significantly greater than for Alternative S-3 (approximately 63 truckloads).

For Alternatives S-2 and S-3, there is a potential for increased stormwater runoff and erosion during construction and excavation activities that would have to be properly managed to prevent or minimize any adverse impacts. For these alternatives, appropriate measures would have to be taken during excavation activities to prevent transport of fugitive dust and exposure of workers and downwind receptors to the VOCs in the Site soils.

The installation of infiltration galleries and interim- and post-remediation soil sampling activities, associated with the in-situ treatment of source-area soils under Alternatives S-2 and S-3, would pose an additional risk to on-Site workers, because these activities would be conducted within areas of potential soil and groundwater contamination.

Because no actions would be performed under Alternative SED-1, there would be no implementation time. Both Alternatives SED-2 and SED-3 would require some infrastructure construction, however, the infrastructure required to implement Alternative SED-3 would be more extensive and, therefore, would require more time to complete. It is estimated that it would take 12 months to implement Alternative SED-2 and 18 months to implement Alternative SED-3.

Alternative SED-2 would require the off-Site transport of contaminated sediments (approximately 550 truckloads), which has the potential to adversely affect local traffic and may pose the potential for traffic accidents, which in turn could result in releases of hazardous substances. Both Alternatives SED-2 and SED-3 would present some limited risk to remediation workers through dermal contact and inhalation related to the handling of the dredged sediments, however, this risk would be increased under Alternative SED-3 due to the longer potential exposure time associated with on-Site treatment. The risks to remediation workers under Alternatives SED-2 and SED-3 could be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Because no actions would be performed under Alternative GW-1, there would be no implementation time. It is estimated that, under Alternative GW-2, it would take 12 months to complete the modifications to the existing underground piping, build the structure to house the new treatment system and install the new treatment system. The overall time to meet the PRGs throughout the entire groundwater plume under Alternative GW-2 (in combination with one of the action soil alternatives) is estimated to be 10 years.

Alternative GW-1 would have no short-term impact to remediation workers or the community and would have no adverse environmental impacts from implementation, because no actions would be taken under this alternative. Alternative GW-2 could present some limited risk to remediation workers through dermal contact and inhalation related to construction activities associated with the underground piping modifications, building construction and periodic groundwater sampling activities. The risks to remediation workers could be mitigated by following appropriate health and safety protocols, exercising sound engineering practices and utilizing proper personal protective equipment.

Implementability

Alternative S-1 would be the easiest soil alternative to implement because there are no activities to undertake. Both Alternatives S-2 and S-3 would employ technologies known to be reliable and that are readily implementable. The equipment, services and materials needed to implement Alternatives S-2 and S-3 are readily available and the actions under these alternatives would be administratively feasible.

Under Alternatives S-2 and S-3, real-time air quality monitoring for VOCs and dust during excavation activities would need to be conducted to protect remediation workers and downwind residents. Sufficient facilities are available for the treatment and disposal of the excavated materials and determining the achievement of the soil PRGs could be easily accomplished through post-excavation soil sampling and analysis. under Alternatives S-2 and S-3.

Alternative SED-1 would be the easiest sediment alternative to implement because it would not involve undertaking any actions. Alternatives SED-2 and SED-3 would employ hydraulic dredging, which is a commonly-used technology proven to be effective in the removal of contaminated sediments. Alternative SED-3 would involve on-Site treatment of contaminated sediments through phytoremediation in geotextile tubes, which was successfully demonstrated during the treatability study conducted on the Clonmell Creek sediment during the RI. The equipment, services and materials needed to implement Alternatives SED-2 and SED-3 are readily available and the actions under these alternatives would be administratively feasible.

Alternative GW-1 would be the easiest groundwater alternative to implement, because it would not entail the performance of any activities. The equipment, services and materials needed to implement Alternative GW-2 are readily available and the actions under this alternative would be administratively feasible. The existing extraction and treatment system has been successful at maintaining hydraulic control and reducing COC concentrations in the groundwater at the Site and the ICs under Alternative GW-2 would be relatively easy to implement.

In accordance with CERCLA, no permits would be required for on-site work (although such activities would comply with substantive requirements of otherwise required permits). Permits would be obtained as needed for off-Site work.

Cost

The present-worth costs for the soil alternatives were calculated using a discount rate of 7 percent and a 15-year timeframe for soil cap maintenance. The present-worth cost for Alternative GW-2 was calculated using a discount rate of 7 percent and a 10-year time interval for operation and maintenance of the treatment system (the estimated time to meet the groundwater PRGs) and a discount rate of 7 percent and a 15-year time interval for groundwater monitoring.

The estimated capital, OM&M, and present-worth costs are summarized below in Table 5.

Table 5: Summary of Alternative Costs

Alternative	Capital	Annual OM&M	Total Present Worth
S-1	$0	$0	$0
S-2	$11,183,360	$248,181	$12,191,308
S-3	$5,198,118	$248,181	$6,206,066
SED-1	$0	$0	$0
SED-2	$4,086,780	$0	$4,086,780
SED-3	$1,860,320	$0	$1,860,320
GW-1	$0	$0	$0
GW-2	$409,826	$225,938	$3,181,534

State Acceptance

NJDEP concurs with the proposed remedy.

Community Acceptance

Community acceptance of the preferred alternative will be addressed in the ROD following review of the public comments received on this Proposed Plan.

PREFERRED REMEDY

Based upon an evaluation of the various alternatives, EPA, in consultation with NJDEP, recommends Alternative S-3 (excavation of lead-contaminated soil with off-Site disposal, excavation of VOC-contaminated soil located 0-4 ft. bgs and treatment with ex-situ bioremediation, followed by on-Site reuse, and enhanced in-situ biodegradation of VOC-contaminated soil situated below 4 ft. bgs) as the preferred alternative to address the contaminated soil at the Site; Alternative SED-3 (hydraulic dredging of contaminated sediment with on-Site phytoremediation and on-Site reuse) as the preferred alternative to address the contaminated sediment at the Site; and Alternative GW-2 (extraction of contaminated groundwater with on-Site treatment, long-term monitoring and ICs) as the preferred alternative to address the groundwater contamination at the Site. The proposed soil and sediment remediation areas are shown in Figure 3.

The soils in the Active Process Area, Chemical Landfill/Gravel Pit, Inactive Process Area, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas with COC concentrations exceeding the PRGs would be excavated to a depth of 4 ft. bgs[11]

The soil in the Township Refuse Area with lead concentrations exceeding the PRGs would be excavated. Additional delineation of the lead contamination in this area would be performed during the remedial design.

A BMP plan would be developed and implemented to manage lead and minimize contamination of the Shooting Range exposure area while the shooting range remains active. If the shooting range becomes inactive, delineation of the lead contamination would be performed and the soils the in the Shooting Range exposure area with lead concentrations exceeding the PRGs would be excavated and disposed of off-Site.

The excavation would be performed using standard construction equipment, such as backhoes and track excavators. An estimated 13,804 CY of contaminated soil would be excavated, consisting of 1,052 CY of lead-contaminated soil and 12,752 CY of soil contaminated with benzene, cumene and collocated COCs would be excavated.

The excavated lead-contaminated soil would be transported to an off-Site treatment and/or disposal facility. The excavated soil containing benzene, cumene and collocated COC concentrations above the PRGs would be treated on-Site using ex-situ bioremediation. Specifically, these soils would be mixed with soil amendments, formed into piles and aerated, either passively or actively (using blowers or vacuum pumps). As part of the remedial design, an analysis would be performed to confirm that the average VOC concentrations that may be released from ex-situ treatment of the soils would not exceed applicable state and federal air emissions standards. If air emissions controls are determined to be necessary based upon these calculations, then those controls would be included in the remedial design. In addition, vapors from the VOCs in the biopiles that volatilize into the air would be monitored to protect Site workers and ensure that state and federal air emission standards are not exceeded and post-remedial sampling would be conducted to ensure that the PRGs are met.

Post-excavation sampling would be conducted to identify/confirm the areas where the PRGs are exceeded in the soils situated below 4 ft. bgs. These soils (saturated and unsaturated) would be treated using enhanced in-situ biodegradation. Enhanced in-situ biodegradation would involve injecting a magnesium sulfate solution into the contaminated soils to stimulate activity and reproduction of naturally-occurring anaerobic microorganisms. The microorganisms would then destroy or transform COCs into less toxic compounds by using them as a food and energy source. Application of the anaerobic treatment solution would be achieved using lateral infiltration galleries consisting of perforated piping installed in a series of shallow trenches. Performance and compliance monitoring would be conducted to determine residual contaminant concentrations and assess the need for additional treatment.

The ex-situ-remediated soils would be reused on-Site, along with imported, certified clean soil, meeting applicable state regulations, to backfill excavated areas and construct an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater, and control surface water runoff/drainage. Vegetation would be placed in areas disturbed during excavation activities to stabilize the soil and maintenance of the soil cover would be performed.

The remedy would also include hydraulic dredging to remove a mixture of contaminated sediment and water (referred to as slurry) from the bottom surfaces of the Stormwater Catchment Basin and Clonmell Creek. It is estimated that 8,500 CY of contaminated sediment would be removed; 1,225 CY from the Stormwater Catchment Basin and 7,275 CY from Clonmell Creek. These volumes represent the removal of 100 percent of the cumene mass in the Stormwater Catchment Basin and approximately 99 percent of the cumene mass within the Clonmell Creek sediment and include all the sediment posing a risk to ecological receptors.

The work area would be enclosed with silt curtains to prevent downstream migration of contaminated sediment during dredging activities. Also, the surface water outside the work area would be monitored to ensure that contaminated sediments are not being resuspended in the water column and transported downstream.

The slurry would be transferred via pipeline into geotextile tubes (located in a treatment cell within the Stormwater Catchment Basin exposure area) for dewatering. The staging area would be designed with proper controls, including but not limited to an impermeable liner, to prevent any impacts to the surrounding soil and groundwater and

[11] Approximately 500 CY of the soils in the Active Process Area and Inactive Process Area exceeding the PRGs would be treated using enhanced in-situ biodegradation rather than being excavated.

maintain containment of the dredged sediments and effluent water from the geotextile tubes. The effluent water would be sampled and, if necessary, treated on-Site before being discharged to the Stormwater Catchment Basin in accordance with substantive NJPDES discharge to groundwater permit requirements. The details of the effluent treatment system would be finalized during the remedial design. Monitoring of groundwater wells around the Stormwater Catchment Basin would be conducted to ensure compliance with permit requirements.

Plants would be planted in the cumene-contaminated sediment within geotextile tubes for a pre-determined growth period.[12] The treated sediments would be reused on-Site as part of an engineered soil cover to reduce infiltration of surface water to the groundwater, and control surface water runoff/drainage, and the plant residuals would be harvested and composted on-Site.

Under the groundwater component of this remedy, a new treatment unit would be built to replace/upgrade the existing one and a small building would be constructed in the Stormwater Catchment Basin exposure area to house the new treatment unit. The existing extraction wells and subsurface pipelines would to be used to capture and carry contaminated groundwater to the new treatment unit.

The extracted groundwater would be pumped into an equalization tank within the treatment building and then treated with a polymer. The polymer would be combined with pH adjustment, if necessary, to promote flocculation of iron and other solids in the groundwater. The groundwater would then be pumped through conventional geotextile tubes followed by GAC-impregnated geotextile tubes, if necessary, to remove iron, solids, and treat COCs. The solids, flocculated iron and other metals, would be captured in the geotextile tubes. The COCs would partition to the solids in the geotextile tubes where they would biodegrade. The spent tubes would be transported off-Site to a permitted disposal facility.

The new system would have an approximate treatment capacity of 125 gallons per minute. Treated water would be discharged to the groundwater in compliance with substantive NJPDES discharge to groundwater permit requirements (using the Stormwater Catchment Basin as an infiltration point). Long-term groundwater monitoring would be continued until the PRGs are met.

ICs would be put in place at the Site, including the establishment of a CEA to prevent groundwater use and the placement of a deed notice on the property, restricting the land use to commercial/industrial and requiring that future buildings on the Site either be subject to a vapor intrusion evaluation or be built with vapor intrusion mitigation systems until the PRGs are met.

Because the proposed remedy would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the site be reviewed at least once every five years.

Basis for the Remedy Preference

Both Alternative S-2 and Alternative S-3 would address principal threat wastes through excavation and treatment and effectively achieve the soil the PRGs. Alternative S-2 would meet the PRGs in the soils from 0-4 ft. bgs more quickly by removing the excavated soils from the property. However, Alternative S-3 would achieve the PRGs in these soils through treatment within a reasonable timeframe (12 months) and would provide a greater environmental benefit than Alternative S-2 because it would allow for on-Site reuse of the treated soils. Alternative S-2 would be considerably more expensive to implement than Alternative S-3 because of the significantly larger volumes of contaminated soil that would need to be transported off-Site for treatment and/or disposal and clean fill that would need to be imported to backfill the excavated areas and construct an engineered soil cap under Alternative S-2. Therefore, EPA believes that Alternative S-3 would effectively address the soil contamination at the Site while providing the best balance of tradeoffs with respect to the evaluating criteria.

Both Alternative SED-2 and Alternative SED-3 would effectively and permanently eliminate the risk posed to environmental receptors by removing the contaminated sediments from the Stormwater Catchment Basin and Clonmell Creek. Alternative SED-2 would require less time and infrastructure construction to implement than Alternative SED-3, however, Alternative SED-2 would be considerably more expensive to implement than Alternative SED-3 because it would involve transporting the contaminated sediments off-Site for treatment and/or disposal and would require a larger volume of clean fill to be imported onto the Site. Alternative SED-3 would provide a greater environmental benefit than Alternative SED-2 because it would allow for on-Site treatment and reuse of the treated sediments as part of an engineered soil cover. EPA believes Alternative SED-3 would effectively mitigate the threat to ecological receptors from the Site while providing the best balance of tradeoffs with respect to the evaluating criteria.

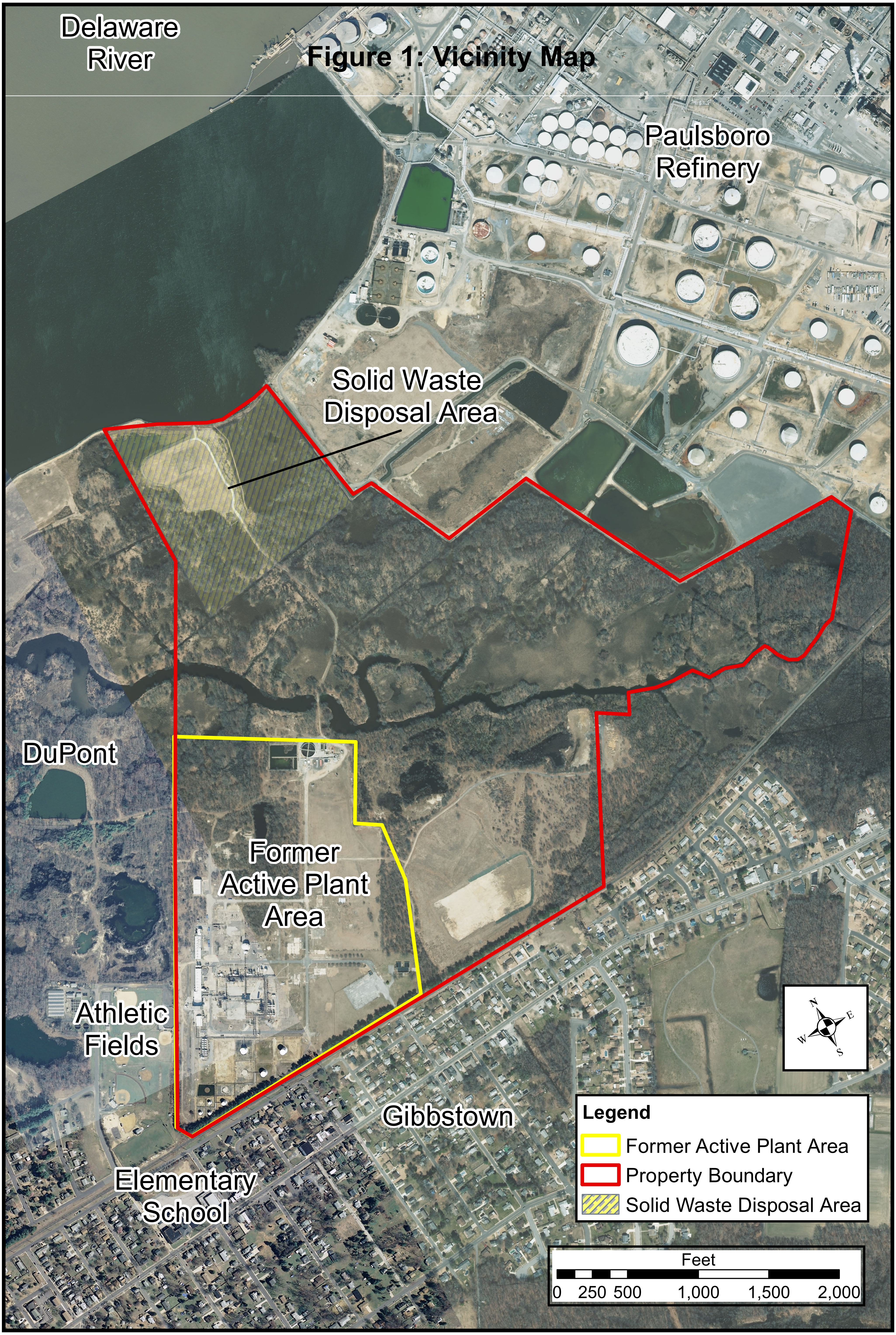
For more than 30 years, a groundwater extraction and treatment system has been operated at the Site as an interim action. This system has successfully reduced contaminant concentrations in the groundwater and

[12] Additional studies would be conducted during the remedial design to refine plant species selection and determine the optimal growth period.

prevented contaminated groundwater from migrating off-property. Because of the effectiveness of the existing system and the anticipated removal of the contaminant source under the preferred soil alternative, EPA has identified Alternative GW-2 as its preferred groundwater alternative.

The preferred remedy is believed to provide the greatest protection of human health and the environment and long-term effectiveness; will be able to achieve the ARARs more quickly, or as quickly, as the other alternatives; upon completion, will allow for commercial/industrial use of the property; and, is cost effective. Therefore, the preferred remedy will provide the best balance of tradeoffs among alternatives with respect to the evaluating criteria. EPA and NJDEP believe that the preferred remedy will address principal threat wastes, be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The preferred remedy also will meet the statutory preference for the use of treatment as a principal element, as well as include consideration of EPA Region 2's Clean and Green Energy Policy.[13]

[13] See http://epa.gov/region2/superfund/green_remediation and http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf.



Delaware River
Figure 1: Vicinity Map
Paulsboro Refinery
Solid Waste Disposal Area
DuPont
Former Active Plant Area
Athletic Fields
Gibbstown
Elementary School
N
E
S
W
Legend
Former Active Plant Area
Property Boundary
Solid Waste Disposal Area
Feet
0 250 500 1,000 1,500 2,000

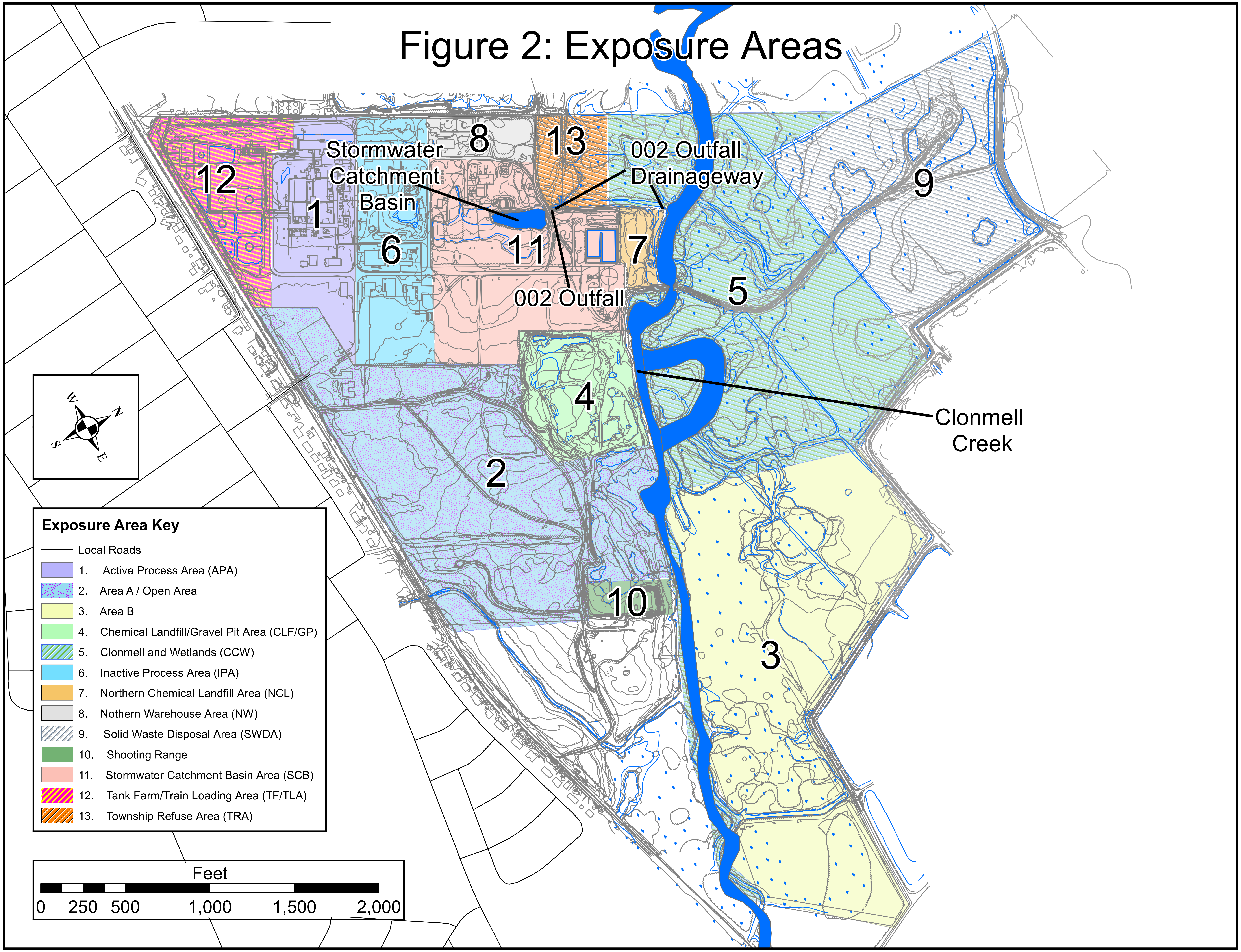
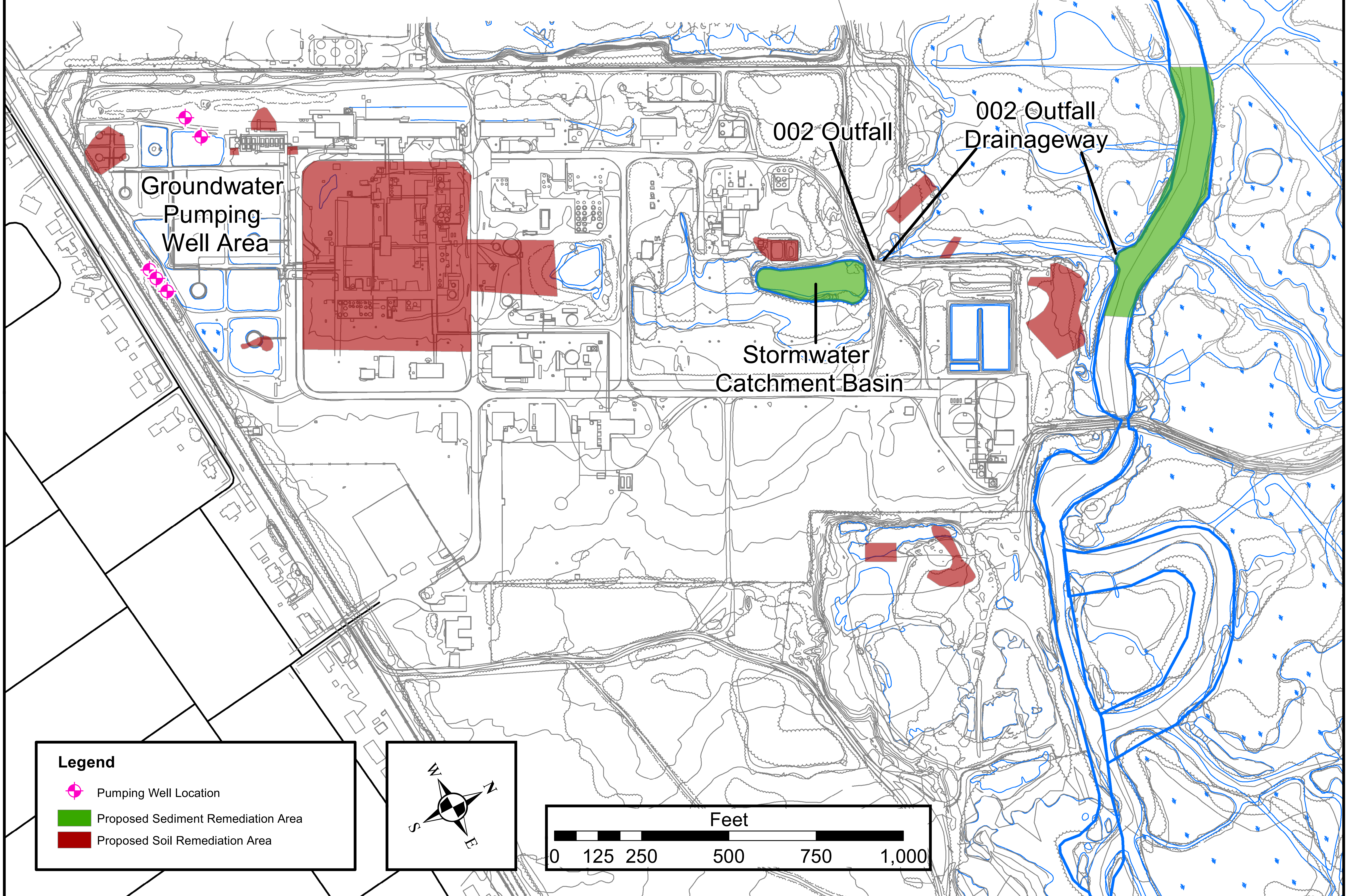


Figure 2: Exposure Areas
12
1
Stormwater
Catchment
Basin
6
8
13
002 Outfall
Drainageway
11
7
9
002 Outfall
5
4
Clonmell
Creek
2
10
3
W
N
S
E
Exposure Area Key
Local Roads
1. Active Process Area (APA)
2. Area A / Open Area
3. Area B
4. Chemical Landfill/Gravel Pit Area (CLF/GP)
5. Clonmell and Wetlands (CCW)
6. Inactive Process Area (IPA)
7. Northern Chemical Landfill Area (NCL)
8. Nothern Warehouse Area (NW)
9. Solid Waste Disposal Area (SWDA)
10. Shooting Range
11. Stormwater Catchment Basin Area (SCB)
12. Tank Farm/Train Loading Area (TF/TLA)
13. Township Refuse Area (TRA)
Feet
0 250 500 1,000 1,500 2,000

Figure 3: Proposed Soil & Sediment Remediation Areas



APPENDIX V-b

Public Notice — Commencement of Public Comment Period

Health

STUDY

Does long life lead to a longer life?

New research: Mortality rates appear to accelerate to age 80 and then seem to plateau

Ben Guarino *Washington Post*

Jeanne Louise Calment lived for 122 years and 164 days, the oldest verified age of any person, ever.

Her interviews revealed a portrait of the centenarian in high spirits: "I've only ever had one wrinkle, and I'm sitting on it," she told reporters when she turned 110.

Calment died in 1997 in Arles, France, where she spent much of her impressively long life. No one else, according to accurate records, has lived beyond 120 years.

Whether there's a limit to the human life span is an age-old question. An actuary named Benjamin Gompertz proposed in 1825 that mortality rates accelerate exponentially as we grow older. Under what is known as the Gompertz law, the odds of dying double every eight years. That seems to be the rule for people ages 30 to 80.

But researchers disagree about what happens to mortality rates very late in life. A new study, published recently in the journal Science, indicates that the Grim Reaper suddenly eases off the accelerator.

"The aim was to settle a controversy about whether human mortality has the same shape as mortality in many other species," said study author Kenneth Wachter, professor emeritus of demography and statistics at the University of California at Berkeley.

"We think we have settled it," he said.

Mortality rates accelerate to age 80, decelerate and then plateau between ages 105 to 110, the study authors concluded. The Gompertz law, in this view, ends in a flat line.

To be very clear, we're talking about the acceleration of mortality rates, not the odds themselves. Those still aren't good.

- Only 2 in 100,000 women live to 110; for men, the chances of becoming a supercentenarian are 2 in 1,000,000.
- At age 105, according to the new study, the odds of surviving to your 106th birthday are in the ballpark of 50 percent.
- It's another 50-50 coin flip to 107, then again to 108, 109 and 110.

Led by Elisabetta Barbi of Sapienza University of Rome and experts at the Italian National Institute of Statistics, the new research tracked everyone in Italy born between 1896 and 1910 who lived to age 105 or beyond. The data included 3,836 people, of whom 3,373 were women and 463 were men. Their registry requires yearly updates from citizens and provides more information than U.S. Social Security data.

Holger Rootzen at the Chalmers University of Technology called it a "very careful and good analysis" that reveals a mortality plateau between ages 105 and 110.

2 in 100,000

the chances, if you are female, that you will live to be 110

2 in 1M

the chances that you will live until 110 if you are male

APPENDIX V-c

Public Meeting Transcript

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY
Region II

- -

HERCULES SUPERFUND SITE

SUPERFUND SITE PUBLIC MEETING

- -

Township Municipal Court
21 North Walnut Street, 2nd Floor Meeting Room
Gibbstown, NJ
August 16, 2018
7:00 p.m.

P R E S E N T

PAT SEPPI, EPA, Community Involvement Coordinator

PATRICIA PIERRE, EPA, Remedial Project Manger

JOEL SINGERMAN, Superfund

DR. LORA SMITH, Human Health Risk Assessor

GWEN ZERVAS, Section Chief of NJ Department of Environmental Protection

CRAIG STEVENS, CSI

P R O C E E D I N G S

MS. SEPPI: I have a couple more people signing in, but I'd like to get started on time.

I really appreciate you being here on time. And it seems like we have a really nice turnout.

I wanted to thank the Mayor and Jeff for letting us use this meeting room tonight. It really worked out fine. We kind of messed them up and moved things around. But we'll put it back when we leave.

What I'd like to do first is have the people who are associated with the Hercules site introduce themselves.

My name is Pat Seppi. I'm with the EPA. We're out of Region II. Our main office is in New York City. And we cover New York, New Jersey, Puerto Rico, and the Virgin Islands. And we also have a satellite office in Edison, New Jersey. And that's where our laboratory is.

And again, I'm Pat Seppi, community involvement coordinator for this site. And I'd like to go around and have the other people who were involved introduce themselves and let you know their role.

MR. SINGERMAN: Joel Singerman from the Superfund program.

MS. PIERRE: My name is Patricia Pierre. I'm the EPA remedial project manager for the site.

DR. SMITH: I'm Dr. Lora Smith. I'm the human health risk assessor for the site.

MS. ZERVAS: I'm Gwen Zervas, The Section Chief of the New Jersey Department of Environmental Protection.

MS. SEPPI: We have a couple other people who I would like to have introduce themselves. Maybe you can just speak loudly, so people can hear you. You don't have to come all way up.

MR. STEVENS: Craig Stevens. I'm with CSI principal working with Ashland and with EPA.

MR. FERRIS: Dustin Ferris environmental scientist, project manager for remedial investigation of the site.

MS. SEPPI: Thank you. So thank you for coming out, again, to the meeting. The reason we're here tonight is to present EPA's preferred alternative for the cleanup for the

Hercules site.

So I guess everybody that I've spoken to has lived here for a long time, so you're very familiar with it, with the site and what's going on. And we're happy to be able to come here tonight to give some good news and talk about the cleanup.

So there's a comment period that goes along with this meeting. And it ends on August 28th.

So tonight, you notice we have a stenographer here. Her name is Kathryn. She'll be taking down all your comments. And then what we'll do is after all those comments, what happens after the end of the comment period, is -- the next thing that comes along is a legally binding document. It's called the Record of Decision. We call it the ROD. And that will set down in black and white what the remedy is. That's why it's important for us to have your comments, because it may change things. It may reinforce the fact so people agree with what we're doing. We definitely want to hear your comments.

And then, again, we'll put them all

together in what is called a responsive summary. And that will be an attachment to this Record of Decision when that comes out.

Now, after tonight's meeting and before the close of business on August 28th, you're certainly still welcome -- you may think of something when you go home tonight and have a comment about it. You can certainly either email that to Patricia or send it to her. If you need that information, I'm happy to send it to you or give it to you. But it's also in the proposed plan that's online. So hopefully some of you have read it. It's a long document. It's a little technical. But if you're able to read even sections of it, I would suggest that you do that.

As I said, we do have a stenographer. I would ask that when you come up at the question and answer session, if you -- we'll have a microphone up here. If you can just state your name so we make sure that we have it for the record so we can respond to your comments.

And I would ask one other favor -- and I know sometimes it's difficult -- if you could hold your comments or your questions until the end of our presentation -- it's not a real long presentation. It's just sometimes if we get off track and start answering questions and maybe your questions will be answered during the presentation. So if you could do that, we would all appreciate that.

I think that that's the most important things that I wanted to tell you. If you haven't signed in, I would ask that you do that.

I'm going to turn this over to Joel. And he's going to talk a little bit about the Superfund process.

MR. SINGERMAN: Several well-publicized toxic waste disposal disasters in the late 1970's shocked the nation and highlighted the fact that past waste disposal practices were not safe.

In 1980, Congress responded with the creation of the Comprehensive Environmental Response, Compensation, and Liability Act, more commonly known as Superfund.

Superfund law provided a federal fund to be used in the cleanup for uncontrolled and abandoned hazardous waste sites and for responding to emergencies involving hazardous substances.

In addition, EPA was empowered to compel those parties that are responsible for these sites to pay for or to conduct the necessary response actions.

The work to remediate a site is usually very complex and takes place in a number of stages. Once a site is discovered, an inspection further identifies the hazards and contaminants.

A determination is then made whether to include the site on the Superfund National Priorities List, a list of nation's worst hazardous waste sites.

The sites are placed on the National Priorities List, primarily on the basis of their scores obtained from the hazard ranking system, which evaluates the threat posed by a site.

Only sites on the National Priorities List are eligible for remedial work financed by the Superfund.

The selection of a remedy for the Superfund site is based on two studies, a remedial investigation and a feasibility study.

The purposes of the remedial investigation is to determine the nature and extent of the contamination at and emanating from the site, and the associated threat to public health and the environment.

The purpose of the feasibility study is to identify and evaluate ways to cleanup the site.

Public participation is a key feature of the Superfund process. The public is invited to participate in the decisions that will be made at the site through the community relations program. Public meetings, such as this one, are held as necessary to keep the public informed about what has happened and what is planned for a site. The public is also given the opportunity to ask questions about the results of the investigations and studies conducted at the site and to comment on the proposed remedy.

After considering public comments on the proposed remedy, a Record of Decision is signed. A Record of Decision documents why a particular remedy was chosen. The site then enters the design phase where the plans associated with the implementation of the selected remedy are developed.

The remedial action is the actual hands-on work associated with cleaning up the site.

Following the completion of remedial action, the site is monitored, if necessary. And once that site no longer poses a threat to the public health or the environment, it can be deleted from the Superfund National Priorities List.

Now, Patricia will talk about the remedial design.

MS. PIERRE: So the Hercules Site is located on North Market Street, here in Gibbstown.

It's a former chemical manufacturing facility built in the 1950's that produced phenol, acetophenone, and cumene and benzene compounds associated with that process.

Operations at the plant ceased in 2009. And most of the aboveground structure was subsequently demolished in 2010.

Hercules LLC, which is a subsidiary of Ashland, LLC, owns the property and is responsible for the plant.

The site sits on 350 acres of developed and undeveloped land near the Delaware River. It's bordered to the north by the River, to the south by a residential area, which is served by municipal water, and to the east and west by other industrial properties.

Clonmell Creek flows northwest through the property towards the Delaware. And there's a storm water retention basin on the site, referred to as the Storm Water Catchment Basin.

The site is divided into two primary areas. The former plant area is in the southwest corner of the property, highlighted in yellow in the bottom left-hand corner, is the former plant area, which covers approximately 80 acres.

And then the solid waste disposal area, which covers about 5 acres, is located in the northernmost portion of the property.

Remediation activities at a site are sometimes divided into two different phases called operable units, or OUs. This site has three operable units.

OU3, which has already been addressed, is associated with the solid waste disposal area.

This area sits about 2,000 feet north of the plant and is surrounded by wetlands.

The contamination in the solid waste disposal area consists primarily of tar waste and some lead fragments and construction debris.

Hercules conducted a Remedial Investigation and Feasibility Study, or RI/FS, under NJDEP oversight. From the result, it was determined that the soil and groundwater required remediation. NJDEP signed a recommended decision selecting an OU3 in 1996.

The remedy called for consolidation of the waste to hinder any permeable path to restrict access and prohibit groundwater in the area, and long-term groundwater monitoring.

The OU3 remedial action was completed in 2014. The ground water is sampled on a quarterly basis. And EPA reviews the remedy every five years to ensure everything is protected.

Operable Units 1 and 2 are essentially the former plant area, and are the subject of tonight's meeting.

OU1 addresses the groundwater and the

process in disposal areas. In the mid 1980's a groundwater pump and treating system was installed to prevent off-site migration of contaminated groundwater. The system was subsequently upgraded in 2008, and is still being operated. A final groundwater remedy will be selected with this.

As part of the groundwater monitoring program, both on and off site monitoring wells as well as the municipal water supplies wells will be sampled on a quarterly basis

OU2 addresses the soil and the main process in disposal areas. And the surface water sedative in the Clonmell Creek and the Storm Water Catcher basin.

The OU1, OU2 RI and FS were conducted by CSI Environmental on behalf of Hercules.

Soil, groundwater, surface water, and sediment samples were collected. And human health and ecological risk assessments were performed as part of the RI and FS. And on site treatability studies were also performed as part of RI FS.

So at this point, I'm going to ask Craig Stevens from CSI to come up and discuss the details of the RIFS and I'll be back to you to present the remaining alternatives.

MR. STEVENS: Good evening, everyone. I'm going to briefly summarize the remedial investigation, what was done, what we found, and the highlights.

This is a figure showing the property lines. The area in the color represents the property, itself -- which you can see extensive investigations have been done during the history of the remedial investigation. All the data points that have been collected, not just on the site but throughout the Township, are represented here. And to date, the soil and sediment was looked at over 8,000 locations and generated more than 500,000 data points to understand and characterize the site.

Here's a little closer view focusing on the groundwater monitoring that works throughout the area. And again, not just on the site, but throughout the Township. We have approximately 80 permanent groundwater monitoring wells that we sample on a combination of annually and quarterly. So we can understand groundwater flow as well as quality, what's at the site, the chemicals, what are they doing, and where do they go.

Another important purpose is so that we can study groundwater conditions throughout the Township, itself, to ensure public safety.

As part of that, there are samples of the two township falls TW4 and TW5 quarterly.

Focusing on the groundwater pumping treating system, it is a critical element that ties in with the groundwater monitoring. Regional flow is in this direction towards the Township and the former plant site.

We have a series of shallow and deep pumping wells that are continuously operated that create, what we call, a groundwater capture zone, shown here, acts almost like a groundwater fence, if you will, to prevent any chemicals that are present on the site's groundwater from infiltrating beneath the Township.

The groundwater from these wells are then pumped to a treatment plant towards the rear of the former manufacturing plant where the treatment occurs and then it's ultimately discharged to the Delaware River via a permanent outfall.

So what's the essence of what we found on this remedial investigation. The process, itself, entails that we want to identify site specific chemicals. We're looking at the right place, the right speed of compounds. And then we go through a process where we look at the human health risk considerations, what's the ecological considerations. And then all that is compiled into a final study. We look at applicable state and federal standards to come up with remediation criteria.

At the end of the day here, we're then able to plot that and look at areas that exceed criteria or require further remediation.

And for soil, it's highlighted in this darker color, reddish brown. Those two areas we've identified where sediment remediation will be required. One is a surface water body and the other is a creek, Clonmell Creek, which transects the back of the property, itself.

In addition, we still have the pumping wells, which maintain the groundwater cap, itself, to be protective of groundwater.

I mentioned the chemicals of concern for the site. Here's the list that's carried forward into this process. It lists the chemicals as well as each media or need further effort.

The two that are highlighted are the two compounds that are really driving a risk at this site, warranting the remediation. And I can say from all the work that we've done that cumene is present most abundantly and has the highest concentration.

So while we've been doing all these studies and evaluating the site, we've also gotten a head start at looking at what remedial technologies are most favorable moving forward, so we can keep the process moving efficiently. This is under the former plan area, itself. This is one of the areas that is requiring shallow, storm, and groundwater remediation.

So we've done a series of tests starting in 2010, where we injected chemicals to oxidize the chemicals that are present in the saturated faulty groundwater to restore them and remove them from the subsurface.

In 2011, we did what is called air sparging and soil vapor extraction test, where you inject air into the surface to try to strip out the chemicals and then capture them in a system.

Same here we also did some oxygen injections called ISOC, where you try to saturate it with oxygen to degrade what's present.

For those first three we saw limited success initially, but we were really hindered by the complex site. So as a result in 2016, 2017, we moved forward with a different type of microbial degradation testing to evaluate and we can put nutrients in to stimulate what's already there to break it down.

The results from that microbial study were very favorable. This is approximately a one year study. We saw really good decline over that one year study.

I mentioned sediment -- areas where we had to do sediment remediation. This is more of a close up of Clonmell Creek to the back behind the plant, it's the old waste water treatment system. And what we did was we tested out using a hydraulic dredge to pump the sediment in this area which flows from through the system into specialty designed textile tubes to restore and resurface for safety and evaluation.

And these are just photos of the study that was done showing different highlights throughout the phase. Initially, when they're pumped into these tubes that contain the sediment and the chemicals that are within them. And we measured all the media, not just the sediment, the water, and the air to verify what was going where.

In the second step, after we reviewed water, we wanted to look at some natural remediation. So we planted specific species of vegetation, all part of remediation, which is a fancy word for plants, in the soil to see what that would do to help further treat the sediments.

And you can see within six months how successful that was and the type of growth that we experienced.

Better yet, we saw excellent results with the chemical data and the sampling from the GO tubes, these are the initial concentrations. And in less than six months, it went down to zero or close to zero. That's a very favorable approach that we're look at that moving forward.

Patricia?

MS. PIERRE: Okay. So based upon the results of the RI and the risk assessments, EPA has developed specific goals for the remediation of the site designed to protect human health, and the environment. These goals are called Remedial Action.

And with these objectives in mind, the remedial alternatives were developed to address contaminated soil sediments and groundwater at the site.

So the first soil alternative, which would be alternative S1, would involve no action being taken.

Soil alternative two would involve excavation with off site disposal of the contaminated soil from 0 to 4 feet deep, and then treatment in place for the contaminated soil that's deeper than 4 feet, using the biodegradation that Craig just discussed.

Soil alternative three would also involve the excavation of contaminated soil from 0 to 4 feet, but only the lead contaminated soil would be sent off site for disposal.

The excavated soil containing benzene and cumene and other COCs found at the site would be treated using bioremediation and then will be used on site. And the soil deeper than 4 feet will still be treated in place using biodegradation.

So for the sediment alternatives -- I won't go over no action need. Alternative SED 2, which consists of removing the contaminated sediments from Clonmell Creek and the storm water catcher basin, and transporting them off site for disposal.

And Alternative SED 3 would involve, again, the removal of the contaminated sediments in the creek and the storm water catcher basin. But instead of being transported off site for disposals, the sediments will be treated on site using bioremediation process that Craig just discussed.

So as we stated earlier in our presentation, many years of monitoring data shows that the existing groundwater treatment system has been effective at preventing contaminated groundwater from migrating off site.

Because of the effectiveness of the system or the existing system and the anticipated removal of the source of the groundwater contamination, either soil alternative S2 or S3 additional groundwater alternatives will not be taken.

So what we have under alternative alternative G2 is a new treatment unit that will be able to replace the existing one. And a small building to hold them.

The existing pipelines and pumping well will continue to be used to extract the contaminated groundwater and carry it to the new treatment.

The preferred remedy for the site consists of soil alternative S3, sediment alternative SED 3, and groundwater alternative G2.

Just to recap, the soil remedy would involve excavation, off site disposal of the lead contaminated soil, excavation on site treatment of the COC contaminated soils from 0 to 4 feet, and then enhanced biodegradation of the COC contaminated soils below 4 feet, followed by on site reuse of the treated soils and institutional controls, which would prevent soil disturbance in the treatment areas until the cleanup levels were met.

The sediment remedy would involve removing of contaminated sediments and placing them into GO textile treatments, dewatering the sediment, and treating the extracted water on site, if necessary. Final remediation of the soil on site will be treated.

And again, the groundwater remedy will involve constructing a new treatment in order to replace the existing one and using the existing wells and pipelines to carry the contaminated ground water to the new treatment. And this alternative will also involve institutional control to prevent the use of the groundwater until the cleanup is met.

So the construction time is estimated to be two years time to meet cleanup levels. The excavated soil that will be treated on site is one year.

Time to meet the cleanup levels in the soil that will be treated in place is 10 years.

And the time to meet the cleanup levels in the groundwater is 10 years, as well. The cost is $11.3 million.

These are just some of the factors that went in to selecting this particular remedy. We believe that it will be moderately easy to implement. And as Greg discussed, there was positive soil and sediments treated during studies.

It will remove the soil that is acting as a source of contamination to the groundwater, as well as permanently remove the sediment poising as an ecological risk.

It will also allow for on-site treatment and beneficial reuse of the soils and sediments.

That's it.

MR. SINGERMAN: The final decision will not be made until we consider all public comments, questions, and concerns.

MS. SEPPI: We'll start some questions.

I just wanted to also let you know that if you will take a look at the proposed plan, all this information is in there, even in a lot more detail. So it will certainly get into more -- if read more of the details. But we would have you here for seven hours if we tried to go through that whole plan.

So please, go ahead, it's on our web page. And also, what we'll do is when I get this from Patricia, this presentation, I'll make sure that we post that on her web page, also. That way, if you want to go back and take a look at it and take some time, that will be available, also. So just give me, probably -- I'd say you can send it to me maybe tomorrow or Monday, early next week it should be posted on our page.

So now it's your to turn to come up and ask questions or give comments. And I'm going to put the mike up here. And Kathryn, our stenographer, if we could just ask that when you come up to give your comment or your question, that you please state your name first so she'll have it for the record. So let me put this out here. And anybody with a question or a comment, please come up.

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PUBLIC COMMENT

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MR. MORLACHETTA: Good evening. My name is Paul Morlachetta. And I reside at Holly Place, here, in Gibbstown. I want to thank EPA for their concise report.

What I have to report is some of the things that have already been discussed. And I don't see any harm in repeating some of those.

Some are questions, some are answers, some are just statements. I'll start off -- why is this proposed cleanup for the Hercules site being proposed again, since it was done and settled before? At that time, there were several cleanup options considered, some costing several million dollars. A greatly reduced option with a considerably less cost was selected. Is there something wrong with the settlement?

Several test wells were installed on Holly Place, where I live. And other members are here from Holly Place and the area around. We're right across Railroad Avenue, just across the street from the site.

These water wells are sampled regularly. Will these wells suffice? Or will more be needed to monitor the groundwater?

I think that a portion of DuPont property was deeded over to Hercules. That area contains several feet of sludge and tar-type materials.

It also was covered with clean fill and a non-porous material. That was an easy out at that time.

While Hercules was operating, there was always a very noticeable odor of cumene. Is there any evidence remaining of cumene on or under the surface? And you already took care of that.

Asbestos-like material was located on a pipe in the northwest area and was not sampled, because the pipe could not be located. That I received from a disk at the library.

Is asbestos an item of concern on the current proposal? And that didn't seem to be addressed.

And the disk I renewed at the library, there was several mentions of red material basin. What is a red material basin? Does anybody have any information on that? It showed up on the disk several times. Apparently, at the time, it was an area of concern. And that's all the information I could get at that time.

Again, in summation, what has happened to reinstitute another proposed cleanup of the Hercules site? Have there been different things uncovered that should have been cared for the first time? And has the time predicated that another plan should be made?

That's all I have to say. But it's very heartening to see so many people out here tonight. The last public hearing that was held for this site, there were two people here, me and a representative from Hercules.

So again, thank you for your input and thank you for everybody being here.

MS. SEPPI: Thank you. Those are comments, and, of course, that will all be into the record. Anything in particular you wanted to respond to now?

MS. PIERRE: Yeah. There's one question that I would like to address. And that is why we're here tonight presenting another remedy for the Hercules site.

And the answer to that is that a Record of Decision was signed for the solid waste disposal area for OU3 in this portion of the site. The subject of tonight's meeting, and the remedy that's being proposed, is the former plant area. So it's not a reopen, per se, of the remedy that was selected. It's a remedy being selected for a different portion of the site.

MS. SEPPI: We appreciate that. That was a lot of good comments. And we will make sure they are addressed in the Response of Summary that will come out with the Record of Decision. So thank you for that.

Anybody else have any -- yes, sir.

MR. GENTILE: My name is Anthony Gentile, 56 South Orchard Street.

Back in 2014, we were having a house built. The contractor built the house into the water table. And we were dumping water constantly, about 300 gallons an hour out of the house. And it had a bad odor.

So during that process, I happened to see a truck across the street from us with all these hoses out of them and they were going to test, which I found out. So I questioned that. I called my lawyer and wanted to know what it was about.

I questioned the operator. He told me he was working for Hercules and CSI. And I got information. I got ahold of my lawyer and my engineer. And I talked to a gentleman from CSI. He, as a matter of fact, came to my house and observed and did notice that there was a smell.

To make a long story short, I had two environmental people come in and did water testing. And the test came out levels above state levels of benzene in my house. Two qualified people, one of them was off the state contractors list, which I got from the State. And we've been living in that fear, living in benzene.

Mrs. Pierre came down. The County came down. And all I asked them to do was Look, if you don't think it's here, because that's what I was getting, the song and the dance -- it's not here. Our tests show it's not here. They are below level. Well, I got two qualified people saying it's above level.

I asked -- simply said, Well you do a test then. They wouldn't do the test. I asked the

County to do a test. They came down, too. A lady came in with a clip board. She goes, I don't see nothing here. Well, do a test. No, we won't do a test. So they avoided the fact that I spent probably 6, $7,000 getting these tests done. And nobody wanted to acknowledge it. Nobody wanted to come in and verify.

The contractor that did the test, he was an environmental hygienist with a scientist's degree. He wasn't a nobody that I got out of the woods somewhere.

But he got his hands smacked and wouldn't come to court and testify for me, because he worked for the State.

So as it turns out, we're living in what they were referring to as a house that is -- a sick house. And we've both been sick from it. And we got pushed into that house with 300 gallons of water coming out of it by the township engineers and officials. Instead of correcting the problem, they covered it up.

So I got reports here, many phone calls to CSI, many phone calls with me and Mrs. Pierre, many phone calls from the County, and we're still living with that.

And I see, they are still working on the groundwater contamination. So there must be some kind of problem going on in this town. There's got to be.

So you're all going to be dying like some of the other people that have been dying from chemicals in this town. That's all I have to say. And don't grin at me because it ain't funny.

MS. SEPPI: Nobody would think it is funny, believe me.

MR. GENTILE: He's laughing up there.

MS. SEPPI: We appreciate that. And it's good to get that story out about what you've been going through, but I don't want to take a whole lot of time now for people to answer to see if anything's changed. If you could stay a little bit afterwards, maybe we could talk a little bit more about your situation there.

MR. GENTILE: Sure.

MS. SEPPI: Thank you.

MS. MEEHAN: Hi Jennifer Meehan. And the question that I have it's -- I guess it's relevant to what he was mentioning, but it's a more broad general question.

In terms of -- what's the ultimate goal in terms of the threshold of cleanup for this? Is it to make sure that there's a certain lack of contaminants that are outside? Is it focused on internally here? Is there ever any intent for this to be cleaned up enough that it could actually be something other than a superfund site where people could actually live or people could spend time? What's the ultimate threshold for this site and the surrounding area?

I understand the little components to a degree of what you're mentioning, but I don't understand where that means ultimately in terms of actually, really, a safe clean site and surrounding it.

MS. SEPPI: Patricia, is that something you can respond to?

MS. PIERRE: Yes. So as part of the RI Process, we have developed preliminary remediation goals. We call them PRGs. These are cleanup numbers based on standards, state and federal.

So this site will be cleaned up to commercial, industrial levels, which will allow the site, ultimately, to be reviewed for that purpose, commercial, industrial.

MS. MEEHAN: Is that a lower threshold? I mean, I assume that it is then -- something that could be housing or farmland, that's impossible, that's never going to happen, given the plans that are in place right now?

MS. PIERRE: Well, that's the current zoning for the property. And our understanding from the town is that it's not anticipated to change. So that's how we selected the remediation goals, based on the zoning.

MS. SEPPI: Cleaning up the residential, that's not the way it's at right now. It would have to be much lower in order to build houses. But that's not our goal. It's to cleanup commercial and not residential.

EPA is involved, too, and interested in reuse and redevelopment. So we'll be here as that work goes on, and work with the town to help them develop what they want to see with this site in the future.

MS. PIERRE: Also, I would like to reiterate that we do have a groundwater attraction and treatment system that is being operated at the site and has been operated for many years. And the data has shown that it's been effective at keeping the contamination in the groundwater contained to the site.

And we also monitor groundwater wells off property. And we are not seeing these site contaminations outside of the property boundary.

MS. SEPPI: I think that's a really good point to make, too. I think, Craig, you said that with all those wells -- some are tested quarterly, some are tested annually. It sounds like there's always testing going on out there --

MR. STEVENS: Correct.

MS. SEPPI: -- and those results, I'm sure, would be available. They must be public if people wanted to see them.

MR. STEVENS: Yes.

MS. MEEHAN: Is all testing done through EPA and the State? Is there any third party that's not affiliated with EPA or with Hercules?

MS. SEPPI: Well, it's our contractors who do the testing, so they are affiliated with

EPA. I'm not aware of any third-party contract.

MS. PIERRE: It's actually Hercules.

MS. SEPPI: Hercules. I'm sorry.

MS. PIERRE: CSI performs the testing at the site, but there are no other parties at the groundwater site.

MS. SEPPI: That's how it is with all the sites. A superfund site that has a responsible party, it's their contractor who does the sampling and writes the report. But, of course, it's an OPA oversight. So we look at all those reports. And the State does, too. Right, Gwen?

MS. ZERVAS: Yes.

MR. SINGERMAN: In addition, all the laboratories they use are all approved laboratories. They have to get the EPA's approval before using those laboratories.

So again, all of this work is being done by the responsible party's contractor under EPA's oversight.

MR. STEVENS: And there's also independent third party validation that goes on outside of CSI that reviews all the lab data so that it's ready for distribution and use.

MS. SEPPI: So there is kind of indirectly a third party out there --

MR. STEVENS: It's quality assurance.

MS. SEPPI: Right. And that's good to know.

MS. GENTILE: Donna Gentile. I just wanted to ask a question to the people from EPA.

When you plan to take all this contaminated soil out of the town, it's going to disrupt things for the citizens here.

Did you plan on letting them know what it's going to be like having trucks with all these contaminants being taken out of the town, probably right down Broad Street? I mean, it's going to take, what, two years for all this? Did you plan or did you let these people know what's going to happen? That's my question.

MS. PIERRE: So we did look at that. And that information, that evaluation, in comparison, is in the proposed plan. But only the lead contaminated soil, which is a very limited amount, will be taken off site for disposal. Because the preferred way would involve heating the excavated soil, benzene and cumene and other COCs on site. We'll be using that treated soil on the site.

MS. GENTILE: When you bring it out of the town, will it be covered? How will it be transported out?

MS. PIERRE: There will be safety measures in place to ensure the protection of the community while this work is being done. And that will be part of a design plan that will ultimately be developed.

MS. SEPPI: After the Record of Decision is final, the next step, as Patricia mentioned, is the remedial design. That's when you get into kind of all the nuts and bolts of what's going on. The transportation, dust control, that kind of information. What kind of air monitoring will be done. They are all separate documents that have to be put into this design.

So sometimes these questions are a little bit premature. But they will definitely all be looked at during the design phase.

MR. SINGERMAN: One of the documents that is prepared is called Health and Safety Plan. That not only protects the workers who work on the site, but it also protects the people who live around it.

So again, our objective is to clean up the site, not to spread contamination around. So it keeps contamination where it's supposed to be. Whatever is excavated, we put in the trucks to be transported so it's not spread outside the boundary of the property.

And again, the air monitoring will be performed during the excavation to make sure there are no releases that are unacceptable. And sometimes these things happen, sometimes they have to measure -- for example, in case we have a release on this property. They would have to stop working and have to pause it. And sometimes just spraying water on an excavation can cause a problem.

Again, all of this will be part of the Health and Safety Plan as part of our design to make sure the workers and the community are safe.

MS. SEPPI: And releases don't happen very often. They really don't. And the trucks that usually go off site, I don't know if you've seen them, we call them burrito trucks, because they actually fold over. So none of the material that's inside the truck can be dumped on the ground.

And usually when trucks are leaving the site, they are decontaminated before they leave the site, too, to make sure they are not tracking any contaminated material out into the streets. Those are all the types of things that we look at in this design.

MR. SINGLETON: Eric Singleton. Just to follow up on Donna's question, can you just give us an idea of what sort of volume of contaminated soil are we looking at excavating and removing in terms of like dump truck fulls, or train cars full? And where is that stuff going to go? Like who are we dumping our problem on?

MR. STEVENS: Most of it is treated on site.

MS. SEPPI: Right.

MS. PIERRE: Again, it will only be the lead contaminated soil that would be transported off site. The volume is roughly 1,200 cubic yards. I don't know off hand what that translates into, as far as truckloads are concerned. The information is in the proposed plan, I just don't remember that figure off the top of my head.

But again, the volume to be transported offsite is very limited.

MS. SEPPI: Is it usually 20 cubic yard trucks?

MR. STEVENS: It depends. The 1,200 yards could be 15, 16, 1,800 tons, and about 20, 25 tons per truck.

But as Patricia said, the rest of the soil is going to remain on site and is going to be treated on site.

MS. SEPPI: Right. Just the lead contaminated is going off.

MR. STEVENS: And we looked at the feasibility study that's transported through town. We wanted to minimize that. That's one of the considerations with treating it on site.

MR. SINGLETON: Where is that going to end up?

MR. STEVENS: After all the treatment is finished, it's going to be used in a clean soil cover to lower the groundwater infiltration rates driving the public treatment system.

So it's, again, part of a holistic remedy to be protective of human health and the environment.

MS. SEPPI: I think he meant off site.

MR. STEVENS: Oh. You mean the lead? That's going to be going to a certified disposal plant. That hasn't been determined yet. It will be a certified facility that's permitted to accept that type of material.

MS. SEPPI: That's part of the design, too. What type of landfill it would go to? We don't know that yet. We won't know that until later on.

MS. MCFARLAND: Hi. Taylor McFarland for the New Jersey Sierra Club.

I do have a question. I don't know if it's in the OU3 area, but if you're taking out the tar pits, the contaminated tar pits, I'm not sure that's specific to the Hercules site. But we do want to know if the tar pits are going to be removed.

And also, if there's any capping going on. We're concerned -- especially, because it's in a flood prone area -- that capping won't work. The breakdown from storm sewers and flooding.

We're specifically concerned, especially with the weather that we've experienced this past week where five counties were in a state of emergency because of extremely high rainfall and flooding.

So we were wondering if capping is included in the proposal, and -- yeah. That's it.

MS. PIERRE: Thank you for your question. So the tar pits are part of OU3, the solid waste disposal area. And a Record of Decision was already signed for that portion of the site. The remedy was conducted. And now that site is in operation.

So to answer your question, those tar pits won't be removed. The remedy was to cap them into place.

The groundwater is monitored on a quarterly basis. To show that, these orange dots show the coverage that we have of the capped area. And these groundwater wells are monitored on a quarterly basis. We review the data to ensure that the remedy remains protected in those areas. And the levels are continuing to decline.

And we also looked at the remedy every five years to ensure that it's protective of human health and the environment. So that's that part of the site.

The second part of your question is capping being proposed for the OU1, OU2 area. And the answer is no.

We would reuse the treated soil and sediment on site in the OU1, OU2 area as a soil cover, just for grading purposes -- right? For grading purposes.

MR. STEVENS: Yes. That's right.

MS. PIERRE: But not as a cap.

MS. MEEHAN: Jennifer Meehan, again. I actually wanted to ask the doctor that's here representing human health concerns for the contaminants that are highest here of biggest concern, can you tell us a little bit more about the health risk? I automatically think about things like cancer. I feel like that's an obvious one that everyone is always concerned about.

What should we actually be aware of and mindful of when we're thinking about the contaminants that are here, and what they can do to us as people?

DR. SMITH: So there are various health pinpoints that we look at for the different contaminants at the site.

Benzene is a known human carcinogen. Cumene, not so much. There are like kidney and liver effects, things like that.

But, you know, based on the data that we've seen, the contamination is pretty much -- it's contained on the property, itself. So we have not seen the contamination in the groundwater moving off property. And stuff that's in the soil is not migrating.

So I don't think that anyone who's off property -- we even looked -- we did in 2011, along Railroad Avenue, the homes that are closest down gradiant on the southern end of the site, we did a vapor intrusion investigation. We looked to see if the contaminants in the groundwater could be migrating up through the soil, collecting under the homes, and then making their way inside the homes.

And in that investigation, we did not find that was a complete exposure pathway. We were not seeing anything in the groundwater. And we weren't seeing anything getting from the groundwater into the homes. So we continued our investigation.

So I don't believe that there are any impacts to the community, based on the data that we have seen. And then this remedy will make sure we don't see any impacts going forward.

MS. MEEHAN: Just to recap, so benzene is a carcinogen. And cumene is kidney and liver.

DR. SMITH: I believe so, yeah. I have some sheets on the Agency for Toxic Substances and Disease Registry, the CDC, they put up these tox facts sheets, which are pretty easy to understand. They are one or two pages. And it goes over how you can be exposed and different health effects to be aware of. I have copies of some of those I can share with you after the meeting.

MS. MEEHAN: And for people that live here in Gibbstown that do have concerns, are there recommendations that you have? Is it drink bottled water and...

DR. SMITH: So your groundwater is the

municipal supply water. So it actually comes from a much deeper aquifer than where we see contaminations on the site. So that goes to municipal wells where it's treated. They test it. You can get reports, annual reports, they put out. They look for COC, which is contaminants that we are mostly concerned with here.

And so that information is available to you. And they've been meeting all of the goals the last time I checked. So groundwater should not be an issue. These contaminants are in the ground. I don't see them becoming volatile. So I don't think there should be an issue --

MS. MEEHAN: What about home gardeners?

DR. SMITH: Well, the only contaminated soil was found on the property. So there are no residents on the property.

So that's why the site is zoned for commercial, industrial. We'll make sure it isn't used for residential purposes in the future.

I mean, I always recommend that you have your soil tested. And there are -- like Rutgers has a center who will test your soil.

And I'm sure there are other local places. But you should always test your soil before you grow a garden, I would say, especially in New Jersey.

MS. SEPPI: And also, it's a good idea to find out more about your water company. Do you know which water company you have here? You can go online. I'm sure they have a website. They also have to send out a yearly report, which I'm sure everybody gets. And they go into a lot of detail. There's a lot of good information. There are contact names and numbers to call if you have any questions. They have to report out if there are any problems. So all that information is there.

So if you get it and you don't have a chance to read it, just go online. And the water company will go town by town where it will have all your information. Is that correct, Mayor, is that how it works?

DR. SMITH: I actually have a copy of the Greenwich Township report with me.

MR. MORLACHETTA: A couple of the graphs I looked at -- you show remediation programs for 80 acres, when the Hercules site is 350 acres.

What happens to the rest of that? I don't know if that was a misnomer or you're just considering the areas where most of the problems exist.

MS. PIERRE: So the 80 acres is the former plant area. And that is where the contamination is, and that's what we're addressing.

The solid waste disposal area, which is a another 5 acres. The rest of the site --

MR. MORLACHETTA: Clonmell Creek is not a part of the 80 acers, right?

MS. PIERRE: Clonmell Creek is not part of the 80 acres.

MR. MORLACHETTA: You're using that as a remediation?

MS. PIERRE: We are remediating the portion of Clonmell Creek that is on the site, yes.

MR. MORLACHETTA: I can assume that you're going to remediate more if it's necessary.

MS. PIERRE: Right. We've investigated the entire site. And our findings are that the area that we're proposing for remediation are the areas that have the contamination.

MR. MORLACHETTA: We're especially concerned because we live so close to the site.

MS. PIERRE: Absolutely. Understood.

MR. MORLACHETTA: Thank you, again.

MR. SINGERMAN: I just want to add one thing. The superfund finds the site as the source of contamination and to where it's gone. So any contamination that has migrated beyond the creek would be addressed.

So if the creek is -- whatever is contaminated in the creek, it's considered part of the site.

And again, our objective is to clean up all contamination.

MR. BRADY: Hi. My name is Tom Brady. I live at 720 Washington Street. I have a question for the EPA.

When you guys were mentioning things about contracts, Hercules, are they associated to Ashland Corporation?

MS. PIERRE: Yes.

MR. BRADY: Who originally owned the site that's contaminated?

MS. PIERRE: Prior to Hercules?

MR. BRADY: Correct.

MS. PIERRE: DuPont.

MR. BRADY: Okay. So we have the company that's doing all the tests, that's the same company that contaminated the site, originally?

MS. PIERRE: Right, meaning Hercules.

MR. BRADY: Okay. It's basically like if I go in and shoot somebody and I'm doing forensics on my own gun, isn't that a conflict of interest?

MS. PIERRE: No. Because this is being done with EPA oversight. So we are reviewing all the data --

MR. BRADY: Well, to be honest with you, that doesn't make me feel any better.

MR. SINGERMAN: Under the superfund law, if there are liable parties out there, we prefer they deal with it first, because the Superfund is only --

MR. BRADY: If they obeyed the law first, they wouldn't have contaminated the site. So you really think that they care about the law when they are evaluating their own site, they are paying for their own site, and all you guys are doing is just doing Jack in the Box.

You can say whatever you want about

improved labs and whatever else, but I find that to be a conflict of interest. I wasn't born yesterday.

MR. SINGERMAN: Well, we signed an agreement with Ashland. There are penalties. They are required --

MR. BRADY: Penalties on a company that has revenue of over $4 billon. And it only cost them 12 million, so do that math. You really think a little peasy couple million dollars is going to hurt a company like that?

You really think they care about Gibbstown? You really think they care that it's going to take two years to do a minimum cleanup for something that's been in place for 30 years and is going to take another decade to make an assumption that it's going to be cleared? Come on.

MR. SINGERMAN: Well, obviously they care, because they entered into an agreement.

MR. BRADY: If they cared, as I said, they wouldn't have allowed that to happen in the first place.

MR. SINGERMAN: But the thing was many companies didn't hold a standard of practice back in the day. It wasn't until -- a lot of environmental regulations weren't in existence at the time. That's one of the reasons why we have Superfund. We have disposal practices that occurred going back 70, 80 years and no one cared.

For example, Love Canal, that was one of the first steps -- I don't know if you've ever heard of the site -- that basically triggered an ultra fund program. It was a canal that was never finished. They put chemical wastes in there. They built a school on top of it. And houses were built right next to it. And it started leaking.

At the time, it wasn't necessarily that chemical disposal had any intentions to hurt anyone, that was the practice back then.

But we entered an agreement with Ashland to do the work. It's under EPA oversight. And our objective is to clean up the site. If we have viable parties that are willing to do the work, we have them do the work.

MR. BRADY: You're saying you're going to help clean up the site, and I want it to be approved to allow for residential and commercial. Because if I'm a business owner, I'm not going to seek out to build on that site. And I'm sure as hell not going to move to Gibbstown as a resident to build on the site.

So why don't you force them to clean it up to a residential level and do it the right way? Because right now, it seems to me like you're just making excuses to cut corners just to do the bare minimum.

MR. SINGERMAN: No. First of all, we look at the zoning of the property. If there's no plans to make it residential, then we clean it up to the levels of what the current zoning is. There are different levels based upon the use of the property.

MR. BRADY: Well, to be honest with you I don't look at it as Gibbstown, as I live here and this is commercial. I look at all of Gibbstown as my neighborhood. And I can live anywhere or go anywhere in Gibbstown. Gibbstown, to me, is my home.

MR. SINGERMAN: Right. And we're cleaning this property up to commercial use, because -- commercial industrial use, that's what it's zoned for.

Once it's cleaned up, industrial and commercial use can be used for that --

MR. BRADY: We have other property that's zoned for commercial, nobody is building there. Do you think anybody is going to select this property any time soon and say, You know what? I'm going to go build on that site. Knowing this is part of a superfund site. And there's a possibility that there's contamination left in there?

MR. SINGERMAN: As it was indicated, there were thousands of samples taken all over the property. And that's why the study took so long. We wanted to make sure that we did a sufficient job to try to find the contamination.

And we think the remedy that's proposed will clean up contamination and make it safe for commercial industrial use.

MR. BRADY: I'm still not satisfied with your answer, but you're not going to please me, honestly. I'm just calling BS on it. That's the way I am.

Can you go to the slide that says how long the project might last, from two years to 10 years, please?

Can you explain the two years and the 10 year marker on that? Can you explain what that actually means? What does that mean?

MS. PIERRE: So the two years is the estimated construction time, that's the time there will be activity at the site in terms of excavating, building groundwater treatment system, things of that nature.

In the time to meet the cleanup level and the soil being treated after being excavated and also the soils being treated in place, that's what you're seeing in the other timeframe, the one year and the 10 years. And the same with the groundwater.

MR. BRADY: So you're saying it could take up to 10 years now, correct?

MS. PIERRE: It could take up to 10 years to meet the cleanup levels.

MR. BRADY: So the project is projected to take 10 years.

MS. PIERRE: To meet the cleanup levels.

MR. BRADY: 10 years. It's a yes or no question.

MS. SEPPI: Yes.

MR. BRADY: So 10 years. So 10 years from now, the site should be considered ready for construction to build a factory, a warehouse, whatever?

MS. PIERRE: That's the point I was making. 10 years to meet the cleanup levels in the media that's being treated below the ground, so the deeper soils and the groundwater.

But it will not take that long for the site to be able to be redeveloped. Once we meet the cleanup goals and treat the soils, basically --

MR. BRADY: How long's that?

MS. PIERRE: Two year construction time.

MR. BRADY: Two year construction time, but it's not going to be totally stamped for approval for 10 years, right?

MS. PIERRE: No.

MR. BRADY: Am I missing something? To me, it looks like it's going to take 10 years still.

MS. PIERRE: Well, the deeper soils and the groundwater can continue to be treated.

And the site could potentially be used at the same time.

MR. BRADY: Okay. So I come in to Gibbstown and talk to Council, right? And I go to my Mayor and say, I'm going to build a warehouse here. It's going to cost me $100 million. Like one town over, they just built a brand new Amazon warehouse.

So I select this site. I build my warehouse. You think I'm really going to build my warehouse knowing that for another 10 years I might have to have my soil tested? And what if something's found?

So we want to talk about risk. Do you really think that that's going to be something a business or corporation is going to look at?

MR. SINGERMAN: Well, if you're building a warehouse, it's most likely going to be on a slab, right? It's not going to be a basement in the warehouse, right? And all the soil above 4 feet will be removed and replaced with clean soil. So we're only talking about treating for 10 years for soil that's below 4 feet.

So theoretically, a building could be

built anywhere on the property, as long as we still have access to the various areas still being treated today.

In addition, there's only about 80 acres that's contaminated. It's a 350 acre site. So there's plenty room, although there are some wetlands and other area designated that won't be used.

But in addition to these areas that surface soils will being cleaned up, there's plenty of other area on the property.

So again, we're cleaning up the soil. It's not going to be determined to build something off site.

So again development should not be hindered by the fact it's going to take 10 years to clean up soil 4 feet below the surface.

MR. BRADY: All right. The other lady also asked a question about -- and another gentleman over here asked a question about where does the material go? You guys couldn't answer that because didn't select that. Where do most other sites already dump their waste?

MR. SINGERMAN: All over the country there are disposal facilities. So during the design process -- again, after we site the remedy, we don't just go out and start building. We have to design something. We have to do more sampling to find boundaries. We have to design the system that's being developed. We also have to find appropriate disposal locations.

There are these facilities that sort of -- as part of that process, we'll go out and solicit bids for approved facilities.

So again, we won't allow them to take any materials to a facility that's not acceptable in that way. We have this process in place where an agency is divided by 10 regions across the country. So each region has someone that's responsible for making sure that all facilities, disposal facilities, in that region are in compliance. All the disposal facilities that treat or accept hazardous waste have to be in compliance with the environmental regulations.

So we will not allow contractors to send any foundation, like lead contaminated soils, to any facility in this country that's not in compliance, meaning they follow the appropriate regulations regarding how to process these materials. It's most likely going to be taken to hazardous place landfill somewhere in the country.

MR. BRADY: Okay. And how will our town be provided updates if this project moves forward after decisions and final decisions are made?

MR. SINGERMAN: After we finally select the remedy, we will post online a Record of Decision. And we will post the responses that were addressed, all the questions and comments presented today.

And we will, as necessary, keep updates on treatments to keep the public informed. Before work starts, we will let people know what's going on.

We're not going to say Okay, good bye, see you in 10 years. There's a whole process here, where the objective is to keep the public informed as to what's going on one way or another. So whatever is appropriate.

And again, the website -- we will keep the website up to date so you can always just go on the website and see what's going on, because we'll post the status online.

MR. BRADY: Okay. Thank you for taking your time.

I'd like to just take a minute to say something to my fellow residents. If you guys go and take a look just like I did, and you look at this company that was once owned by DuPont -- now it's Hercules, and then now it's bought out by Ashland -- and don't you just kind of think for yourselves it's kind of coincidental that the same company that polluted the ground is also the same company that was awarded a federal contract to clean up all their own problems? I find that still to be a conflict of interest. And I'm not even sure how that got past the Ethics Boards at the EPA level. I would have done touch points myself. And I would have looked at it and saw it to be a conflict of interest.

Just like me, if I have a contract and I go to the town, don't you think that someone from a review board is going to look at it and say maybe we should look at it a little more deeper because he has a particular interest in this? And if you look at it, also, do your own information on Google.

$12 million is a drop in the bucket for a corporation that is making 4 billion a year, not 100 million, not 400 million, 4 billion in a year is their net revenue. Think about that.

And it's going to take up to 10 years for us, another two year effort up to 10 years for the soil possibly -- it's not even guaranteed. We're not even guaranteed it.

So what's going to happen in another 10 years? You think the Federal Government is going to come back in and say, Yeah, we made a mistake and we're going to clean it up again? This is my personal opinion, I think this is all just smoke screen. Thank you.

MR. SINGERMAN: Just to clarify a few things. First of all, EPA does not have a contractural relationship with the contractor. We entered an agreement with Ashland. And it's their contract.

And we have not no contractural relationship with CSI. They've been working for Ashland under EPA's oversight.

In addition, once the record is implemented, as noted by Patricia earlier, every five years we do what's called a five year review. Where we look at the data, we reassess whether or not the remedy is protected. So from this point, once -- going forward, we will, every five years, assess the data and what's going on to make sure it's still protected.

Because again, our purposes here is to clean up the site and make sure it's protected from this point going forward.

And the thing is -- the fact that Ashland makes a lot of money, that's a good thing because they have the money to pay for the cleanup. And they have to money to pay for the investigation.

And again, as I said, we entered an agreement with them. And they agreed to do the work. If they don't do the work, they pay penalties. But they are cooperating.

And again, the important thing about Superfund is that it's only used -- federal funding is only used if the responsible party is not willing or not able to do the work. And that's when EPA hires contractors to do the work.

In this case, we have a viable party. And they are willing to do the right thing by doing the work.

DR. SMITH: I just would like to make a little clarification that even though Hercules is paying for the contract and is collecting the samples, EPA is overseeing all of it. And I can tell you that I've been involved on the site for nine years. And I have told them where to collect samples, how to do the samples, how deep to collect the samples. I told them we need more samples in this area. I oversee all of it.

And the labs that they use are EPA accredited labs. They go through a vigorous process to be approved to take these samples. And they go through a quality assurance and quality control process. These samples are -- we can trust these samples.

I can tell you I've been involved in this site. I care about this site. I have a cousin who lives in this town, so I've been intimately involved in this site. And I can tell you that this is good data. We have a ton of samples here. We don't often get sites where we can collect this many samples. So this is amazing to have this much data to inform our decisions here.

So I understand your frustration. I understand maybe this is your first experience with the Superfund process. It's a long process. And I apologize for that. There's a lot of legal stuff that goes on with that. But I can tell you that we are doing the right thing at this site. That's all I wanted to clarify.

MS. SEPPI: And again, thank you for your comments. Because, believe me, we hear that many times in a lot of our sites. They are being taken care of by responsible parties.

The one thing that Joel said that is true, if we didn't have a responsible party and we had to rely on federal funding, this -- I'm telling you, this would take much, much longer because we only have a limited amount of funding. So we have to prioritize the sites that are out there. And maybe this site would be a priority, maybe not. I don't know.

So we feel that we're fortunate to have a company that's cooperative and willing to pay.

MR. BRADY: Please don't act like you're doing us any favors at this point. At this point, we're way past that. Don't --

MS. SEPPI: I'm sorry. I don't know what you mean by that statement.

MR. BRADY: You're trying to pitch it to us like we should be fortunate. We should be glad they stepped up. You think we really care about that? They've already did their damage. So let's not try to power coat the real issue.

They done wrong. They got caught. And you guys are stepping in because that's your job as the EPA.

MS. SEPPI: That's fine.

MR. BRADY: I don't want to hear the spiel like, you know, we should be fortunate and happy.

Just like 10, 15, 20 years ago companies that made cigarettes used to do their own scientific things saying smoking doesn't kill. We saw where that went.

You have a company that is hiring a third party contractor to do their own assessment, that's where I got a problem. It's a conflict of interest. There's thousands of companies in this country, thousands. And they are all equally able to bid on government contracts, okay? It's just coincidental that -- it's so ironic to me that the company won their very own cleanup contract. That just blows my mind.

MR. SINGERMAN: This is not a government contract. This is a private contract.

MR. BRADY: It's a private contract that you put out for bid for a company to clean up their own cleanup.

MR. SINGERMAN: We entered an agreement with Ashland to do the work.

MR. BRADY: Right. Well, why don't you bill Ashland or whatever the hell they're called today, have them refund you. EPA can go hire their own contract company to clean up the site?

Why did you go through the same company that contaminated the site to clean up their own mess? Doesn't that sound kind of stupid?

MR. SINGERMAN: That is the process. The parties that are responsible --

MR. BRADY: Well, maybe you need to change your process. If this ain't the first rodeo that you've been through -- when people ask you the same question, maybe you need to sit down with your book and look at your policies and procedures and decide maybe we shouldn't allow people to pay us to clean up their own mess. Maybe we should bill them. And then, if not, we sue their ass.

MR. SINGERMAN: We do bill them for our time. The time we spend overseeing the work --

MR. BRADY: I'm totally sure that you probably have a nice working relationship with Ashland on this site and everything else.

MR. SINGERMAN: We do. They have been very cooperative.

MR. BRADY: I'm sure.

DR. SMITH: I just want to make one more clarification. Hercules is the company that -- DuPont originally owned the site. Hercules bought it from DuPont.

MR. BRADY: And now Hercules is owned by Ashland.

DR. SMITH: Hercules contaminated the site. Ashland came in and bought out Hercules and the --

MR. BRADY: But they are all linked together --

DR. SMITH: They bought the liability --
MR. BRADY: They are all linked together.
AUDIENCE MEMBER: Can you please allow her to finish?
MR. BRADY: Don't be trying to make excuses.
DR. SMITH: I'm just trying to clarify so you understand the line of succession at the site.
So Ashland came in and bought the liability of the Hercules site. So they are coming in and cleaning it up, because Hercules didn't.
MS. SEPPI: It's not only the company that actually did the contaminating of the site, but it's a successor coming in who probably had nothing to do with the actual contamination. But when they bought the company, they assumed their assets as well as their liabilities. And that's what happened in this case.
So that's why we feel that we have a responsible party here who didn't necessarily contaminate the site themselves, but when they took over Hercules, they became responsible for cleaning the site.

MR. BRADY: When you buy a company, you also buy their debt, you buy their problems --

MS. SEPPI: Absolutely. That's correct.

MR. BRADY: So they're responsible for this.

MS. SEPPI: I'm sure they knew that when they took the company over.

MR. BRADY: Maybe they did, maybe they didn't.

MS. SEPPI: That's possible, too. I have no idea.

But thank you for your comment. We appreciate that. We do.

Any other questions?

MR. CAMPBELL: How you doing? Lee Campbell.

The athletic fields that are neighboring the Hercules fund site, was there testing done on them athletic fields where our youth kids play sports? Do you know if -- was there any type of testing?

Because I do know, probably, 10, 15 years ago Hercules was on supply, a water supply, for a sprinkler system. And in that far corner, I don't know what corner it is, the far corner of the property away from the river, they drilled down. They drilled for water. And they did hit benzene.

So that property being there, was there testing done on them athletic fields?

MS. PIERRE: Craig, can you speak to that?

MR. STEVENS: The site's been delineated --

MR. CAMPBELL: I know there's multiple sites all -- you said throughout the town. I was just wondering if that property right next to it was tested.

MR. STEVENS: The testing went up to the property line and right in that area. And reached the EPA required goal, so there's no need to do other testing. The groundwater containment system, the capture zone is along here. Hercules didn't install that. That was done without their knowledge. And testings was done on that well.

So the irrigation wells that you're referring to was installed by someone else in that area. And then it was tested. And you're right. It's within the capture zone. We could predict that deep, not shallow, deep. We're talking 100 feet below the ground surface. There's going to be low levels of impact from the site that would be all within the capture zone. So that irrigation well was never used after that. So does that answer the question?

MR. CAMPBELL: Yeah. I just wanted to know if there was testing actually on them athletic fields. So I guess your answer is there wasn't testing because it didn't go on the outside.

MR. STEVENS: Right. We have delineation along the property boundary in that direction. So there's no need to step out to prove it extends beyond that.

MR. CAMPBELL: What do we have to do to get that -- the EPA, what do we have to do to get them fields tested? Because I'm sure that probably reached over a little bit. What's the chances of getting them fields tested?

MS. PIERRE: Are you referring to the soil?

MR. CAMPBELL: Yes.

MS. PIERRE: So, again, our data does not indicate that the soil contamination extends off the site property. So we do have samples up to the property boundary to show us that the soil contamination does not extend beyond the property boundary.

MR. CAMPBELL: Okay. Thank you.

MS. COLLINS: Pat Collins. 107 West Broad Street. I'm the branch manager at the library. I wanted to invite you to over to review some of the material that Mr. Morlachetta looked at. We have disks and we have flash drives and we have information. Also there are some books going back several years. And they were checked every year during this site work.

Also, my dad worked at Hercules. So it's interesting to listen to this.

But do come over and spend some time in looking at all of the maps. One of the things that was on the report were the floor of the fauna. Was anything done with that in your newer reports? You know, the animals that lived there and the plants that lived there?

MS. PIERRE: Yes. We did conduct an ecological risk assessment as part of the RI. So that information would be in the RI report.

MS. COLLINS: That information would be in the RI. So that information would be comparable to what was there before?

MS. PIERRE: Yes.

MS. COLLINS: Thank you.

MS. SEPPI: RI is remedial investigation, so if you wanted to look up any information -- thank you, Pat. It's nice to know the library is available for anyone who wanted to take a look at it.

Anymore questions?

MS. MEEHAN: I just have one last -- Jennifer Meehan, again. I just have one last comment or question since I know I have a little bit of concern about the whole who's paying for it, and third parties, and the neutral party.

Even though Hercules or the new former Ashland is paying for all this, if there are EPA funds that otherwise would have to be allocated if there wasn't an owner paying for things, could there be an additional fund set aside to have some kind of neutral, outside party that's not involved with the company that's paying for it to do some periodic testing to let residents feel a little bit more confident about what the results actually are?

MR. SINGERMAN: Again, as I said earlier, because of the fact we have liable parties to do the work at our oversight, we're overseeing the work, making sure it's being done properly. The laboratories they all go through are approved EPA laboratories. And there is a third party ensuring that the data is valid. So we have no reason to believe that we need to spend additional funds or government funds to conduct an independent investigation.

Sometimes if we have problems with responsible parties that require the work, we will split samples with them and make sure that we agree with the results.

But in this case, we think that we have a party that's doing an appropriate job. And we don't see a need for samples. We think what's being done, that data they are generating is appropriate and is correct.

And again, as I cited earlier, we think it's a good thing that the responsible party is willing to do the work. Because as I sited in my section, there are no viable parties and sometimes you have to wait several years, depending on how much money, you have to wait for the money.

So if this was a fund financed activity, it's possible that there may be several years before we were able to start. Here, we have a viable party that wants to finish the design. Once they finish the design, they'll be able to go out there and start the work, as opposed to a fund financed effort that could be three, seven years before we actually get the money, because we have limited funding. And we have many sites across the country. There's just not enough budget for this area. It's all 50 states.

MS. SEPPI: It sounds like it's a good idea. We just don't have that kind of money to set aside funding. Any money that we have is trying to be used to clean up the sites that's not being taken care of by the party.

Joel is absolutely right. I mean, I have about 30 sites. There are many of them just kind of sitting out there in limbo because they haven't prioritized them to start receiving money.

So it's a difficult situation if it's a funded site by the EPA. You might have to wait, like Joel said, quite a long time. So at least here we feel like we're moving ahead. It would be nice if we have had that kind of funding that we could give to something.

MS. PIERRE: Just to piggyback on what Joel and Pat said, we do not have the ability to just decide which sites will be funded, where superfund moneys are used for the cleanup, versus a responsible party.

If we have a viable, responsible party, who is willing to do the work, able to do the work, then we have to follow our process, which is to allow them to do the work under our oversight. We don't really have, you know, the authority to change the process.

MR. SINGERMAN: Also, sometimes, you know, other sites we have parties that were responsible, but they are not willing to do the work. Sometimes we have to force them to do the work. In a case like that, perhaps we have to do work, those oversights, sampling. We can't necessarily trust them.

Or if they are not willing to do the work, then what we need to -- we can do the work and then we would bill them. But in this case, we have a liable party, which makes the process go much more quickly because the fact they are doing it at their expense. And we don't have to go through the process of obtaining money to do the work.

We think it's a good thing that we have a responsible party, that's being responsible, that's stepped up to the plate and is doing the work.

Again, it's under EPA's oversight. We're not letting them lose to do whatever they want. They have to develop sampling plants, they have develop quality assurance plans. There's a whole process they have to go through before they can take any samples.

So we have all these people that review these reports and they are experts in the field to make sure that the processing they are using is acceptable, the laboratories they are using are acceptable. We have very close supervision of what's going on.

And like we said, Ashland is being very responsible. And Lora mentioned the fact that she went out to the field and pointed out get a sample from here, there, and there, they weren't happy about it, but they did it.

MS. SEPPI: Sometimes, too, we'll have a responsible property who is not cooperative and refuses to do the work -- and I have a couple sites right now, where they go to court and it comes up in litigation. So in the meantime, that site is kind of sitting there waiting for something to happen. We feel sorry for the people who are living on or near that site, because it's tied up in the courts.

As Joel said, sometimes after awhile we have to step in and just say all right. This is going nowhere. We'll fund the money to clean the site and then we'll collect it from you later. There's a lot of different ways this can happen.

Anymore questions?

MR. BRADY: Are there any other sites that have been identified that've not been dealt with yet in Gibbstown?

MS. SEPPI: I'm not aware of...

MR. SINGERMAN: This is the only National Priorities List site that's in Gibbstown.

MR. BRADY: Say that one more time. I didn't understand.

MR. SINGERMAN: National Priorities -- Superfund sites are put on what's called a National Priorities List. The Hercules site is the only site in Gibbstown that's on the National Priorities List.

There are other sites in other cities in New Jersey, but this is the only one that's in Gibbstown.

MS. SEPPI: Actually, an interesting fact is there's about nationwide approximately 1,400 sites, 1350. New Jersey has approximately 115. New Jersey has more Superfund sites than any state in this country.

And a couple reasons, mainly it's because they are highly industrial. One of the reasons is because we have very strict environmental laws. But I always find it interesting for such a small state, you know, we have that many sites.

MR. STEWART: My name is Doug Stewart. I'm the environmental consultant for Greenwich Township. And I've been reviewing this case for some matter of years. I was involved with the vapor intrusion. We also did check the soil data when the ball fields got flooded about five or six years ago, so we did kind of do that.

And a little different than -- maybe what a lot of these folks can tell you, this isn't really their decision. Yes, it's presented by Ashland. Yes, Ashland pays. But we have been inconsistent at times. And I can say this, I don't work for any of the agencies anymore. I did at one time.

You have federal rules based on federal laws. You have New Jersey laws and New Jersey rules. New Jersey rules, sorry guys, we're better for public health and the community in my view. I worked for the state agency. I gave $200,000 a year, $200 million, a year for cleanups. Over four years, 2,000 cases. And the case where the responsible parties would not do the work, went to, what's called, publicly funded. That's your contract sport. And those are the worst cases.

The contractors change. The contracts are only for so long. And even a case like this, for the amount of time that it's taken, will take longer. Everything is about the contract.

Getting back to -- I couldn't help

anymore -- the number of cases, sites, in New Jersey, and particularly this site, was in 1982 -- EPA had a clear authorization and a track to handle these kind of cases. The EPA didn't have that many employees. The State didn't have that many employees. It took a group of employees who looked at these worst cases and there was a numerical ranking system.

And if New Jersey could get the ranking system high enough to get on the national priority list, it was punted to EPA. And so whether there were more sites actually in New Jersey or New Jersey was just more proactive because the funding wasn't there for the State to do it. The same cases that I have private parties give $200 million a year, the State could have never paid for that.

So that's one of the reasons, quite frankly, I believe, why things take a little longer. At some point, EPA took care of it and they gave some money to the DEP. The DEP helped them along. And DEP did it for a while. It's not a great system. I'm sure there's other states where you guys just do it and the State is not involved with it.

That's the history of where all these sites come from. And to make different decisions relative to residential or the level of cleanup and things like that, it's specified not just in the laws, but, quite frankly, in the rules sometimes.

The New Jersey rules in 1993 were only slightly modified. The state legislature said, You don't have to clean up if it's costs too much. If you can cap it in place if it's not getting in groundwater or if it's not getting into the air. So things like capping are approvable in DEP to modify legislatively a few times.

These guys, they are working in the confines of law. The question that you would like to live anywhere you want in town and it should be cleaned up to that, in North Jersey if you're willing to pay $450,000 for a one bedroom condo and a car park to live on a site like that, I have news for you. You cannot plant a tomato plant. You cannot dig through the liner of your yard. So yes, you can have residential on the property if the market will bear it to have residential from all the environmental controls you have in place.

I just think that's important background on that. And I think, also, that I've been doing this for 36 years. I was both an agency person, briefly a contractor, if anything now, I'm almost an anti-contractor. I do test everybody's paperwork, their samples, their maps, their end points. And it has been done here.

And as far as the future of this property to be put back in productive use, which is, I believe, one of the objectives of the Township, I think this is how we're going to get there for a more productive use.

If anyone has any other questions, I'll stay a little after.

AUDIENCE MEMBER: How did you resolve the vapor intrusion by just capping DuPont?

MR. STEWART: Capping DuPont?

AUDIENCE MEMBER: They went in there and just capped it.

MR. STEWART: Do you mean Hercules?

AUDIENCE MEMBER: No, DuPont.

MR. STEWART: I'm not familiar with vapor intrusion on off site in the residential. But vapor intrusion can be on a residential property or a commercial property if you build the structure to handle it.

In some ways, it's no different than radon. If you have radon in your house and you put in an passive venting system on an active venting system, if you're stuck with contamination, it can't be addressed.

AUDIENCE MEMBER: My question was DuPont had several instances --

MR. STEWART: I'm not familiar with an unknown vapor intrusion coming off the properties.

AUDIENCE MEMBER: But they are about to cap something that's 200 some acres of contaminated soil. How do you stop vapor intrusion from coming through that cap?

MR. STEWART: The allowable levels of capping, as far as the soil removal, and I said it before about capping for residential, nonresidential use, it cannot contribute to groundwater contamination or surface water. And it can't be released to vapor intrusion.

So the things that are being capped are really the things that you can't come in contact with that you can't eat and you can't get on your skin. But they shouldn't be in groundwater. And that's the quantum leap on this basis. They are getting more source control of the contaminants.

And in fact, in this case, a major leap forward is whether or not anyone here wanted are to -- they are using the DEP standards, which are definitely more stringent, the impact of groundwater on this are more stringent than what affects would necessarily apply if it was just their decision.

So New Jersey is looking out for you legislatively as best they can. These guys are stuck with a whole lot of cases because the State of New Jersey couldn't punt the ball to get rid of these cases. They had no money and they had no staff.

So like I said, I'll be here afterwards. I shouldn't have taken any questions from these guys.

MS. SEPPI: No, that's fine.

MR. SINGERMAN: Just to clarify, when the State has a more stringent standard, we always pick more stringent standards.

MR. STEWART: We're not going to have that discussion.

MR. SINGERMAN: We always pick the more stringent standard.

MS. SEPPI: Okay. Anybody else have a question? Sir?

MR. RIDINGER: The tar pits --

MS. SEPPI: Could you come up here, please?

MR. RIDINGER: Ken Ridinger. The tar pits that were mentioned earlier, is that natural tar or is that just a sludge? I mean, what kind of tar are you talking about? Is that like a hotspot of chemicals that were put in the ground?

MS. PIERRE: Our understanding is that the tar pits are bi-product of animal reproduction, the process that DuPont used --

MR. RIDINGER: Still bodies?

MS. PIERRE: Still bodies, correct.

MR. RIDINGER: Is it hazardous?

MS. PIERRE: It is hazardous.

MR. RIDINGER: Okay. Is it lime?

MS. PIERRE: There's a thin permeable cap that does not allow infiltration into the waste.

MR. RIDINGER: I'm not worried about the cap. I'm concerned about the cap, because she talked about the floodplain and the fact that the cap might be an easy way out. Can this -- is this sludge going to go permeate into the ground continually year, after year, after year?

Down the highway, we had the Bridgeport Rentals. They had a sludge pit. That was a Superfund site, I guess you know already. And I'm thinking of the same thing. And isn't it kind of -- I don't know. It's kind of an oxymoron to put a cap on it and walk away from it. I think. Is it a money issue?

MS. PIERRE: It's definitely not a money issue. We certainly haven't walked away from it. The remedy was capping, but we also included groundwater monitoring.

Now, as part of the OU3 remedial investigation, many groundwater samples were collected. And what we saw is that there is really minimal impact to the groundwater in that area.

But for the contaminants that we did see, we are monitoring on a quarterly basis.

MR. RIDINGER: This is oil-based, right?

MS. PIERRE: Yes.

MR. RIDINGER: So you're saying it's never going to make its way down into the water?

MS. PIERRE: What we have seen based on the samples that we've collected during the remedial investigation, also as part of the long-term monitoring, is that there are minimal impacts to the groundwater in that area.

MR. RIDINGER: I would feel better if it got pumped out, or -- you can't get a liner in there now. If it doesn't have a liner, capping it worries me. I just want to make that point. If you have a few extra bucks, get it out of there. That's what I want to say. Thanks.

MR. SINGERMAN: The fact that it has internal memory means that water cannot infiltrate through. So as a result, it's basically no -- water is not getting into it. There's no migrate.

And the fact that groundwater samples are collected around it quarterly, and we don't find anything in the groundwater, that's an indication that it's working.

But again, if something is detected, and in the future -- that's one of the reasons we do five year reviews. We look at the data. If it shows that levels are going up, then we have to reconsider the remedy. At this point, it appears that it's working because the levels are going down.

And the thing is, there was no liner placed there because I believe it was a wetland. So they didn't put a liner down. So it's not reaching as you go off the water that's going through.

MS. SEPPI: Any questions?

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(No response.)

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MS. SEPPI: I thank you all for coming. It was a very lively discussion. And we appreciate that.

And as I said, early next week, if you're interested in seeing this, I will post it online on our web page. And the proposed plan is already up on the web page if you want to go through. There's a lot particular information.

And you have mine and Pat's information.

The press will release the notice that went out. It's on the web page, also. So don't hesitate to call us at any time. We'll be happy to answer any of your questions and answer your calls.

Does everyone know what our web page is? WWW.DPA.gov/Superfund/Hercules-Gibbstown.

Or an easy thing, go to Google. Google Hercules superfund site. It will take you there, too. Any other questions?

MS. COLLINS: Can you send that to me, too, so I can put it on our web address? Thank you.

You have two weeks to put your comments it?

MS. SEPPI: Well, they have until August 28th. Then it will take some time to put the Responsive Summary together. And then we have to get the transcript from Kathryn. And that will have all the questions and comments on it. We'll work on putting those together.

And once the Record of Decision is ready, probably towards the end of September, that's our goal, that will be put online. I'll let people know and make it easier. We have our email list. And you can go on there to see what their decision is and also the response will be answers to your comments. Thank you again.

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Whereupon the meeting concluded at 8:48 p.m.

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C E R T I F I C A T I O N

I, hereby certify that the proceedings and evidence noted are contained fully and accurately in the stenographic notes taken by me in the foregoing matter, and that this is a correct transcript of the same.

____

Kathryn Doyle
Court Reporter - Notary Public

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APPENDIX V-d

Written Comments Received During Public Comment Period

SIERRA CLUB
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NEW JERSEY CHAPTER
145 West Hanover St., Trenton, NJ 08618
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Patricia Simmons Pierre, Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 20th Floor, N.Y., N.Y., 10007
pierre.patricia@epa.gov

Re: Hercules, Inc. Superfund site in Gibbstown, N.J.

Dear Ms. Pierre,

The Hercules, Inc. Superfund Site cleanup up plan with a cap and continued pump and treat is an interim cleanup and not a long-term decision. Based on your own guidance, we the preferred cleanup plan should be a full cleanup plan because it is the only real way to ensure the public health is protected. These methods of institutional controls will fail at some point. We believe the record of decision should call for a complete cleanup plant or remove the tar pits and toxic chemicals underneath it like lead and benzene. This is one of the worst Superfund sites in New Jersey and under the EPA Priority List, it should be treated as such.

We support the remediation plan that includes the removal of contaminated soil on the site and continuing pump and treat of ground water. But we are concerned that it will not fix the underlying problem which are the tar pits. The EPA pumped out 2 billion gallons of contaminated groundwater for the site, but it will continue as long as the tar pit is still there. Pumping is an interim solution, not a full remedy. Toxic chemicals such as benzene and lead are located under the tar pits and pose a serious threat to the community and the environment. Benzene can affect people’s immune system, increase their chance of infection, and even cause cancer. Lead can also cause illness and even in small amounts can lead to brain damage and learning disabilities.

We are concerned that contamination off the site could migrate. If the contamination in the aquifer migrates, local wells may be threatened. Pollutants can leach from the disposal area into the surrounding wetlands or Clonmell Creek and impact wildlife. Toxic chemicals can also spread into the Delaware River because the Clonmell Creek feeds into the river.

The other issue is that the cleanup plan includes capping in a flood prone area. We believe that simply capping over the contaminated soil is not the best action for the environment or the people of Gibbstown. There are other options that could work to better remove and store the contaminated materials until they can be completely removed from the area. Storing them elsewhere rather than capping them keeps the contamination out of the floodplain in the meantime. All of the metals, VOCs, and lead have to be removed from the system because institutional controls will not work here in the long term. We have seen institutional controls damaged or knocked out during floods, releasing toxic water into the nearby water sources.

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We are urging the EPA to make sure that the tar pits are removed in their clean up plan for the Hercules- Gibbstown Superfund site. Capping the contaminated soil will not effectively contain the toxic materials that can leach out into the community and environment. Caps will not address the contaminated soil, they will fail and undo all of the progress of getting rid of the contamination on this site.

If you have any questions or would like to discuss this matter further, please feel free to call me at (609) 558-9100.

Sincerely,

Jeff Tittel

Director, New Jersey Sierra Club

APPENDIX VI

STATEMENT OF FINDINGS — FLOODPLAINS AND WETLANDS

STATEMENT OF FINDINGS — FLOODPLAINS AND WETLANDS

Need to Affect Floodplains and Wetlands

Approximately 218 acres of a 100-year floodplain and an additional 43 acres of a 500-year floodplain are located within the Hercules, Inc. site boundary. The floodplain is associated with the Delaware River and Clonmell Creek and is present, primarily, in the northern portion of the 350-acre site.

In 2007, a wetlands letter of interpretation/line verification was submitted to and approved by the New Jersey Department of Environmental Protection (NJDEP). As part of this effort, the wetlands at the site were mapped and surveyed. The resulting maps indicate that approximately 168 acres of wetlands are present within the site boundary. These mapped wetlands primarily consist of palustrine forested wetland, with palustrine scrub-shrub/emergent wetlands, palustrine emergent wetlands, and open water/emergent wetlands also being present. These wetlands are located to the north and south of Clonmell Creek, from the western to the eastern Site boundary. Clonmell Creek and four small areas located between Clonmell Creek and the on-site Gravel Pit Area are classified as open water/emergent wetlands. Some scrub-shrub/emergent wetland areas are also located in the area between Clonmell Creek and the Gravel Pit Area.

Soils in portions of the floodplain within the site property boundary, sediments in a portion of Clonmell Creek, and sediments in the Stormwater Catchment Basin contain elevated concentrations of contaminants of concern (COCs) that exceed site remediation goals.

The March 2017 baseline ecological risk assessment (BERA) determined that the sediments within the Stormwater Catchment Basin and a portion of Clonmell Creek pose a risk to ecological receptors. The results of the June 2017 baseline human health risk assessment indicated that the contaminated site soils do not pose an unacceptable risk to human health, however, the concentrations of benzene, cumene, and collocated COCs in the shallow groundwater in portions of the site pose a direct contact exposure risk to human health. Because the benzene, cumene, and collocated COCs are present in site soils at concentrations that exceed applicable New Jersey nonresidential direct contact soil remediation standards and are acting as a source of contamination to the groundwater, and because site sediments are associated with unacceptable ecological risk, remedial action alternatives were developed in the feasibility study (FS) to address the soils and sediments in portions of the wetland and floodplain areas at the site.

The selected soil and sediment alternatives, Alternatives S-3 and SED-3 include the excavation and hydraulic dredging of contaminated soils and sediments, respectively, from portions of the on-site floodplain area. Impacts to wetlands, if any, will be associated with the launching and recovery of the hydraulic dredge to remove sediments and are anticipated to be minimal and temporary. Because the Stormwater Catchment Basin was historically a functional stormwater management feature, its associated wetlands have been classified as a poor habitat. The resulting modifications to the Stormwater Catchment Basin area are anticipated to improve the wetland habitat in this area following completion of the selected remedy.

Installation of the soil cover associated with the Alternative S-3 soil remedy is estimated to impact approximately 1.2 acres of the 100-year floodplain and 12.5 acres of the 500-year floodplain in the Tank Farm/Train Loading and Active Process Areas. Although the floodplain will be modified in this area, the soil cover will alleviate ponding in the Tank Farm/Train Loading Area, which currently causes increased recharge to the shallow groundwater table. Minimizing groundwater recharge in this area will decrease groundwater seepage velocities, thereby improving stormwater drainage in the southern portion of the site, increasing the protectiveness of the groundwater remedy. Temporary disturbance of approximately 2.9 acres of the 100-year floodplain and 0.7 acres of 500-year floodplain is expected to occur in the Stormwater Catchment Basin and Northern Chemical Landfill Areas where the dredged sediments and the hydraulic dredge will be staged, respectively. Approximately 1.6 acres of the 100-year floodplain are anticipated to be temporarily disturbed as part of the expansion of the Stormwater Catchment Basin area to improve storm water drainage in this area over the long term.

In addition to the selected soil and sediment alternatives, the FS considered no-action alternatives, Alternatives S-1 and SED-1, which would not entail excavation of contaminated wetlands/floodplains soils and sediments. Under Alternatives S-1 and SED-1, the contaminated soils and sediments would have remained in-place, posing a risk to on-site ecological receptors, and would have continued to act as a source of contamination to the groundwater. Thus, the no-action soil and sediment alternatives would not be protective of human or ecological receptors. The implementation of any of the action alternatives developed in the FS would be more protective of human health and the environment than the no-action alternatives, because they would meet the remedial action objectives and remediation goals for the site and would result in less residual risks than the no-action alternatives.

EPA and NJDEP have determined that there is no practicable alternative that would be sufficiently protective of human health and the environment that would not result in the excavation of the soils and sediments located in the floodplain and wetlands areas. Consequently, any remedial action that might be taken would affect the floodplain and wetlands associated with the site.

Effects of Proposed Action on the Natural and Beneficial Values of Floodplains and Wetlands

Excavation of contaminated sediments and soils in the wetlands and floodplain will result in temporary, localized disturbance to the on-site wetlands and floodplain. The estimated construction timeframe for the selected remedy is 12 months. It is not anticipated that implementation of the selected remedy will result in any significant alteration of the existing site hydrology.

The primary benefit of the selected remedy will be the removal of the soil- and sediment-bound contaminant mass from the floodplains in several portions of the site and the wetland areas associated with the Stormwater Catchment Basin. The contaminated sediments will be removed from the floodplains and will no longer function as a source of contamination for the downstream areas or pose risk to ecological receptors. In this context, the selected remedy will have a substantial positive impact on both the natural and beneficial values of the floodplain and wetlands.

Compliance with Applicable State or Local Floodplain Protection Standards

All remedial work in the wetlands and floodplain bed will need to comply with the substantive requirements of the New Jersey Rules on Coastal Resources and Development (7:7E-1.1 *et seq*.), Freshwater Wetlands Protection Act (NJSA 13:9B-1 et seq.), Flood Hazard Area Control Act Regulations (NJAC 7:13-10,11) Soil Erosion and Sediment Control Act (NJDA 4:24-39 *et seq*.)_as well as Executive Order 11988, Executive Order 11990, 40 CFR Part 6 Appendix A, "Statement of Procedures on Floodplains Management & Wetlands Protection," and Section 404 of the Clean Water Act.

Measures to Mitigate Potential Harm to the Floodplains and Wetlands

Mitigation measures will be undertaken to reduce impacts on floodplains and wetlands, including:

- application of engineering procedures to the wetlands (*e.g.,* berms, silt curtains, etc.) during remediation to prevent spreading of contaminated sediments particularly during a flood event;
- restoration of the disturbed remediated wetlands and floodplain soils, if necessary;
- restoring the existing floodplain resources affected by the selected remedial action;
- development of a five-year wetland restoration monitoring plan during the remedial design to ensure that the restoration achieves the desired result and to protect against the establishment of unwanted invasive plant species; and
- routine inspection of the restored wetlands and replanting to ensure adequate survival of the planted vegetation.